To: CN=Maryt Smith/OU=DC/O=USEPA/C=US@EPA;CN=Julie Hewitt/OU=DC/O=USEPA/C=US@EPA;CN=Paul Balserak/OU=DC/O=USEPA/C=US@EPA[]; N=Julie Hewitt/OU=DC/O=USEPA/C=US@EPA;CN=Paul Balserak/OU=DC/O=USEPA/C=US@EPA[]; N=Paul Balserak/OU=DC/O=USEPA/C=US@EPA[]
Cc: []
From: CN=Paul Shriner/OU=DC/O=USEPA/C=US
Sent: Mon 8/1/2011 1:01:03 PM
Subject: FYI - summary of NY final policy

The following performance goals are identified for selection of BTA to minimize adverse environmental impact from a CWIS:
1. Dry closed-cycle cooling as the performance goal for all new industrial facilities sited in the marine and coastal district (ECL § 13-0103) and along the Hudson River up to the Federal Dam in Troy;
2. Wet closed-cycle cooling as the minimum performance goal for all new industrial facilities located along all waters other than those covered by 1 above;
3. Wet closed-cycle cooling or its equivalent as the performance goal for existing industrial facilities that operate a CWIS in connection with a point source thermal discharge; and
4. Wet closed-cycle cooling as the performance goal for all repowered industrial facilities that operate a CWIS in connection with a point source thermal discharge.

Ex. 5 - Deliberative Also note the following exemption

Exemption from the Entrainment Performance Goal
An existing electric generating facility operated at less than fifteen (15) percent of its electric generating capacity over a current 5-year averaging period will be subject to the impingement mortality reduction performance goals of this policy and may be exempt from meeting the entrainment performance goal....

To: CN=Paul Balserak/OU=DC/O=USEPA/C=US@EPA[]
Cc: []
From: CN=Paul Balserak/OU=DC/O=USEPA/C=US
Sent: Wed 8/3/2011 2:09:49 PM
Subject: Fw: FYI - summary of NY final policy

Paul Balserak
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Washington, DC 20460
202-566-0072

----- Forwarded by Paul Balserak/DC/USEPA/US on 08/03/2011 10:09 AM -----

From: Paul Shriner/DC/USEPA/US
To: Maryt Smith/DC/USEPA/US@EPA, Julie Hewitt/DC/USEPA/US@EPA, Paul Balserak/DC/USEPA/US@EPA
Date: 08/01/2011 09:01 AM
Subject: FYI - summary of NY final policy

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To: CN=Paul Balserak/OU=DC/O=USEPA/C=US@EPA[]
Cc: []
From: CN=Paul Balserak/OU=DC/O=USEPA/C=US
Sent: Thur 8/11/2011 7:53:05 PM
Subject: Fw: FYI - summary of NY final policy

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----- Forwarded by Paul Balserak/DC/USEPA/US on 08/11/2011 03:53 PM -----

From: Paul Balserak/DC/USEPA/US
To: Paul Balserak/DC/USEPA/US@EPA
Date: 08/03/2011 10:09 AM
Subject: Fw: FYI - summary of NY final policy

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----- Forwarded by Paul Balserak/DC/USEPA/US on 08/03/2011 10:09 AM -----

From: Paul Shriner/DC/USEPA/US
To: Maryt Smith/DC/USEPA/US@EPA, Julie Hewitt/DC/USEPA/US@EPA, Paul Balserak/DC/USEPA/US@EPA
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Progress Energy

August 18, 2011

Sent Via E-mail (OW-Docket@epa.gov)
Water Docket
U.S. Environmental Protection Agency
Mail Code 4203M
1200 Pennsylvania Ave., NW
Washington, DC 20460

RE: Comments on the U.S. EPA's Proposed §316(b) Rule for Cooling Water Intake Structures at Existing Facilities and New Units: Docket No. EPA-HQ-OW-2008-0667

Dear Sir or Madam:

Progress Energy is a regional energy company located in the Southeast region of the United States providing electricity to more than 3 million customers. Progress Energy is organized as a holding company that operates regulated utilities in the Carolinas and Florida. Progress Energy owns and operates more than 22,000 megawatts of electrical generating capacity. Of that total capacity, 14,000 megawatts are produced by steam electric generating facilities that require cooling water and will be affected by the subject proposed rule. On behalf of these operations, I am writing to provide comments on the EPA's proposed rule establishing requirements for cooling water intake structures at existing facilities and Phase I facilities, 76 Fed. Reg. 22174-22288 (April 19, 2011). Progress Energy is a member of the Edison Electric Institute, the Nuclear Energy Institute and the Utility Water Act Group, and the Company supports the comments submitted by these organizations. In addition, the Company supports the comments by the Electric Power Research Institute (EPRI) on technical aspects of the proposed rule.

The cooling water intake structure rule is one of several new, federal environmental regulations that Progress Energy faces. The Company is currently addressing an unprecedented convergence of new federal regulations. Like many in the industry, Progress Energy is in the midst of a long-term transformation and has invested billions in modern pollution controls, made the difficult decision to shutter some older coal-fired facilities and begun expending significant capital on a state-of-the-art power system, including natural gas-fueled facilities and a smarter grid. However, the Company's mandate – to provide affordable, reliable electricity safely and in an environmentally responsible manner – has not changed. Progress Energy urges the EPA to collaborate with the other federal agencies, the electric utility industry and engaged stakeholders to understand the total impact the cooling water intake structure rule, in conjunction with other pending and proposed regulations, will have on the electric utility industry and its customers. The Company believes such a dialogue would lend itself to a more integrated, flexible and efficient transition that minimizes the cumulative impact on customers.

Progress Energy Service Company, LLC
P.O. Box 1551
Raleigh, NC 27602

The Company recognizes the tremendous task that the Agency has undertaken in developing this proposal and agrees with some of the decisions made. First, Progress Energy concurs with EPA's determination that modified traveling screens with a fish collection and return system, or a reduction of intake velocity, are for the most part, cost-effective technologies for reducing impingement mortality (IM) that would be workable at many, but not all, facilities. In addition, Progress Energy agrees with EPA's determination that no single technology can be designated as best technology available to minimize entrainment and a site-specific determination is the most appropriate approach. Lastly, Progress Energy strongly supports EPA's proposed definition for "new unit" at an existing facility which does not include rebuilt, repowered or replacement units.

While the Company agrees with certain aspects of EPA's approach as noted above, Progress Energy respectfully submits that other portions of the proposal are flawed and lack sufficient support on the basis of facts, documents and data collected in the record. The Company's detailed comments will focus on the following points:

- EPA has interpreted §316(b) such that the Agency is obligated to establish standards based on the best technology available to minimize impingement and entrainment regardless of whether or not there is adverse impact to the environment;

- EPA has proposed numeric IM limits that are too rigid and unworkable;

- EPA has proposed monitoring requirements to demonstrate compliance with the proposed IM standards that are unreasonable and too costly;

- EPA has underestimated the level of effort and expense that will be required to install modified traveling screens with fish collection and return systems;

- EPA has failed to provide any relief for facilities that have very low levels of impingement or impingement mortality;

- EPA has proposed a velocity limit as an alternate standard for reducing IM that is unnecessarily restrictive and which must be met under all conditions;

- EPA has proposed that shellfish protection for facilities withdrawing water from oceans or tidal waters be comparable to barrier nets which is unnecessary and, in some cases, infeasible;

- EPA has proposed that all facilities include a means for impingeable fish and shellfish to escape the cooling water intake system without demonstrating that entrapment is a significant issue;

- EPA has proposed that all facilities with traveling screens modify those screens with fish collection and return systems even if the facility employs closed-cycle cooling or complies with the velocity standard;

- EPA has failed to designate existing facilities with an intake flow of less than 125 million gallons per day (MGD) as compliant with the proposed entrainment mortality standard

even though the benefits of entrainment mortality controls most likely would not justify the costs;

- EPA has failed to exempt existing facilities with a design intake flow of five percent or less of the mean annual flow of a freshwater river or stream, and those that withdraw cooling water from a lake or reservoir, from the entrainment mortality standard even though the risk of significant entrainment is minimal;

- EPA did not list benefits derived from existing mitigation efforts as outcomes that should be included in the Benefits Valuation Study;

- EPA has created a potential dilemma stemming from the different compliance timelines for the impingement and entrainment standards;

- EPA has proposed a specialized definition for closed-cycle recirculating cooling systems that is too restrictive and too rigid; and

- EPA requires submission of the Impingement Mortality Reduction Plan, the Entrainment Mortality Data Collection Plan and other information within six months of the effective date of the rule which is unreasonable and unrealistic.

EPA's Obligation Under Section 316(b) of the Clean Water Act

Section 316(b) of the Clean Water Act requires that "any standard established…applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact." As stated in the proposed rule's preamble, EPA has interpreted §316(b) such that the Agency is obligated to establish standards based on the Best Technology Available to minimize impingement and entrainment. Progress Energy does not concur that any rate of impingement or entrainment mortality, no matter how small or large, is necessarily adverse or harmful to the environment. Moreover, after conducting long-term monitoring at many of its steam-electric plants with once-through cooling systems, the Company has not observed adverse impacts on fish populations and the ecosystems that support them resulting from impingement and entrainment. No adverse effect to fish, shrimp, and crab populations has been detected at the Company's Brunswick Plant, located on an estuary, after over two decades of estuarine population monitoring. This was true even before intake modifications designed to reduce entrainment and impingement were installed at the site. Furthermore, estuarine fish population studies repeated during 2001-2002 indicated no adverse changes in species composition, abundance, size structure, or spatial and seasonal distributions. Similarly, continuous fish population monitoring in Hyco Lake from the late 1970s to date indicate no adverse effects of entrainment and impingement resulting from once-through cooling operations at the Roxboro Plant located near Semora, NC. Results indicate balanced fish populations and strong recreational fisheries. Independent sampling of target recreational species in Hyco Lake conducted by the North Carolina Wildlife Resources Commission (NCWRC) also indicate balanced recreational fisheries.

Impingement Mortality (IM) Standard, Option #1 – Numeric Mortality Limits

In the proposed rule, EPA selects state-of-the-art traveling screens modified with fish buckets, low-pressure screen wash, dedicated fish return system, etc. as Best Technology Available; establishes numeric IM limits (monthly maximum and annual average); and specifies at least bi-weekly monitoring to demonstrate compliance.

EPA's determination that modified traveling screens can be highly effective in reducing IM is correct.

Progress Energy agrees that traveling screens modified with modern fish collection and return systems can be highly effective in reducing IM. However, the Company believes that there are other technologies and measures (including passive screens, barriers, or behavioral devices that do not meet the proposed velocity limit, not to mention carefully selecting the intake location to avoid impingeable fish) that have also proven effective at reducing impingement. Notwithstanding, the proposed rule renders many previously approved cooling water intake structure modifications – specifically designed to reduce fish impingement and in many cases resulting from regulatory proceedings – invalid and irrelevant.

The proposed numeric IM limits are too rigid and unworkable.

Progress Energy has several major concerns with the numeric limits as follows:

- As proposed, the standard would apply to all species and "all life stages of fish that are collected or retained on a 3/8 inch sieve." Mortality rates are highly dependent on the species collected. For some species such as bay anchovies, which are prevalent in the coastal waters in the Southeast region of the country, the simple act of handling the fish will result in high rates of mortality. In addition, life history characteristics of some fish species such as bay anchovies and clupeids are such that the risk of adverse effects from localized impingement to the population is minimal. Fish species such as these are characterized by having relatively high population levels, high fecundity rates, serial spawning and widespread distributions and spawning locations. Further, a large number of species may be present at any particular site, but only a few species are routinely impinged in relatively large numbers. Over two hundred species have been documented at the Company's Brunswick Plant, but only nine to ten species comprise 90-95% of the total number impinged annually. Moreover, impingement at some sites may be dominated by non-native species. This is the case at the Company's Cape Fear Plant where threadfin shad, a non-native endemic to the central region of the United States, comprised 78% of the total number of fish impinged annually. A reasonable approach would be to establish species of concern (SOC) or representative important species that would be tested and monitored for IM. This SOC list would necessarily be site specific due to differences in region and water body types. The SOC list would be established through interactive negotiations with the permittee and state resource and regulatory agency personnel as these individuals would have the most knowledge of the species found in the local water bodies. Criteria for the selection of species could include, but not be limited to, dominance in impingement samples, life history or environmental characteristics that increase or decrease risk from impingement, ecological significance and recreational or commercial importance.

- It is not clear whether the standard would be applied to the total number of fish collected or to each species separately. Progress Energy recommends that the standard be applicable to a site-specific SOC list as described above.
- The rule's proposed mortality limits were based on a limited number of studies (two freshwater and one estuarine) from New York state and do not account for variability in impingement mortality (IM) on a national level. Additional IM data must be considered before reasonable numeric IM limits are adopted. The various waterbodies across the United States from which cooling water is withdrawn contain a significant diversity and abundance of aquatic organisms. Any national numeric standard must take into account these large differences by adopting limits that are reasonably achievable with the installation and operation of Beset Technology Available technologies. EPA's justification for excluding numerous nationwide studies is unclear and inconsistent at best. As an example, EPA discounted many IM study results based on holding times greater than 48 hours, on the assumption that longer holding times introduce an added source of mortality due to the inability to feed the test subjects. Initial survival monitoring at Progress Energy's Brunswick facility located on an NC estuary incorporated a 96-hour holding time. Results indicated that latent mortality was completely accounted for within the first 48 hours. No additional mortality occurred from 48 to 96 hours. In other words, survival study results based on 96-hour holding time were completely valid.
- The proposed standards would unfairly penalize facilities that have low rates of impingement. If a facility impinges only a few fish a month and one dies, the facility could easily violate the IM standard, yet any adverse environmental impact would be minimal.
- The proposed standards provide no credit to a facility that has already installed measures to reduce impingement. At the Company's Brunswick Nuclear Plant, a diversion structure constructed at the mouth of the cooling water intake canal has been demonstrated, based on long-term monitoring data collected before and after its construction, to be highly effective for reducing impingement rates. Yet, with the proposed rule, the compliance focus would be solely at the plant's intake screens. Full consideration must be given to facilities that already have technology improvements fully authorized and mandated by previous NPDES permit requirements.

The proposed monitoring requirements are unreasonable and costly.
The draft rule proposes that monitoring for IM is to be conducted on a weekly or bi-weekly basis for the life of the facility (LOF). Monitoring requirements of this scope and frequency are not warranted or justified. The permittee and its state regulatory and resource agencies have the most knowledge and best understanding of aquatic communities in the local waterbodies. Therefore, monitoring requirements should be established by the state permitting authority and not be nationally mandated. In addition, weekly or bi-weekly sampling frequencies proposed for monitoring of IM for the life of the facility provide no additional information of value. Numerous reasons lead to this conclusion including:

- Periods of greater impingement rates typically occur seasonally and vary with respect to location and species present. At the Company's Brunswick plant, located on an estuary, finfish impingement is greater during the winter months, and the impingement of shellfish (penaeid shrimp and blue crab) is greater during the summer. Impingement

characterization studies at the Cape Fear Plant, located on a freshwater river, indicate greater impingement rates during the winter and little impingement the remainder of the year. The important consideration here is that sampling frequencies for impingement mortality (IM) can be optimized by conducting sampling in a stratified fashion targeting periods of greatest abundance. This minimizes effort while increasing the quality of the results. Sample sizes are increased and handling times are minimized since more target organisms are available. It is important to note sampling frequencies will necessarily vary by region and waterbody type.

- There is no reason to believe that survival and mortality rates of target organisms established during initial testing will change as long as there are no changes in traveling screen and return system technologies or operation. Impingement survival studies were conducted at the Company's Brunswick Plant from 1984-1989. Results indicated that seasonal and inter-annual variability of IM for target species was adequately addressed with 1-2 years of monitoring. Initial monitoring to demonstrate the proper installation and function of Best Technology Available (BTA) technologies would be appropriate, but additional monitoring should be limited.
- EPA also reasons that IM monitoring for the life of the facility is needed to address any shifts in species composition that might occur where a more fragile species becomes dominant over a hardy species targeted during original studies. This reasoning is not valid since routine state resource and regulatory agency monitoring programs will detect any such changes in species composition and formal IM testing can be commenced at the request of the state permitting authority. EPA has no data to support the contention that more fragile species could become dominant over time. It is reasonable to require periodic verification of the efficacy and operation of technology-based systems to reduce impingement losses. It is unreasonable to require continuous, life of facility monitoring for facilities that have BTA, or demonstrated equivalent technologies, installed and operating.
- IM monitoring will be costly. Specialized holding tanks and a constant flow-through water supply are required. Specialized sampling gears must be adapted to each specific facility. An entire laboratory facility was maintained just to conduct IM sampling at the Company's Brunswick Plant. Additional personnel also were required to facilitate successful IM monitoring. Six individuals were required to conduct sampling and stocking of the holding tanks. Numerous personnel were required to facilitate rapid transfer of test subjects from the sampling gear to the holding tanks. In addition, sampling for IM was conducted at night since more organisms were available after dark. This resulted in extended work hours for numerous personnel. 48-hour holding times began once organisms were placed into the holding tanks, requiring the staffing of additional personnel until the end of the latent IM assessments. Personnel were needed during this time to periodically monitor water quality and remove dead organisms.

Installation of modified screens with fish collection and return systems may be infeasible, or at least very costly, at some sites.

Progress Energy has several facilities that do not currently employ traveling screens. The installation of traveling screens at some of these facilities may require major modifications to the cooling water intake including its location. At other facilities which currently have traveling screens, installing fish return systems that do not "promote predation or re-impingement of fish" could present significant challenges. At the Company's Roxboro Plant, the location of the intake

structure relative to site infrastructure (buildings, railways, support structures, discharge canal, etc.) is such that a long, winding fish return flume would be required to return fish to an appropriate location. The fish return flume itself is likely to introduce a source of mortality due to its long convoluted layout. A similar effect may occur at the Company's Crystal River facility due to the long return system that would be required to return organisms to an appropriate location in the Gulf of Mexico.

Installation of modified screens with fish collection and return systems is unreasonably costly at sites with minimal impingement.
As a result of studies conducted in response to the Phase II rule (2004), Progress Energy found that impingement rates at several facilities were very low. Specific examples follow:

- An impingement sampling program at the Company's Suwannee River Plant collected a total of 19 fish over 25 impingement sampling events. No crayfish, mussels or other invertebrates were collected over the duration of the sampling program. Extrapolating sampling results with operational flow data yields an estimated 7,314 fish impinged during one full year of plant operation.
- Impingement characterization studies were conducted at the Company's Cape Fear Plant during 2005-2006. The dominant native species impinged was bluegill. An estimated 4,113 bluegill were impinged annually based on actual intake flow. There are several ways to assess the relative magnitude of this specific impingement impact. One is to assess the economic value of the impact. In a report prepared by EPRI entitled "Estimates of the Economic Value of Entrainment and Impingement Losses: Facility No. 387NC8P," the estimated annual economic value of bluegill impinged at the Cape Fear Plant was only $597.58.

Progress Energy believes that installation of modified screens with fish collection and return systems at facilities with minimal impingement rates is not cost-effective or warranted.

Impingement Mortality (IM) Standard, Option #2 – Velocity Limits

As an alternative to complying with the numeric IM limits, EPA has proposed allowing facilities to comply with the IM standard by demonstrating that the through-screen design velocity does not exceed 0.5 feet per second, or by demonstrating that the actual average intake velocity does not exceed 0.5 feet per second.

The requirement to comply with a through-screen design velocity limit under all conditions is unnecessarily rigid.
Progress Energy agrees that a reduction in through-screen velocity is an effective means of reducing IM. EPA correctly recognizes that achieving the velocity reductions necessary to comply with the proposed velocity limit would not be possible at all facilities due to space constraints and other factors. However, the standard as it pertains to intake design velocity is made more difficult to achieve by requiring that it be met "under all conditions, including during minimum ambient source water surface elevations (based on the Director's judgment using hydrological data) and maximum head loss across the screens." Complying with the design velocity standard at all times may not be technologically feasible or economically practicable for once-through facilities, including some that cannot meet the IM percentage standards either. Meeting the velocity standard would require either enlarging existing intakes; using passive screens or nets deployed year-round, which may be infeasible in some cases and very costly in

many cases; or retrofitting closed-cycle cooling to reduce flow (which, as EPA's own cost estimates show, would be enormously costly).

Progress Energy recommends that the impingement mortality (IM) standard for velocity be modified such that the limit need not be met "under all conditions." The Company believes that relatively infrequent events with short durations during which intake velocity increased to a rate greater than 0.5 feet per second, would not result in measurable harm resulting from an increase in impingement. Accordingly, Progress Energy recommends the requirement be modified such that excursions with infrequent recurrence intervals are allowed. Examples of modifications that would provide the needed flexibility include, but are not limited to, the following:

- for lakes, establishing a limit on lake elevation variability based on a watershed model, or past elevation data, that would predict recurrence intervals for extreme events;
- amending the design velocity standard as one that applies except under conditions that are likely to occur less than 2 or 5 percent of the time; or
- simply allowing permit writers to authorize brief periods of increased velocity.

IM Standard – Additional Requirements

In addition to the impingement requirement that all plants meet limits for IM or intake velocity, the proposal would require that (1) facilities on marine or tidal waters use barrier nets or other technology for shellfish protection; (2) all facilities provide a means for impingeable fish or shellfish to escape the intake system or be returned to the waterbody; and (3) all "active screens" (which the Company understands to mean those screens that move, in contrast to those that are stationary) include advanced fish protection and return features such as modified buckets, guard rails, smooth woven mesh, a low-pressure wash, and a fish handling and return system, even if the facility achieves the velocity standard or the IM standard using some other type of technology. For the most part, Progress Energy believes those additional requirements are unnecessary or not feasible.

The requirement for facilities withdrawing cooling water from the ocean or tidal waters to reduce IM of shellfish to a level comparable to that achieved by properly deployed barrier nets is unnecessary and not feasible at all sites.

EPA states in the preamble that this additional requirement is needed because "shellfish such as crustaceans may pose a unique issue for traveling screens because the shellfish are not impinged, but rather they may grab hold of the traveling water screen surface and are not removed from the traveling screen by pressure wash sprays." The use of barrier nets either seasonally or year-round in addition to modified traveling screens and a fish return system is not justified. EPA did not provide any evidence in either the proposed rule or the Technical Development Document that carry over of shellfish on traveling screens warrants any concern. EPA's concern is inconsistent with the data Progress Energy has collected at its Brunswick Plant. The Plant has operated with modified traveling screens and a fish return since 1983. Shellfish, primarily blue crab (*Callinectes sapidus, C. similis, C. ornatus*) and penaeid shrimp (*Farfantepenaeus aztecus, F. duorarum, Litopenaeus setiferus*) comprised 16% of the total number and 37% of the biomass impinged on the traveling screens during 2009. Approximately 96% of the blue crab and 90-94% of the penaeid shrimp were returned alive to the estuary.

The use of barrier nets would be infeasible at many sites. Intake canal configurations, usage, and species present may not be compatible with barrier net installation or operation. For example, at the Company's Crystal River Plant, the cooling water intake canal is also used by large, American Bureau of Shipping, ocean-going barges to routinely transport coal to the site to fuel four, base-load, coal-fired electric generating units. It would be impractical to deploy a barrier net and then retract it each time a barge enters or exits the canal. Another significant concern with barrier nets at the Crystal River Plant would be the possibility of an entanglement hazard for the endangered West Indian Manatee, as well as four species of threatened or endangered sea turtles, that routinely frequent the area.

Progress Energy believes there are several other factors that would make the use of barrier nets infeasible at all sites. Those factors include the following:

- high rates of biofouling and debris loading that could occur at some locations, especially those located in marine coastal environments;
- high volumes of gelatinous zooplankton (jellyfish and ctenophores) that would be encountered at its coastal sites;
- the possibility of significant gilling of fish that might occur in using a barrier net to protect shellfish;
- the difficulty of safely deploying barrier nets in tidal waters given the effects of strong tidal and wind-driven currents and significant wave action that occur at these locations; and
- safety-related issues (e.g., necessary service water withdrawal) that might occur at nuclear facilities should a barrier net break free and become impinged on the trash racks of a cooling water intake structure.

The requirement for facilities to ensure that there is a means for impingeable fish or shellfish to escape the cooling water intake system or be returned to the waterbody through a fish return system is unnecessary and should be omitted.

Progress Energy does not agree that entrapment is a valid concern. EPA does not provide any data in the rule or the Technical Development Document indicating that entrapment of impingeable-sized fish is a significant issue. EPA appears to be concerned with the possibility that significant numbers of larger, impingeable fish may become entrapped by barriers or in the intake pipes of offshore intakes or in the forebays to which these offshore intakes lead. This concept is inconsistent with reality considering that barriers, barrier nets, and offshore intakes themselves are constructed with the aim of protecting fish populations. Barriers and barrier nets are designed and installed with through-screen velocities of less than or equal to 0.5 feet per second (fps). In addition, most use screening as an additional aid in minimizing the entry of fish. Fish small enough to pass through the screening are entrainable sized fish and will be addressed under the entrainment standard. Offshore intake pipes minimize impingement of larger fish by use of velocity caps ($\leq$ 0.5 fps) and location of the intake itself (i.e., offshore in deeper water well away from locations with relatively high fish densities). It is not logical that significant numbers of large fish would be unable to avoid escape from a velocity cap, and EPA fails to provide any data to the contrary. Similar to barriers, any entrainable-sized organisms that might enter an offshore intake would be subsequently entrained at the intake structure and addressed by the rule's entrainment requirements.

The additional requirements for protective measures applicable to any facility "that employs traveling screens or equivalent active screens" are excessive and unjustified.
The proposed regulation would require all facilities with traveling screens to add "protective measures including but not limited to: buckets designed to minimize turbulence, guard rails or barriers, replacement of screen panels with smooth woven mesh, a low pressure spray to remove fish prior to any high pressure spray on the ascending side of the screens, and a fish handling and return system with sufficient water flow to return the fish to the source water in a manner that does not promote predation or re-impingement of the fish." Progress Energy believes this open-ended requirement goes too far and should be removed. It appears that this requirement would apply to all traveling screens even if the facility is achieving compliance with the impingement mortality (IM) standard without those measures, or is complying or proposes modifications that will comply with the velocity standard, or has or proposes to retrofit closed-cycle cooling. Imposing the substantial cost of such retrofits is excessive and unjustified.

If EPA's goal is to ensure that facilities achieve a consistent level of mortality reduction, then a facility achieving that standard has passed the test and should be in compliance. If EPA's goal is to ensure that all facilities have and are properly maintaining the technology EPA selected as Best Technology Available (BTA), then it should allow facilities to demonstrate that they have done so, without reference to a performance standard. There is no basis for requiring all facilities to do both. For the same reason, there is no legitimate reason for requiring facilities that meet the velocity standard or have closed-cycle cooling, or propose to do so, to add screening technology to achieve some further level of reduction.

Progress Energy's Recommended Approach for IM

Progress Energy believes that the modified traveling screen technology EPA has chosen as BTA can be highly effective at reducing IM for many species of fish and shellfish. However, the Company is convinced that consistent compliance with the proposed IM numeric limits will be unachievable. As it has explained in the previous paragraphs, Progress Energy has many other serious concerns with the proposed IM standard. Accordingly, Progress Energy recommends that the EPA modify the proposed rule such that a permittee could choose to demonstrate compliance with the BTA standards for IM by selecting either of two regulatory tracks.

Under Track I, a facility could choose to have the state permitting authority determine standards for IM on a site-specific, case-by-case basis in conjunction with the permitting authority's determination of the facility's entrainment mortality standard. These standards would reflect the state's determination of the maximum reduction in IM warranted after consideration of all factors relevant for determining the best technology available at each facility, including the factors specified in § 125.98. Track I would allow for site-specific consideration of impingement rates for species of concern and existing measures a facility may have already taken to reduce impingement.

Under Track II, a facility could forego the additional studies and negotiations inherent to Track I and commit to installing a pre-approved BTA (modified traveling screens with a fish return system or a velocity limit). Under Track II, the facility would be required to operate and maintain the technology in accordance with an approved guidance manual. Also, the automatic requirement for barrier nets or equivalent technology and the prohibition against entrapment would not be required under Track II.

Regardless of which track is chosen, facilities with closed-cycle cooling would be deemed compliant with the impingement mortality standard, and no additional requirements would be applicable.

Entrainment Mortality Standard

In the preamble, EPA concludes that a single technology, such as wet closed-cycle cooling, cannot be identified as Best Technology Available (BTA) for entrainment. Instead, EPA proposes a framework by which permit writers would select BTA for entrainment mortality on a case-by-case basis. The Company agrees with this approach. However, there are a few modifications to the proposed rule regarding entrainment that Progress Energy recommends.

Existing facilities with an actual intake flow of greater than 2 MGD, but less than 125 MGD, should be deemed compliant with the entrainment mortality standard unless the permit writer has specific information that can be used to justify additional studies or entrainment controls.

EPA explains in the preamble to the proposed rule that it has determined that a threshold of 125 MGD would capture 90 percent of actual flows and focus permit authorities on the majority of cooling water withdrawals. Accordingly, Progress Energy recommends that the Agency establish a regulatory presumption that the benefits of entrainment mortality controls for such facilities do not justify the costs, absent otherwise available site-specific information to the contrary. This approach would alleviate uncertainty and reduce burdens for both permit writers and the regulated community, while leaving permit writers the flexibility to inquire further where available information indicates that there is a material reason for concern.

The proposed rule should exempt existing facilities with a design intake flow of five percent or less of the mean annual flow of a freshwater river or stream, and those that withdraw cooling water from a lake or reservoir, from the entrainment mortality standard.

In the 2004 Phase II rule, EPA correctly exempted facilities having a low propensity for causing significant entrainment impacts due to several relevant factors including general waterbody characteristics (e.g. life histories of species present). The earlier determination was not challenged in court by any stakeholder and was proper. Keeping the waterbody type and proportional flow provisions of the 2004 Phase II rule in the final rule for existing facilities would reduce the burden on state permit writers while preserving the effectiveness of the rule in minimizing entrainment-related impacts.

The benefits of existing mitigation should be included in the Benefits Valuation Study described at § 122(r)(11) and should be considered by the Director when site-specific entrainment mortality controls are determined per § 125.98(e).

As proposed, §122(r)(11)(iii) specifies that the permittee include "recent mitigation efforts already completed" in the Benefits Valuation Study. Progress Energy recommends that "recent" be replaced with "existing." Progress Energy has acted to mitigate impingement and entrainment impacts at several of its facilities. These past actions were required by permitting authorities and were often the product of good faith negotiations. The benefit produced should be recognized and accounted for in the Benefits Study. A good example is the Company's Crystal River Plant in Florida.

The current NPDES permit for Crystal River Units 1-3 (NPDES FL0000159) was issued with a Fact Sheet that recognized the unique regulatory history concerning Best Professional Judgment (BPJ) under Clean Water Act § 316(b) for these units. The Fact Sheet included the following language:

> "316(b) Considerations: Section 316(b) CWA requires that the location, design, construction, and capacity of a cooling water intake structure reflect the best technology available for minimizing environmental impacts. In 1988, EPA determined that a reduction of plant flow by 15 percent during the months of November through April, in conjunction with the construction and operation of a fish hatchery over the remaining operating life of the three units constituted minimization of the environmental impacts of the cooling water intake."

More specifically, the Mariculture Center at Crystal River, which remains in place, was required under a negotiated settlement between EPA and Progress Energy's Florida utility to resolve litigation concerning renewal of the NPDES permit in the late 1980s. Environmental studies at the time identified twelve marine species considered to be significantly affected by entrainment and impingement at these units. As part of the negotiated NPDES permit settlement, the Company committed to constructing and operating a multi-species marine hatchery to address these entrainment and impingement concerns.

Construction of the Crystal River Mariculture Center was completed in 1991 at a cost of $2.5 million. The facility includes a two-story hatchery/laboratory building, eight one-acre ponds, and associated seawater intake, flow-through, and discharge piping. The Mariculture Center operates on an average annual O&M and capital budget of $360,000. In addition to two full-time employees, the facility utilizes additional outside labor resources for intensive production activities and facility maintenance and operations. In addition to offsetting the impacts of power plant operations, the facility provides educational opportunities for students, teachers and the general public.

The overall objective of the Mariculture Center for approximately 20 years of continuous operation has been to mitigate fisheries impacts related to the once-through cooling system at Crystal River Units 1, 2, and 3. Since 1991, seven species have been successfully cultured and released over the life of the facility, including over 950,000 red drum fingerlings and 1.3 million red drum larvae; 1.2 million spotted seatrout fingerlings and 715,000 spotted seatrout larvae; 415,000 pink shrimp; 525,000 striped mullet larvae; 39,900 silver perch; 32 million stone crab larvae; and 93 million blue crab larvae.

Simply put, a federal agency should not retroactively apply a new legal requirement when "the inequity of retroactive application has not been counterbalanced by sufficiently significant statutory interests." See Retail, Wholesale & Dept. Store Union v. NLRB, 466 F.2d 380, 389-90 (D.C. Cir. 1972) (relying on SEC v. Chenery, 332 U.S. 194 (1952)). In Retail, Wholesale & Dept. Store Union, the D.C. Circuit Court of Appeals determined that a ruling by the NLRB (which was prompted by then recent Supreme Court precedent) should not require imposing a penalty for actions undertaken that at the time "were squarely within explicitly articulated [agency] policy as sustained by the courts." Id. at 388. Similarly, in Stewart Capital Corporation v. Andrus, the 10th Circuit Court of Appeals held that the Bureau of Land Management's adjudicatory interpretation of its oil and gas lease bidding regulations should not apply retroactively to bid applications filed by an individual who over the preceding years had

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submitted "several thousand applications of the same type at issue" without objection by the Bureau of Land Management. 701 F. 2d 846 (10th Cir. 1983).

Also instructive is Tosco Corp. v. Hodel, 611 F. Supp. 1130 (D. Colo. 1985), which involved the federal Department of Interior's (DOI's) policy regarding whether or not annual assessment work must be performed in order to maintain oil shale claims. For more than two decades, the DOI affirmatively represented that it would not contest oil shale claims on grounds of nonperformance of annual assessment work and issued numerous patents consistent with these representations. Many claim owners relied on these representations and did not perform annual assessment work. Several years later, the U.S. Supreme Court held that DOI's longstanding interpretation of the law was erroneous. As a result, DOI sought to invalidate several mining claims and refused to issue mineral patents to the claim owners on grounds that the annual assessment work had not been performed. The Tosco court held that "some forms of erroneous [agency] advice are so closely connected to the basic fairness of the administrative decision making process that the government may be estopped from disavowing the misstatement." Id. at 1206. The court reasoned that equitable estoppel prevents the application of a new rule retroactively "when to do so would unduly intrude upon reasonable reliance interests." Id. at 1207 (citing Heckler v. Community Health Services, 467 U.S. 51, 60 n. 12 1984). The court ultimately held that it would run afoul of the "basic fairness of the administration decision making process" to now allow the DOI to repudiate 28 years of action and attempt to invalidate the mining claims.

The Tosco case went to the 10th Circuit on appeal, at which point the parties reached a settlement agreement under which all findings of fact and conclusions of law embodied in the Tosco opinion were vacated as moot. Tosco Corp. v. Hodel, 826 F.2d 948, 948-49 (10th Cir. 1987). However, because the lower court Tosco opinion was not vacated on its merits, it remains valid as persuasive legal precedent.

Similarly, in the facts of this case, Progress Energy has incurred very significant expenses in constructing and operating the Crystal River Mariculture Center. Both EPA and Progress Energy agreed to this mitigation facility in good faith in settling NPDES litigation based on applicable law. Progress Energy reasonably relied on EPA's assurances that the verifiable marine life restoration provided by the Mariculture Center would be taken into account in meeting §316(b) requirements. Continuing to recognize this unique outcome at the Crystal River Plant under EPA's new intake regulations is legally permissible and is necessary to avoid "an inequitable and unjust result."

EPA should continue to recognize the Crystal River flow reductions and Mariculture Center as meeting BPJ requirements under Clean Water Act §316(b).

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The proposed rule should establish a clear expectation that permit writers will not impose entrainment requirements for which the costs are not justified by the benefits.
Progress Energy strongly recommends that entrainment requirements should not be imposed if the costs of complying with any standard exceed the benefits. This recommended modification could be accomplished by substituting the word "will" or "shall" instead of "may" in proposed 40 C.F.R. § 125.98(e). After modification, the sentence would read as follows:

> "The Director ~~may~~ shall reject an otherwise available technology as BTA standards for entrainment mortality if the social costs of compliance are not justified by the social benefits, or if there are adverse impacts that cannot be mitigated that the Director deems to be unacceptable."

The proposed rule creates a potential dilemma stemming from the different compliance timelines for the impingement and entrainment standards that needs resolution.
The site-specific provisions of the proposed rule for entrainment require permittees to provide information addressing both entrainment and impingement losses and to consider the environmental benefits of technologies for reducing both types of loss. This might be appropriate, were it not for the fact that the rule also imposes nationally uniform impingement requirements that limit impingement mortality (IM) or intake velocity and mandate additional technology measures. Facilities forced to incur substantial costs to reduce velocity or install modified traveling screens to meet the IM requirements face the very real risk that a later decision on entrainment will make the earlier expenditure unnecessary.

The mandatory peer review requirements should be removed.
Progress Energy agrees that peer review can be a useful tool. However, based on its experience, the Company believes that for all of its facilities, the responsible state permit writers and resource management agencies already possess significant levels of expertise and would not require or desire the assistance offered by peer reviewers. Thus, the Company recommends that the peer review requirements be deleted. State permit writers and resource management agencies can always initiate a peer review process should they deem it necessary.

Specialized Definitions

At § 125.92, EPA proposes several new "special definitions" that are applicable to Subpart J - Requirements Applicable to Cooling Water Intake Structures for Existing Facilities. Many of these definitions will significantly impact how individual facilities are affected by the proposed rule and are therefore of critical importance.

The proposed definition for closed-cycle recirculating system should be modified.
EPA defines a closed-cycle recirculating system as one that minimizes make-up and blowdown flows and then defines minimized make-up by specifying minimum cycles of concentration for cooling towers and make-up flow reductions for closed-cycle recirculating systems other than cooling towers. The specified minimum cycles of concentration are unreasonable and too restrictive. The compulsory operation of cooling towers at a minimum of 3.0 (or 1.5 depending on salinity of source water for make-up) cycles of concentration will adversely impact existing facilities in several ways, including a significant increase in operation and maintenance chemical costs; an increase in water consumption; and/or new water quality-based discharge limitations that will necessitate additional wastewater treatment for compliance. One circumstance that illustrates the concern can be found in Florida. Florida's water quality standard for chlorides in marine waters, provides that chloride levels shall "not [be] increased more than 10% above

normal background." The proposed rule would require a minimum of 1.5 cycles of concentration, which in general would result in chloride concentrations of approximately 50% above background. In some waters, mixing zones may not be available to achieve compliance with the chloride criterion. This aspect of EPA's regulation is untenable because it potentially forces noncompliance with Florida's water quality standard.

At other facilities, existing closed-cycle cooling systems will be unable to qualify. For example, Progress Energy owns and operates a plant in the sandy coastal plain of eastern North Carolina that uses an unlined cooling pond. The make-up flows required for seepage and evaporation losses during peak summer months would not comply with the percentage flow reduction specified in the proposed definition.

In addition to these shortcomings, some aspects of EPA's proposed definition of closed-cycle recirculating system are much too vague to be workable. For example, in Florida, North Carolina and South Carolina, all coastal states, there are many waters (including inland waters) in which the salinity concentrations vary between less than and higher than 0.5 parts per thousand. Under the proposed rule, it seems that a waterbody would be characterized permanently as saline or fresh. The proposed rule does not address how the cycles of concentration benchmark would be addressed when the salinity of a waterbody rises above and then falls beneath 0.5 parts per thousand. Also, it is not clear how this determination is to be made in estuarine rivers where the "salt wedge" changes with tidal cycles.

Progress Energy recommends that the specified cycles of concentration and make-up flow reductions be deleted from the proposed definition.

The portion of the proposed definition for "new unit" clarifying that any rebuilt, repowered or replacement unit at an existing facility is not a new unit, is appropriate.
Progress Energy agrees that any rebuilt, repowered or replacement unit located at an existing facility should be subject to the cooling water intake structure requirements for existing facilities and not those requirements established for new facilities. The clarification is needed and is correct.

Initial Permit Application and Supporting Information Requirements

The proposed rule at §125.95(b)(1)(i) would require existing facilities with a design intake flow of greater than 50 MGD to submit information specified at §122.21(r)(2), (r)(3), (r)(4), (r)(5), (r)(6), (r)(7), and (r)(8) no later than six months after the effective date of the final rule. Significantly, §122.21(r)(6) addresses the Impingement Mortality (IM) Reduction Plan and would require the facility to specify the approach it will use to meet the Best Technology Available standards for impingement mortality. At §125.95(b)(2)(i), the proposed rule would require that facilities with a design intake flow of greater than 125 MGD submit an Entrainment Mortality Data Collection Plan, with peer reviewer identified, no later than six months after the effective date of the final rule. The requirement to submit the IM Reduction Plan, the Entrainment Mortality Data Collection Plan and the other information required within six months of the rule's effective date is unreasonable and unrealistic. As discussed in the proposed rule's preamble, EPA seems to believe that much of the information specified will have been collected in response to the 2004 Phase II. But in fact, many facilities suspended data collection efforts when EPA suspended the Phase II rule.

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Also of concern is that all facilities with a design intake flow of greater than 50 MGD will be competing for a finite pool of consulting resources necessary to prepare the Impingement Mortality Reduction Plan concurrently. Progress Energy recommends that these initial, six-month deadlines be extended to a least one year and that all subsequent deadline be extended consistently.

Progress Energy appreciates the opportunity to submit comments on this important regulatory proposal and earnestly requests EPA's careful consideration of these comments and recommendations for improving the rule. Please do not hesitate to contact me at 919-546-3775 if you have any questions.

Sincerely,

Caroline Choi
Executive Director
Environmental Services and Strategy

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From: Jason Schwartz
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Date: 08/19/2011 11:15AM
Subject: comments on standards for cooling intake structures
(See attached file: Policy Integrity Final Comments on Cooling Rule.pdf)

The Institute for Policy Integrity would like to share with you the comments we submitted on EPA's standards for cooling intake structures.

Sincerely,
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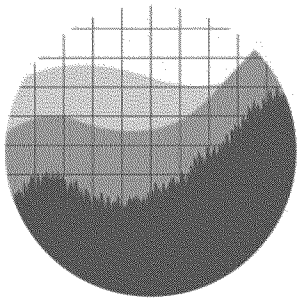

Institute *for* Policy Integrity

new york university school of law

August 18, 2011

Nancy K. Stoner, Assistant Administrator
Office of Water, EPA
OW-Docket@epa.gov

Attention: Docket No. EPA-HQ-OW-2008-0667

Subject: Comments on Proposed Regulations to Establish Requirements for Cooling Water Intake Structures at Existing Facilities and Amend Requirements at Phase I Facilities

The Institute for Policy Integrity ("Policy Integrity") submits the following comments on the Environmental Protection Agency's ("EPA") proposed revisions to its regulation of cooling water intake structures at existing manufacturing and power plant facilities. These comments are aimed at ensuring that these regulations maximize net social benefits and incorporate flexibility, ease, and efficiency.

Policy Integrity at New York University School of Law is a non-partisan think tank dedicated to improving the quality of government decisionmaking through advocacy and scholarship in the fields of administrative law, economics, and public policy. Environmental quality is one particular area of focus for Policy Integrity.

EPA's 2011 proposed Phase II rule has significant advantages over its 2004 iteration. Nonetheless, EPA's proposals could be refined and strengthened in various ways to ensure that the finalized regulations reliably maximize net benefits without creating an undue burden for regulated entities. In the final rulemaking EPA should make the following changes:

- Include more quantification in the national cost-benefit analysis;
- Conduct an explicit break-even analysis when monetized costs exceed monetized benefits;
- Ensure that site-specific standards are implemented within a set time frame;
- Set a deadline by which all existing facilities must comply with the new source standards;
- Justify the use of site-specific or nationally uniform standards on cost-benefit grounds;
- Require structured site-specific reviews to maximize net social benefits;
- Avoid relying on self-reported industry data whenever possible;
- Strengthen the peer review process under proposed Sections 122.21(r)(9)-(12);
- Clarify how structured site-specific review differs from a "best professional judgment" standard;
- Utilize retrospective review;
- Implement an administrative appeals process;

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- Retain federal authority for facilities that risk significant interstate issues and/or externalities; and
- Articulate the justification for expanding the scope of the Phase II Rule to cover more facilities.

I. Legislative and Judicial Background for Cooling Water Intake Structures Regulation

EPA has proposed regulating cooling water intake structures at existing facilities pursuant to Section 316(b) of the Clean Water Act:

> Any standard established pursuant to section 301 or section 306 of this Act [33 U.S.C.S. §§ 1311 or 1316] and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.[1]

The cross-reference to Sections 301 and 306 indicates that Section 316(b) covers new and existing point sources regulated under the National Pollutant Discharge Elimination System ("NPDES") permitting program.

The proposed regulation of cooling water intake structures is further pursuant to a consent decree issued by the Southern District of New York in 1995 and amended thereafter.[2] The consent decree underwent a number of revisions, and in 2000 the environmental group plaintiffs and EPA agreed to divide the 316(b) regulation into three separate phases.[3] In 2001, EPA finalized Phase I, which regulates certain new sources.[4] In 2004, EPA finalized Phase II, which covered large existing facilities withdrawing 50 million gallons of water per day ("MGD"), at least 25% of which is used for cooling.[5] In 2006, EPA finalized Phase III, which regulated all remaining facilities under Section 316(b), namely new offshore and coastal oil and gas extraction facilities.[6]

Various coalitions of states and environmental and industry groups challenged the 2004 Phase II rule in the Second Circuit. On July 9, 2007, in response to the Second Circuit's decision in *Riverkeeper v. EPA*,[7] EPA suspended its Phase II rule pending future rulemaking.[8] In 2009, the Supreme Court reversed the Second Circuit in part, holding that cost-benefit analysis is a permissible consideration under Section 316(b).[9] The Supreme Court otherwise left untouched the following conclusions by the Second Circuit: Section 316(b) covers existing facilities;[10] EPA may

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[1] 33 U.S.C. § 1326(b) (2011).

[2] Cronin v. Browner, 898 F. Supp. 1052 (S.D.N.Y. 1995).

[3] *See* Cronin v. Browner, 90 F. Supp. 2d 364, 374-5 (S.D.N.Y. 2000).

[4] National Pollutant Discharge Elimination System: Regulations Addressing Cooling Water Intake Structures for New Facilities, 66 Fed. Reg. 65,255 (Dec. 18, 2001) (to be codified at 40 C.F.R. pts. 9, 122, 123, 124, and 125).

[5] National Pollutant Discharge Elimination System—Final Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities, 69 Fed. Reg. 41,575 (July 9, 2004) (to be codified at 40 C.F.R. pts. 9, 122, 123, 124, and 125) [hereinafter 2004 Phase II Rule], *suspended by* National Pollutant Discharge Elimination System–Suspension of Regulations Establishing Requirements for Cooling Water Intake Structures at Phase II Existing Facilities, 72 Fed. Reg. 37,107 (July 9, 2007) (to be codified at 40 C.F.R. pts. 122 and 125).

[6] National Pollutant Discharge Elimination System—Final Regulations To Establish Requirements for Cooling Water Intake Structures at Phase III Facilities, 71 Fed. Reg. 35,006 (June 16, 2006) (to be codified at 40 C.F.R. pts. 9, 122, 123, 124, and 125).

[7] Riverkeeper, Inc. v. EPA (*Riverkeeper II*), 475 F.3d 83 (2d Cir. 2007).

[8] National Pollutant Discharge Elimination System–Suspension of Regulations Establishing Requirements for Cooling Water Intake Structures at Phase II Existing Facilities, 72 Fed. Reg. 37,107 (July 9, 2007) (to be codified at 40 C.F.R. pts. 122 and 125).

[9] Entergy Corp. v. Riverkeeper, Inc., 129 S. Ct. 1498 (U.S. 2009).

[10] *Riverkeeper II*, 475 F.3d at 121-23.

permissibly rely on impingement and entrainment mortality as proxies for "adverse environmental impact";[11] and EPA acted within its permissible discretion in assuming zero entrainment survival.[12]

However, the Second Circuit remanded the rule to EPA on several other grounds, which the Supreme Court did not reach on appeal. In particular, the Second Circuit held that restoration measures are an impermissible basis for compliance with Section 316(b).[13] EPA plans to eliminate the restoration compliance option from the Phase I regulation via the proposed rulemaking.

On November 22, 2010, EPA amended its existing consent decree with a coalition of environmental groups (including Riverkeeper) that had sued to compel regulation under Section 316(b). At that time EPA agreed to issue a notice of proposed rulemaking by March 14, 2011, and a final rule by July 27, 2012.[14] These comments are submitted in response to that notice, which was published in the Federal Register on April 20, 2011.[15]

II. Justification of the Proposed Rule on Cost-Benefit Grounds

Section 316(b) requires EPA to regulate cooling water intake structures. Consistent with Executive Orders 12,866 and 13,563, EPA guidelines, and persuasive policy arguments, EPA has issued this rulemaking on the basis of cost-benefit analysis. While this is the correct analytical framework, there are several opportunities for EPA to improve its use of cost-benefit analysis throughout the proposed rule. EPA should attempt to quantify more of the costs and benefits of the proposed rule, particularly ancillary benefits and countervailing risks. EPA should also conduct an explicit break-even analysis in light of the fact that its monetized costs exceed its monetized benefits.

Cost-Benefit Analysis Is the Appropriate Analytical Framework for this Rulemaking

Cost-benefit analysis seeks to maximize the net benefits that society will enjoy from regulations and policy choices.[16] Net benefits are calculated by subtracting the costs of the policy from the resulting social benefits. The benefits of environmental policies may include prices lowered, lives saved, habitat restored, or diseases avoided. The costs of environmental policies may include direct compliance costs, administrative enforcement costs, and price increases. The goal of cost-benefit analysis is to identify the policy alternative for which the cumulative benefits exceed the cumulative costs by the largest margin. These are the projects that generate the largest net benefits for society.

Estimating costs and benefits forces decisionmakers to carefully consider a policy proposal and anticipate its market and non-market impacts. By monetizing these impacts, cost-benefit analysis simplifies comparisons between projects and generates results that are salient to policymakers, interested groups, and the public at large. While cost-benefit analysis has been controversial in some circles,[17] it remains a useful tool for allocating resources across policy options.

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[11] *Id.* at 123-25.

[12] *Id.* at 126-27.

[13] *Id.* at 108-10.

[14] *See* Settlement Agreement among the U.S. Environmental Protection Agency, Plaintiffs in *Cronin, et al. v. Reilly*, 93 Civ. 314 (LTS) (SDNY), and Plaintiffs in *Riverkeeper, et al. v. EPA*, 06 Civ. 12987 (PKC) (SDNY), *available at* http://water.epa.gov/lawsregs/lawsguidance/cwa/316b/phase2/upload/316bsettlement.pdf.

[15] National Pollutant Discharge Elimination System—Cooling Water Intake Structures at Existing Facilities and Phase I Facilities, 76 Fed. Reg. 22,174 (proposed Apr. 20, 2011) (to be codified at 40 C.F.R. pts. 122 and 125) [hereinafter Proposed Rule].

[16] *See generally* RICHARD L. REVESZ & MICHAEL A. LIVERMORE, RETAKING RATIONALITY: HOW COST-BENEFIT ANALYSIS CAN BETTER PROTECT THE ENVIRONMENT AND OUR HEALTH 12 (2008) ("This book makes the case for cost-benefit analysis not only because such analysis is inevitable, but also because it is desirable . . . . [Cost-benefit analysis] allows us to spend money to the point at which the last dollar spent buys one dollar of risk reduction. If we spend beyond that point, we will pay more than we receive. But if we spend any less, we forego risk reductions that are socially desirable.").

[17] *See, e.g.*, FRANK ACKERMAN & LISA HEINZERLING, PRICELESS: ON KNOWING THE PRICE OF EVERYTHING AND THE VALUE OF

Executive Orders 12,866 and 13,563, along with guidelines from both EPA and the Office of Management and Budget ("OMB"), require the use of cost-benefit analysis unless otherwise prohibited by statute.[18] Furthermore, the Supreme Court has specifically affirmed EPA's authority to conduct cost-benefit analysis under Section 316(b).[19]

Both Executive Orders make clear that cost-benefit analysis should be used to identify and select policies that maximize net benefits.[20] Executive Order 13,563 underscores the importance of valuing benefits that are not easily quantified or monetized, affirming that, "[w]here appropriate and permitted by law, each agency may consider (and discuss qualitatively) values that are difficult or impossible to quantify."[21] EPA should take into account all major costs and benefits—direct and indirect, quantifiable and qualitative.[22]

Further, EPA published its own cost-benefit analysis guidelines in December 2010, which clarify the directives contained in the two Executive Orders.[23] EPA's guidelines provide detailed instructions on best practices for cost-benefit analysis in light of the obstacles frequently faced by agencies.[24] Expanding on the Executive Orders, EPA gives extensive direction on how to value benefits that are often difficult, and sometimes impossible, to quantify or monetize to ensure that those benefits are not ignored in the analysis.[25] OMB has published similar guidance.[26]

The National Cost-Benefit Analysis Improves on the 2004 Rule, but Should Quantify More

EPA has improved its assessment of non-use benefits from the 2004 iteration of the Phase II rule. The 2004 Phase II rule monetized only direct use market and non-market values—commercial

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[18] Exec. Order No. 12,866, 58 Fed. Reg. 51,735 (Sept. 30, 1993); Exec. Order No. 13,563, 76 Fed. Reg. 3821(Jan. 21, 2011); EVNTL. PROT. AGENCY, GUIDELINES FOR PREPARING ECONOMIC ANALYSES (2010); OFFICE OF MGMT. & BUDGET, EXECUTIVE OFFICE OF THE PRESIDENT, CIRCULAR A-4 (2003) *available at* http://www.whitehouse.gov/sites/default/files/omb/assets/regulatory_matters_pdf/a-4.pdf.

[19] Entergy Corp. v. Riverkeeper, Inc., 129 S. Ct. 1498 (2009).

[20] *See* Exec. Order No. 13,563 § 1(b) ("[T]o the extent permitted by law, each agency must, among other things: (1) propose or adopt a regulation only upon a reasoned determination that its benefits justify its costs (recognizing that some benefits and costs are difficult to quantify)."); *see also* Exec. Order No. 12,866 § 1 ("In choosing among alternative regulatory approaches, agencies should select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.").

[21] Exec. Order No. 13,563 § 1(c).

[22] *See, e.g.*, Exec. Order No. 13,563 § 1 (Costs and benefits "include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider."); Exec. Order. No. 12,866 § 1 ("Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider.").

[23] ENVTL. PROT. AGENCY, *supra* note 18, at 1-2 (2010) ("[A] thorough and careful economic analysis is an important component in informing sound environmental policies. Preparing high quality economic analysis can greatly enhance the effectiveness of environmental policy decisions by providing policy makers with the ability to systematically assess the consequences of various actions. An economic analysis can describe the implications of policy alternatives not just for economic efficiency, but also for the magnitude and distribution of an array of impacts. Economic analysis also serves as a mechanism for organizing information carefully. Thus, even when data are insufficient to support particular types of economic analysis, the conceptual scoping exercise may provide useful insights.").

[24] *Id.*

[25] *Id.* at 11-3 ("It is important, however, not to exclude an important benefit or cost category from benefit-cost analysis even if it cannot be placed in dollar terms. Instead, such benefits and costs should be expressed quantitatively if possible (e.g. avoided adverse health impacts). If important benefit or cost categories cannot be expressed quantitatively, they should be discussed qualitatively (e.g. a regulation's effect on technological innovation).").

[26] OFFICE OF MGMT. & BUDGET, *supra* note 18.

fishing and recreational fishing, respectively.[27] Non-use values and indirect-use values were not monetized at all. EPA addressed this with a break-even analysis, which found significant regional variation between the willingness-to-pay needed to justify the 2004 rule on cost-benefit grounds.[28]

The cost-benefit analysis for the proposed rule is already an improvement over the one performed in support of the 2004 Phase II rule, and EPA plans to further utilize a stated preference study to monetize non-use values in support of this regulation.[29] The quantification of non-use benefits, whenever possible, allows for a more precise cost-benefit analysis. Although EPA has not yet had sufficient time to complete the stated preference study, its inclusion in the rulemaking process is a laudable effort to execute a rigorous and thorough cost-benefit analysis. The proposed rule also takes a more thorough look at ancillary benefits and countervailing risks than the 2004 Phase II rule did.[30] In particular, the proposed rule includes a narrative discussion of potential reductions in thermal discharge, which was lacking from the previous rule.[31]

However, there are additional effects that should be addressed in the context of a cost-benefit analysis. These include, at a minimum, the possibility of fuel switching,[32] likely effects on water consumption,[33] and any additional air pollution resulting from plants compensating for the "energy penalty."[34] The proposed rule requires the states to evaluate many of these factors on a local basis in Section 125.98(e).[35] While EPA suggests that some of these effects cannot be effectively quantified at the national level because of local variation between plants,[36] site-specific variation is an insufficient reason to avoid quantifying impacts at the national level. This variation is a form of uncertainty, the proper treatment of which is discussed at length in existing guidance from EPA and OMB.[37] Using facility-level data already collected in preparation for this rulemaking, EPA can estimate national or regional averages for many of these variables, which can be used in a statistical projection of likely costs and benefits.

Conduct an Explicit Break-Even Analysis When Monetized Costs Exceed Monetized Benefits

When the monetization of all costs and benefits is not possible, agencies should conduct break-even analyses assessing potential regulations.[38] In such cases, OMB directs regulatory agencies to:

> [E]xercise professional judgment in determining how important the non-quantified benefits or costs may be in the context of the overall analysis. If the non-quantified benefits and costs are likely to be important, you should carry out a "threshold" analysis to evaluate their significance. Threshold or "break-even" analysis answers the question, "How small could

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[27] 2004 Phase II Rule, *supra* note 5, at 41,657-58.

[28] *Id.* at 41663-64.

[29] Proposed Rule, *supra* note 15, at 22,243.

[30] *See generally* OFFICE OF MGMT. & BUDGET, *supra* note 18, at 26.

[31] Proposed Rule, *supra* note 15, at 22,246.

[32] *See, e.g.*, ENERGY INFO. ADMIN., MANUFACTURING FUEL-SWITCHING CAPABILITY (2006), http://www.eia.doe.gov/emeu/mecs/special_topics/energy_use_manufacturing/energyuse98_02/fuel_switch.html (describing fuel switching at manufacturing facilities in response to changing economic conditions).

[33] *See, e.g.*, SCOTTMADDEN MGMT. CONSULTANTS, ELECTRIC UTILITIES: NAVIGATING THE WATER CRISIS 5 (2008), *available at* www.scottmadden.com/?a=strm&aid=13 (describing the relationship between power plant cooling water intake structures and recent droughts).

[34] Proposed Rule, *supra* note 15, at 22,209.

[35] *Id.* at 22,288 (to be codified at 40 C.F.R. pts. 125.98(e)(1)-(9)).

[36] *Id.* at 22,209 ("EPA is not able to quantify the frequency with which facilities may experience these local impacts, and therefore EPA believes a site-specific assessment must be conducted to fully address such local impacts.").

[37] OFFICE OF MGMT. & BUDGET, *supra* note 18, at 38-42; ENVTL. PROT. AGENCY, *supra* note 18, at 11-12.

[38] OFFICE OF MGMT. & BUDGET, *supra* note 18, at 2.

> the value of the non-quantified benefits be (or how large would the value of the non-quantified costs need to be) before the rule would yield zero net benefits?"[39]

EPA guidelines also identify break-even analyses as a proper alternative when "either risk data or valuation data are lacking."[40] It is clear from OMB's A-4 Circular and EPA's Guidelines for Preparing Economic Analyses that break-even analysis should be used to ensure that agencies maximize social welfare when data is limited. EPA conducted such an analysis when it promulgated the 2004 Phase II rule.[41] EPA should endeavor to promulgate a rule that, in its expert judgment, maximizes the aggregate of non-monetized and monetized net benefits.

It appears that EPA is already, in essence, conducting a break-even analysis—the proposed rule's monetized costs exceed the monetized benefits, and the agency has identified significant non-monetized benefits that make the rule cost-benefit justified.[42] To further strengthen the rule's administrative record, EPA should explicitly state that it is conducting a "threshold" or "break-even" analysis and explain what that entails.

III. The Rule Should Encourage Timely Upgrades and Avoid Excessive Grandfathering

The proposed rule contains some elements of undesirable grandfathering.[43] Grandfathering is a form of transition assistance for older facilities. It may be desirable in situations where the costs of imposing tough new regulatory standards on existing sources exceed the benefits of those standards. For example, if a firm intends to retire a facility in the near future, it may be preferable to allow it to operate for the rest of its intended design-life rather than require the installation of expensive retrofits. While some of the grandfathering under the proposed rule is cost-benefit justified, certain aspects of the rule would result in excessive grandfathering and generate a net loss to society. EPA can eliminate the distortive effects of the proposed rule by requiring the states to set their site-specific standards within a definite time frame, and by setting a fixed national deadline for all existing sources to comply with the new source standards under Phase I.

Ensure that Site-Specific Standards Are Implemented Within a Specific Time Frame

The proposed rule does not set a deadline for state development or facility compliance with the entrainment standard. The proposed rule merely directs state agencies to set site-specific entrainment standards "as soon as possible."[44] In contrast, EPA has set an 8-year deadline for compliance with the impingement standards.[45] Site-specific regulatory standards have the potential to delay regulatory compliance because of the additional administrative burden involved. Without a fixed time frame, some firms may attempt to delay compliance for as long as they can.[46]

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[39] *Id.*

[40] ENVTL. PROT. AGENCY, *supra* note 18, at 7-58.

[41] *See* 2004 Phase II Rule, *supra* note 5, at 41,662-64.

[42] *See* Proposed Rule, *supra* note 15, at 22,267.

[43] ENVTL. PROT. AGENCY, *supra* note 18, at 4-6 ("It is also common to 'grandfather' or exempt older polluters from new prescriptive regulations. This means that they are effectively subject to a less stringent standard than newer polluters. Grandfathering creates a bias against constructing new facilities and investing in new pollution control technology or production processes. As a result, grandfathered older facilities with higher emission rates tend to remain active longer than they would if the emissions standard applied to all polluters.").

[44] Proposed Rule, *supra* note 15, at 22,282.

[45] *Id.*

[46] Numerous environmental groups have expressed concerns that the site-specific entrainment determinations will delay the regulatory process by bogging down the state agencies that are charged with conducting them. *See, e.g.*, Press Release, Riverkeeper, Dead Fish, Fouled Water, EPA Misses Opportunity to Fix Power Plant Damage (Mar. 29, 2011), *available at* http://www.riverkeeper.org/news-events/news/preserve-river-ecology/dead-fish-fouled-water-epa-misses-opportunity-to-fix-power-plant-damage/.

A federally mandated deadline would mitigate this risk. Furthermore, the proposed rule has the advantage of delegating and dividing the labor among state agencies, rather than burdening any single agency with the task of making case-by-case determinations. This delegation should be viewed as an opportunity to minimize delay throughout the regulatory process.

Set a Deadline by Which All Existing Facilities Must Comply with the New Source Standards

Under the proposed rule, existing sources are only required to install closed-cycle cooling systems to accommodate additional "new units."[47] The proposed rule defines "new unit" at Section 125.92 as "newly built units added to increase capacity at the facility and does not include any rebuilt, repowered or replacement unit, including any units where the generation capacity of the new unit is equal to or greater than the unit it replaces."[48] Under a plausible reading of the proposed rule, a plant could, over time, replace all its existing generators with newer, higher capacity generators without ever triggering the closed-cycle cooling requirements under proposed Section 125.94(a)(3).[49] Furthermore, plants could continue to do so indefinitely. This is a potentially significant loophole in the regulation of existing facilities.

Indeed, proposed Section 125.92 actually creates an incentive for older, more destructive facilities to remain active with outdated technology long past their originally intended service lives and socially optimal retirement dates. The problem arises from creating a stringent standard for new sources and a more lenient one for existing sources. In some cases it may be cheaper for firms to prolong the operational lives of their existing facilities rather than build new facilities requiring costly control technologies.[50] As plants grow older, operation and maintenance costs tend to increase. Meanwhile, as technology improves, new and more efficient plants can be constructed more cheaply. Absent any regulation, rational firms will naturally retire an older plant when the costs of its operation exceed the costs of building a new plant. However, a tough new source standard increases the costs of constructing a new plant and thereby delays the point at which a rational firm will decide to replace older plants. The result may be that environmentally destructive plants remain open longer than they otherwise would have absent the regulation. This is often referred to as the "old plant" effect.[51]

This is not a theoretical phenomenon. Firms acted this way in response to the New Source Review provisions of the Clean Air Act, which require existing facilities to install expensive pollution control technologies only if they modify their plants.[52] One result, predictably, has been years of

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[47] Proposed Rule, *supra* note 15, at 22,282 (to be codified at 40 C.F.R. pt. 125.94(a)(3)).

[48] *Id.* (to be codified at 40 C.F.R. pt. 125.92).

[49] *Id.* at 22,282 (to be codified at 40 C.F.R. pt. 125.94(a)(3)). Some plants, responding to a similar regulatory structure under the Clean Air Act, pursued exactly this strategy. In one noteworthy case, the Seventh Circuit Court of Appeals rejected a utility's argument that major renovations at its plant, including "repair and replacement of the turbine-generators, boilers, mechanical and electrical auxiliaries and the common plant support facilities," failed to trigger the Act's new source standards. Wis. Elec. Power Co. v. Reilly, 893 F.2d 901, 906 (7th Cir. 1990). In its decision, the court expressed its concern that permitting such extensive plant renovations under a grandfathered standard "would open vistas of indefinite immunity from [the new source performance standards]." *Id.* at 909.

[50] *See* Jonathan Remy Nash & Richard L. Revesz, *Grandfathering and Environmental Regulation: The Law and Economics of New Source Review*, 101 NW. U. L. REV. 1677, 1708-12 (describing how "differential environmental regulations delay plant retirement."); *see also* Richard L. Revesz & Allison L. Westfahl Kong, *Regulatory Change and Optimal Transition Relief* 48-49 (N.Y. Univ. Sch. of Law Pub. Law & Legal Theory Research Paper Series, Working Paper No. 10-62, 2010), *available at* http://ssrn.com/abstract=1674469 ("The existence of pollution regulations applying to new sources, however, may give the plant an incentive to bear these inefficiencies for longer than would otherwise be the case because they are less costly than complying with the standards applicable to new sources.").

[51] *See* RICHARD L. REVESZ, ENVIRONMENTAL LAW AND POLICY 405-22 (Robert C. Clark et al. eds., 2008) (discussing the "old plant" effect in more depth).

[52] 42 U.S.C. § 7411(a)(2) (2006) (requiring performance standards only for stationary sources, "the construction or modification of which is commenced after the publication of regulations.").

regulation and litigation over the exact meaning of "modification."[53] Another result is that some power facilities have remained in service since the 1950s with little or no improvement to their environmental performance.[54] In this respect, the Clean Water Act has been much more successful than the Clean Air Act because, in addition to setting new source standards, it also established tough standards for existing sources, which gradually increased over time.[55] The result has been a steady phase-out of the oldest, most inefficient plants. But by shielding existing sources with such a narrow definition of "new unit," the proposed rule imports one of the Clean Air Act's shortcomings.

The best solution to this problem is to set a deadline by which all existing facilities must come into compliance with the tougher new source standards. In setting such a deadline, EPA should not seek to compel all existing facilities to immediately install closed-cycle cooling facilities; because of the variability between facilities, this would result in overregulation in instances where the marginal costs of immediate installation exceed the marginal benefits of additional protection.[56] Rather, the deadline should be set to eliminate the perverse incentives created by the bifurcated new source and existing source standards.

IV. National versus Site-Specific Standards

The proposed rule creates separate standards for entrainment and impingement mortality. EPA justifies the use of a site-specific standard for entrainment on the grounds that there is high variability between facilities, particularly regarding local energy reliability, air emissions, land availability, and remaining useful plant life.[57] EPA justifies the use of a national standard for impingement because a cost-benefit justified technology is uniformly available.[58] While these are valid considerations, they fall short of the necessary analysis of whether site-specific or national controls best maximize net benefits.

National standards are usually justified for a rule that applies to a large number of similarly situated entities. Though a uniform standard risks creating inefficiencies if there is too much site-to-site variability, if most regulated parties face similar costs and benefits, then a national standard can largely avoid that potential for costly over- and under-regulation. When the costs of such errors is less than the administrative cost of site-specific analyses and regulation, a single, national standard is most likely to maximize net benefits.

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[53] For example, in 1999 and 2000, the Department of Justice brought suit against nine utility companies that made major plant modifications without complying with the new source standards. Press Release, U.S. Dept. of Justice, U.S. Sues Electric Utilities in Unprecedented Action to Enforce the Clean Air Act (Nov. 3, 1999), *available at* http://www.usdoj.gov/opa/pr/1999/November/524enr.htm. *See also* Nash & Revesz, *supra* note 50, at 1681 ("Commentators regularly note that Congress expected most existing sources to gradually phase out over the course of their ordinary lives or to upgrade and trigger the new source performance standards, leaving most major stationary sources subject to federal control.").

[54] *See, e.g.*, Dina Fine Maron, *TVA Agrees to Shut Down 18 Coal-Fired Boilers and Curb Emissions*, N.Y. TIMES, Apr. 15, 2011, http://www.nytimes.com/cwire/2011/04/15/15climatewire-tva-agrees-to-shut-down-18-coal-fired-boiler-72955.html (describing a settlement between EPA and the Tennessee Valley Authority in which the utility has agreed to close 18 generating units, "[a]lmost all of [which] date back to the 1950s and had no modern pollution controls installed.").

[55] *See* REVESZ, *supra* note 51, at 507 ("[R]ather than "grandfathering" existing sources like the CAA, the CWA adopted a phased approach to the setting of federal standards for existing sources, such that EPA was directed to set increasingly stringent effluent limitations for point sources over time.").

[56] *See* Revesz & Kong, *supra* note 50, at 57 ("Grandfathering existing actors will not always be optimal, but it is appropriate when their compliance with the new rule would cost more 'than the reduction in the expected harm' that would result from complying with the new rule.") (*quoting* Steven Shavell, *On Optimal Legal Change, Past Behavior, and Grandfathering*, 37 J. LEGAL STUD. 37, 44-45 (2008)).

[57] Proposed Rule, *supra* note 15, at 22,208-10.

[58] *Id.* at 22,197 ("EPA's record shows modified traveling screens are available for all facilities, whereas reduced intake velocity may not be available at all locations.").

When these conditions do not hold, either because sites are highly variable or because there are relatively few regulated entities, the most effective and efficient method to address case-by-case differences within the regulated community is the use of a market-based regulatory solution such as a cap-and-trade system. Market-based regulatory mechanisms allow firms the flexibility to account for variability without a large commitment of administrative resources from the government. Before settling on a program that requires site-specific standards, EPA should consider the feasibility of such market-based regulatory mechanisms.

If market-based solutions are unavailable, a site-specific standard is justified when the benefits of individualized standards exceed the administrative costs of setting them. The benefits of a case-by-case standard result from avoiding the potential over- and under-regulation of a hypothetical national standard; given variable compliance costs and benefits, a national standard may be excessively stringent at some sites and excessively lenient at others. Where variability between sites is high, this error rate will also be high, and the benefits of a flexible program increase. The administrative costs of setting site-specific standards are borne by the permitting authority and the facilities themselves, which must invest in additional monitoring and reporting. These administrative costs will be higher when there are many facilities to regulate.

On the other hand, site-specific standards have the disadvantage of reducing regulatory certainty, which reduces industry's ability to anticipate and plan for impending regulatory requirements. There may also be practical advantages and disadvantages to making final regulatory requirements site-specific. Local agencies may have increased familiarity with local ecosystems, for example, but they may also be less familiar with the best practices of cost-benefit analysis.[59] Ultimately, EPA should weigh all these factors to determine whether a national standard or site-specific standards is most appropriate for any given regulation.

Justify a Site-Specific Entrainment Standard on Cost-Benefit Grounds

If EPA wants to retain its site-specific entrainment standard in the final Phase II rule, the agency should clarify the cost-benefit analysis used to support its conclusion. As discussed above, a program of site-specific review is only desirable if the benefits of the reviews exceed the administrative costs of conducting them. EPA should explain that, of the available regulatory tools, site-specific review would maximize net social benefits by accounting for variability and keeping compliance costs relatively low. EPA has already determined that there is a high rate of variability between plants: benefits vary with local ecological conditions;[60] compliance costs vary because some sites are not suited to particular retrofits;[61] and much of the impingement and entrainment data is inaccurate, unreliable, or inadequately representative.[62] The administrative costs of the

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[59] *See* JASON A. SCHWARTZ, 52 EXPERIMENTS WITH REGULATORY REVIEW: THE POLITICAL AND ECONOMIC INPUTS INTO STATE RULEMAKING 81 (2010), *available at* http://policyintegrity.org/publications/detail/52-experiments-with-regulatory-review/ (reviewing regulatory review practices in all 50 states, as well as in the District of Columbia and Puerto Rico, and concluding in part: "Sparse and inconsistent impact statements (especially on quantifying and describing benefits), combined with the failure in most states to emphasize the goal of maximizing net benefits, inevitably means that most state reviews operate more as gatekeepers than as calibrators: rules are rejected for being too burdensome or illegal or beyond statutory authority, but are far less often refined and improved to enhance social welfare.").

[60] Proposed Rule, *supra* note 15, at 22,248 ("The record demonstrates that biological organisms subject to impingement and entrainment from cooling water intake structures may vary considerably from site to site.").

[61] For example, some facilities are subject to land use constraints that would prevent them from installing closed-cycle cooling systems. *Id.* at 22,209 ("EPA found that some facilities with large acreage still could not feasibly install cooling towers due to local zoning or other local concerns.").

[62] Because impingement and entrainment data are based on extrapolation from a relatively small number of facilities, there may be considerable variation between the programmatic assumptions and the actual conditions at any particular plant. *See id.* at 22,207 (certain coastal waterbodies, for example, contain "some fish species . . . [that] have biological spawning attributes that differ from those at other locations.").

reviews are a function of their complexity, the skill of those conducting them, and the number of facilities reviewed.

Justify a National Impingement Standard on Cost-Benefit Grounds

The justifications for a nationally uniform standard are discussed above generally. If EPA ultimately opts for a national impingement standard without a site-specific option, it should justify this decision on cost-benefit grounds. A proper cost-benefit analysis that leads to selecting a national standard must demonstrate that it maximizes net benefits over alternative approaches.

With regard to entrainment, EPA has concluded that a site-specific review is appropriate. There may be key differences between impingement and entrainment that justify a site-specific option for one and not the other. If EPA makes that determination, however, it should clearly explain the engineering and economic distinctions between the two processes that justify divergent regulatory standards. In the event that EPA offers a site-specific impingement standard, all of the recommendations discussed in this comment regarding best practices for the site-specific entrainment analysis should be considered instructive for impingement as well.

Of course, a prerequisite for the success of a site-specific compliance option is that the forums for the determination provide fair reviews and utilize high quality, evidence-based decisionmaking. EPA should provide sufficient guidance to state agencies in this regard to ensure that they are using EPA's preferred methodologies and are pursuing the same goal of maximizing net benefits. Some factors EPA should consider in developing such guidance are discussed in the next section.

V. EPA Can Improve the Quality of Site-Specific Reviews

The structured site-specific review outlined in the proposed rule has a strong theoretical basis. However, EPA should take further steps to clarify the standard of review for states to apply and to ensure that the system operates as intended. The proposed rule delegates much of EPA's authority to state agencies to set and enforce the site-specific standards.[63] EPA can ensure that these standards are consistently set at the optimal level by

- unambiguously requiring the site-specific reviews to maximize net benefits;
- incorporating a preference for independently collected data;
- taking steps to ensure high-quality peer review of data collection and reporting, including creating a database of reliable peer reviewers and making peer review comments transparent and publicly available;
- stressing the ways in which structured site-specific review differs from best professional judgment;
- setting the threshold for additional reporting at a cost-benefit justified threshold;
- and ensuring review of site-specific determinations ex post through retrospective reviews and, potentially, an administrative appeals process.

[63] This delegation to state-level authorities has upset some commentators, who fear that for public choice reasons state agencies may be less effective than federal regulators at setting sufficiently protective standards. *See, e.g.*, Riverkeeper *supra* note 46 ("EPA has chosen the path of least resistance by caving into industry pressure and punting this issue to state agencies that too often lack the resources and the will to stand up to industry on this issue."). The relative susceptibility of federal and state regulators to public choice pressures is a complex and hotly debated topic. *See* Richard L. Revesz, *Federalism and Environmental Regulation: A Public Choice Analysis*, 115 HARV. L. REV. 553 (2001) (arguing against the proposition that public choice pressures push states to systematically under-regulate environmental performance). *But see* Charles Duhigg, *Clean Water Laws Are Neglected, at a Cost in Suffering*, N.Y. TIMES, Sept. 13, 2009, at A1 (describing lax state enforcement of the Clean Water Act). This is an unresolved empirical question, and it is one on which Policy Integrity does not take a position.

Require Structured Site-Specific Reviews to Maximize Net Social Benefits

EPA most clearly articulates the standard to be applied by state agencies in making their site-specific determinations of best technology available ("BTA") in proposed Section 125.98(e).[64] The crucial part of this section establishes that the "entrainment mortality controls must reflect the [state agency's] determination of the maximum reduction in entrainment mortality warranted after consideration of factors relevant for determining the best technology available at each facility."[65] The section goes on to list nine factors that must be considered "at a minimum." These factors include "numbers and types of organisms entrained," "remaining useful plant life," and "quantified and qualitative social benefits and social costs of available entrainment technologies, including ecological benefits and benefits to any threatened or endangered species."[66]

This section lists important factors to consider during a site-specific review of best technology available—including certain important ancillary benefits and countervailing risks, such as "thermal discharge impacts,"[67] which had been largely overlooked during the 2004 Phase II rulemaking. However, it does not expressly require states to set BTA at the level that maximizes net social benefits. Instead, it merely tells state agencies what factors to consider without explaining how those factors should be weighed against one and another. Thus, absent evidence that a state agency failed to "consider" one of the variables expressly listed in Section 125.98(e), a state agency would be free to set any standard, regardless of the outcome of a cost-benefit analysis.[68]

The policy justification for performing a site-specific review is to maximize net social benefits by minimizing the error costs inherent in applying a nationally uniform standard to variable facilities. EPA should thus require, absent extraordinary circumstances, that state agencies select the standard for BTA that will maximize net social benefits on a case-by-case basis. While Section 125.98(e), as proposed, requires that state agencies review and consider a cost-benefit analysis, it does not expressly require that states adopt a net benefit maximizing standard.[69] Moreover, the description of cost-benefit analysis in Section 125.98(e) contains some troubling language that could be interpreted by state agencies as unwarrantedly favoring deregulation.[70] EPA should remedy this problem by adding additional express language that, barring a compelling reason to the contrary, requires state agencies to adopt any additional control technology for which the additional social benefits exceed the additional social costs.

The national impingement standard is set at the level maximizing net social benefits using standard cost-benefit analysis principles. Therefore, by permitting state agencies to set site-specific standards on the basis of something other than the maximization of net social benefits, the proposed rule treats entrainment mortality differently than impingement mortality. EPA should offer a well-reasoned explanation for why it has chosen to set a net benefit-maximizing standard for impingement, but not for entrainment.

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[64] Proposed Rule, *supra* note 15, at 22,288 (to be codified at 40 C.F.R. pt. 125.98(e)).

[65] *Id.*

[66] *Id.* (to be codified at 40 C.F.R. pt. 125.98(e)(1)-(9)).

[67] *Id.* (to be codified at 40 C.F.R. pt. 125.98(e)(4)).

[68] *Id.* (to be codified at 40 C.F.R. pt. 125.98(e)).

[69] *Id.* (to be codified at 40 C.F.R. pt. 125.98(e)(3)) ("At a minimum, the proposed determination . . . must be based on consideration of the following factors . . . . Quantified and qualitative social benefits and social costs of available entrainment technologies.").

[70] For example, the proposed rule explains, "The [state agency] may reject an otherwise available technology as [best technology available] standards for entrainment mortality if the social costs of compliance are not justified by the social benefits." *Id.* (to be codified at 40 C.F.R. pt. 125.98(e)).

There are other virtues to requiring that a site-specific standard maximize net social benefits. Most importantly, setting the BTA standard according to a cost-benefit analysis will help to ensure that social welfare is consistently maximized, an outcome that accords with the principles set forth in Executive Order 13,563.[71] It will reduce the uncertainty inherent in case-by-case determinations for both regulated firms and regulatory beneficiaries. Since the determinations of BTA would be established on the basis of cost-benefit analyses—which themselves should be performed according to clear, publicly available guidelines—interested parties could more often predict the outcome of state regulation.[72] Setting these standards according to a consistent and widely applied methodology will also improve their credibility among the regulated community and the public at large.

State-level cost-benefit analyses should be no less rigorous than similar analyses at the federal level. EPA should ensure that states are applying a uniform methodology to arrive at the optimal site-specific determinations, allowing for reasonable local variation costs and benefits.[73] State regulators have widely varying familiarity with cost-benefit analysis.[74] Due to this variability, EPA should provide reasonable assistance to state agencies applying this methodology. EPA should require that the state agencies adhere to the principles embodied in Executive Order 13,563 and the best practices established in OMB Circular A-4[75] and the 2010 EPA Guidelines for Preparing Economic Analyses.[76] Each of the factors listed in proposed Sections 125.98(e)(1)-(9) are reducible to variables in a cost-benefit analysis consistent with these guidelines—if not as quantified values, than as qualitative narrative values. EPA can support the performance of state-level cost-benefit analyses through subsequent guidance including recommended valuation techniques (and/or recommended values) for entrainment mortality, thermal discharge, impacts on water consumption, and any other relevant factors. Two possible sources of these values are EPA's upcoming stated preference study and the regional benefits analysis, both conducted in support of this rule.

Avoid Relying on Self-Reported Industry Data Whenever Possible

Relying on industry-reported data can be problematic because industry has incentives to provide information that is skewed to its advantage.[77] In preparing this rule, EPA has relied on industry-reported data to estimate impingement and entrainment, as well as industry costs more generally. The proposed rule solicits additional information from regulated entities, including the

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[71] Exec. Order No. 13,563 § 1(b)(3) ("[E]ach agency must, among other things: . . . select, in choosing among alternative regulatory approaches, those approaches that maximize net benefits.").

[72] Executive Order 13,563 also sets predictability as a goal: "Our regulatory system must . . . . promote predictability and reduce uncertainty." *Id.* § 1(a).

[73] For example, the proposed rule recognizes regional differences in the non-use benefits derived from averting fish mortality. *See* Proposed Rule, *supra* note 15, at 22,242-43 ("EPA applied estimated values from a study occurring in Rhode Island; these estimates are likely to be representative of nonuse values held by individuals residing in the Northeast US, and less accurate in other regions.").

[74] SCHWARZ, *supra* note 59.

[75] OMB, *supra* note 18.

[76] EPA, *supra* note 18.

[77] *See* Thomas O. McGarity & Ruth Ruttenberg, *Symposium: What We Know and Do Not Know About the Impact of Civil Justice on the American Economy and Policy: Counting the Cost of Health, Safety and Environmental Regulation*, 80 TEX. L. REV. 1997, 2055 (2002) ("One obvious implication . . . for policymakers who rely on industry- and agency-prepared cost assessments is that they must take such assessments with a considerable grain of salt. . . . [P]olicymakers should understand that such cost assessments should not determine the outcome of close decisions."); *see also* ENVTL. PROT. AGENCY, *supra* note 17, at 11-13 (2010) ("In any economic analysis, there should be a clear presentation of how data are used and a concise explanation of why the data are suitable for the selected purpose. The data's accuracy, precision, representativeness, completeness, and comparability should be discussed when applicable. In addition, when data are available from more than one source, a rationale for choosing the source of the data should be provided.").

"Entrainment Characterization Studies" and "Benefits Valuation Studies," which will be used by state agencies to formulate their site-specific standards.[78] EPA should permit the use of independently provided data for costs and benefits to increase both the transparency and the legitimacy of the regulatory process.[79] Furthermore, EPA should direct states to rely on independent data unless there is some reason to believe that the industry-reported data will be more reliable.

Strengthen the Peer Review Process Under Proposed Sections 122.21(r)(9)-(12)

The proposed rule requires that facilities withdrawing more than 125 MGD actual intake flow submit an array of reporting documents, including an extensive entrainment characterization study.[80] Each of these documents must be subjected to peer review.[81] Under the proposed rule, the regulated firm "must select peer reviewers in consultation with the [state agency], including that the [state agency] may require additional peer reviewers."[82] In overseeing this peer review, the state agency "may consult with EPA and Federal, State and Tribal fish and wildlife management agencies with responsibility for fish and wildlife potentially affected by the cooling water intake structure(s) to determine which peer review comments must be addressed by the final study."[83]

In most cases, these studies will form the basis for the state agency's determination of best technology available.[84] It is therefore essential to the success of the rule that these studies be reliable, accurate, and comprehensive. EPA should ensure that the peer review process is sufficiently robust to accomplish this goal, particularly given the inherent risks of relying on self-reported industry data.[85] It can do so by requiring consultation with other interested federal, state, and tribal agencies during the peer review process, instead of merely allowing it.

Furthermore, EPA should assist the selection of reliable peer reviewers by maintaining a database of qualified individuals and organizations that are willing to participate in the peer review process for state agencies. EPA should also ensure that the peer review process is transparent by making peer reviewer comments and industry responses publicly available.

Set the Threshold for Additional Reporting at the Point that Maximizes Net Benefits

Under the proposed rule, EPA would establish a tiered system of monitoring and data reporting. Firms that have installed closed-cycle cooling systems are required to submit less documentation

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[78] Proposed Rule, *supra* note 15, at 22,275-79 (to be codified at 40 C.F.R. pt. 122.21(r)) (detailing the assorted monitoring and reporting requirements of regulated facilities).

[79] *See* Michael Greenstone, *Toward a Culture of Persistent Regulatory Experimentation and Evaluation*, *in* NEW PERSPECTIVES ON REGULATION 111, 119 (David Moss & John Cisternino eds., 2009) (explaining the benefits of "evaluations by independent research groups (for example, academics or private companies)").

[80] Proposed Rule, *supra* note 15, at 22,275-79 (to be codified at 40 C.F.R. pt. 122.2(r)) (detailing the assorted monitoring and reporting requirements of regulated facilities).

[81] *See, e.g.*, Proposed Rule, *supra* note 15, at 22,278 (to be codified at 40 C.F.R. pt. 122.21(r)(9)(ii)) ("Obtain peer review of the entrainment mortality data collection plan. You must select peer reviewers in consultation with the Director, including that the Director may require additional peer reviewers. The Director may consult with EPA and Federal, State and Tribal fish and wildlife management agencies with responsibility for fish and wildlife potentially affected by the cooling water intake structure(s) to determine which peer review comments must be addressed by the final plan. You must provide an explanation for any significant reviewer comments not accepted. Peer reviewers must have appropriate qualifications in biology, engineering, hydrology, or other fields and their names and credentials must be included in the peer review report.").

[82] *Id.*

[83] *Id.*

[84] *Id.* at 22,261 ("EPA . . . does not generally expect that the [state agency] would develop additional information on which to base the evaluation of social benefits and costs, though the [state agency] may opt to do so.").

[85] *See supra* note 77.

than existing facilities without closed-cycle cooling.[86] Existing firms with an actual intake flow over 125 MGD are subject to the highest reporting requirements, including entrainment characterization studies, technical feasibility and cost evaluation studies, benefits valuation studies, and non-water quality and other environmental impacts studies.[87] As EPA correctly argues, there are good reasons to bifurcate the monitoring and data reporting requirements in this way. A tiered structure incentivizes firms to voluntarily reduce the amount of water extracted in order to avoid administrative costs. It also reduces the compliance costs for smaller and less destructive facilities for which the costs of detailed analyses may not be worth the benefits of perfectly calibrated regulation.

However, EPA must further articulate its justification for setting the threshold at 125 MGD actual intake flow. The proposed rule explains that this threshold "would significantly reduce facility burden by more than two-thirds of the potentially in-scope facilities, and would focus permit authorities on the majority of cooling water withdrawals."[88] This statement may be true, but it should not end the analysis. It may also be true that a lower threshold would cover a much larger volume of cooling water withdrawals without burdening a disproportionately high number of facilities. EPA should better explain how it has determined the optimal monitoring and reporting threshold. Raising the threshold reduces administrative costs, but it may also reduce the accuracy of the site-specific standard and thus reduce the social benefits produced. Conversely, lowering the threshold increases the administrative costs, but potentially increases the social benefits. EPA should set this threshold at the point where the burdens of additional reporting (marginal costs) are equal to the social benefits of the additional information (marginal benefits). EPA should be able to estimate these values from its existing facility surveys, sample entrainment characterization studies, and regional benefits analyses.

Clarify How Structured Site-Specific Review Differs from Best Professional Judgment

In the absence of a federal rule for existing facilities under Section 316(b), states have been applying a best professional judgment standard. "Best professional judgment" is a term of art and describes a particular methodology of review. EPA most notably defined "best professional judgment" in its 1996 NPDES Permit Writers' Manual ("Manual").[89] The Manual defines it as "the highest quality technical opinion developed by a permit writer after consideration of all reasonably available and pertinent data or information that forms the basis for the terms and conditions of a NPDES permit."[90] According to the Manual, the authority to regulate using a state agency's best professional judgment derives from Section 402(a)(1) of the Clean Water Act,[91] and it is employed when specific national regulations are not otherwise available.[92] According to EPA, the best professional judgment standard "allows the permit writer considerable flexibility in establishing permit terms and conditions. Inherent in this flexibility, however, is the burden on the permit writer to show that [this standard] is reasonable and based on sound engineering analysis."[93] On

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[86] *See* Proposed Rule, *supra* note 15, at 22,275-76 (to be codified at 40 C.F.R. pt. 122.21(r)(ii)(A)).

[87] *See id.* at 22,275-76; *see also id.* at 22,277-79 (to be codified at 40 C.F.R. pt. 122.21(r)(9)-(12)).

[88] Proposed Rule, *supra* note 15, at 22,195.

[89] ENVTL. PROT. AGENCY, U.S. EPA NPDES PERMIT WRITERS' MANUAL 68-75 (2006), *available at* http://cfpub.epa.gov/npdes/writermanual.cfm?program_id=45 [hereinafter NPDES MANUAL].

[90] *Id.* at 68.

[91] 33 U.S.C. § 1342(a)(1) (2006).

[92] NPDES MANUAL, *supra* note 89, at 68. After revoking the original Phase II rule, EPA reinstated best professional judgment as the standard for regulating cooling water intake structures. *Supra* note 8, at 37,108.

[93] NPDES MANUAL, *supra* note 89, at 69.

the basis of these federal guidelines, each state defines "best professional judgment" for its own purposes.[94]

Best professional judgment is similar to structured site-specific analysis insofar as they are both case-by-case determinations by state environmental agencies. However, structured site-specific review under the proposed rule is clearly meant to be distinct from a best professional judgment determination. For example, the proposed rule requires state agencies to factor particular considerations into their site-specific reviews on the basis of specific submissions by plant owners and operators.

In the proposed rule, EPA should directly contrast the two standards and articulate the ways in which structured site-specific review differs from best professional judgment.[95] Early reactions to the proposed rule suggest that the differences between the two are insufficiently clear, and some commentators seem to be conflating them.[96] Given that environmental groups may be conflating the two standards, it is possible that state agencies may do something similar. The states have been applying the best professional judgment standard to cooling water intake structures since Section 316(b) became law in the 1970s. They have compiled detailed guidance and institutional memory regarding its use. There exists a real risk that state agencies may improperly import these practices into their case-by-case determinations under the proposed rule. In a recent survey of regulatory review procedures of all fifty states, very few states had experience with applying cost-benefit analysis at the same level of sophistication as the federal government.[97] In conjunction with the wide discretion that states have to "consider" the relative importance of factors under the proposed rule,[98] states may underemphasize the role of cost-benefit analysis in their final site-specific determinations. EPA can combat this risk, in part, by emphasizing the ways in which the two standards differ.

Utilize Retrospective Review

Executive Order 13,563 requires federal agencies to develop and implement a program of retrospective review to evaluate the performance of existing regulations.[99] In developing this proposed rule, EPA should consider the role of retrospective review. Under such review, EPA should seek to evaluate the rule's ongoing costs and benefits at the national level and also to evaluate the performance of state agencies in developing and enforcing site-specific standards for entrainment mortality. This should include periodic audits of regulated facilities. To minimize the administrative burden on state and federal agencies, these audits should focus on simple, easy-to-

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[94] *See, e.g.*, BUREAU OF WATERSHED MANAGEMENT, GUIDANCE FOR EVALUATING INTAKE STRUCTURES USING BEST PROFESSIONAL JUDGMENT (BPJ), *available at* http://www.dnr.state.wi.us/org/water/wm/wqs/316b/316bGuidanceBPJ.pdf.

[95] The proposed rule would continue to use best professional judgment for a limited number of facilities. For example, state agencies would apply best professional judgment when permitting the cooling water intake structures at offshore liquefied natural gas terminals. Proposed Rule, *supra* note 15, at 22,281 (to be codified at 40 C.F.R. pt. 125.91(d)).

[96] *See, e.g.*, Josh Galperin, *New Rule Suggests EPA Is Caving Under Pressure (And So Are the Fish)*, CLEANENERGY.ORG (Mar. 30, 2011), http://blog.cleanenergy.org/2011/03/30/epacaving-under-pressure/ ("Equally disappointing, EPA has not set any standards for entrainment. Rather, EPA has told state agencies to use their 'best professional judgment' when deciding how plants should address the problem of entrainment.").

[97] SCHWARTZ, *supra* note 59.

[98] Proposed Rule, *supra* note 15, at 22,288 (to be codified at 40 C.F.R. pt. 125.98(e)).

[99] Exec. Order No. 13,653 § 6, 76 Fed. Reg. 3821, 3822 (Jan. 18, 2011); *see also* OFFICE OF INFO. AND REGULATORY AFFAIRS, OFFICE OF MGMT. & BUDGET, EXEC. OFFICE OF THE PRESIDENT, M-11-10, EXECUTIVE ORDER 13563, "IMPROVING REGULATION AND REGULATORY REVIEW" 4-6 (2011) (elaborating upon the retrospective review requirements of Executive Order 13,653.).

read metrics, including fish age-one equivalent mortality, energy output, electricity rates, and fuel switching.[100]

EPA should use the results of these audits to improve the effectiveness of the rule in achieving the objectives of the Clean Water Act and of Executive Order 13,563.[101] What this means in practice will depend on the results obtained. It may entail issuing new guidance on how states should perform their structured site-specific reviews. Or, if the rule is dramatically failing to achieve its goals, it may entail an entirely new rulemaking.

However the agency decides to use these results, EPA should not use them as a basis to penalize facilities, provided that they are compliant with existing state requirements. This ensures the cooperation of plant owners and operators and preserves certainty for the regulated community. In other words, an unsatisfactory reduction in fish mortality in the context of a retrospective review should not, by itself, invalidate existing permits. Rather, retrospective review should be an opportunity to evaluate the rule's successes and failures on a programmatic level.

Consider Implementing an Administrative Appeals Process

EPA should also consider whether the rule would benefit from an administrative appeals process to allow timely challenges to state determinations of "best technology available." An appeals process should provide an opportunity both for regulated firms to challenge what they perceive as an overly stringent regulatory determination and for regulatory beneficiaries to challenge state inaction or under-regulation.[102]

There are potential drawbacks to an administrative appeals process. It creates opportunities for delay by regulated firms and it imposes additional administrative costs. Therefore, EPA should only implement an appeals process if it concludes that these additional costs are outweighed by the benefits of such a program. The benefits would include the opportunity for regulatory beneficiaries to meaningfully challenge regulatory inaction in the face of potentially severe environmental damage; opportunities for settlement before a legal challenge reaches the courts, which may reduce regulatory delay; and—most importantly—the facilitation of an ongoing dialogue among the various state agencies and with EPA, which should result in site-specific regulatory determinations that more consistently maximize net benefits.

EPA Properly Selected Closed-Cycle Cooling as a Regulatory Safe Harbor

EPA's narrative description of the proposed rule stresses structured site-specific review as the primary method of compliance with the entrainment standard. It is true that this is likely the regulation's most important feature and the majority of covered facilities will opt to receive such a review from their respective state agencies. However, the proposed rule quietly contains another compliance option. Under proposed Section 125.94(a)(2), the owner or operator of an existing

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[100] *See* European Commission, *Impact Assessment Guidelines*, SEC(2009) 48-49 (Jan. 15, 2009) (explaining best practices in the European Union for regulatory review), *available at* http://ec.europa.eu/governance/impact/commission_guidelines/docs/iag_2009_en.pdf; *see also* European Commission, *Part III: Annexes to Impact Assessment Guidelines* 76-78 (Jan. 15, 2009) (elaborating upon best practices in the European Union for retrospective regulatory review), *available at* http://ec.europa.eu/governance/impact/commission_guidelines/docs/iag_2009_annex_en.pdf.

[101] *See* OFFICE OF INFO. AND REGULATORY AFFAIRS, *supra* note 99, at 4 ("While systematic review should focus on the elimination of rules that are no longer justified or necessary, such review should also consider strengthening, complementing, or modernizing rules where necessary or appropriate—including, if relevant, undertaking new rulemaking.").

[102] With the notable exception of *Massachusetts v. EPA*, 549 U.S. 497 (2007), Article III courts have generally shied away from challenging agency inaction even in situations where potential regulations could increase social welfare. Any administrative appeals process established under this rule should seek to combat that bias by entertaining challenges that state agencies have under-regulated or failed to regulate cooling water intake structures. *See generally* REVESZ & LIVERMORE, *supra* note 16, at 159 (discussing the existing structural biases against challenges to agency inaction).

facility may choose to comply with the entrainment mortality standard by installing a cooling water intake structure that reduces either actual intake flow or entrainment mortality to a level roughly equivalent to closed-cycle cooling.[103] This is a viable and important option for compliance. A closed-cycle cooling standard is consistent with the new source requirements established under Phase I of the Section 316(b) regulations. Moreover, it complements the proposed rule's tiered monitoring and reporting structure by further reducing the administrative burden for plants that adopt closed-cycle cooling.

A safe harbor has important benefits for state environmental agencies. First, it sends a clear signal to state regulators that they should take their responsibilities seriously to set sufficiently protective standards. Creating a clear, but rebuttable, presumption in favor of a stringent compliance option is one way to do so. Second, as EPA notes in the proposed rule, structured site-specific reviews are likely to be a resource-intensive process for the state agencies.[104] The existence of an automatic compliance option allows state agencies to better manage their administrative burdens. While the decision to adopt closed-cycle cooling lies with a facility's owner and operator, if the automatic compliance option is more desirable for state agencies, they may negotiate with the regulated community to persuade them to adopt the more stringent standard.

There may be reasons for owners and operators to prefer the safe harbor as well, even one as potentially expensive as closed-cycle cooling. A safe harbor has the virtue of certainty. Particular plants might be able to obtain a less stringent determination of best technology available from the state agency; however, such a determination would follow years of monitoring, analysis, and potential litigation. Even after expending considerable resources towards conducting or cooperating with the analysis, a weaker standard is by no means guaranteed. Owners and operators may prefer the long-term certainty of a known standard to the near-term goal of avoiding upgrades to their cooling water intake structures. This is most true for facilities that suspect they may ultimately by subject to closed-cycle cooling requirements anyway. Further, the costs of the various extra reporting requirements under Section 122.21 may simply exceed the marginal costs of installing a closed-cycle cooling system. In such cases even a firm with perfect information about the future would rationally prefer to adopt the more stringent standard. A closed-cycle cooling system will also typically make it easier for facilities to comply with the proposed rule's impingement requirements.[105] Finally, if EPA decides to adopt a deadline by which all existing facilities must install closed-cycle cooling systems—as this Comment argues that it should—firms may prefer to adopt closed-cycle cooling in the near-term rather than delay it. This would avoid the prospect of incurring costs to install interim compliance measures today only to face the requirement for further upgrades in the future. No single one of these factors is likely to persuade a firm to voluntarily install closed-cycle cooling; however, some combination of them may be persuasive.

VI. Federalism and the Rule's Scope

EPA should considering altering the division of regulatory authority between federal and state agencies and should bolster its explanation regarding the determination of which facilities will be regulated under the rule.

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[103] Proposed Rule, *supra* note 15, at 22,282 (to be codified at 40 C.F.R. pts. 125.94(a)(2) and 125.94(d)).

[104] *Id.* at 22, 261 ("EPA recognizes the resource limitations faced by [state] permitting authorities.").

[105] *Id.* at 22,205 ("As a practical matter, make-up water withdrawals are made at such low velocities that facilities with closed-cycle [sic] can demonstrate compliance with the alternative reduced intake velocity to meet the impingement mortality limits.").

Retain Federal Authority for Facilities that Risk Significant Interstate Externalities

EPA delegates a large amount of authority to the states under the site-specific entrainment provision of the proposed rule. There are certain situations, however, where the federal government is better positioned to determine this standard than are the individual states. In particular, this includes situations where a facility's choice of cooling water intake structure may impose significant externalities on downstream states. Such a situation is more likely to arise when a facility is located near the border between two states, though it may occur whenever a facility is in a position to affect downstream resources such as fish migration across state boundaries.[106] State agencies are unlikely to fully consider social benefits that accrue to other states from the regulation of cooling water intake structures. Therefore, the upstream states are likely to adopt sub-optimally lax standards and under-invest in protective technology.

"The presence of interstate externalities constitutes a market failure . . . . [C]orrecting the externality leads to the maximization of social welfare."[107] Given the structure of the proposed rule, the simplest solution is to retain federal authority over the regulation of sources that risk significant interstate externalities. The federal government is in a better position to evaluate these facilities without bias and thus adopt a standard that maximizes net benefits, regardless of state lines.

Expanding the Rule's Scope to Cover Facilities above 2 MGD Will Help Maximize Net Benefits

In 2004 Phase II rulemaking, EPA elected to create national standards for existing facilities that withdrew at least 50 MGD from U.S. waterbodies.[108] EPA has expanded the national Phase II regulation considerably—the proposed regulation now covers existing facilities that withdraw in excess of 2 MGD.[109]

Under the proposed rule, EPA has created a blanket rule with a de minimus exception. Establishing de minimus exceptions is often an appropriate regulatory approach, because there is generally a size threshold for firms below which the administrative costs of regulation outweigh the benefits. In 2004, it was unclear why EPA chose to regulate impingement and entrainment only of firms that withdrew greater than 50 MGD; the costs of regulating firms falling beneath the 50 MGD threshold did not obviously outweigh the benefits.

EPA should expand its justification for setting the exception where it has. In practice, any bright line threshold between regulated firms and the de minimus exception will involve some level of arbitrariness and impose some wasteful costs. That being said, such a threshold is justified, so long as EPA clearly articulates the reasons for its choice, clarifying the analytical framework it used and the inquiry conducted. If EPA can demonstrate that facilities withdrawing less than 2 MGD would generally cost more to regulate than the benefits warrant, this exception maximizes net benefits.

VII. Conclusion

The proposed rule has the potential to significantly enhance the nation's water quality by revoking an implicit and unjustified subsidy to industrial facilities. It requires power plants and manufacturing facilities to internalize the costs of their cooling water operations on environmental health and ecosystem services.

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[106] For one notable case addressing analogous issues in the context of the Clean Air Act, *see Air Pollution Control District of Jefferson County v. Envtl. Prot. Agency*, 739 F.2d 1071 (6th Cir. 1984).

[107] Richard Revesz, *Federalism and Interstate Environmental Externalities*, 144 U. PA. L. REV. 2341, 2374-75 (1996).

[108] 2004 Phase II Rule, *supra* note 5.

[109] Proposed Rule, *supra* note 15, at 22,174.

EPA should ensure that it is using consistent, substantive criteria and cost-benefit methodology throughout this rulemaking. EPA should also ensure that any site-specific analyses comply with the mandate of Executive Order 13,563 and the stated goal of the agency to maximize net benefits. Further, EPA should articulate a long-term goal of upgrading all regulated facilities over time and ensure that the rule will achieve that goal.

The proposed rule represents a dramatic improvement in the methodology, the policy ambitions, and the administrative record over the 2004 Phase II rule. These recommended improvements to the final Phase II rule will help maximize net social benefits making it a stronger, more efficient, and more useful regulation.

Sincerely,

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N=Bill Maxwell/OU=RTP/O=USEPA/C=US@EPA;CN=Brian
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OBrien/OU=R2/O=USEPA/C=US@EPA;CN=Karrie-Jo
Shell/OU=R4/O=USEPA/C=US@EPA;CN=Kate
O'Mara/OU=DC/O=USEPA/C=US@EPA;CN=Kevin
Pierard/OU=R5/O=USEPA/C=US@EPA;CN=Marcus
Zobrist/OU=DC/O=USEPA/C=US@EPA;CN=Mark
Smith/OU=R3/O=USEPA/C=US@EPA;CN=Mark
Stein/OU=R1/O=USEPA/C=US@EPA;CN=MaryEllen
Levine/OU=DC/O=USEPA/C=US@EPA;CN=Mimi
Dannel/OU=DC/O=USEPA/C=US@EPA;CN=Moses
Chang/OU=R2/O=USEPA/C=US@EPA;CN=Paul
Balserak/OU=DC/O=USEPA/C=US@EPA;CN=Richard
Witt/OU=DC/O=USEPA/C=US@EPA;CN=Sandy
Evalenko/OU=DC/O=USEPA/C=US@EPA;CN=Sharon
DeMeo/OU=R1/O=USEPA/C=US@EPA;CN=Stephen
Jann/OU=R5/O=USEPA/C=US@EPA;CN=Steve
Newbold/OU=DC/O=USEPA/C=US@EPA;CN=Tom Born/OU=DC/O=USEPA/C=US@EPA[];
N=Brian Littleton/OU=DC/O=USEPA/C=US@EPA;CN=Bruce
Kent/OU=R8/O=USEPA/C=US@EPA;CN=Cindy
Roberts/OU=DC/O=USEPA/C=US@EPA;CN=Colleen
Gillespie/OU=R8/O=USEPA/C=US@EPA;CN=Danielle
Gaito/OU=R1/O=USEPA/C=US@EPA;CN=David
Drelich/OU=DC/O=USEPA/C=US@EPA;CN=David

Webster/OU=R1/O=USEPA/C=US@EPA;CN=DavidW
Smith/OU=R9/O=USEPA/C=US@EPA;CN=Erik
Helm/OU=DC/O=USEPA/C=US@EPA;CN=Glenn
Curtis/OU=R7/O=USEPA/C=US@EPA;CN=Isaac
Chen/OU=R6/O=USEPA/C=US@EPA;CN=JamesPaul
Marincola/OU=R9/O=USEPA/C=US@EPA;CN=Jamie
Piziali/OU=DC/O=USEPA/C=US@EPA;CN=John
Dunn/OU=R7/O=USEPA/C=US@EPA;CN=John
Powers/OU=DC/O=USEPA/C=US@EPA;CN=Js
Wilson/OU=DC/O=USEPA/C=US@EPA;CN=Julie
Hewitt/OU=DC/O=USEPA/C=US@EPA;CN=Karen
OBrien/OU=R2/O=USEPA/C=US@EPA;CN=Karrie-Jo
Shell/OU=R4/O=USEPA/C=US@EPA;CN=Kate
O'Mara/OU=DC/O=USEPA/C=US@EPA;CN=Kevin
Pierard/OU=R5/O=USEPA/C=US@EPA;CN=Marcus
Zobrist/OU=DC/O=USEPA/C=US@EPA;CN=Mark
Smith/OU=R3/O=USEPA/C=US@EPA;CN=Mark
Stein/OU=R1/O=USEPA/C=US@EPA;CN=MaryEllen
Levine/OU=DC/O=USEPA/C=US@EPA;CN=Mimi
Dannel/OU=DC/O=USEPA/C=US@EPA;CN=Moses
Chang/OU=R2/O=USEPA/C=US@EPA;CN=Paul
Balserak/OU=DC/O=USEPA/C=US@EPA;CN=Richard
Witt/OU=DC/O=USEPA/C=US@EPA;CN=Sandy
Evalenko/OU=DC/O=USEPA/C=US@EPA;CN=Sharon
DeMeo/OU=R1/O=USEPA/C=US@EPA;CN=Stephen
Jann/OU=R5/O=USEPA/C=US@EPA;CN=Steve
Newbold/OU=DC/O=USEPA/C=US@EPA;CN=Tom Born/OU=DC/O=USEPA/C=US@EPA[];
N=Bruce Kent/OU=R8/O=USEPA/C=US@EPA;CN=Cindy
Roberts/OU=DC/O=USEPA/C=US@EPA;CN=Colleen
Gillespie/OU=R8/O=USEPA/C=US@EPA;CN=Danielle
Gaito/OU=R1/O=USEPA/C=US@EPA;CN=David
Drelich/OU=DC/O=USEPA/C=US@EPA;CN=David
Webster/OU=R1/O=USEPA/C=US@EPA;CN=DavidW
Smith/OU=R9/O=USEPA/C=US@EPA;CN=Erik
Helm/OU=DC/O=USEPA/C=US@EPA;CN=Glenn
Curtis/OU=R7/O=USEPA/C=US@EPA;CN=Isaac
Chen/OU=R6/O=USEPA/C=US@EPA;CN=JamesPaul
Marincola/OU=R9/O=USEPA/C=US@EPA;CN=Jamie
Piziali/OU=DC/O=USEPA/C=US@EPA;CN=John
Dunn/OU=R7/O=USEPA/C=US@EPA;CN=John
Powers/OU=DC/O=USEPA/C=US@EPA;CN=Js
Wilson/OU=DC/O=USEPA/C=US@EPA;CN=Julie
Hewitt/OU=DC/O=USEPA/C=US@EPA;CN=Karen
OBrien/OU=R2/O=USEPA/C=US@EPA;CN=Karrie-Jo
Shell/OU=R4/O=USEPA/C=US@EPA;CN=Kate
O'Mara/OU=DC/O=USEPA/C=US@EPA;CN=Kevin
Pierard/OU=R5/O=USEPA/C=US@EPA;CN=Marcus
Zobrist/OU=DC/O=USEPA/C=US@EPA;CN=Mark
Smith/OU=R3/O=USEPA/C=US@EPA;CN=Mark
Stein/OU=R1/O=USEPA/C=US@EPA;CN=MaryEllen
Levine/OU=DC/O=USEPA/C=US@EPA;CN=Mimi
Dannel/OU=DC/O=USEPA/C=US@EPA;CN=Moses
Chang/OU=R2/O=USEPA/C=US@EPA;CN=Paul
Balserak/OU=DC/O=USEPA/C=US@EPA;CN=Richard
Witt/OU=DC/O=USEPA/C=US@EPA;CN=Sandy
Evalenko/OU=DC/O=USEPA/C=US@EPA;CN=Sharon

DeMeo/OU=R1/O=USEPA/C=US@EPA;CN=Stephen
Jann/OU=R5/O=USEPA/C=US@EPA;CN=Steve
Newbold/OU=DC/O=USEPA/C=US@EPA;CN=Tom Born/OU=DC/O=USEPA/C=US@EPA[];
N=Cindy Roberts/OU=DC/O=USEPA/C=US@EPA;CN=Colleen
Gillespie/OU=R8/O=USEPA/C=US@EPA;CN=Danielle
Gaito/OU=R1/O=USEPA/C=US@EPA;CN=David
Drelich/OU=DC/O=USEPA/C=US@EPA;CN=David
Webster/OU=R1/O=USEPA/C=US@EPA;CN=DavidW
Smith/OU=R9/O=USEPA/C=US@EPA;CN=Erik
Helm/OU=DC/O=USEPA/C=US@EPA;CN=Glenn
Curtis/OU=R7/O=USEPA/C=US@EPA;CN=Isaac
Chen/OU=R6/O=USEPA/C=US@EPA;CN=JamesPaul
Marincola/OU=R9/O=USEPA/C=US@EPA;CN=Jamie
Piziali/OU=DC/O=USEPA/C=US@EPA;CN=John
Dunn/OU=R7/O=USEPA/C=US@EPA;CN=John
Powers/OU=DC/O=USEPA/C=US@EPA;CN=Js
Wilson/OU=DC/O=USEPA/C=US@EPA;CN=Julie
Hewitt/OU=DC/O=USEPA/C=US@EPA;CN=Karen
OBrien/OU=R2/O=USEPA/C=US@EPA;CN=Karrie-Jo
Shell/OU=R4/O=USEPA/C=US@EPA;CN=Kate
O'Mara/OU=DC/O=USEPA/C=US@EPA;CN=Kevin
Pierard/OU=R5/O=USEPA/C=US@EPA;CN=Marcus
Zobrist/OU=DC/O=USEPA/C=US@EPA;CN=Mark
Smith/OU=R3/O=USEPA/C=US@EPA;CN=Mark
Stein/OU=R1/O=USEPA/C=US@EPA;CN=MaryEllen
Levine/OU=DC/O=USEPA/C=US@EPA;CN=Mimi
Dannel/OU=DC/O=USEPA/C=US@EPA;CN=Moses
Chang/OU=R2/O=USEPA/C=US@EPA;CN=Paul
Balserak/OU=DC/O=USEPA/C=US@EPA;CN=Richard
Witt/OU=DC/O=USEPA/C=US@EPA;CN=Sandy
Evalenko/OU=DC/O=USEPA/C=US@EPA;CN=Sharon
DeMeo/OU=R1/O=USEPA/C=US@EPA;CN=Stephen
Jann/OU=R5/O=USEPA/C=US@EPA;CN=Steve
Newbold/OU=DC/O=USEPA/C=US@EPA;CN=Tom Born/OU=DC/O=USEPA/C=US@EPA[];
N=Colleen Gillespie/OU=R8/O=USEPA/C=US@EPA;CN=Danielle
Gaito/OU=R1/O=USEPA/C=US@EPA;CN=David
Drelich/OU=DC/O=USEPA/C=US@EPA;CN=David
Webster/OU=R1/O=USEPA/C=US@EPA;CN=DavidW
Smith/OU=R9/O=USEPA/C=US@EPA;CN=Erik
Helm/OU=DC/O=USEPA/C=US@EPA;CN=Glenn
Curtis/OU=R7/O=USEPA/C=US@EPA;CN=Isaac
Chen/OU=R6/O=USEPA/C=US@EPA;CN=JamesPaul
Marincola/OU=R9/O=USEPA/C=US@EPA;CN=Jamie
Piziali/OU=DC/O=USEPA/C=US@EPA;CN=John
Dunn/OU=R7/O=USEPA/C=US@EPA;CN=John
Powers/OU=DC/O=USEPA/C=US@EPA;CN=Js
Wilson/OU=DC/O=USEPA/C=US@EPA;CN=Julie
Hewitt/OU=DC/O=USEPA/C=US@EPA;CN=Karen
OBrien/OU=R2/O=USEPA/C=US@EPA;CN=Karrie-Jo
Shell/OU=R4/O=USEPA/C=US@EPA;CN=Kate
O'Mara/OU=DC/O=USEPA/C=US@EPA;CN=Kevin
Pierard/OU=R5/O=USEPA/C=US@EPA;CN=Marcus
Zobrist/OU=DC/O=USEPA/C=US@EPA;CN=Mark
Smith/OU=R3/O=USEPA/C=US@EPA;CN=Mark
Stein/OU=R1/O=USEPA/C=US@EPA;CN=MaryEllen
Levine/OU=DC/O=USEPA/C=US@EPA;CN=Mimi

Dannel/OU=DC/O=USEPA/C=US@EPA;CN=Moses
Chang/OU=R2/O=USEPA/C=US@EPA;CN=Paul
Balserak/OU=DC/O=USEPA/C=US@EPA;CN=Richard
Witt/OU=DC/O=USEPA/C=US@EPA;CN=Sandy
Evalenko/OU=DC/O=USEPA/C=US@EPA;CN=Sharon
DeMeo/OU=R1/O=USEPA/C=US@EPA;CN=Stephen
Jann/OU=R5/O=USEPA/C=US@EPA;CN=Steve
Newbold/OU=DC/O=USEPA/C=US@EPA;CN=Tom Born/OU=DC/O=USEPA/C=US@EPA[];
N=Danielle Gaito/OU=R1/O=USEPA/C=US@EPA;CN=David
Drelich/OU=DC/O=USEPA/C=US@EPA;CN=David
Webster/OU=R1/O=USEPA/C=US@EPA;CN=DavidW
Smith/OU=R9/O=USEPA/C=US@EPA;CN=Erik
Helm/OU=DC/O=USEPA/C=US@EPA;CN=Glenn
Curtis/OU=R7/O=USEPA/C=US@EPA;CN=Isaac
Chen/OU=R6/O=USEPA/C=US@EPA;CN=JamesPaul
Marincola/OU=R9/O=USEPA/C=US@EPA;CN=Jamie
Piziali/OU=DC/O=USEPA/C=US@EPA;CN=John
Dunn/OU=R7/O=USEPA/C=US@EPA;CN=John
Powers/OU=DC/O=USEPA/C=US@EPA;CN=Js
Wilson/OU=DC/O=USEPA/C=US@EPA;CN=Julie
Hewitt/OU=DC/O=USEPA/C=US@EPA;CN=Karen
OBrien/OU=R2/O=USEPA/C=US@EPA;CN=Karrie-Jo
Shell/OU=R4/O=USEPA/C=US@EPA;CN=Kate
O'Mara/OU=DC/O=USEPA/C=US@EPA;CN=Kevin
Pierard/OU=R5/O=USEPA/C=US@EPA;CN=Marcus
Zobrist/OU=DC/O=USEPA/C=US@EPA;CN=Mark
Smith/OU=R3/O=USEPA/C=US@EPA;CN=Mark
Stein/OU=R1/O=USEPA/C=US@EPA;CN=MaryEllen
Levine/OU=DC/O=USEPA/C=US@EPA;CN=Mimi
Dannel/OU=DC/O=USEPA/C=US@EPA;CN=Moses
Chang/OU=R2/O=USEPA/C=US@EPA;CN=Paul
Balserak/OU=DC/O=USEPA/C=US@EPA;CN=Richard
Witt/OU=DC/O=USEPA/C=US@EPA;CN=Sandy
Evalenko/OU=DC/O=USEPA/C=US@EPA;CN=Sharon
DeMeo/OU=R1/O=USEPA/C=US@EPA;CN=Stephen
Jann/OU=R5/O=USEPA/C=US@EPA;CN=Steve
Newbold/OU=DC/O=USEPA/C=US@EPA;CN=Tom Born/OU=DC/O=USEPA/C=US@EPA[];
N=David Drelich/OU=DC/O=USEPA/C=US@EPA;CN=David
Webster/OU=R1/O=USEPA/C=US@EPA;CN=DavidW
Smith/OU=R9/O=USEPA/C=US@EPA;CN=Erik
Helm/OU=DC/O=USEPA/C=US@EPA;CN=Glenn
Curtis/OU=R7/O=USEPA/C=US@EPA;CN=Isaac
Chen/OU=R6/O=USEPA/C=US@EPA;CN=JamesPaul
Marincola/OU=R9/O=USEPA/C=US@EPA;CN=Jamie
Piziali/OU=DC/O=USEPA/C=US@EPA;CN=John
Dunn/OU=R7/O=USEPA/C=US@EPA;CN=John
Powers/OU=DC/O=USEPA/C=US@EPA;CN=Js
Wilson/OU=DC/O=USEPA/C=US@EPA;CN=Julie
Hewitt/OU=DC/O=USEPA/C=US@EPA;CN=Karen
OBrien/OU=R2/O=USEPA/C=US@EPA;CN=Karrie-Jo
Shell/OU=R4/O=USEPA/C=US@EPA;CN=Kate
O'Mara/OU=DC/O=USEPA/C=US@EPA;CN=Kevin
Pierard/OU=R5/O=USEPA/C=US@EPA;CN=Marcus
Zobrist/OU=DC/O=USEPA/C=US@EPA;CN=Mark
Smith/OU=R3/O=USEPA/C=US@EPA;CN=Mark
Stein/OU=R1/O=USEPA/C=US@EPA;CN=MaryEllen

Levine/OU=DC/O=USEPA/C=US@EPA;CN=Mimi
Dannel/OU=DC/O=USEPA/C=US@EPA;CN=Moses
Chang/OU=R2/O=USEPA/C=US@EPA;CN=Paul
Balserak/OU=DC/O=USEPA/C=US@EPA;CN=Richard
Witt/OU=DC/O=USEPA/C=US@EPA;CN=Sandy
Evalenko/OU=DC/O=USEPA/C=US@EPA;CN=Sharon
DeMeo/OU=R1/O=USEPA/C=US@EPA;CN=Stephen
Jann/OU=R5/O=USEPA/C=US@EPA;CN=Steve
Newbold/OU=DC/O=USEPA/C=US@EPA;CN=Tom Born/OU=DC/O=USEPA/C=US@EPA[];
N=David Webster/OU=R1/O=USEPA/C=US@EPA;CN=DavidW
Smith/OU=R9/O=USEPA/C=US@EPA;CN=Erik
Helm/OU=DC/O=USEPA/C=US@EPA;CN=Glenn
Curtis/OU=R7/O=USEPA/C=US@EPA;CN=Isaac
Chen/OU=R6/O=USEPA/C=US@EPA;CN=JamesPaul
Marincola/OU=R9/O=USEPA/C=US@EPA;CN=Jamie
Piziali/OU=DC/O=USEPA/C=US@EPA;CN=John
Dunn/OU=R7/O=USEPA/C=US@EPA;CN=John
Powers/OU=DC/O=USEPA/C=US@EPA;CN=Js
Wilson/OU=DC/O=USEPA/C=US@EPA;CN=Julie
Hewitt/OU=DC/O=USEPA/C=US@EPA;CN=Karen
OBrien/OU=R2/O=USEPA/C=US@EPA;CN=Karrie-Jo
Shell/OU=R4/O=USEPA/C=US@EPA;CN=Kate
O'Mara/OU=DC/O=USEPA/C=US@EPA;CN=Kevin
Pierard/OU=R5/O=USEPA/C=US@EPA;CN=Marcus
Zobrist/OU=DC/O=USEPA/C=US@EPA;CN=Mark
Smith/OU=R3/O=USEPA/C=US@EPA;CN=Mark
Stein/OU=R1/O=USEPA/C=US@EPA;CN=MaryEllen
Levine/OU=DC/O=USEPA/C=US@EPA;CN=Mimi
Dannel/OU=DC/O=USEPA/C=US@EPA;CN=Moses
Chang/OU=R2/O=USEPA/C=US@EPA;CN=Paul
Balserak/OU=DC/O=USEPA/C=US@EPA;CN=Richard
Witt/OU=DC/O=USEPA/C=US@EPA;CN=Sandy
Evalenko/OU=DC/O=USEPA/C=US@EPA;CN=Sharon
DeMeo/OU=R1/O=USEPA/C=US@EPA;CN=Stephen
Jann/OU=R5/O=USEPA/C=US@EPA;CN=Steve
Newbold/OU=DC/O=USEPA/C=US@EPA;CN=Tom Born/OU=DC/O=USEPA/C=US@EPA[];
N=DavidW Smith/OU=R9/O=USEPA/C=US@EPA;CN=Erik
Helm/OU=DC/O=USEPA/C=US@EPA;CN=Glenn
Curtis/OU=R7/O=USEPA/C=US@EPA;CN=Isaac
Chen/OU=R6/O=USEPA/C=US@EPA;CN=JamesPaul
Marincola/OU=R9/O=USEPA/C=US@EPA;CN=Jamie
Piziali/OU=DC/O=USEPA/C=US@EPA;CN=John
Dunn/OU=R7/O=USEPA/C=US@EPA;CN=John
Powers/OU=DC/O=USEPA/C=US@EPA;CN=Js
Wilson/OU=DC/O=USEPA/C=US@EPA;CN=Julie
Hewitt/OU=DC/O=USEPA/C=US@EPA;CN=Karen
OBrien/OU=R2/O=USEPA/C=US@EPA;CN=Karrie-Jo
Shell/OU=R4/O=USEPA/C=US@EPA;CN=Kate
O'Mara/OU=DC/O=USEPA/C=US@EPA;CN=Kevin
Pierard/OU=R5/O=USEPA/C=US@EPA;CN=Marcus
Zobrist/OU=DC/O=USEPA/C=US@EPA;CN=Mark
Smith/OU=R3/O=USEPA/C=US@EPA;CN=Mark
Stein/OU=R1/O=USEPA/C=US@EPA;CN=MaryEllen
Levine/OU=DC/O=USEPA/C=US@EPA;CN=Mimi
Dannel/OU=DC/O=USEPA/C=US@EPA;CN=Moses
Chang/OU=R2/O=USEPA/C=US@EPA;CN=Paul

Balserak/OU=DC/O=USEPA/C=US@EPA;CN=Richard
Witt/OU=DC/O=USEPA/C=US@EPA;CN=Sandy
Evalenko/OU=DC/O=USEPA/C=US@EPA;CN=Sharon
DeMeo/OU=R1/O=USEPA/C=US@EPA;CN=Stephen
Jann/OU=R5/O=USEPA/C=US@EPA;CN=Steve
Newbold/OU=DC/O=USEPA/C=US@EPA;CN=Tom Born/OU=DC/O=USEPA/C=US@EPA[];
N=Erik Helm/OU=DC/O=USEPA/C=US@EPA;CN=Glenn
Curtis/OU=R7/O=USEPA/C=US@EPA;CN=Isaac
Chen/OU=R6/O=USEPA/C=US@EPA;CN=JamesPaul
Marincola/OU=R9/O=USEPA/C=US@EPA;CN=Jamie
Piziali/OU=DC/O=USEPA/C=US@EPA;CN=John
Dunn/OU=R7/O=USEPA/C=US@EPA;CN=John
Powers/OU=DC/O=USEPA/C=US@EPA;CN=Js
Wilson/OU=DC/O=USEPA/C=US@EPA;CN=Julie
Hewitt/OU=DC/O=USEPA/C=US@EPA;CN=Karen
OBrien/OU=R2/O=USEPA/C=US@EPA;CN=Karrie-Jo
Shell/OU=R4/O=USEPA/C=US@EPA;CN=Kate
O'Mara/OU=DC/O=USEPA/C=US@EPA;CN=Kevin
Pierard/OU=R5/O=USEPA/C=US@EPA;CN=Marcus
Zobrist/OU=DC/O=USEPA/C=US@EPA;CN=Mark
Smith/OU=R3/O=USEPA/C=US@EPA;CN=Mark
Stein/OU=R1/O=USEPA/C=US@EPA;CN=MaryEllen
Levine/OU=DC/O=USEPA/C=US@EPA;CN=Mimi
Dannel/OU=DC/O=USEPA/C=US@EPA;CN=Moses
Chang/OU=R2/O=USEPA/C=US@EPA;CN=Paul
Balserak/OU=DC/O=USEPA/C=US@EPA;CN=Richard
Witt/OU=DC/O=USEPA/C=US@EPA;CN=Sandy
Evalenko/OU=DC/O=USEPA/C=US@EPA;CN=Sharon
DeMeo/OU=R1/O=USEPA/C=US@EPA;CN=Stephen
Jann/OU=R5/O=USEPA/C=US@EPA;CN=Steve
Newbold/OU=DC/O=USEPA/C=US@EPA;CN=Tom Born/OU=DC/O=USEPA/C=US@EPA[];
N=Glenn Curtis/OU=R7/O=USEPA/C=US@EPA;CN=Isaac
Chen/OU=R6/O=USEPA/C=US@EPA;CN=JamesPaul
Marincola/OU=R9/O=USEPA/C=US@EPA;CN=Jamie
Piziali/OU=DC/O=USEPA/C=US@EPA;CN=John
Dunn/OU=R7/O=USEPA/C=US@EPA;CN=John
Powers/OU=DC/O=USEPA/C=US@EPA;CN=Js
Wilson/OU=DC/O=USEPA/C=US@EPA;CN=Julie
Hewitt/OU=DC/O=USEPA/C=US@EPA;CN=Karen
OBrien/OU=R2/O=USEPA/C=US@EPA;CN=Karrie-Jo
Shell/OU=R4/O=USEPA/C=US@EPA;CN=Kate
O'Mara/OU=DC/O=USEPA/C=US@EPA;CN=Kevin
Pierard/OU=R5/O=USEPA/C=US@EPA;CN=Marcus
Zobrist/OU=DC/O=USEPA/C=US@EPA;CN=Mark
Smith/OU=R3/O=USEPA/C=US@EPA;CN=Mark
Stein/OU=R1/O=USEPA/C=US@EPA;CN=MaryEllen
Levine/OU=DC/O=USEPA/C=US@EPA;CN=Mimi
Dannel/OU=DC/O=USEPA/C=US@EPA;CN=Moses
Chang/OU=R2/O=USEPA/C=US@EPA;CN=Paul
Balserak/OU=DC/O=USEPA/C=US@EPA;CN=Richard
Witt/OU=DC/O=USEPA/C=US@EPA;CN=Sandy
Evalenko/OU=DC/O=USEPA/C=US@EPA;CN=Sharon
DeMeo/OU=R1/O=USEPA/C=US@EPA;CN=Stephen
Jann/OU=R5/O=USEPA/C=US@EPA;CN=Steve
Newbold/OU=DC/O=USEPA/C=US@EPA;CN=Tom Born/OU=DC/O=USEPA/C=US@EPA[];
N=Isaac Chen/OU=R6/O=USEPA/C=US@EPA;CN=JamesPaul

Marincola/OU=R9/O=USEPA/C=US@EPA;CN=Jamie
Piziali/OU=DC/O=USEPA/C=US@EPA;CN=John
Dunn/OU=R7/O=USEPA/C=US@EPA;CN=John
Powers/OU=DC/O=USEPA/C=US@EPA;CN=Js
Wilson/OU=DC/O=USEPA/C=US@EPA;CN=Julie
Hewitt/OU=DC/O=USEPA/C=US@EPA;CN=Karen
OBrien/OU=R2/O=USEPA/C=US@EPA;CN=Karrie-Jo
Shell/OU=R4/O=USEPA/C=US@EPA;CN=Kate
O'Mara/OU=DC/O=USEPA/C=US@EPA;CN=Kevin
Pierard/OU=R5/O=USEPA/C=US@EPA;CN=Marcus
Zobrist/OU=DC/O=USEPA/C=US@EPA;CN=Mark
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N=JamesPaul Marincola/OU=R9/O=USEPA/C=US@EPA;CN=Jamie
Piziali/OU=DC/O=USEPA/C=US@EPA;CN=John
Dunn/OU=R7/O=USEPA/C=US@EPA;CN=John
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Born/OU=DC/O=USEPA/C=US@EPA[]; N=Tom Born/OU=DC/O=USEPA/C=US@EPA[]
From: CN=Sean Ramach/OU=R5/O=USEPA/C=US
Sent: Thur 1/12/2012 7:32:46 PM
Subject: Re: briefing materials for 316b

Thanks Paul for the information. The only piece that I believe is missing and should be added is that the definition of "new unit" was changed t

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Ex. 5 - Deliberative

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Sean Ramach
Environmental Scientist
NPDES Programs Branch, Water Division
USEPA Region 5

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Chicago, IL 60604

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Fax: 312-692-2502

P Please consider the environment before printing this e-mail.

From: Paul Shriner/DC/USEPA/US
To: Agnes Ortiz/DC/USEPA/US@EPA, Alexis Strauss/R9/USEPA/US@EPA, Bill Maxwell/RTP/USEPA/US@EPA, Brian Littleton/DC/USEPA/US@EPA, Bruce Kent/R8/USEPA/US@EPA, Cindy Roberts/DC/USEPA/US@EPA, David Drelich/DC/USEPA/US@EPA, David Webster/R1/USEPA/US@EPA, Erik Helm/DC/USEPA/US@EPA, Glenn Curtis/R7/USEPA/US@EPA, Isaac Chen/R6/USEPA/US@EPA, JamesPaul Marincola/R9/USEPA/US@EPA, Jamie Piziali/DC/USEPA/US@EPA, John Dunn/R7/USEPA/US@EPA, John Powers/DC/USEPA/US@EPA, Julie Hewitt/DC/USEPA/US@EPA, Karen OBrien/R2/USEPA/US@EPA, Karrie-Jo Shell/R4/USEPA/US@EPA, Kevin
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Pierard/R5/USEPA/US@EPA, Mark Smith/R3/USEPA/US@EPA, Mark Stein/R1/USEPA/US@EPA, MaryEllen Levine/DC/USEPA/US@EPA, Mimi Dannel/DC/USEPA/US@EPA, Paul Balserak/DC/USEPA/US@EPA, Richard Witt/DC/USEPA/US@EPA, Sandy Evalenko/DC/USEPA/US@EPA, Sean Ramach/R5/USEPA/US@EPA, Sharon DeMeo/R1/USEPA/US@EPA, Stephen Jann/R5/USEPA/US@EPA, Tom Born/DC/USEPA/US@EPA, Marcus Zobrist/DC/USEPA/US@EPA, Moses Chang/R2/USEPA/US@EPA, DavidW Smith/R9/USEPA/US@EPA, Danielle Gaito/R1/USEPA/US@EPA, Steve Newbold/DC/USEPA/US@EPA, Kate O'Mara/DC/USEPA/US@EPA, Js Wilson/DC/USEPA/US@EPA, Colleen Gillespie/R8/USEPA/US@EPA
Date: 01/12/2012 12:55 PM
Subject: briefing materials for 316b

This material may be of use in preparation for next week's option discussion with the DA.

Paul

[attachment "Section 316 OS dicussion 01122011.docx" deleted by Sean Ramach/R5/USEPA/US]

To: CN=Lesley Schaaff/OU=DC/O=USEPA/C=US@EPA[]
Cc: []
Bcc: []
From: CN=Paul Balserak/OU=DC/O=USEPA/C=US
Sent: Wed 4/13/2011 8:13:50 PM
Subject: Re: ACTION Item: Short bullets requested by 4:30 today please (Thanks!) NCSL Agency Visits 4/14/2011

See below; happy to add / modify.
Paul

From: Lesley Schaaff/DC/USEPA/US
To: Paul Balserak/DC/USEPA/US@EPA, Lena Ferris/DC/USEPA/US@EPA, William Nickerson/DC/USEPA/US@EPA, Charlotte Bertrand/DC/USEPA/US@EPA, Bridgid Curry/DC/USEPA/US@EPA
Cc: Alexander Cristofaro/DC/USEPA/US@EPA, Ken Munis/DC/USEPA/US@EPA, Nicole Owens/DC/USEPA/US@EPA
Date: 04/13/2011 11:57 AM
Subject: ACTION Item: Short bullets requested by 4:30 today please (Thanks!) NCSL Agency Visits 4/14/2011

Hi all. See Robin's note below and request for a few bullets on each topic considering state interests. (Lena -- would you mind working with Bill since he literally just took over waters of the U.S. this week if Nicole doesn't mind). See my assignments below in blue.

Lesley Schaaff
Director, Policy & Regulatory Analysis Division
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U.S. Environmental Protection Agency
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----- Forwarded by Lesley Schaaff/DC/USEPA/US on 04/13/2011 11:54 AM -----

From: Robin Kime/DC/USEPA/US
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Cc: Alex Barron/DC/USEPA/US@EPA
Date: 04/13/2011 11:49 AM
Subject: ACTION Item: Short bullets requested by 4:30 today please (Thanks!) NCSL Agency Visits 4/14/2011

Hi

Tomorrow, Michael, Bicky and Alex B, along with OCIR, will meet with state legislators at their request. Below are some topics of interest they may raise. I'd appreciate it if you could send me 2-3 bullets on each topic, considering the vantage point of the states, by 4:30 today. Are there other topics we may want to include? Lesley reminded me of the state burden reduction effort.

I appreciate your help!

Potential Topics of Discussion

Ex. 5 - Deliberative

- Cooling water intake proposal (Paul)
- We proposed a cooling water intake structures rule which imposes a national categorical impingement standard for existing facilities over 2 MGD.

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Ex. 5 - Deliberative

To: CN=Paul Balserak/OU=DC/O=USEPA/C=US@EPA[]
Cc: []
Bcc: []
From: CN=Paul Balserak/OU=DC/O=USEPA/C=US
Sent: Wed 8/3/2011 2:09:49 PM
Subject: Fw: FYI - summary of NY final policy

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----- Forwarded by Paul Balserak/DC/USEPA/US on 08/03/2011 10:09 AM -----

From: Paul Shriner/DC/USEPA/US
To: Maryt Smith/DC/USEPA/US@EPA, Julie Hewitt/DC/USEPA/US@EPA, Paul Balserak/DC/USEPA/US@EPA
Date: 08/01/2011 09:01 AM
Subject: FYI - summary of NY final policy

The following performance goals are identified for selection of BTA to minimize adverse environmental impact from a CWIS:
1. Dry closed-cycle cooling as the performance goal for all new industrial facilities sited in the marine and coastal district (ECL § 13-0103) and along the Hudson River up to the Federal Dam in Troy;
2. Wet closed-cycle cooling as the minimum performance goal for all new industrial facilities located along all waters other than those covered by 1 above;
3. Wet closed-cycle cooling or its equivalent as the performance goal for existing industrial facilities that operate a CWIS in connection with a point source thermal discharge; and
4. Wet closed-cycle cooling as the performance goal for all repowered industrial facilities that operate a CWIS in connection with a point source thermal discharge.

Ex. 5 - Deliberative Also note the following exemption

Exemption from the Entrainment Performance Goal
An existing electric generating facility operated at less than fifteen (15) percent of its electric generating capacity over a current 5-year averaging period will be subject to the impingement mortality reduction performance goals of this policy and may be exempt from meeting the entrainment performance goal....

To: CN=Paul Balserak/OU=DC/O=USEPA/C=US@EPA[]
Cc: []
Bcc: []
From: CN=Paul Balserak/OU=DC/O=USEPA/C=US
Sent: Thur 8/11/2011 7:53:05 PM
Subject: Fw: FYI - summary of NY final policy

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----- Forwarded by Paul Balserak/DC/USEPA/US on 08/03/2011 10:09 AM -----

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To: Maryt Smith/DC/USEPA/US@EPA, Julie Hewitt/DC/USEPA/US@EPA, Paul Balserak/DC/USEPA/US@EPA
Date: 08/01/2011 09:01 AM
Subject: FYI - summary of NY final policy

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

National Pollutant Discharge Elimination System – Cooling Water Intake Structures at Existing Facilities and Phase I Facilities

76 Fed. Reg. 22,174 (April 20, 2011)

Docket ID No.
EPA–HQ–OW–2008–0667

COMMENTS OF RIVERKEEPER, INC., NATURAL RESOURCES DEFENSE COUNCIL, SIERRA CLUB, WATERKEEPER ALLIANCE, EARTHJUSTICE, ENVIRONMENTAL LAW AND POLICY CENTER, CLEAN AIR TASK FORCE, NETWORK FOR NEW ENERGY CHOICES, CALIFORNIA COASTKEEPER ALLIANCE, SOUNDKEEPER, INC., DELAWARE RIVERKEEPER NETWORK, SAVE THE BAY – RHODE ISLAND, FRIENDS OF CASCO BAY, NY/NJ BAYKEEPER, HACKENSACK RIVERKEEPER, SANTA MONICA BAYKEEPER, SAN DIEGO BAYKEEPER, SCENIC HUDSON, AMERICAN LITTORAL SOCIETY, AND CONSERVATION LAW FOUNDATION

Submitted via Federal Express & E-mail to:

Water Docket, EPA Docket Center
U.S. Environmental Protection Agency
EPA West Building, Room 3334
1301 Constitution Avenue, N.W.
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Submitted on behalf of commenters listed above by:

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Dated: August 18, 2011

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[1] To aid the reader, we have included here a one-page abridged summary of the Table of Contents, containing all of the major headings and condensed versions of some of the subheadings.

EXECUTIVE SUMMARY

When EPA promulgates the final version of this rule in 2012, four decades will have passed since Congress first directed the agency to stop power plant fish kills, yet the staggering aquatic mortality continues unabated as if it were still 1972. Today, Americans use electricity to power their cell phones and tablet PCs instead of rabbit-eared televisions, but cooling water regulation remains frozen in time as the plants supplying that power continue to kill enormous numbers of fish, overheat our waterways, and severely damage aquatic ecosystems using exactly the same once-through cooling systems as they did two generations ago. Unfortunately, the proposed rule[2] does little to solve this problem, despite the ready availability of modern technology that can nearly eliminate it.

In January 1993, when George H. W. Bush was still president, Riverkeeper and several of the other commenters sued EPA to compel issuance of the intake structure regulations mandated by the 1972 Clean Water Act.[3] Late last year, Administrator Lisa Jackson wrote to Representative Fred Upton of Michigan, who had requested that EPA delay issuance of the Proposed Rule beyond the March 2011 deadline that was agreed upon after the courts remanded EPA's prior rule for existing power plant intake structures. The Administrator refused to postpone the new rule, explaining to the Congressman:

> By the time the agency takes final action in July 2012, industry will have been waiting nearly twenty years [since Riverkeeper's 1993 lawsuit] for the *regulatory certainty that facilitates sound investment decisions*. The public will have been waiting just as long for *reassurance that the aquatic environment is being protected*. I do not want to delay any longer.[4]

Astonishingly, having recognized the need for both regulatory certainty and environmental protection – and the need to end decades of inaction – EPA has now issued a proposal that could hardly be less certain, less protective, or less expeditious. Contrary to the Clean Water Act's mandate, the Proposed Rule entrusts states with the task of stopping the annual slaughter of a trillion aquatic organisms by 1,200 power plants and manufacturers – one plant at a time. Worse yet, the Proposed Rule then burdens those state agencies with a complex yet indeterminate, subjective, standardless and undeniably lengthy case-by-case process that EPA knows full well cannot be effectively accomplished. The only "regulatory certainty" EPA has bestowed upon industry is the certainty of knowing that they can continue to run their plants with antiquated technology and thereby kill fish with impunity. Meanwhile, the public has been deprived of any semblance of reassurance that the aquatic environment is being protected.

---

[2] *See* 76 Fed. Reg. 22,174 (April 20, 2011) (National Pollutant Discharge Elimination System – Cooling Water Intake Structures at Existing Facilities and Phase I Facilities) (the "Proposed Rule").

[3] *See Cronin v. Reilly*, 93 Civ. 0314 (SDNY).

[4] Letter from Administrator Lisa P. Jackson to Congressman Fred Upton, December 16, 2010, at 1 (emphasis added), submitted as Exhibit 1 to these comments. Hereinafter, all citiations to comment exhibits include the exhibit number in this format: (Exh. #). In additon, Appendices A through I are also submitted herewith.

These comments make the following key points:[5]

The Proposed Rule is Illegal and Will Not Protect the Environment

Approach to "Best Technology Available" (BTA)

- ***EPA proposes to unlawfully reject uniform, national, categorical, technology-based, and technology-forcing standards*** in favor of case-by-case assessments of consequential water quality effects. EPA begins with an unlawful premise that a technology must be capable of being implemented universally as a prerequisite for setting national categorical standards and proceeds to ignore nearly all of the fundamental precepts that Congress established as the foundation of the Clean Water Act's technology-based framework.

- ***EPA's reliance on open-ended cost-benefit considerations is unlawful***. While not prohibited, cost-benefit analysis can be used only as a secondary tool to screen out absurd results and not as a primary decision-making criterion based on the flawed cost-benefit balancing exercise EPA has attempted here. Congress knew that attempts to quantify and monetize environmental benefits would hinder regulation, rather than improve it. EPA's cost-benefit folly in this rulemaking illustrates exactly why Congress meant to constrain EPA's discretion in that regard.

Entrainment

- ***The Proposed Rule does little to change the unacceptable status quo and protect the aquatic environment from entrainment. EPA should establish an entrainment standard based on closed-cycle cooling as envisioned in the agency's Option 3.*** The agency had before it a regulatory option – a national categorical standard based on the performance of closed-cycle cooling systems (Option 3) – that would protect the environment at a reasonable cost to industry, create jobs, and cause no significant adverse effects on the environment, electric reliability, or consumer prices. EPA unlawfully rejected that option in favor of preserving the status quo. Closed-cycle cooling is a feasible and readily affordable technology. A national, categorical entrainment standard based on that technology could include a narrow safety-valve variance to properly take account of site-specific factors for those plants fundamentally different than the majority. Parameters for such a variance are proposed below.

- ***Contrary to industry's hyperbolic claims, Option 3 would not cause electric reliability problems and would barely increase electricity prices.*** EPA estimates that if the total cost of Option 3 were to be passed on to ratepayers, those costs would total only $1.47 per month per household. Conversely, if 100 percent of the costs fell upon power companies, the majority of parent entities would incur annualized costs of less than one percent of revenues. Further, assuming none of those costs could be passed on, plant retirements caused by Option

[5] These comments are submitted without waiver of, or prejudice to, any previously stated positions (or, potentially, any future positions) taken in litigation or adjudication with respect to contested aspects of power plant permitting and cooling water intake regulation (including, without limitation, the illegality of formal cost-benefit analyses in this context). The commenters reserve all rights in this regard.

3 would represent less than 1.5 percent of total capacity, which could be easily replaced by new, cleaner generation.

- ***EPA's economic findings are unambiguous: the stronger the regulation, the greater the boost to the economy and job creation***. At either discount rate EPA used in its analysis, Option 3 creates jobs and stimulates the economy to a greater degree than any of the other options. At a 7 percent discount rate, it produces 10,102 new jobs under EPA's analysis, but the actual benefits to the economy of Option 3 are likely much greater. Option 3 is therefore a job-creating rule that will improve the economy.

- ***EPA's national cost-benefit analysis is deeply flawed and illegal.*** These comments and the attached reports of the Stockholm Environment Institute ("SEI") and Powers Engineering identify significant flaws in EPA's national cost-benefit analysis. Making only partial and conservative corrections to EPA's analysis, the monetizable benefits of a national standard based on the performance of closed-cycle cooling systems (Option 3) exceed its costs.

- ***In place of Option 3 (or Option 2, a watered-down version of Option 3), EPA has illegally substituted Option 1, a case-by-case decision making process that is legally infirm.*** A nationally uniform entrainment standard based on the performance of closed-cycle cooling systems, like Option 3, is technologically and economically feasible. Therefore, EPA's case-by-case approach to standard setting (Option 1) is a wholesale abdication of its statutory duties.

- ***The Proposed Rule will turn permitting proceedings into an endless quagmire because states are incapable of developing permit requirements in the absence of national categorical standards.*** As states repeatedly have told EPA and EPA has itself recognized, state permitting agencies lack the resources to undertake or review the multiple engineering, biological, economic and other studies that the Proposed Rule requires as a condition of permitting. States are particularly incapable of conducting cost-benefit analysis in the context of NPDES permit proceedings, but the Proposed Rule contemplates 1,200 such analyses in the coming years (one for every plant subject to the rule), even though EPA itself, with all of its resources and many years to do it, has still never come close to monetizing more than a few percent of the benefits in its national rulemakings under Section 316(b).

- ***OMB took EPA's illegal and weak proposal and made it worse.*** The agency sent OMB a proposal designed around a case-by-case format in which state permitting authorities would begin with a rebuttable presumption that closed-cycle cooling was the best technology available. EPA also sought to avoid making cost-benefit analysis a primary consideration, using it only to eliminate extreme results under a "wholly disproportionate" test. That regulatory approach was insufficient to begin with, but OMB further weakened it, leaving a completely rudderless decision-making process that allows state agencies to consider an open-ended set of factors the director deems to be "relevant" and then choose the technologies the agency deems "warranted." The Proposed Rule now invites those permitting directors to determine that "no additional control requirements are necessary beyond what a facility is already doing." OMB's changes thus render the entire rule an elaborate ruse for doing nothing at all.

Impingement

- ***EPA should establish a national categorical impingement standard based on closed-cycle cooling.*** The Proposed Rule does not do this, but instead provides a choice among options that are clearly less protective.

- ***EPA should also establish an additional impingement standard based on the 0.5 ft/s velocity limit*** and allow a carefully crafted variance for facilities that legitimately cannot meet it. Because the velocity limit will not eliminate impingement, EPA should also retain the requirements to install protective devices on travelling screens, install barrier nets for shellfish in marine waters, and provide a mechanism for "entrapped" fish (for example, those caught in a forebay) to escape.

- ***Although EPA found that reducing intake velocity to 0.5 feet per second would be more protective than other impingement mortality standards it considered, EPA nevertheless gave existing facilities the choice between the velocity limit and meeting a twelve-percent-annual impingement mortality standard (i.e., meaning that no more than twelve percent of impinged fish may die in a given year).*** The twelve-percent standard, however, is not only weaker than the velocity limit but would also require extensive monitoring and latent mortality testing that will inevitably lead to vague, controversial and inconclusive results as to the percentage of impinged fish that have survived impingement.

- ***To measure performance against the twelve percent standard, plant operators would be required to hold impinged organisms for 24 to 48 hours, yet latent impingement mortality can occur 96 hours after the impingement event.*** Moreover, there are no agreed-upon protocols for handling and holding impinged fish, and it is difficult to determine whether fish have died from impingement or some other cause. Because certain species are more susceptible to impingement and less likely to survive, the twelve percent standard would disproportionately affect those species, and would cause plant operators to seek to invoke a provision of the Proposed Rule that would allow permit writers to exclude certain species from monitoring requirements and calculations.

Definition of "New Unit"

- ***EPA should revert to the new units definition and standards that it proposed to OMB with minor revisions suggested below.*** The version of the proposed rule that EPA sent to OMB would have required all replacements, repowerings, and rebuilt power plants to meet standards based on closed-cycle cooling because those plants have the ability to include closed-cycle cooing systems as part of the initial design of the rebuilt, repowered or replacement plant. But OMB modified those provisions such that only "new units at existing facilities," a very narrowly defined class of entities, now have to meet the closed-cycle cooling standards. That OMB change would allow the operators of the worst fish-killing plants in the country to demolish their plants and rebuild entirely new plants from scratch without having to install modern equipment.

Other Critical Provisions

- ***EPA should define and protect "species of concern."*** Previously, EPA has explained that "species of concern" are species that may be "in need of conservation actions, but are not currently listed as threatened or endangered under State or Federal law."[6] Sadly, a decades-long backlog of endangered species listings means that hundreds of species whose claims to endangered or threatened status are supported by substantial scientific evidence fit into this category. EPA should define and extend additional protections to species of concern, as it did in the original Phase II rulemaking.

- ***EPA should prevent states from excluding any species from the rule's scope.*** The provision contained in proposed 40 CFR § 125.98(c)(6), mentioned above in the context of impingement, should be revised to prevent state permit directors from excluding "other specific species," which are neither invasive nor naturally moribund, from monitoring, sampling, and study requirements. Since BTA determinations and compliance with BTA standards will be in large part determined through monitoring, sampling and studies, this "species of [no] concern" provision would allow states to simply ignore, rather than minimize, mortality to certain species.

- ***EPA should assume that entrainment mortality is 100 percent in all cases.*** Assessing entrainment mortality on a site-specific and species-specific basis is administratively unworkable. It will lead to significant delays in the permitting of cooling water intake structures, for little, if any, gain. EPA should presuppose, in all cases, that entrainment mortality is 100 percent.

- ***EPA should specify minimum monitoring requirements.*** EPA lays out its minimum expectations with respect to monitoring practices in the preamble, but then, inexplicably, leaves the final determination to state regulators. It is inefficient for each state to reinvent monitoring requirements dozens of times – once for each facility. EPA should specify in the rule uniform minimum monitoring requirements that meet the expectations it laid out in the preamble.

- ***EPA should prohibit the use of freshwater for once-through cooling in arid regions or those at risk of drought.*** BTA must be defined to require reclaimed water use as the potential benefits of using reclaimed water for power plant cooling are immense and would result in additional environmental protection and water savings and improved reliability at both once-through and closed-cycle facilities that utilize freshwater intake. EPA's proposed approach fails to fully recognize either the availability of reclaimed water or the public and environmental benefits of using reclaimed water for cooling and fails explicitly to require local consideration of this readily available option.

- ***EPA should not exempt cooling water withdrawals that are also used for desalination.*** The proposed exclusion of seawater used for both cooling and desalination from the definition of "cooling water" would allow the power plant to contend that the water is drinking water and

[6] 69 Fed. Reg. 41,576, 41,587 (col. 1) (July 9, 2004) (National Pollutant Discharge Elimination System – Final Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities).

the desalination plant to contend that the water is cooling water, leaving the withdrawal completely unregulated, contrary to the intent of Section 316(b).

- ***EPA should require that if a calculation baseline is used by permit writers, it must reflect the actual operation of the facility, not a fictional "full flow" baseline.*** EPA acknowledges that one of the most "challenging" aspects of the 2004 Phase II rule was the calculation baseline; EPA claims to have developed an approach that does not use a calculation baseline. In fact, EPA has just punted the calculation baseline issue to the states. Consequently, EPA should either make clear in the rule that no calculation baseline can be used in implementing the rule or, if a calculation baseline may be used, then the rule should require that the operational component of the calculation baseline – which is the most controversial baseline issue – reflect actual plant operation, not a fictional "full-flow" baseline.

- ***EPA should remove the special site-specific BTA determination for nuclear facilities.*** It is extremely unlikely that a BTA requirement could conflict with NRC requirements because the cooling water system used to condense steam used in generating electricity (which is the subject of this rulemaking) is completely separate from and independent of the "service water" system which cools reactors, spent fuel pools and other critical plant systems in the event of an accident. Moreover, existing NRC regulations adequately address proposed changes to a nuclear facility, rendering an additional process unnecessary and potentially confusing as part of a BTA determination. At a minimum, EPA should revert to the version of the nuclear facility provision contained in the version of the proposed rule sent to OMB.

- ***EPA should require interim measures to protect aquatic ecosystems until long term compliance solutions are in place.*** We request that EPA include in the rule a requirement for interim measures that most plants can use to reduce their intake of cooling water, particularly at peak spawning times. Such measures could include installation of variable speed pumps or drives at peaking facilities or scheduling regular maintenance outages during peak spawning periods whenever feasible. Until full compliance at a site is achieved, these interim measures should be implemented as NPDES permit conditions, without allowing them to supplant permanent measures.

- ***EPA should clarify that only offshore seafood processing facilities, not onshore facilities, are exempt from the Rule.*** EPA intended to exempt seagoing vessels from the rule because of concerns about space limitations and retrofits that could compromise the seaworthiness of drilling rigs, liquefied natural gas terminals, and fishing boats. But EPA should include the word "offshore" before "seafood processing facilities" in its exemption at 40 C.F.R. § 125.91(d) to make it clear that only vessels, and not coastal fish processing plants, are exempt.

- ***EPA must consult with the National Marine Fisheries Service and the Fish and Wildlife Service.*** EPA must obtain the opinions of its sister federal agencies on the Proposed Rule's impact upon threatened and endangered species and the advisability of reasonable and prudent alternatives, such as a nationally uniform closed-cycle cooling standard. In declining to set such a standard, EPA is authorizing existing facilities to continue to take endangered species and to adversely modify habitat that is critical to multiple endangered species.

Cost-Benefit Analysis

- ***If EPA persists in employing a cost-benefit analysis for the national rulemaking (which is neither required, nor useful) that analysis must be significantly improved by valuing more of the benefits in the manner suggested by economists Frank Ackerman and Elizabeth Stanton in their attached Stockholm Environmental Institute (SEI) comments.*** Not only does EPA's approach to cost-benefit analysis exceed the restrictions imposed by Congress (as noted above), EPA also vastly underestimated the benefits and overestimated the costs of the rulemaking options. EPA used old data which do not reflect current conditions and fish kill levels and then monetized only a very small fraction of the benefits. EPA also used a misleading and distorted industry model, rather than its own model, and thereby overstated the costs by approximately a factor of two. A more accurate cost-benefit analysis, (although still limited by existing economic tools) shows that the benefits of Option 3 clearly exceed the costs.

- ***The substantial shortcomings in EPA's cost-benefit analysis demonstrate conclusively why state permitting agencies should be forbidden from considering costs in relation to benefits in the site-specific context.*** No cost-benefit analysis is to be conducted under EPA's Phase I rule for new facilities, the new oil rig regulations in the Phase III rule, or the "new units" requirements of this rule. None should be conducted by states under this rule either.

- ***However, to the extent that states are authorized to conduct site-specific cost-benefit analyses for existing facilities, EPA should set very specific requirements for states to follow***, as suggested by Ackerman and Stanton in the attached SEI comments, so that such analyses do not undermine the purpose of the rule and of Section 316(b) – to minimize the adverse environmental impacts of cooling water intake structures using the best technology available.

Revision to the Phase I Rule

- ***EPA should make clear in the regulatory text of the Phase I rule that a facility choosing Track II must aim for 100 percent of the entrainment and impingement reductions of Track I, and if it falls short within 10 percent, that will be acceptable, but may not aim for 90 percent and achieve only an 89 percent reduction.*** EPA is proposing to delete the references to "restoration measures" in the Phase I rule because the Second Circuit held in *Riverkeeper I* (and again in *Riverkeeper II*) that the statute does not authorize use of such measures to comply with Section 316(b). At the same time, EPA should make an additional revision to the Phase I rule in order to implement the finding of the Second Circuit in *Riverkeeper I* that under Track II, it would be inappropriate for EPA to use 90 percent as a benchmark and allow an additional margin of error in measuring compliance with that benchmark.

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BACKGROUND

A. Factual Background: Once-Through Cooling Causes Adverse Environmental Impacts of Staggering Proportions.

Power plants and other industrial facilities use cooling water intake structures to withdraw massive volumes of water from natural waterbodies for cooling. The overwhelming majority of that water is drawn by plants using "once-through" cooling systems, which, as their name suggests, do not recirculate cooling water after its use. Instead, they pump cold water through a condenser just once, return the now-heated water to the water body from which it was withdrawn, and continually draw more cold water for further cooling.

The profligate withdrawal of such large volumes of water causes – as EPA first explained a decade ago – "multiple types of undesirable and unacceptable adverse environmental impacts," including but not limited to entrainment and impingement; reductions of threatened, endangered or other protected species; damage to critical aquatic organisms, including important elements of the food chain; diminishment of a population's compensatory reserve; losses to populations including reductions of indigenous species populations, commercial fisheries stocks, and recreational fisheries; and stresses to overall communities and ecosystems as evidenced by reductions in diversity or other changes in system structure and function.[7]

In the *Riverkeeper I* case, the Second Circuit observed that "[t]he environmental impact of [cooling water intake] systems is staggering: A single power plant might impinge a million adult fish in just a three-week period, or entrain some 3 to 4 billion smaller fish and shellfish in a year, destabilizing wildlife populations in the surrounding ecosystem."[8]

Not only have EPA and the courts previously recognized and documented the staggering adverse environmental impacts of once-through cooling systems, but other federal and state agencies, and biologists and other professionals in the private sector have as well. In the preambles to the Phase I, Phase II and Phase III rules, EPA included lengthy discussions of these impacts under the heading "Environmental Impact(s) Associated with Cooling Water Intake Structures."[9] Astonishingly, in this rulemaking, the agency did not even bother to include (or,

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[7] 66 Fed. Reg. 65,256, 65,292 (Dec. 18, 2001) (Final Rule - National Pollution Discharge Elimination System: Regulations Addressing Cooling Water Intake Structures for New Facilities); *see also* 69 Fed Reg. at 41,586.

[8] *Riverkeeper v. EPA*, 358 F.3d 174, 181 (2d Cir. 2004) (hereinafter "*Riverkeeper I*").

[9] 65 Fed. Reg. 49,060, 49,071-75 (col. 3) (Aug. 10, 2000) (National Pollution Discharge Elimination System–Regulations Addressing Cooling Water Intake Structures for New Facilities); 66 Fed. Reg. at 65,262 (col. 3); 67 Fed. Reg. 17,122, 17,136-40 (col. 1) (Apr. 9, 2002) (National Pollution Discharge Elimination System–Proposed Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities); 69 Fed. Reg. at 41,586-90 (col. 1); 69 Fed. Reg. 68,444, 68,461-66 (col. 2) (Nov. 24, 2004) (National Pollution Discharge Elimination System–Proposed Regulations To Establish Requirements for Cooling Water Intake Structures at Phase III Facilities); 71 Fed. Reg. 35,006, 35,012-14 (col. 3) (June 16, 2006) (National Pollutant Discharge Elimination System–Final Regulations To Establish Requirements for Cooling Water Intake Structures at Phase III Facilities). The rulemaking record for this rule includes "the data and information contained in the records supporting the Phase I, Phase II, and Phase III rulemakings." 76 Fed. Reg. at 22,184 (col. 1).

perhaps, studiously avoided including) a similar discussion of adverse impacts in the preamble. Instead, this important discussion is buried in a supporting document (the EEBA), which the vast majority of even the interested public will not read. That failure is emblematic of EPA's current dereliction of its responsibility to protect the aquatic environment. While EPA's discussion of adverse environmental impacts has faded into the support documents, the impacts themselves continue unabated, and are discussed in these comments immediately below.

1. Massive Water Withdrawals

Virtually all of the adverse environmental impacts of cooling water intake structures are caused by the massive withdrawal of water into the plants through those structures. With an actual daily intake volume in excess of 200 billion gallons per day, or 75 trillion gallons per year, industrial cooling water systems are, by far, the largest source of water withdrawals in the United States.[10] Steam-electric power plants use the vast majority of this massive volume, accounting for 93 percent of the total saltwater use, 41 percent of total freshwater use, and 49 percent of all water use nationwide.[11] Power plants use more water than any other industry sector in the country, withdrawing more than all irrigation and public water supplies combined.[12] Manufacturing facilities (primarily in the pulp and paper, chemicals, primary metals, and petroleum refining sectors) also use appreciable volumes of water, but far less than power plants.

EPA estimated that 633 presently operating power plants have a design intake flow (DIF) greater than 2 million gallons per day (MGD).[13] Collectively, these power plants have the capacity to withdraw more than 370 billion gallons per day (BGD) – more than 135 trillion gallons per year – from our nation's waters for cooling.[14] A typical power plant using once-through cooling withdraws hundreds of millions to several billion gallons of water per day. EPA estimated that 112 power plants have DIFs greater than one BGD and another 145 have DIFs between 500 MGD and 1 BGD.[15] Approximately 21 percent of the plants withdraw from an ocean, estuary or tidal river; seven percent from the Great Lakes; and approximately 72 percent

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[10] EPA, Environmental and Economic Benefits Analysis of the Proposed Section 316(b) Existing Facilities Regulation (March 28, 2011)("2011 EEBA"), at 1-3, Table 1-1 (note unweighted, increase by less than 10%); *see also* J.F. Kenny et al., *Estimated Use of Water in the United States in 2005*, U.S. Geological Survey Report, Circular 1344 (2009), at 38, (Exh. 2), *also available at* http://pubs.usgs.gov/circ/1344/pdf/c1344.pdf (last visited July 2011).

[11] J.F. Kenny et al., Estimated Use of Water in the United States in 2005, U.S. Geological Survey Report, Circular 1344 (2009), at 38, (Exh. 2), *also available at* http://pubs.usgs.gov/circ/1344/pdf/c1344.pdf (last visited July 2011).

[12] *Id.*

[13] EPA estimated from its 1999 and 2000 questionnaires that there were 671 power plants above the 2 MGD threshold and that 38 have ceased operation, leaving 638 facilities still operating. *See* EPA, Technical Development Document for the Proposed Section 316(b) Phase II Existing Facilities Rule (2011), (hereinafter "2011 TDD"), at 4-4, Exh. 4-1, Cooling Water Use in Surveyed Industries (estimating that 671 electric generating facilities withdraw more than 2 MGD); *see also* 76 Fed. Reg. at 22,190 ("According to the 2007 EIA database, 38 of the 671 facilities have ceased operation since the Survey"). It should also be noted that the reference to "Phase II" in the title of the 2011 TDD appears to be a vestige that should have been deleted, given that the existing (power plant and manufactuers) rule is no longer referred to as Phase II.

[14] 2011 TDD, at 4-4, Exh. 4-1.

[15] 2011 TDD, Exh. 4-3. Note that these numbers were based on EPA's 1999/2000 questionnaires; EPA more recently estimated that 38 of the 671 power plants have closed. *See* footnote 13, *supra*.

from a freshwater (non-Great) lake, river, stream or reservoir.[16] Although EPA's presentation of the data is very unclear it appears that approximately 75 percent of the cooling systems are once-through and about 25 percent are closed-cycle.[17] Adding manufacturing facilities, which have a collective capacity of 39 BGD, yields a grand total of 409 BGD or nearly 150 trillion gallons per year of cumulative design intake capacity by the approximately 1,200 industry facilities subject to the rule.[18]

2. Impingement and Entrainment

Because cooling water intake structures remove such extraordinarily large amounts of water from natural waterbodies, their withdrawals necessarily affect the full spectrum of organisms at all life stages in the aquatic ecosystem, killing billions of fish, destroying habitats and destabilizing aquatic populations.[19] The principal environmental damage is the mortality of aquatic organisms through entrainment and impingement.

Entrainment occurs when fish and shellfish, eggs, larvae, and other organisms too small to be screened out are drawn through a cooling water intake structure into a plant's cooling system. As small, fragile entrained organisms pass through the cooling system, they are subject to mechanical, thermal, and toxic stress: including physical impacts in the pumps and condenser tubing; pressure changes caused by diversion of the cooling water into the plant or by the hydraulic effects of the condensers; sheer stress; thermal shock in the condenser and discharge tunnel; and, chemical toxemia induced by antifouling agents such as chlorine. Few, if any, entrained organisms survive.[20]

Impingement occurs when larger fish and other aquatic organisms become trapped on screening devices or other barriers installed at the entrance of the intake structure. Impingement is caused by the force of water passing through the intake structure and can result in starvation and exhaustion (when organisms are trapped against an intake screen), asphyxiation (when organisms are forced against a intake barrier by velocity forces that prevent proper gill movement or when organisms are removed from the water for prolonged periods of time), descaling (when organisms are removed from an intake screen by a wash system), and other physical harms.[21] A substantial number of the aquatic organisms entrained and impinged are killed or subjected to significant harm.[22]

Cooling water withdrawals kill the full spectrum of organisms in the aquatic food chain: phytoplankton (tiny, free-floating photosynthetic organisms); zooplankton (small aquatic

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[16] 2011 TDD, Exh. 4-6.

[17] 2011 TDD, Exh. 4-8.

[18] 2011 TDD, Exh. 4-1.

[19] *See Riverkeeper v. EPA*, 358 F.3d 174, 181 (2d Cir. 2004) ("*Riverkeeper I*"); *Cronin v. Browner*, 90 F.Supp.2d 364, 366 (S.D.N.Y. 2000) ("[C]ooling water systems 'may interfere with the maintenance or establishment of optimum yields of sport or commercial fish and shellfish, decrease populations of endangered organisms, and seriously disrupt sensitive ecosystems.'").

[20] 66 Fed. Reg. at 65,263 (col. 1); see also 65 Fed. Reg. at 49,072.

[21] 66 Fed. Reg. at 65,263 (col. 1).

[22] *Id.* (col. 2-3).

organisms that consume phytoplankton); fish, shellfish, crustaceans, reptiles (such as sea turtles) and marine mammals (such as seals and sea lions) at all life stages, including eggs, larvae, juvenile, and adult; and many other forms of aquatic life, including threatened, endangered and other protected species.[23]

The death toll of wildlife from power plant intakes is staggeringly high. As EPA acknowledges, it is impossible to quantify with any precision the extent of the adverse environmental impacts caused by the withdrawal of more than 75 trillion gallons of water per year (actual flow) by power plant cooling water intake structures.[24] Nonetheless, by EPA's own highly conservative estimates, and looking only to fish and shellfish mortality, industrial cooling water withdrawals annually result in the death of at least 2.2 billion age one-equivalent[25] fish, crabs, and shrimp, and a minimum of 528 billion eggs and larvae that serve as the basis of the aquatic food chain.[26] The actual mortality figures are likely much higher. As Drs. Peter Henderson and Richard Seaby of PISCES Conservation, Ltd. point out in their attached report, there are many issues with the quality of the data EPA used to make these estimates. For example, many of the data sets used in the calculations are old and many of the studies do not report all species caught, which causes some species to be underrepresented in the national calculations. Thus, EPA's estimate of the fish killed by power plants is likely an underestimate – potentially a significant underestimate – of the actual mortality numbers.[27] A table in the 2011 EEBA states that 1,055,936,410,000 (that is, more than a *trillion*) organisms are killed by in-scope facilities every year, which is double the estimate of 528 billion individuals given in the preamble.[28] Although, according to EPA, that discrepancy resulted from a programming error in the algorithm used to compile Appendix C of the EEBA,[29] the

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[23] 66 Fed. Reg. at 65,262-263; 69 Fed. Reg. at 41,586; 66 Fed. Reg. at 65,262-263; California Environmental Protection Agency, State Water Resources Control Board, *Water Quality Control Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling, Final Substitute Environmental Document* (May 4, 2010), hereinafter ("Calif. OTC Policy SED") (Exh. 3), *also available at* http://www.waterboards.ca.gov/board_info/minutes/2010/ may/ 050410_5_staffpresentation.pdf (last visited May 16, 2011).

[24] 67 Fed. Reg. at 17,139 (col. 3) ("Studies like those described … may provide only a partial picture of the severity of environmental impact associated with cooling water intake structures. ….[T]he methods for evaluating adverse environmental impact used in the 1970s and 1980s, when most section 316(b) evaluations were performed, were often inconsistent and incomplete…").

[25] According to EPA, "[t]he Equivalent Adult Model (EAM) is a method for converting organisms of different ages (life stages) into an equivalent number of individuals in any single age. For its 316(b) analyses, EPA standardized all I&E mortality losses into equivalent numbers of 1-year-old fish, a value termed age-1 equivalents (A1Es)." 2001 EEBA at 3-2 (internal citation omitted). This adult or age-1 "equivalent" method, however, is ecologically bankrupt, misleading, and illegal, and therefore should not be used, as a measure of the impacts caused by cooling water intake strucutres or the benefits of installing protective technologies because large number of eggs and larvae are not "equivalent" to smaller numbers of adult fish. In addition to becoming juveniles and then adults in later life stages, eggs and larvae also play a highly significant role in the aquatic ecoystem, which the EAM and A1E metrics ignore.

[26] 76 Fed. Reg. at 22,239 (col. 1).

[27] *See Biological comments on the US EPA's 2011 proposed rule for cooling water intake structures at existing facilities*, Henderson, P.A. and Seaby, R. M. H., PISCES Conservation, Ltd., hereinafter ("PISCES Report") (attached as Appendix B).

[28] 2011 EEBA, Table C-16, p. C-27.

[29] Communication between Tom Born and Reed Super, June 14, 2011.

actual fish and shellfish losses at all life stages may well be closer to that one trillion figure. In many cases, the toll on fisheries by power plants rivals or exceeds that of the fishing industry.

As just several examples of the devasting aquatic mortality at hundreds of power plants across the country:

- The Salem Nuclear Generating Station in New Jersey withdraws over 3 billion gallons per day from Delaware Bay and kills an estimated 375,000 white perch, 281,746 herrings (alewife & blueback), 305,000 spot, 61,100 Atlantic croaker, 3,239 striped bass, 842,000,000 bay anchovy and 1,120,000 weakfish annually – four times as many bay anchovy and weakfish each year than are commercially caught in the Delaware Estuary.[30]

- The Northport power plant on the north shore of Long Island, New York, withdraws up to 939 million gallons per day from Long Island Sound and entrains an estimated 8,430,808,238 fish eggs and larvae of all species each year.[31]

- The Brunswick nuclear plant on the Cape Fear estuarine system in North Carolina, has entrained as much as 3-4 billion individual fish and shellfish at early life stages annually. Studies there have predicted an associated 15-35 percent reduction in populations, which may be altered beyond recovery;[32]

- On Florida's Gulf Coast, the Crystal River power plant seriously reduces forage species and recreational and commercial landings (e.g., 23 tons per year);[33]

- On Lake Michigan, the D.C. Cook nuclear plant killed one million fish during a three-week study period.[34]

- Huge numbers of fish are also entrained at the Indian Point power plant, situated in a narrow section of the Hudson River estuary just south of Peekskill. As reported by

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[30] Versar, *Technical Review and Evaluation of Thermal Effects Studies and Cooling Water Intake Structure Demonstration of Impact for the Salem Nuclear Generating Station* at § VI-4 (Revised Final Report) (1989) (Exh. 4) (reported on an "equivalent adult" basis). 30 million pounds of bay anchovy and weakfish are lost each year due to entrainment and impingement at Salem compared to 6.8 million pounds of yearly commercial landings between 1975-1980.

[31] New York State Department of Environmental Conservation, *Best Technology Available (BTA) for Cooling Water Intake Structures, DEC Policy Issuing Authority*, Draft, March 4, 2010, Appendix A: BTA Policy Technical Document, Table 1: Estimated Entrainment and Impingement at Major New York Facilities Using Once-Through Cooling Water, p. 2 of 20 (hereinafter "DEC Draft BTA Policy") (Exh. 5); *see also* Network for New Energy Choices, *Reeling in New York's Power Plants: The Case for Fish-Friendlier Power* (June 2010) (Exh. 6)

[32] 67 Fed. Reg. at 17,138.

[33] *Id.*

[34] *Id.*

the New York State Department of Environmental Conservation, 1.2 to 1.3 billion fish eggs and larvae are entrained at Indian Point each year.[35]

- Cumulatively, the five power plants on the Hudson River (Indian Point, Bowline, Roseton, Lovett[36] and Danskammer) have caused year-class reductions estimated to be as much as 79 percent, depending on fish species.[37] The generators' 2000 analysis of three of these plants completed in predicted year-class reductions of up to 20 percent for striped bass, 25 percent for bay anchovy, and 43 percent for Atlantic tomcod, even without assuming 100 percent entrainment mortality.[38] New York State has concluded that these losses could seriously deplete any reserve or compensatory capacity needed to survive unfavorable environmental conditions.[39] Indeed, data shows that in the Hudson River, 10 of 13 key species are in decline.[40]

- The Brayton Point facility in Somerset, Massachusetts withdraws 1.3 billion gallons per day from Mt. Hope Bay and has apparently caused an 87 percent reduction in finfish abundance since a 50 percent increase in its cooling water withdrawal in 1985.[41]

- At the San Onofre Nuclear Generating Station on the Southern California coast, in a normal (non-El Niño) year, 121 tons of midwater fish are entrained, causing a 34-70 percent decline in Pacific Ocean fish populations within 3 kilometers.[42]

- A 2005-6 study commissioned by the owner of the Bayshore power plant on Lake

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[35] New York State Notice of Intention to Participate and Petition to Intervene, *In re: License Renewal Application Submitted by Entergy Nuclear Indian Point 2, LLC, Entergy Nuclear Indian Point 3, LLC, and Entergy Nuclear Operations, Inc.*, U.S. Nuclear Regulatory Commission Docket Nos. 50-247-LR and 50-286-LR, ASLBP No. 07-858-03-LR-BD01, DPR-26, DPR-64 (Nov. 30, 2007), p. 286 (Exh. 7), *also available at* http://www.dec.ny.gov/docs/permits_ej_operations_pdf/noiindianpoint.pdf (last visited June 2011).

[36] The Lovett plant has since closed.

[37] 67 Fed. Reg. at 17,138, citing John Boreman and Phillip Goodyear, *Estimates of Entrainment Mortality for Striped Bass and Other Fish Species Inhabiting the Hudson River Estuary*, American Fisheries Society Monograph 4:152-160, 1988 (Exh. 8).

[38] *Id.*, citing Consolidated Edison Company of New York, Draft environmental impact statement for the state pollutant discharge elimination system permits for Bowline Point, Indian Point 2 & 3, and Roseton steam electric generating stations (2000).

[39] 67 Fed. Reg. at 17,138, citing New York Department of Environmental Conservation, Internal memorandum provided to the USEPA on NYDEC's position on SPDES permit renewals for Roseton, Bowline Point 1 & 2, and Indian Point 2 & 3 generating stations (2000).

[40] A report commissioned by Riverkeeper and released on May 15, 2008, *The Status of Fish Populations and the Ecology of the Hudson*, produced by Pisces Conservation Ltd., reveals that many Hudson River fish are in serious long-term decline. Of the thirteen key species studied, ten have declined in abundance since the 1980s (shad, tomcod, bay anchovy, alewife, blueback herring, rainbow smelt, hogchoker, white catfish, weakfish and white perch) (Exh. 9) *also available at* http://www.riverkeeper.org/document.php/758/THE_STATUS_OF_F.pdf.

[41] 67 Fed. Reg. at 17,138, citing Gibson, Mark R., R.I. Div. Fish and Wildlife, *Comparison of Trends in the Finfish Assemblage of Mt. Hope Bay and Narragansett Bay in Relation to Operations at the New England Power Brayton Point Station* (1996) (Exh. 10). Brayton is retrofitting cooling towers to address this damage.

[42] 67 Fed. Reg. at 17,139 (col. 1), citing S. Swarbrick and R.F. Ambrose (1988).

Erie in Ohio estimated that more than 60 million adult fish and more than 2.5 billion fish eggs and larvae were killed in a given year.[43] A later study of the Bayshore plant by the University of Toledo put the number of fish eggs and larvae killed at more than 12 billion per year.[44]

- New York's Huntley Generating station, located along the Niagara River, which connects Lake Ontario to Lake Erie near the world-famous Niagara Falls, is estimated to entrain over 105 million fish eggs and larvae per year, with annual impingement of well over 96 million adult and juvenile fish – the largest impingement toll of any power plant in the state.[45]

- On the shores of Lake Michigan in Wisconsin, the Oak Creek power plant was estimated by its operator to impinge well over 2 million fish weighing 57-plus tons in a single year on its intake screens. In addition, between April and October of 2002, it entrained over 6 million larvae and over 9 million fish eggs.[46]

3. Taking of Endangered and Threatened Species

Since power plant cooling water intake structures generally suck in a cross-section of all species present in the waterbody, any plant located near the habitat or range of a rare or special status species is likely to be impinging and/or entraining individuals of that species. EPA explained in the preamble that cooling water intake structures may harm threatened or endangered species in several ways: populations of protected species may suffer direct harm as a result of impingement or entrainment mortality; they may suffer indirect harm if the withdrawals alter food webs; and intake structures may alter habitat critical to their long-term survival.[47]

EPA identifies 88 threatened or endangered species at risk from cooling water intakes (which is more than a third of the threatened or endangered species EPA assessed) and more than 130,000 baseline losses of threatened and endangered species annually.[48] Yet EPA acknowledges even these numbers are likely to be underreported.[49] Significantly,

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[43] Kinetrics, *Bay Shore Power Plant Cooling Water Intake Structure Information and I&E Sampling Data* (January 2008) (Exh. 11), *also available at* http://www.epa.state.oh.us/portals/35/permits/bayshore_IE_data_collection.pdf (last visited May 2011).

[44] Christine Mayer, University of Toledo, *Effects of Bayshore Power Plant on Ecosystem Function in Maumee Bay, Western Lake Erie, Annual Progress Report to NOAA: October 2010-February 2011* (Exh. 12), *also available at* http://www.utoledo.edu/as/lec/research/be/docs/maumee_bay_mayer_etal_annual_r.pdf (last visited July 2011).

[45] DEC Draft BTA Policy, Appendix A: BTA Policy Technical Document, Table 1: Estimated Entrainment and Impingement at Major New York Facilities Using Once-Through Cooling Water, p. 2 of 20 (Exh. 5).

[46] Public Service Commission, Wisconsin Department of Natural Resources, *Final EIS for the Elm Road Power Plant*, Chapter 8 (Exh. 13); *see also* Sierra Club, *Giant Fish Blenders: How Power Plants Kill Fish & Damage Our Waterways (And What Can Be Done To Stop Them)*, July 2011 (Exh 14).

[47] 76 Fed. Reg. at 22,244 (col. 2-3).

[48] 2011 EEBA at 5-3 and 5-8.

[49] 2011 EEBA at 5-8. Because threatened and endangered species are, by definition, rare, they will appear in samples in much lower frequency than common species and since sampling is limited, may be missed entirely; further, there is a strong disincentive for plant operators to report the taking of threatened and endangered species, which may be prohibited by federal and/or state law.

"[impingement and entrainment] mortality may either lengthen population recovery time, or hasten the demise of these species."[50]

As just several examples,

- The Pittsburg and Contra Costa Plants in the San Francisco Bay Delta in northern California can impinge and entrain more than 300,000 endangered and threatened species per year, including Delta smelt, Sacramento splittail, Chinook salmon, steelhead trout.[51]

- From 1976 to 1994, approximately 3,200 threatened or endangered sea turtles entered enclosed cooling water intake canals at the St. Lucie Nuclear Generating Plant in Florida.[52] In the first 13 years of that period, 122 (7.5%) of the 1,631 loggerheads, 18 (6.7%) of the 269 green turtles, and four Kemp's ridleys entrapped in the canal were found dead.[53]

- From 1992–2004, a total of 32 sea turtles – loggerhead, green and Kemp's ridley – were found captured from the intake trash bars at the Oyster Creek Generating Station.[54]

4. Fish Population Declines

As EPA has recognized, "studies estimating the impact of impingement and entrainment on populations of key commercial or recreational fish have predicted *substantial declines in population* size. This has lead to concerns that some populations may be *altered beyond recovery*."[55] Moreover, even where a fish population has not yet experienced a documented decline, the loss of large numbers of individuals deplete the species' ability to survive other unfavorable environmental conditions, whether man-made or natural, such as drought and climate change.[56] EPA has also noted the concerns of its sister agencies in this regard:

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[50] 2011 EEBA at 2-12.

[51] *Id.* (numbers of fish expressed as age 1 equivalents).

[52] 66 Fed. Reg. at 65,263 (col. 3), citing, Florida Power and Light Company, *Assessment of the impacts at the St. Lucie Nuclear Generating Plant on sea turtle species found in the inshore waters of Florida* (August 1995) [DCN 10-5516] (Exh. 15).

[53] Committee on Sea Turtle Conservation, National Research Council (U.S.), Decline of the sea turtles: causes and prevention, at 112, National Academies Press (1990) [DCN 10-4845]; *see also* Florida Power & Light Co., *Assessment of the Impacts of the St. Lucie Nuclear Generating Plant on Sea Turtle Species Found in the Inshore Waters of Florida*, at 5 (August 1995) [DCN 10-5516] (Exh. 15) (The St. Lucie plant has impinged five species of endangered sea turtles—loggerhead, green, Kemp's ridley, leatherback and hawksbill).

[54] Amergen Energy Company, LLC, *Assessment of the Impacts of the Oyster Creek Generating Station on Kemp's Ridley, Loggerhead, and Atlantic Green Sea Turtles* at 6-32, Table 6-2 "Mortality of Sea Turtles Captured From Intake Trash Bars at the Oyster Creek Generating Station 1969-2004 (Live/Dead)" (Dec. 2004) (Exh. 16).

[55] 66 Fed. Reg. at 65,264 (col. 1) (emphasis added).

[56] 69 Fed. Reg. at 41,588 (col. 1).

> … NMFS [the National Marine Fisheries Service] documented in several fishery management plans that cooling water intake structures are one of the threats that may adversely affect fish stocks and their habitats.[57]
>
> … NOAA documents in a number of their fishery management plans that cooling water intake structures, particularly once-through cooling water systems that withdraw large volumes of water, cause adverse environmental impacts due to significant impingement of juveniles and entrainment of eggs and larvae."[58]

5. Depressed Commercial and Recreational Fishing Yields

Because impingement and entrainment cause fish populations to decline, there are fewer fish available to be caught by commercial and recreational fisherman, thereby depressing their harvests. Although estimating the extent of these depressed fishery yields is highly imprecise, and depends on, among other things, rudimentary assumptions about the relationship between fish stock and harvest,[59] EPA estimated annual commercial and recreational fishing losses due to impingement and entrainment losses as follows:

Region	Commercial Fishing Losses (pounds)	Recreational Fishing Losses (number of harvest-able adult fish)
California	1,379,000	1,022,339
North Atlantic	430,000	761,183
Mid-Atlantic	10,672,000	9,081,061
South Atlantic	99,000	133,897
Gulf of Mexico	5,559,000	2,851,347
Great Lakes	346,000	349.648
Source: 2011 EEBA, Chs. 6, 7		

For the reasons discussed above, these are likely significant underestimates.

6. Aquatic Community and Ecosystem Impacts

Impingement and entrainment mortality "has immediate and direct effects on the population size and age distribution of affected species, and may cascade through food webs."[60] In particular, EPA has recognized that "the loss of large numbers of aquatic organisms" may affect not only "stocks of various species" and their compensatory reserve, but also "the overall

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[57] 66 Fed. Reg. at 65,295 (col. 1) (citing DCN# 2– 024M, 2–024N, and 2–024O).

[58] 66 Fed. Reg. at 65,297 (col. 3).

[59] For example, EPA assumed a linear relationship between stock and harvest, meaning, for example, that a 10 percent decrease in a fish population would reduce the harvest by 10 percent.

[60] 2011 EEBA at 2-9.

health of ecosystems."[61] In addition to altered food webs, in the 2011 EEBA, EPA discusses several other related aquatic community and ecosystem impacts, including "altered community structure and patchy distribution of species," "reduced taxa and genetic diversity," and "nutrient cycling effects."[62]

Significantly, in a 2004 Federal Register publication, EPA approvingly cited an analysis of such ecosystem effects prepared by the New York State Department of Environmental Conservation (NYSDEC) in connection with the permitting of three Hudson River power plants. NYSDEC found that entrainment not only reduces adult populations of the species whose eggs and larvae are entrained and depletes the species' ability to survive unfavorable environmental conditions, but, perhaps most significantly, diminishes the forage base, which disrupts the food chain, transferring energy from higher to lower trophic[63] levels and compromising the health of the entire aquatic community.[64] In particular, as NYSDEC and EPA explained, using a simplified example, if an individual bay anchovy is killed via entrainment and disintegrated upon passage through an intake structure it is no longer available as food to striped bass and other top predators, and is instead consumed only by lower trophic level organisms, such as detritivores (organisms that feed on dead organic material), thus transferring energy from the top of the ecosystem to the bottom and affecting the integrity and proper functioning of the system. Likewise, the entrained bay anchovy would no longer be available to consume phytoplankton, which upsets the distribution of nutrients in the ecosystem.[65]

Furthermore, while often overlooked, intake structures destroy countless small organisms (some of which are microscopic) that are ecologically important. These include benthic organisms (i.e., "bottom dwellers" such as mussels, anemones, crabs and shrimp) and planktonic organisms (i.e., free-floating microscopic plants and animals), which "are an important source of food for other aquatic organisms and an essential component of the food chain in aquatic ecosystems."[66]

7. Reduced Ecological Resilience

As EPA has recognized, the effect of long-term or chronic impingement and entrainment mortality may lead to a decrease in ecosystem resistance and resilience – that is, the ability of ecosystems to resist and recover from disturbances such as invasive species and unusual weather events like hurricanes or severe flooding. Consequently, EPA found that mortality caused by cooling water intake structures is "likely to reduce the ability of ecosystems to withstand and recover from adverse environmental impacts, whether those impacts are due to anthropogenic effects or natural variability."[67]

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[61] 66 Fed. Reg. at 65,292 (col. 2).

[62] 2011 EEBA, pp. 2-16 to 2-17.

[63] The term "trophic" refers to the feeding habits or food relationship of different organisms in a food chain.

[64] 69 Fed Reg. at 41,587-88, citing NYS DEC, 2003, Final Environmental Impact Statement: Concerning the Applications to Renew NY SPDES Permits for the Roseton 1 & 2, Bowline 1 & 2 and Indian Point 2 & 3 Steam Electric Generating Stations.

[65] *Id.*

[66] 66 Fed. Reg. at 65,263 (col. 1 at fn 2).

[67] 2011 EEBA, p. 2-17, citing C. Folke, S. Carpenter, et al., "Regime Shifts, Resilience, and Biodiversity in

8. Thermal Discharges

The discharge of heated water from cooling systems has also been shown to harm fish and wildlife and has long been recognized to have effects upon the structure and function of ecosystems.[68] The operational differences between once-through cooling systems and closed-cycle cooling systems will significantly reduce the thermal load of the discharge to surface water. Unlike once-through cooling systems, where the entire thermal load is delivered to the surface water body, in a closed-cycle cooling system most of the heat is transferred to the air resulting in evaporation.[69] Thus, irrespective of how the flows are configured, there will be a substantial reduction in the thermal load of the effluent from a closed-cycle system compared to a once-through system.

In the EEBA, EPA notes that:

> Numerous studies have shown that thermal discharges may substantially alter the structure of the aquatic community by modifying photosynthetic, metabolic, and growth rates, and reducing levels of DO [dissolved oxygen]. Thermal pollution may also alter the location and timing of fish behavior including spawning, aggregation, and migration, and may result in thermal shock-induced mortality for some species. Thus, thermal pollution is likely to alter the ecological services provided by ecosystems surrounding facilities returning heated cooling water into nearby waterbodies.[70]

The EEBA also explains that facility-specific factors control the degree to which thermal pollution will affect an aquatic ecosystem. These factors include the volume of the waterbody source, other heat loads, the rate of water exchange, the presence of nearby areas whose climate remains habitable for rare or endangered species when that of the surrounding area has been changed, and the extent that nearby fish species congregate.[71] As expected, adverse temperature effects may also be more prominent in ecosystems that are already subject to other environmental stressors such as high biochemical oxygen demand (BOD) levels, sediment contamination, or pathogens.[72] Additionally, there are indirect effects on fish and other

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Ecosystem Management," 35(1) *Annual Review of Ecology, Evolution, & Systematics* 557 (2004) [DCN 10-4770] (Exh. 17) and L.H. Gunderson, "Ecological Resilience – In Theory and Application." 31 *Annual Review of Ecology, Evolution, & Systematics* 425 (2000) [DCN 10-4785].

[68] *Cronin*, 90 F. Supp. at 366, citing James R. May & Maya K. van Rossum, "The Quick and the Dead: Fish Entrainment, Entrapment, and the Implementation and Application of Section 316(b) of the Clean Water Act," 20 *Vt. L. Rev.* 373, 382 (1995) (Exh. 18).

[69] B. Dziegielewski and T. Bik, Southern Illinois University Carbondale, *Water Use Benchmarks for Thermoelectric Power Generation in the United States* (prepared for United States Geological Survey) (2006) (Exh. 19).

[70] 2011 EEBA at 2-12, citing Bulthuis 1987; Chuang et al. 2009; Martinez-Arroyo et al. 2000; Poornima et al. 2005; Leffler 1982.

[71] 2011 EEBA at 2-12-2-13.

[72] 2011 EEBA at 2-12.

vertebrate populations caused by thermal discharge, which include increased pathogen growth and infection rates.[73]

Indeed, there is a great deal of scientific literature addressing the harm to aquatic ecosystems caused by thermal pollution.[74] As noted by two research professors at the University of Maryland Center for Environmental Science, "temperature has long been recognized as a major environmental factor at the molecular, cellular, tissue, organism and ecosystem levels of biological hierarchy."[75]

Increased demand for electricity in the 1960s and 1970s led to the expansion of steam-electric power plants. That boom accelerated researchers' and environmental managers' interest in temperature effects. Researchers became even more concerned when it became apparent that the steam-electric power plant sector proposed to "heat virtually 100 percent of large non-tidal riverine flows during summer low-flow conditions."[76]

Elevated temperature induces behavioral changes that have been documented in important managed species such as bluefish, fluke, winter flounder, and tautogs.[77] Some of these behavioral changes include:

- Avoidance of parts or all of a waterbody by certain species during summer and early fall;[78]
- Attraction to parts or all of a waterbody during winter by species that should have migrated out of the area due to cold temperatures.[79]
- Large-scale mortality (due to thermal shock from a rapid drop in temperature) resulting from the failure to migrate followed by a planned or emergency shutdown.[80]

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[73] 2011 EEBA at 2-12.

[74] *See* Kennedy & Mihursky, *The Effects of Temperature on Invertebrates and Fish: A Selected Bibliography*, University of Maryland Center for Environmental Science (Exh. 20), *available at* http://www.mdsg.umd.edu/issues/chesapeake/habitat/fishtemp/.

[75] *Id.*

[76] *Id.*

[77] O. Donovan, D. Doyle, C. O'Neill and E. Kearns, "Thermal Plume Impact on Fish Distributions in Barnegat Bay," 10(3) *Bull. Amer. Lit. Soc.* 14 (1977) (Exh. 21).

[78] M.J. Kennish, "State of the Estuary and Watershed: An Overview," SI 32 *Journal of Coastal Research* 243 (2001) (Exh. 22).

[79] M.J. Kennish, M.B. Roche and T.R. Tatham, "Anthropogenic effects on aquatic organisms," in M.J. Kennish and R.A. Lutz (eds.), *Ecology of Barnegat Bay, New Jersey*, at 318-338 Springer-Verlag (1984) (Exh. 23), *available at* http://yosemite.epa.gov/water/owrccatalog.nsf/7322259e90d060c885256f0a0055db68/3c2b3d081f4714fd85256b06007233ee!OpenDocument.

[80] Oyster Creek Nuclear Generating Station Fish Kill Monitoring Report, NRC ML#003684420 (January 2000) (Exh. 24); Oyster Creek 2001 Annual Environmental Operating Report, NRC ML#020660222 (February 2002) (Exh. 25); A. Cradic, New Jersey Department of Environmental Protection, *Oyster Creek Generating Station fined for water violations and fish kills: DEP seeks compensation for Natural Resources Damages* (December 12, 2002) (Exh. 26), *also available at* http://www.state.nj.us/dep/newsrel/releases/02_0131.htm.

- Metabolic rate of organisms increases with increased temperatures resulting in decreased growth and survival,[81] especially during summer months when ambient water temperatures are at their peak.

- Tropical/subtropical invasive species are able to thrive in the surrounding warm water plume.[82]

- Calefaction or thermal loading directly interferes with physiological processes of biota, such as enzyme activity, feeding, reproduction, respiration, and photosynthesis. Less conspicuous, indirect effects, which are difficult to quantify, include greater vulnerability to disease, to changing gaseous solubilities, and to chemical toxicants associated with thermal enrichment.[83]

9. Chemical Discharges

As EPA notes in the EEBA:

> One of the environmental impacts associated with power plant operations is the release of chemicals in the discharge of once-through cooling waters. These chemicals include metals from internal corrosion of pipes, valves and pumps (e.g., chromium, copper, iron, nickel, and zinc), additives (anti-fouling, anticorrosion, and anti-scaling agents) and their byproducts, and materials from boiler blowdown and cleaning cycles.[84]

These anti-fouling and cleaning chemicals can pose a risk to aquatic organisms downstream of the CWIS discharge, potentially causing organisms to develop acute and residual effects.[85] As the EEBA explains, "[a] typical biofouling procedure is continuous low-level chlorination at chronic toxicity levels with an occasional high ("shock") dose," while the "use of oxidants (chlorine, bromide) can give rise to residuals and/or disinfection byproducts (DBPs) such as trihalomethanes, haloacetic acid, bromoform, and others."[86] Although the effects of some discharge chemicals are not well documented, in most cases, these effects, along with thermal and mechanical effects, are believed to be an additional component of the cumulative stress of entrainment on local aquatic ecosystems: "[C]oncentrations of these chemicals may be additive to low-level chronic adverse effect with other anthropogenic stressors identified above."[87]

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[81] T. L. Beitinger, W. A. Bennett, R. and W. McCauley, (2000) *Temperature Tolerances of North American Freshwater Fishes Exposed to Dynamic Changes in Temperature*. Environmental Biology of Fishes, 58(3): 237 – 275 [DCN 10-4716].

[82] M.J. Kennish (2001) *State of the Estuary and Watershed: An Overview*. Journal of Coastal Research, SI 32: 243-273 (Exh. 22).

[83] *Id.*

[84] 2011 EEBA at 2-13.

[85] 2011 EEBA at 2-14, citing Kelso and Milburn 1979.

[86] 2011 EEBA at 2-14, citing Taylor 2006.

[87] 2011 EEBA at 2-14.

10. Cumulative Impacts

Cooling water intake structures also cause cumulative impacts, understood to refer to impacts caused by multiple power intake structures on the same waterway as well as the impacts of the intake structures combined with fishing and other pressures. EPA has delineated these cumulative impacts in this rulemaking (in the EEBA) and previously in the preamble to EPA's prior Section 316(b) rules:[88]

> In addition to impingement and entrainment losses associated with the operation of the cooling water intake structure, EPA is concerned about the cumulative overall degradation of the aquatic environment as a consequence of (1) multiple intake structures operating in the same watershed or in the same or nearby reaches and (2) intakes located within or adjacent to an impaired waterbody. Historically, impacts related to cooling water intake structures have been evaluated on a facility-by-facility basis.[89]
>
> Cumulative effects of CWISs are likely to occur if multiple facilities are located in close proximity such that they impinge or entrain aquatic organisms within the same source waterbody, watershed system, or along a migratory pathway of a specific species (e.g., striped bass in the Hudson River). The cumulative impacts of CWISs may be exacerbated by the presence of other anthropogenic stressors.[90]
>
> There is concern … about the effects of multiple intakes on fishery stocks. … EPA analyses suggest that over 99 percent of the existing facilities with cooling water withdrawal that EPA surveyed in its Section 316(b) survey of existing facilities are located within 2 miles of waters that are identified as impaired and listed by a State or Tribe as needing development of a total maximum daily load (TMDL) to restore the waterbody to its designated use. EPA notes that the top four leading causes of waterbody impairment (siltation, nutrients, bacteria, and metals) affect the aquatic life uses of a waterbody. The Agency believes that cooling water intakes potentially contribute additional stress to waters already showing aquatic life impairment from other sources such as industrial discharges and urban stormwater.[91]

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[88] Tellingly, however, the only references to "cumulative impacts" in the preamble to the Proposed Rule are three mentions of the cumulative *financial* burdens on power companies from EPA's air, water, and hazardous waste rules. After years of cumulative impacts from intake structures taking their toll on waterways, EPA is now apparently more concerned about the cumulative effect of regulation on industry's bottom line than the effect on aquatic resources.

[89] 66 Fed. Reg. at 65,263 (col. 2).

[90] 2011 EEBA at 2-17 (internal citation omitted).

[91] 66 Fed. Reg. at 65,263 (col. 2).

11. Habitat Loss

As EPA also recognizes, "[m]ost 316(b) facilities have been built on shoreline locations where power-generation buildings, roadways, CWISs [cooling water intake structures], canals, impoundments, and other water storage or conveyance structures have often been constructed at the cost of natural habitat, including terrestrial, aquatic, and wetlands."[92] Moreover, the loss of fish habitat due to construction of a power plant and its intake structure combined with the direct losses of fish from operation of the intake exert even greater pressures on aquatic species:

> Habitat loss in adjacent shoreline areas exacerbates the effect of CWIS losses, since many fish species affected by I&E [impingement and entrainment] mortality (e.g., bay anchovy, winter flounder) rely on coastal wetlands as nursery areas.[93]

12. Altered Flow Patterns in Source and Receiving Waters

Another adverse impact of cooling water intake structures recognized by EPA is that their massive withdrawals and discharges significantly alter patterns of flow within receiving waters both in the immediate area of the intake and discharge pipes, and in mainstream waterbodies, particularly in inland riverine settings.[94] In some ecosystems intake structures may cycle a substantial proportion of the water body through the power plant's cooling system. EPA noted that "of the 521 facilities that are located on freshwater streams or rivers, 31 percent (164) of these facilities have average intake greater than 5 percent of the mean annual flow of the source waters."[95] Even if the volume of water in the river stays relatively constant, "the flow characteristics of the waterbody, including turbulence and water velocity, may be significantly altered. This is particularly true in locations with multiple CWISs located close to each other."[96] Significantly, as EPA found:

> Altered flow velocities and turbulence may lead to several changes in the physical environment, including sediment deposition (Hoyal et al. 1995), sediment transport (Bennett and Best 1995), and turbidity (Sumer et al. 1996), each of which play a role in the physical structuring of ecosystems. Biologically, flow velocity is a dominant controlling factor in aquatic ecosystems. Flow has been shown to alter feeding rates, settlement and recruitment rates (Abelson and Denny 1997), bioturbation activity (Biles et al. 2003), growth rates (Eckman and Duggins 1993), and population dynamics (Sanford et al. 1994). In addition to flow rates, turbulence plays an important role in the ecology of small organisms, including fish eggs and larvae, phytoplankton, and zooplankton. In many cases, the turbulence of a waterbody directly affects the behavior of aquatic organisms, including fish, with respect to swimming speed (Lupandin 2005), location preference with a waterbody (Liao 2007), predator-prey interactions (Caparroy et

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[92] 2011 EEBA, pp. 2-2 to 2-3.

[93] 2011 EEBA, p. 2-3.

[94] 2011 EEBA, p. 2-15.

[95] *Id.*

[96] *Id.*

> al. 1998; MacKenzie and Kiorboe 2000), recruitment rates (MacKenzie 2000; Mullineaux and Garland 1993), and the metabolic costs of locomotion (Enders et al. 2003). The sum of these effects may result in changes to the food web or the location of used habitat, and thereby substantially alter the aquatic environment.[97]

These problems will likely be exacerbated by climate change.[98]

13. Water Availability and Related Energy Impacts

The enormous amount of water required for power plant water withdrawals threatens not only electrical power generation, but the general sustainability of water use in the U.S. In 2005, cooling water withdrawals accounted for nearly 41 percent of all freshwater withdrawals and 49 percent of all water withdrawals (fresh and saline) in the United States.[99] With hundreds of U.S. power plants still relying on once-through cooling, power plants are the largest water users in the country. The use of once-through cooling also represents an enormous opportunity cost to other water users. If cooling water is needed for downstream power plants, then upstream users must forego their use of this water to accommodate the needs of the power plants. This is particularly a problem in places where power plants are located near thirsty cities and other users.

EPA's Proposed Rule makes mention of the supposed reliability threats the power sector may face due to modernization to closed-cycle cooling.[100] However, nowhere does EPA discuss the threats to power generation and water supplies if facilities continue to utilize once-through cooling. These threats must be considered and incorporated into any BTA determination.

a. Impacts on Upstream Beneficial Uses of Water

The massive amounts of water withdrawn by power plants' once-through cooling systems affect water resource planning and land use policy in several fundamental ways. As an extremely telling example, consider the 1,021 MW coal-fired Gorgas Steam Plant in north central Alabama, which uses a once-though cooling system to withdraw up to 978 million gallons of cooling water per day from the Black Warrior River. Like many power companies, Alabama Power has resisted upgrading the cooling system to a once-through system, even though that would reduce the intake flow by approximately 95 percent. The adverse impacts of Gorgas's massive withdrawals are, however, not limited to entrainment, impingement, thermal discharges, and their consequential effects (which are felt not only at the intake and downstream, but also upstream). That is because Alabama Power also operates a hydroelectric dam (known as the Lewis Smith development as part of the Warrior River Hydroelectric Project) above the Gorgas Plant and, since 1974, the company has operated the dam so as to ensure that Gorgas' massive water requirements are met. The steam plants' extremely large cooling water demands

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[97] *Id.*

[98] *Id.*

[99] J.F. Kenny et al., Estimated Use of Water in the United States in 2005, U.S. Geological Survey Report, Circular 1344 (2009), at 38, (Exh. 2), *also available at* http://pubs.usgs.gov/circ/1344/pdf/c1344.pdf (last visited July 2011).

[100] *See, e.g.*, 76 Fed. Reg. at 22,229.

affect Alabama Power's decisions both as to when to release water from the dam and how much water to release.

Because of the purported "need" to ensure massive flows to the downstream power plant, Alabama Power has opposed an alternative operational plan, proposed by residents, which would provide higher and more stable reservoir elevations in Smith Lake and thereby improve habitat for fish and wildlife (including a federally-listed species of mussel) and recreation in and on the lake.[101] If, however, plants like Gorgas were required to retrofit to closed-cycle cooling, the upstream dam could be operated in a more environmentally and socially appropriate manner.

This sort of competition for water will only worsen as droughts intensify and temperatures increase due to climate change. Often, the result will be that other beneficial uses of water upstream, including not only habitat and recreation but also drinking water and agriculture, will be curtailed in order to supply the power plant.

As the Atlanta Journal and Constitution reported in 2007, industry's contention that once-through cooling systems do not "consume" water fails to acknowledge the competition with upstream uses for those flows:

> Utility water use has escaped scrutiny, in part, because false assumptions have guided public policy in water planning. Utilities have argued for years that their use doesn't matter because they return virtually all the water they use.
>
> But use does matter when drought shrinks the water supply, and consumption from other sources puts pressure on reservoirs and rivers.
>
> A Southern Co. coal-fired plant in Florida or its Farley nuclear plant in Alabama may put at least half of the water used back into the Chattahoochee River. But that water isn't going back to Lake Lanier.
>
> Power plants also require minimum river flows to keep operating. Low flows on the Coosa River forced Georgia Power to cut back energy output at one plant this summer.[102]

Another example of power plants' massive water needs driving water resource and land use policies concerns flood-plain development. In a draft policy proposal, the White House Council on Environmental Quality (CEQ) recommended that development and other unwise use of floodplains and flood-prone areas be avoided in order to serve a variety of goals including to "[p]reserve and restore the hydrologic and natural resources functions" of those areas.[103] In

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[101] *See* Federal Energy Regulatory Commission, *Final Environmental Assessment for Hydropower License, Warrior River Hydroelectric Project* at 15-16, 40, 136, P-2165-022 (March 2009) (Exh. 27).

[102] Ken Foskett, Margaret Newkirk, Stacy Shelton, "Georgia's Water Crisis: The Power of Water," *Atlanta Journal Constitution* (November 18, 2007) (Exh. 28).

[103] *See* Council on Environmental Quality, *Proposed National Objectives, Principles and Standards for Water and Related Resources Implementation Studies* at 6 (Dec. 3, 2009) (Exh. 29), *also available at* http://www.whitehouse.gov/administration/eop/ceq/initiatives/PandG/. *See also* 74 Fed. Reg. 65,102 (Dec. 9, 2009)

response, the Edison Electric Institute (EEI), sought to perpetuate the status quo and urged CEQ to factor the "availability of cooling water" into its water resource decisions, arguing that "cooling water intake structures are necessarily built in flood plains" and that such development should not be considered "inappropriate or … discouraged."[104] Of course, EEI has it backwards: EPA should discourage the continued use of fragile, precious waterfront land by power plants, rather than accept or encourage it. The demonstrated ability of facilities in the Southwest to locate away from waterbodies and out of flood plains proves that power plants are not water-dependent.

b. Threats to Power Generation and Grid Reliability

Furthermore, in many cases and increasingly frequently, power plants relying on once-through cooling will be unable to operate due to the lack of sufficient volumes of water or because the water may not be sufficiently cool. The threats posed to reliable power generation by water availability and temperature issues are real and well known.[105] According to DOE, "[w]ater shortages, potentially the greatest challenge to face all sectors of the United States in the 21st century, will be an especially difficult issue for thermoelectric generators due to the large amount of cooling water required for power generation."[106] Even industry recognizes these threats to reliability at once-through facilities due to water shortages.[107] For facilities using once-through cooling, "[i]f cooling water sources fall below the established minimum water level, or if the maximum thermal threshold for the discharge of cooling water cannot be met, a facility is required to power down or go offline."[108]

In 2003, an EPRI study presented county-level thermoelectric power generation constraints in the year 2025 based on projected water availability and electricity demands. As

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(Council on Environmental Quality: Draft Principles and Standards Sections of the "Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies"; Initiation of Revision and Request for Comments).

[104] Letter from C. Richard Bozek, EEI's Director of Environmental Policy to Mr. Terrance L. Breyman, Deputy Associate Director for Natural Resources, CEQ at 5, 3 (April 5, 2010) (Exh. 30).

[105] *See* Lisa Song, "Heat Waves Putting Pressure on Nuclear Power's Outmoded Cooling Technologies," *SolveClimate News* (May 4, 2011) (Exh. 31), *also available at* http://www.reuters.com/article/2011/05/04/idUS163919996420110504. *See also* National Research Council, *Adapting to the Impacts of Climate Change* at 73 (2010) (Exh. 32), *also available at* https://download.nap.edu/catalog.php?record_id=12783.

[106] National Energy Technology Laboratory ("NETL"), *Estimating Freshwater Needs to Meet Future Thermoelectric Generation Requirements: 2010 Update* at 9 (Sept. 30, 2010) [hereinafter "NETL 2010"] (Exh. 33).

[107] Brent Barker, "Running Dry at the Power Plant," *EPRI Journal* at 29-30 (Summer 2007) ("It is critical to recognize . . . that although the once-through plant consumes only a small fraction of the water it withdraws, it needs the withdrawal to operate. Hence, under drought conditions, a generating plant may have to be shut down or severely curtailed in operation because of its inability to withdraw a sufficient amount of water to meet its thermal discharge permit.") (Exh. 34).

[108] Nicole T. Carter, Congressional Research Service, *Energy's Water Demand: Trends, Vulnerabilities, and Management* at 6 (January 5, 2011)[hereinafter "CRS 2011"] (Exh. 35), *also available at* http://www.fas.org/sgp/crs/misc/R41507.pdf.

shown in Appendix E, the report projected that thermoelectric cooling water withdrawals would be constrained in hundreds of U.S. counties by the year 2025.[109]

Some of the underlying assumptions in the study may be outdated because the study has not been updated to reflect recent changes in power demand predictions[110] and climate change impacts to water availability.[111] Nonetheless, the study highlights the critical relationship between water and energy and the possible threats to energy generation under the assumed withdrawal scenarios.

More recently, the Union of Concerned Scientists compiled a sampling of reliability problems that have already occurred at once-through facilities because of water-related constraints, including:[112]

- In 2006, high intake water temperatures during a heat wave forced four nuclear plants in the Midwest to reduce their electrical output when it was needed most. One plant in Prairie Island, MN, was forced to reduce output by 50%.

- Only by relying on water from irrigation supplies did the 1,650 mw coal-fired Laramie River Station in Wheatland, WY, avert impacts to power production in 2008.

- In the summer of 2010, the Browns Ferry nuclear plant in Athens, AL, significantly reduced output for five weeks because of high discharge water temperature. This same facility had to reduce output for similar reasons in 2007.[113]

As the UCS report and others highlight, threats to energy generation because of source water concerns arise not only in the arid areas of the western U.S., but also in an "increasing number of water bodies in the East."[114] The threats to energy reliability will only get worse with increases in energy use[115] and climate change,[116] and competition from other water users – such

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[109] Sujoy B. Roy, Karen V. Summers & Robert A. Goldstein, "Water Sustainability in the United States and Cooling Water Requirements for Power Generation," 126 *Water Resources Update* 94 (Nov. 2003) (Exh. 36), *also available at* http://opensiuc.lib.siu.edu/jcwre/vol127/iss1/12/.

[110] Interview with Sujoy Roy (Apr. 6, 2011).

[111] CRS 2011 at 7.

[112] Union of Concerned Scientists, *The Energy-Water Collision: Power and Water at Risk* (June 2011) (internal citations omitted) (Exh. 37), *also available at* http://www.ucsusa.org/assets/documents/clean_energy/ew3/power-and-water-at-risk-with-endnotes.pdf.

[113] CRS 2011 at 6.

[114] *Id.* (citing U.S. Department of Agriculture Forest Service, *2000 RPA Assessment of Forest and Range Lands*, FS-687, at 14 (Feb. 2001) (Exh. 38)).

[115] NETL 2010 at 1 (citing Energy Information Administration, *Annual Energy Outlook 2010 with Projections to 2035* (Exh. 39) *also available at* http://www.eia.doe.gov/oiaf/aeo/index.html).

[116] CRS 2011 at 8; *See also* Mitch Weiss, Associated Press, *Southern Drought May Force Nuclear Plants to Shut Down* (Jan. 24, 2008) ("The water was low on the Tennessee River and had become warmer than usual under the hot sun. By the time it had been pumped through the Browns Ferry plant, it had become hotter still – too hot to release back into the river, according to the TVA. So the utility shut down a reactor.") (Exh. 40).

as domestic and agricultural – will only get more intense,[117, 118] as the Associated Press has reported:

> An Associated Press analysis of the nation's 104 nuclear reactors found that 24 are in areas experiencing the most severe levels of drought. All but two are built on the shores of lakes and rivers and rely on submerged intake pipes to draw billions of gallons of water for use in cooling and condensing steam after it has turned the plants' turbines.
>
> Because of the yearlong dry spell gripping the region, the water levels on those lakes and rivers are getting close to the minimums set by the Nuclear Regulatory Commission. Over the next several months, the water could drop below the intake pipes altogether. Or the shallow water could become too hot under the sun to use as coolant.
>
> "If water levels get to a certain point, we'll have to power it down or go off line," said Robert Yanity, a spokesman for South Carolina Electric & Gas Co., which operates the Summer nuclear plant outside Columbia, S.C.
>
> * * *
>
> During Europe's brutal 2006 heat wave, French, Spanish and German utilities were forced to shut down some of their nuclear plants and reduce power at others because of low water levels – some for as much as a week.[119]

In addition to these vulnerabilities due to inadequate water supply or increased water temperature, power plants using once-though cooling are also vulnerable due to the sheer volume of aquatic life being withdrawn from the source water:

- In September 1984, a flotilla of jellyfish blocked the intake at the St. Lucie nuclear plant in Florida, forcing both of its nuclear reactors to shut down for several days due to lack of cooling water.[120]
- In July 2011, five generators were shut down due to jellyfish in Japan, Israel and Scotland.[121]

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[117] NETL 2010 at 9.

[118] "According to a GAO 2003 report, national water availability has not been comprehensively assessed in 25 years, thus water availability on a national level is ultimately unknown. However, as the report goes on to say, current trends indicate that demands on the nation's supplies are growing while the nation's capacity to store surface-water is increasingly more limited and ground-water is being depleted." NETL 2010 at 9 (internal citations omitted).

[119] Mitch Weiss, Associated Press, *Southern Drought May Force Nuclear Plants to Shut Down* (Jan. 24, 2008) (Exh. 40).

[120] Union of Concerned Scientists, *Got Water?* at 5 (Dec. 4, 2007) (Exh. 41), *also available at* http://www.ucsusa.org/nuclear_power/nuclear_power_technology/got-water-nuclear-power.html.

- In March 2011, the McGuire nuclear plant was forced to shut down both reactors because of "macro-fouling" – where fish from Lake Norman clogged the plant's water system.[122]

Meanwhile, EPA seems well aware of these types of risks and of the benefits closed-cycle cooling can provide. Indeed, EPA visited a number of sites that already have retrofitted to closed-cycle cooling for a variety of reasons:[123]

- McDonough (GA), Yates (GA), Canadys (SC) and Wateree (SC) converted all generating units to closed-cycle cooling.[124]
- Nearman Creek (KS) converted its generating units to reduce the need for cooling water at times of the year (summer) when the source water level is low.[125] [During EPA's site visit, facility representatives noted that its closed-cycle recirculating cooling system is easy to operate and actually leads to slightly *better* performance by the generating units, as the return water from the tower is cooler than river water.][126]
- Linden (NJ) constructed several new combined cycle units to replace retiring fossil units and uses grey water from a nearby treatment plant for its makeup water.[127]

EPA notes that, "[w]hile the reasoning for some retrofits may not explicitly include consideration of 316(b), flow reduction is clearly an issue in the forefront of permitting and operational decisions at many facilities. Even in cases where 316(b) was not a consideration, the benefits to aquatic communities are realized nonetheless."[128]

c. Water Supply Sustainability Risks in a Changing Climate

This sort of competition for water will only worsen as droughts intensify and temperatures increase due to climate change. Climate change will have a significant impact on the sustainability of water supplies in the coming decades, by increasing the risk that water supplies will not be able to keep pace with withdrawals in many areas of the United States. A

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[121] Peter Hanlon, *Jellyfish to Power Plants: You Suck*, http://www.ecocentricblog.org/2011/07/26/jellyfish-to-power-plants-you-suck/ (July 26, 2011) (Exh. 42).

[122] U.S. Nuclear Regulatory Commission, McGuire Nuclear Station Licensee Event Report 369/2011-01, Revision 1 (Apr. 1, 2011) (Exh. 43), *available at* http://pbadupws.nrc.gov/docs/ML1110/ML111020305.pdf.

[123] 2011 TDD at 2-14.

[124] *See* Site Visit Report for McDonough-Atkinson Power Plant, February 11, 2009 [DCN 10-6536], Site Description Report for Yates Power Plant, February 11, 2009 [DCN 10-6538]; Site Visit Report for Canadys Station, February 10, 2009 [DCN10-6535] and Site Visit Report for Wateree Station, February 10, 2009 [DCN 10-6534], respectively.

[125] 2011 TDD at 2-14.

[126] Site Visit Report of Nearman Creek Power Station, March 3, 2009, at 4 [DCN 10-6524].

[127] *See* Site Visit Report for Linden Generating Station, May 26, 2010 [DCN 10-6557].

[128] 2011 TDD at 2-14.

2010 study conducted by Tetra Tech for the Natural Resources Defense Council (NRDC) found that in many parts of the nation, water withdrawals already outpace renewable water supply. The Tetra Tech report also found that "[t]he impacts of climate change will greatly increase the number of areas where renewable water supply will be lower than withdrawal, therefore increasing the number of areas vulnerable to future water shortages."[129]

The Tetra Tech study projected that water withdrawals in 2050 will greatly outpace available precipitation in many U.S. counties, as is shown in Appendix F. After considering a number of sustainability factors such as population and economic growth, the Tetra Tech study further concluded that more than 1,100 U.S. counties in the lower 48 states will have higher risk of water shortages by 2050 as a result of climate change, as shown in Appendix G.

As EPA notes, the Proposed Rule has the potential to address over half of the water withdrawals in the entire nation.[130] Unfortunately, as is highlighted herein, the proposed rule does little if anything to curtail these significant water withdrawals.

14. Industrial Use of Valuable, Scenic Waterfront Land

It is no coincidence that power plants are located along the country's mightiest rivers and on highly valued and scenic locations adjoining our most treasured oceans, lakes and estuaries: plants using once-through cooling need cooling water in volumes that can only be found at the edge of a major waterbody. Closed-cycle cooling, however, lowers intake volumes to levels which can be met by alternative water sources as such municipal water supplies, ground water, or treated sewage effluent discharges. By using such alternative water sources, power plants can be located away from waters of the U.S. Closed-cycle cooling thus decouples industrial cooling water needs from the need to site plants on sensitive, scenic and valuable waterfront property. Such facilities can locate in brownfields or industrial parks, avoiding incompatibility of land uses. This significant increase in siting flexibility, particularly for replaced, rebuilt or repowered facilities, is yet another advantage of moving away from once-through cooling and towards closed-cycle cooling.

B. Statutory Background: Congress Enacted Section 316(b) as Part of the 1972 Clean Water Act Amendments to Standardize Permitting and Minimize Once-Through Cooling's Massive Water Withdrawals and Fish Kills.

When Congress enacted Section 316(b) as part of the sweeping 1972 amendments to the Clean Water Act, it was well aware of the enormity of once-through cooling water withdrawals, fish kills and thermal discharges, as well as the superiority of closed-cycle cooling. The provision was intended to standardize permitting and require the Best Technology Available – which was then and still is closed-cycle cooling – to minimize the water withdrawals and fish kills.

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[129] Sujoy Roy et al., Tetra Tech, *Evaluating Sustainability of Projected Water Demands Under Future Climate Change Scenarios* (2010) (Exh. 44), *also available at* http://rd.tetratech.com/climatechange/projects/nrdc_climate.asp.

[130] 76 Fed. Reg. at 22,189.

1. In 1972 Congress Was Well Aware of the Enormous Damage Caused by Once-Through Cooling.

Although once-through cooling systems have been in use for more than a century, and the size of U.S. power plants dramatically increased after World War II, it was not until the late 1960s that federal policymakers turned their attention to the environmental damage caused by intake structures. In 1967, Senator Warren Magnuson warned that "by 1980 thermal power plants throughout the nation will require an amount of cooling water greatly in excess of the average flow of the mighty Mississippi at St. Louis."[131] Congress first considered the impacts of power plants' massive water usage during extensive hearings on the effects of waste heat discharged from industrial facilities.[132] The White House was similarly concerned, and in 1968 President Lyndon Johnson's staff issued a report explaining that "the large volumes of water withdrawn in once-through cooling processes [can have] as much or more effect on aquatic life than the waste discharges on which control measures are required."[133]

In the early 1970s, a number of well-publicized massive fish kills occurred at U.S. power plants, such as the Brayton Point Power Station in Mt. Hope Bay, Massachusetts, which killed an astonishing 164.5 million menhaden and river herring in just one day, July 2, 1971,[134] the P.H. Robinson plant in Galveston Bay, Texas, which impinged more than 7 million fish in 12 months in 1969 and 1970, the Indian Point No. 1 nuclear facility on New York's Hudson River, which killed 1.3 million fish over a 10 week period,[135] and the Millstone nuclear plant in Niantic Bay, Connecticut, where more than 2 million dead menhaden clogged the intake screens in the late summer of 1971.[136]

Public concern over these and other incidents prompted Congress to add Section 316(b) to the Clean Water Act amendments of 1972.[137] Significantly, during debate over the Clean

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[131] 113 Cong. Rec. 30129 (1967) (Exh. 45).

[132] *Thermal Pollution, Hearings before the Subcomm. on Air and Water of the Senate Comm. on Public Works*, 90th Cong., pts 1-4 (1968); *id.* at 1 (statement of Sen. Muskie) ("[b]y the end of the next decade, approximately one-sixth of the total fresh-water runoff in the United States will be required for cooling and condensing purposes.") (Exh. 46); *id.* at 98-102, 104, 112-13, 137-38, 143 (testimony on intake impact on aquatic organisms); *Environmental Effects of Producing Electric Power, Hearings before the Joint Committee on Atomic Energy*, 91st Cong., pt. 1, 341-345, 375-76 (1969) (intake impact).

[133] Office of Science and Technology of the Executive Office of the President, *Considerations Affecting Steam Power Plant Site Selection*, 46 (1968) (Exh. 47).

[134] U.S. EPA, Development Document for Best Technology Available for the Location, Design, Construction and Capacity of Cooling Water Intake Structures for Minimizing Adverse Environmental Impact, 1976 at p. 9, table I-3 (Exh. 48). EPA reported that the fish were "mangled." Id.

[135] Clark and Brownell, *Electric Power Plants in the Coastal Zone: Environmental Issues,* American Littoral Society Special Publication at V-8, tbl. V-B (1973) (Exh. 49); *see also New York Times Abstracts*, May 24, 1972, p. 94, col. 1 ("alleged 'massive' killing of fish at [Con Ed's] No. 2 nuclear-power plant at Indian Point on the Hudson River") and *New York Times Abstracts*, March 1, 1972, p. 77, col. 3 ("more than 100,000 fish have been killed in last wk [at Indian Point]") (Exh. 50).

[136] Clark and Brownell, *Electric Power Plants in the Coastal Zone: Environmental Issues,* American Littoral Society Special Publication (1973), p. V-8, tbl. V-B (Exh. 49); *see also New York Times Abstracts*, August 16, 1972, p. 41, col. 1 ("massive fish kill in Apr at Millstone Point nuclear power complex") (Exh. 51).

[137] Although Section 316(b) has been occasionally described as "something of an afterthought," (*Riverkeeper I*, 358 F.3d at 187 n.12) because of the minimal discussion of that provision in the *published* legislative history of the

Water Act, Senator James Buckley of New York cited with approval two newspaper articles reporting a decision of the Atomic Energy Commission (AEC) to require Consolidated Edison to install closed-cycle cooling at Indian Point.[138] The articles noted that the plants withdrew massive amounts of water from the Hudson River, entraining thousands of organisms per minute, and that the AEC had ordered Consolidated Edsion to stop removing such large volumes of water from the River and to install closed-cycle cooling in order to abate these massive fish kills.[139] Troubled by the extraordinary mortality at Indian Point, Senator Buckley sought to ensure that regulatory agencies could require closed-cycle cooling at power plants. In response, Senator Edmund Muskie of Maine, the chief architect of the Act, assured Senator Buckley that EPA would have that authority.[140]

2. The 1972 CWA Amendments Fundamentally Restructured U.S. Water Pollution Regulation by Replacing Ineffectual Site-Specific Assessments of Water Quality with National Technology-Based Standards.

The objective of the CWA is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."[141] In furtherance of this goal, in 1972, Congress fundamentally reformed the Act in what has been described as a "sea change" in this country's water pollution control strategy.[142] Prior law had failed because, among other things, it "focused on the tolerable effects rather than the preventable causes of water pollution."[143] Indeed, Congress passed the Federal Water Pollution Control Act Amendments of 1972 (now known as the Clean Water Act) because it recognized that "'the Federal water pollution control program …ha[d] been inadequate in every vital aspect …'"[144]

Clean Water Act, that is plainly incorrect. More voluminous *unpublished* materials documenting the committee negotiations on the precise wording of what was eventually codified into the three subsection of Section 316 show that, during extensive six-month negotiations, the committee discussed and debated intake structure regulations at length. These materials are all available in the National Archives and located in a series of "Cartons" labeled "Accession No. 46-75-003, Senate Public Works Committee, Subcommittee on Environmental Pollution, Federal Water Pollution Legislation Files." Within each box there are "Folders" with topic labels and often smaller individual "Files" with topic labels. In particular, there are five highly relevant committee files: (1) a File labeled "316," containing drafts of Section 316, in a Folder labeled "Conference Committee Language" contained in Carton No. 2; (2) a file containing correspondence on "Phase I and Phase II," in that same Folder and Carton; (3) files labeled "9/13" and "9/14," containing notes on the individual sessions of the House and Senate conferees held on September 13th and 14th, 1972, in a Folder labeled "Conference Committee Conference Sessions," in Carton No. 2; (4) a File labeled "General," containing internal committee memoranda to Senate Muskie and to the Senate Conferees in a file labeled "General" in Carton No. 2; and (5) a File labeled "Thermal" in Carton No. 1. Those files are submitted herewith as Exhibit 52 (Exh. 52).

[138] 1 *Legislative History of the Water Pollution Control Act Amendments of 1972*, 196-97 (Committee Print compiled for the Senate Committee on Public Works by the Library of Congress), Ser. No. 93-1 (1973) (Exh. 53).

[139] *Id.*

[140] *Id.*; see also *In the Matter of: Carolina Power & Light Company (Brunswick Steam Electric Plant)*, USEPA, Decision of the General Counsel, EPA GCO 41 at 178 (June 1, 1976) (noting that Congress was "well aware" of the impacts of intake structures when it enacted the CWA) (Exh. 54).

[141] CWA § 101(a), 33 U.S.C. § 1251(a). The Act defines "pollution" to include "the man-made or man-induced alteration of the … biological … integrity of water." CWA § 502(19), 33 U.S.C. § 1362(19).

[142] *Riverkeeper I*, 358 F.3d at 184.

[143] *EPA v. California*, 426 U.S. 200, 202-03 (1976).

[144] *Milwaukee v. Illinois*, 451 U.S. 304, 310 (1981), quoting S. Rep. No. 92-414, 7 (1971), 2 Legislative History of

The 1972 "Amendments were viewed by Congress as a 'total restructuring' and 'complete rewriting' of the existing water pollution legislation."[145] The single most important regulatory reform achieved by the 1972 Act was the seemingly paradoxical notion that the nation's ambitious water quality goals could best be achieved if they were no longer tied to compliance with water quality standards. Congress concluded that past efforts to maintain such a regulatory link had failed because the science of water ecology was too complex to measure the "tolerable effects" with the precision necessary to have water quality standards serve as the primary touchstone for determining the appropriate level of control.[146]

Congress deliberately established the NPDES program to relieve permitting agencies of the need to conduct costly, lengthy, and indeterminate ecological studies to issue permits. Congress's focus on uniform technology standards in the 1972 amendments was an explicit repudiation of unsuccessful predecessor statutes that relied on "water quality standards" as the primary method of pollution control. Prior to 1972, sources were regulated "based on their effect on the surrounding water" and discharges were limited only if they caused water quality to drop below an acceptable level.[147] But that approach created a "virtually unbridgeable causal gap" because "proving that a particular polluter had caused the water quality to dip below the standards was all but impossible to satisfy."[148] Thus, "Congress realized not only that its [pre-1972] water pollution efforts … had failed, but also that reliance on receiving water capacity as a crucial test for pollution levels had contributed greatly to that failure."[149]

To reverse the anarchy and ineffectiveness of case-by-case regulation, Congress required EPA to set standards for categories of polluters:

> In presenting the Conference Report to the Senate, Senator Muskie, perhaps the Act's primary author, emphasized the importance of uniformity in setting § 301 limitations….[which] required that EPA focus on classes or categories of sources in formulating effluent limitations….
>
> "The Conferees intend that the factors [for permitting standards]… be considered only within classes or categories of point sources and that such factors not be considered at the time of the application of an effluent limitation to an individual point source within such a category or class." 118 Cong. Rec. 33697 (1972), Leg.

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the Water Pollution Control Act Amendments of 1972, 1452 (Committee Print compiled for the Senate Committee on Public Works by the Library of Congress), Ser. No. 93-1 (1973).

[145] *Id.*, 451 U.S. at 317, quoting House Debate on H.R. 11896, 1 Leg. Hist. 350-51, 359-60 (remarks of Reps. Blatnik and Jones). 1 *Legislative History of the Water Pollution Control Act Amendments of 1972* 350 (Committee Print compiled for the Senate Committee on Public Works by the Library of Congress), Ser. No. 93-1 (1973) (Exh. 55).

[146] *EPA v. California State Water Resources Control Board*, 426 U.S. 200, 202-03 (1976).

[147] *Riverkeeper I* at 189, citing *CPC Int'l v. Train*, 515 F.2d 1032, 1034-35 (8th Cir. 1975).

[148] *Id.* at 189-90, quoting *CPC*, 515 F.2d at 1035 and *Bethlehem Steel Corp. v. EPA*, 538 F.2d 513, 515 (2d Cir. 1976).

[149] *Weyerhaeuser*, 590 F.2d at 1042.

Hist. 172.[150]

The Senate Public Works Committee explained the Act's requirement for standardized effluent limits and this "shift to end-of-pipe standards":[151]

> The Committee adopted this substantial change …because of the great difficulty associated with establishing reliable and enforceable precise effluent limitations on the basis of a given stream quality. Water quality standards, in addition to their deficiencies in relying on the assimilative capacity of receiving waters, often cannot be translated into effluent limitations – defendable in court tests, because of the imprecision of models for water quality and the effects of effluents in most waters…..
>
> With effluent limits, the Administrator can require the best control technology; he need not search for a precise link between pollution and water quality.[152]

"Government regulators were therefore freed from the 'need [to] search for a precise link between pollution and water quality in enforcing pollution controls."[153] Moreover, the new approach to regulation also:

> implemented changing views as to the relative rights of the public and of industrial polluters. Hitherto, the right of the polluter was pre-eminent, unless the damage caused by pollution could be proven. Henceforth, the right of the public to a clean environment would be pre-eminent, unless pollution treatment was impractical or unachievable. … This new view of relative rights was based in part on the hard-nosed assessment of our scientific ignorance: "we know so little about the ultimate consequences of injection of new matter into water that (the Act requires) a presumption of pollution. . . ."[154]

Under the 1972 Act:

> a discharger's performance is … measured against strict technology-based effluent limitations [setting forth] specified levels of treatment to which it *must conform* … This new approach reflected developing views on practicality and rights. Congress concluded that water pollution seriously harmed the environment, and that although the cost of control would be heavy, the nation would benefit from controlling that pollution. Yet *scientific uncertainties made it difficult to assess the benefits to particular bodies of receiving water*.[155]

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[150] *E. I. du Pont. v. Train,* 430 U.S. 112, 130 (1977).

[151] *Id.* at 163.

[152] S. Rep. No. 414, 92d Cong., 1st Sess. 8 (1971) (Exh. 56).

[153] *Friends of the Earth, Inc. v. Gaston Copper Recycling Corp.*, 204 F.3d 149, 151 (4th Cir. 2000), citing legislative history (internal citations omitted).

[154] *Weyerhaeuser v. Costle*, 590 F.2d 1011, 1043 (D.C. Cir. 1978), citing legislative history (internal citations omitted).

[155] *Weyerhaeuser*, 590 F.2d at 1042 (emphasis added).

A significant objective of Congress was to standardize permitting and to have EPA set a federal floor for environmental protection in order to avoid a "race to the bottom" by state regulators, which commonly occurred before 1972, when States competed to attract industries by relaxing control requirements:

> [B]y eliminating the issue of the capacity of particular bodies of receiving water, Congress made nationwide uniformity in effluent regulation possible. Congress considered uniformity vital to free the states from the temptation of relaxing local limitations in order to woo or keep industrial facilities. In addition, national uniformity made pollution clean-up possible without engaging in the divisive task of favoring some regions of the country over others.[156]

In particular, the 1972 Act fundamentally restructured the law to rely in the first instance on the imposition of a series of categorically-determined technology-based standards to be promulgated by EPA that did not themselves depend on site-specific showings of impact of particular activities on water quality. These technology-based standards are designed to achieve the maximum reduction in activities that degraded water quality, by focusing on the extent to which certain technology was, depending on the type of source or pollutant, "practicable," "achievable," "available" or "demonstrated."[157]

Water quality standards were retained in the 1972 Act only as a supplementary mechanism that – except in the case of thermal pollution under section 316(a), which is a "notable exception" – can only be used to set limitations stricter, but not more lenient, than technology-based limitations.[158] In 1977, Congress also observed that its "one experiment in the Act with allowing consideration of receiving water capacity," section 316(a), "had led to a regulatory breakdown. 'Heat has thus become an unregulated pollutant, clearly not the intent of the Congress. . . . That limited exemption has been turned into a gaping loophole.'"[159]

Congress intended the CWA's technology-based standards to become more stringent over time. For permits issued before EPA had promulgated national standards, NPDES permit writers used their "best professional judgment" (BPJ) on a case-by-case basis.[160] Next, by 1977, discharges from existing facilities were to be brought in line with the "best practicable control technology currently achievable" (BPT).[161] In the next phase, by 1989, most facilities

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[156] *Weyerhaeuser,* 590 F.2d at 1042; *see also Natural Resources Defense Council, Inc. ("NRDC") v. Train*, 510 F.2d 692, 709-10 (D.C. Cir. 1974) (explaining that Congress intended uniform federal requirements to "safeguard against industrial pressures by establishing a uniform 'minimal level of control imposed on all sources within a category or class'").

[157] See CWA sections 301(b), 304(b), 306; 33 U.S.C. §§ 1311(b), 1314(b), 1316.

[158] See CWA section 301(b)(1)(C), 33 U.S.C. § 1311(b)(1)(C); *EPA v. California,* 426 U.S. at 205 n. 12; *Riverkeeper*, 358 F.3d at 184 n. 10, 190; *Weyerhaeuser*, 590 F.2d at 1043.

[159] *Id.* at 1044, citing legislative history.

[160] 33 U.S.C. § 1342(a)(1)(B). Even in BPJ cases, the conditions are to reflect best practices in the industry rather than local conditions. *See Natural Resources Defense Council ("NRDC") v. EPA*, 863 F.2d 1420, 1425 (9th Cir. 1988).

[161] BPT represents the "average of the best existing performance by plants … within each industrial category. This average is not based upon a broad range of plants within an industrial category or subcategory, but is based upon

nationwide would be required to step up the level of pollution control to standards based on the "best available technology economically achievable" (BAT).[162]

Finally, for new facilities, Congress created the strictest standard in the Act, "new source performance standards," which require the application of "best available demonstrated control technology" (BADT).[163] These standards are similar to the technology-based limitations established for existing sources, except that no cost-based variances are allowed during permitting.[164] Indeed, with the passage of time and the tightening of the standards, cost considerations were to be relegated to a more peripheral role in the selection of best technology.[165] Courts have consistently held that a central statutory objective of technology standards is to "predicate[] pollution control on the application of control technology *on the plants themselves*"[166] to reduce pollution's impacts "at their source."[167]

Consequently, the Clean Water Act's technology-based limitations were designed to force the iterative development of more protective technologies, and to ratchet down discharges and other impairments to water quality until they could be eliminated.[168] Congress and numerous federal courts have emphasized this "technology-forcing" character of the Act's categorical standards within the context of the section 301 BAT requirement. Indeed, the most critical aspect of BAT is that it compels polluting industries to meet ever more stringent limitations on the path towards complete elimination of water pollution.[169] BAT must be "at a minimum, established with reference to the best performer in any industrial category."[170] "The BAT standard reflects the intention of Congress to use the latest scientific research and technology in setting effluent limits, pushing industries toward the goal of zero discharge as quickly as possible. In setting BAT, EPA uses not the average plant, but the optimally operating plant, the pilot plant which acts as a beacon to show what is possible."[171]

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performance levels achieved by exemplary plants." *EPA v. National Crushed Stone Assoc.*, 449 U.S. 64, 76 n.15 (1980).

[162] 33 U.S.C. § 1311(b)(2). BAT uses "the optimally operating plant, the pilot plant which acts as a beacon to show what is possible." *Kennecott v. EPA*, 780 F.2d 445, 448 (4th Cir. 1985).

[163] CWA § 306; 33 U.S.C. § 1316.

[164] *E.I. du Pont de Nemours & Co. v. Train*, 430 U.S. 112, 137 (1977).

[165] *NRDC v. EPA*, 822 F.2d 104, 110 (D.C. Cir. 1987); *see also Riverkeeper I*, 358 F.3d at 185 (EPA "should give decreasing weight to expense as facilities have time to plan ahead to meet tougher restrictions.").

[166] *Hooker Chems. & Plastics Corp. v. Train,* 537 F.2d 620, 623 (2d Cir. 1976) (emphasis added).

[167] *Bethlehem*, 538 F.2d at 515.

[168] The use of national, uniform standards also promotes the Congressional interest in "horizontal equity," *i.e.*, that similar facilities be treated similarly under the CWA insofar as possible. *NRDC v. EPA*, 859 F.2d 156, 200 (D.C. Cir. 1988) ("[O]ne congressional purpose in this respect was clear: … to maximize horizontal equity."); *American Iron & Steel Inst. v. EPA*, 526 F.2d 1027, 1044 (3d Cir. 1975) ("[T]he intent is that effluent limitations applicable to individual point sources be as uniform as possible.").

[169] *NRDC v. EPA*, 822 F.2d 104, 123 (D.C. Cir. 1987).

[170] Conf. Rep. on S. 2770 (October 4, 1972), 1 *Legislative History of the Federal Water Pollution Control Act of 1972* 170 (Committee Print compiled for the Senate Committee on Public Works by the Library of Congress), Ser. No. 93-1 (1973) (Exh. 57).

[171] *Kennecott v. EPA*, 780 F.2d 445, 448 (4th Cir. 1985), citing legislative history 1 *Legislative History of the Federal Water Pollution Control Act of 1972*, 798 (Committee Print compiled for the Senate Committee on Public Works by the Library of Congress), Ser. No. 93-1 (1973) (Exh. 58).

"[I]t is clear that Congress did not intend by that phrase [i.e., BAT] to limit the technology to that which is widely in use. … 'It will be sufficient, for the purpose of setting the level of control under available technology, that there be one operating facility which demonstrates that the level can be achieved or that there is sufficient information and data from a relevant pilot plant.'"[172] BAT must "utilize the latest technology to reach 'the greatest attainable level … which could be achieved.[173] As explained by the U.S. Court of Appeals for the District of Columbia Circuit:

> [T]he [Clean Water Act's] regulatory scheme is structured around a series of increasingly stringent technology-based standards … *[T]he most salient characteristic of this statutory scheme, articulated time and again by its architects and embedded in the statutory language, is that it is technology-forcing.…* The essential purpose of this series of progressively more demanding technology-based standards was not only to stimulate but to press development of new, more efficient and effective technologies. *This policy is expressed as a statutory mandate, not simply as a goal.*[174]

Moreover, as the Supreme Court has recognized, the potential for economic consequences does not obviate the mandate for technology based standards:

> Prior to the passage of the Act, Congress had before it a report … [that] estimated that there would be 200 to 300 plant closings caused by the first set of pollution limitations. Comments in the Senate debate were explicit: 'There is no doubt that we will suffer some disruptions in our economy because of these efforts; many marginal plants may be forced to close.'[175]

Much more recently, the Second Circuit recognized that technology standards are economically achievable even if they could result in the closure of certain facilities.[176] Referring to an 11 percent industry-wide risk of closure, the Court stated that "the EPA – and courts – have treated more substantial risks of closure as nonetheless supporting a finding of economic achievability."[177] In *Chemical Manufacturers*, for example, the Fifth Circuit upheld a BAT standard where 14 percent of facilities would be forced to close.[178]

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[172] *American Iron & Steel Inst. v. EPA*, 526 F.2d 1027, 1058 (3d Cir. 1975), quoting legislative history.

[173] *NRDC v. EPA*, 863 F.2d 1420, 1431 (9th Cir. 1988). See also *Texas Oil & Gas Ass'n v. United States EPA*, 161 F.3d 923, 928 (5th Cir. 1998) (BAT limitations to be based on the performance of "the single best-performing plant.") *American Iron & Steel*, 526 F.2d at 1061; *National Ass'n of Metal Finishers v. EPA*, 719 F.2d 624, 657, n. 51 (3d Cir. 1983); *FMC Corp. v. Train*, 539 F.2d 973, 983 (4th Cir. 1976); *American Frozen Food Inst. v. EPA*, 539 F.2d 107, 117 (D.C. Cir. 1976).

[174] *NRDC v. EPA*, 822 F.2d 104, 123 (D.C. Cir. 1987) (emphasis added).

[175] *EPA v. National Crushed Stone*, 449 U.S. 64, 80 (1980).

[176] *Waterkeeper*, 399 F.3d at 518.

[177] *Id.*

[178] *Chem. Mfrs.*, 870 F.2d at 202.

3. As Part of the CWA's Technology-Based Regime, Section 316(b) Requires EPA to Adopt Uniform, National, Categorical, Technology-Based and Technology-Forcing BTA Standards for Cooling Water Intake Structures.

CWA Section 316(b) represents the convergence of two important Congressional objectives: to minimize the massive water withdrawals and fish kills caused by once-through cooling at power plants, and to do so through the imposition of national, categorical, technology-based standards that can be made stricter, but not weaker, as a result of site-specific water quality assessments. As noted above, Section 316(b) was enacted as part of the sweeping 1972 amendments to the Clean Water Act. The plain language of this provision and an examination of the relevant statutory structure compels the conclusion that EPA is required to adopt uniform, national, categorical, technology-based and technology-forcing BTA standards for cooling water intake structures.

a. Section 316(b) Requires EPA to Establish National Standards.

With its use of a clear command – "shall" – Section 316(b) affords the Administrator of EPA no discretion to decline to establish standards for the intake of cooling water.[179] Indeed, EPA recognizes that Section 316(b) "*requires EPA to establish standards* for cooling water intake structures that reflect the 'best technology available for minimizing adverse environmental impact.'"[180] Significantly, the term "standard" is used in the CWA only to refer to *national* standards, such as the "standards of performance" EPA issues as national categorical regulations for new facilities,[181] the "pretreatment standards" EPA issues as national categorical regulations for industrial facilities discharging toxic pollutants to sewer systems,[182] and the "standards of performance" EPA issues as national categorical regulations for marine sanitation devices.[183] Significantly, in the seminal 1977 case of *E. I. du Pont de Nemours v. Train* the Supreme Court relied, in part, on the fact that "§ 316(b) refers to '[any] *standard* established pursuant to section 301'" in holding that Congress intended EPA to promulgate effluent limitations for existing sources by regulation (and not case-by-case) under section 301.[184] As the Second Circuit confirmed in its review of EPA's Phase II cooling water intake rule, Section 316(b) constitutes a "statutory directive to set national standards."[185]

b. The National Standards Section 316(b) Requires Are a Form of Limitation Required by Sections 301 and 306.

Significantly, Congress has in Section 316(b) also directed EPA to utilize a *particular* Clean Water Act standard for implementing the BTA mandate: a "standard established pursuant

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[179] "'Shall' … is the language of command." *Escoe v. Zerbst*, 295 U.S. 490, 493 (1935).

[180] 76 Fed. Reg. at 22,196 (col. 2) (emphasis added).

[181] CWA § 306; 33 U.S.C. § 1316.

[182] CWA § 307(b); 33 U.S.C. § 1317(b). As the Courts have noted, these standards are to be uniform within an industrial category. *See Chemical Mfrs.*, 870 F.2d at 244, 253.

[183] CWA § 312(b); 33 U.S.C. § 1322(b).

[184] *E. I. du Pont de Nemours v. Train*, 430 U.S. 112, 133 n.24 (1977) (emphasis added).

[185] *Riverkeeper II*, 475 F.3d at 126.

to [CWA sections 301 or 306] and applicable to a point source."[186] Any argument that EPA may choose to regulate on an individual, plant-by-plant basis thus is foreclosed not simply by Congress's use of the term "standard" in Section 316(b), but also by that section's requirement that intake structures be regulated *as part of* the categorical "standards established pursuant to" sections 301 and 306.[187]

Further, the legislative history provides that "[s]ection 316 must be read with other sections in the bill including section 301 effluent limitations . . . and section 306, new sources."[188] Looking to the cross-referenced sections 301 and 306, and consistent with the Supreme Court's conclusion in *du Pont* that the reference to "standards" in Section 316(b) means national categorical regulations, the courts have found that Section 316(b) requires EPA to establish BTA requirements as part of the standards required by sections 301 and 306 and subject to the deadlines set forth in those sections. For example, before remanding EPA's first BTA regulations in 1977, the Fourth Circuit concluded that:

> [t]he regulations issued under § 316(b) are…closely related to the effluent limitations and new source performance standards of §§ 301 and 306… It bears emphasis that § 316(b)…*requires § 301 and § 306 standards to deal with cooling water intake structures*….[The] regulations [are] issued at least in part under the same statutory sections, some of which limit intake structures, others, effluent discharges.[189]

Significantly, that court noted the fundamental differences in the statutory scheme for effluent limitations and Section 316(b) standards, as compared to water quality standards.[190] In that opinion, the Fourth Circuit also took note of "the aim of Congress to achieve nationally uniform standards."[191]

Likewise, in rejecting a challenge to EPA's authority to regulate cooling water structures in NPDES permits, the Seventh Circuit held that the requirements of Section 316(b) "are to be implemented through standards established pursuant to §§ 301 and 306."[192] In entering the consent decree requiring EPA's three-phase BTA rulemaking, the Southern District of New York held that "a Section 316(b) limitation should be considered a form of limitation under sections 301 and 306" and "the time limits in section 301 and 306 govern EPA's duty to take action under Section 316(b)."[193] And in reviewing EPA's Phase I Rule, the Second Circuit observed that Section 316(b)'s text:

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[186] CWA § 316(b).

[187] Also telling is the fact that BTA requirements must be issued for the same facilities, *i.e.*, "point sources" to which categorical discharge limitations apply.

[188] *Riverkeeper I*, 358 F.3d at 186, quoting statement of Rep. Clark.

[189] *Virginia Electric and Power Company v. Costle ("VEPCO"),* 566 F.2d 446, 450 (4th Cir. 1977); see also *Cronin v. Browner*, 898 F.Supp. 1052, 1059 (S.D.N.Y. 1995).

[190] *VEPCO,* 566 F.2d at 450, n.17 citing *Bethlehem*, 538 F.2d 513, and noting that unlike water quality standards, Section 316(b) regulators are "closely tied to § 301 or § 306." *Id.*

[191] *Id.* at 450, citing *American Frozen Food Inst. v. EPA*, 539 F.2d 107, 118 (D.C. Cir. 1976).

[192] *United States Steel Corp. v. Train*, 556 F.2d 822, 850 (7th Cir. 1977).

[193] *Cronin*, 898 F.Supp. at 1059.

> makes clear that administrative regulations under this section are promulgated "pursuant to" both sections 301 and 306 as well as Section 316(b). When the EPA "established" new source performance discharge "standard[s]" "pursuant to section … 306," it ought *then* to have regulated new intake structures, because, by virtue of Section 316(b), section 306's standards "shall require that … cooling water intake structures reflect the best technology available."[194]

Accordingly, EPA not only should have promulgated requirements for cooling water intake structures at the same time as it promulgated discharge requirements for the point sources using the intakes, in accordance with the specific deadlines set forth in sections 301 and 306,[195] — i.e., by 1989, at the latest — but EPA was also required to promulgate those requirements as a form of section 301 and 306 limitations as part of the same standards.

c. The National Standards Section 316(b) Requires Must Be Uniform and Categorical.

The fact that Section 316(b) standards are a form of limitation under CWA sections 301 and 306 also reveals an essential feature about them: like the Act's other technology-based standards, Section 316(b) standards are to be implemented on a nationwide, uniform basis whenever it is feasible to do so.[196] The industrial point source standards promulgated under sections 301 and 306 are "categorical" in nature. That is, each standard applies to a particular industrial category and, except in those limited circumstances where an individualized waiver or variance may be available, applies uniformly to all facilities in the United States in that category.[197] Since the requirements for cooling water intakes are required to be issued as part of these categorical standards, and are to be applicable to the same facilities to which categorical discharge limitations apply, it is therefore inescapable that these requirements are also to be categorical.

The integration of Section 316(b)'s "best technology available" (BTA) requirement to minimize adverse environmental impacts with the effluent limitations under sections 301 and 306 indicates Congress's intent for national technology-based standards to control entrainment and impingement.

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[194] *Riverkeeper I*, 358 F.3d at 185-86 (emphasis in original).

[195] For existing sources those deadlines were July 1, 1977 (33 U.S.C. § 1311(b)(1)(A)) and March 31, 1989 (33 U.S.C. § 1311(b)(2)(C) – (F)). For new sources, EPA was required to publish a list of at least 27 specified industry categories by January 17, 1973 (33 U.S.C. § 1316(b)(1)(A)), and to promulgate standards for each category within one year thereafter (33 U.S.C. § 1316(b)(1)(B)).

[196] This does not mean, of course, that the substance of the Section 316(b) regulations is to be based on the substantive factors applicable to the section 306 standards or any of the various section 301 standards. The substance of the Section 316(b) standards is to be determined with reference to the language of Section 316(b) itself.

[197] *See* 33 U.S.C. § 1311(b)(2)(A) (directing EPA to promulgate "effluent limitations for *categories and classes* of [existing] point sources"); 33 U.S.C. § 1316(b)(1)(B) (specifying that "after a *category* of sources is included in a list" as required by this section, EPA "shall propose and publish regulations establishing Federal standards of performance for new sources *within such category*") (emphases added). *See generally E.I. du Pont de Nemours & Co. v. Train*, 430 U.S. 112, 126-29 (1977).

Clearly, had it chosen to do so, Congress *could* have drafted Section 316(b) as solely a substantive requirement to be determined case-by-case by individual permit writers. For instance, Congress could simply have required that cooling water intake structures meet BTA, with no reference to "standards" or to sections 301 and 306. Or Congress could have written Section 316(b) to refer instead to CWA section 402,[198] since permit conditions are established pursuant to *that* section, not section 301 or 306. The fact that Congress added these additional mandates reflects a clear intent that the BTA requirements be issued as categorical standards.[199]

C. Regulatory Background: For Forty Years, Regulation on a Case-by-Case Site-Specific Basis Has Caused Bureaucratic Paralysis, Litigation Quagmires, and the Perpetuation of the Unacceptable Status Quo, Contrary to Congress's Intent.

Since 1972, in the absence of national regulations, cooling water intake structures have been relegated on an *ad hoc,* case-by-case, site-specific basis by individual permit writers, typically State agencies, exercising their "best professional judgment."[200] Permit proceedings have typically extended over many years – in some cases, more than a decade – despite the CWA's requirements that NPDES permits be limited to five years duration[201] and that BAT regulations be reviewed and, if appropriate, revised every five years.[202] Permit renewals are backlogged in virtually every state and hundreds of facilities operate on long-expired permits. When BTA decisions have been made, these site-specific proceedings have resulted in uneven and conflicting rulings, the widespread use of inferior technology, little change in the status quo, and enormous, unnecessary aquatic mortality, all of which run contrary to the goals of the Clean Water Act and the direct mandate of Section 316(b).

Industry, which has a critical strategic advantage in these complex proceedings because of its superior resources, has taken advantage of biological and economic complexity and used litigation and delay tactics to avoid technology upgrades. In particular, industry will inundate regulators with an overabundance of information, which is highly time-consuming to evaluate, if it can be evaluated at all. As just one example of which EPA is aware, in New Jersey, one plant's permit renewal application comprised 36 volumes, supported by 137 volumes of technical and reference materials, which took the state agency seven years to review and finally act upon.[203]

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[198] 33 U.S.C. § 1342.

[199] Of course, there will be some circumstances in which uniform regulation is simply impracticable for a particular aspect of certain facilities' operation. There may be technical or administrative impediments to uniform regulation, a lack of available data, or site-specific conditions preventing any one set of technologies from being deemed the "best available." Under *those* circumstances, plant-by-plant permitting may be appropriate; otherwise, there would be no regulation at all. *See generally NRDC v. Train*, 510 F.2d 692, 710 (D.C. Cir. 1974); *NRDC v. Costle*, 568 F.2d 1369, 1379-80 (D.C. Cir. 1977). But the fact that EPA's attempts to establish nationwide uniform standards may be thwarted on occasion by practical considerations does not give the agency *carte blanche* to refuse to set such standards for an entire category whenever it prefers another approach. It certainly does not allow EPA to countermand the congressional preference for uniform standards based on the agency's own policy judgments.

[200] *See* CWA § 402(a)(1)(B), 33 U.S.C. § 1342(a)(1)(B) (prior to national regulations, permits are case-by-case); *NRDC v. EPA*, 863 F.2d 1420, 1424 (9th Cir. 1988).

[201] CWA § 402(b)(1)(B), 33 U.S.C. § 1342(b)(1)(B).

[202] CWA § 301(d), 33 U.S.C. § 1311(d)

[203] 67 Fed. Reg. at 17,153 (col.1).

Industry then uses the enormous volumes of technical information in purported justification of a laundry list of baseless excuses and unsupported arguments, such as the following:

1. Industry incorrectly contends that adverse environmental impact (AEI) must be established at each facility before Section 316(b) applies or BTA requirements can be imposed.[204]
2. Industry further incorrectly contends that permitting agencies must define AEI at some threshhold level of ecological damage for each individual facility's permit application.[205]
3. Industry often contends, contrary to the obvious facts, that a particular power plant is not causing AEI despite entraining and impinging large numbers of organisms.[206]
4. Industry often incorrectly contends that AEI must be or should be measured at the population level.[207]
5. Industry incorrectly argues that the methods used by fisheries scientists to evaluate the inpacts of proposed harvesting regimes should be used to evaluate the harms of impingment and entrainment.[208]
6. Industry often incorrectly contends that populations will not be affected by intake structures, despite the loss of large numbers of early life stages of fish, based on the misapplication of the ecologically baseless concept of "surplus production."[209]

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[204] In New York, facility operators contest the existence of an adverse environmental impact as the first step in the state's BTA case analysis process. *See In the Matter of Athens Generating Company, LP*, Interim Decision of the Commissioner of the N.Y. State Dep't of Envtl. Conservation at 4, (June 2, 2000), available at http://www.dec.ny.gov/hearings/10976.html ("Pursuant to CWA §316(b), a four step analysis determines whether 'best technology available' is being utilized by any particular facility" and the first step is determining "whether the facility's cooling water intake structure may result in adverse environmental impact.")..

[205] *See, e.g.*, July 11, 2000, letter from Utility Water Action Group Cooling Systems Committee Chair David Bailey to OMB Office of Information and Regulatory Affairs Deputy Administrator Don Arbuckle, at 2, attached to July 11, 2000 letter from Kristy A.N. Bulleit to EPA Office of Science and Technology Director Geoffrey Grubbs. See also Comments of the Utility Water Action Group on EPA's Proposed Section § 316(b) Rule for New Facilities and ICR No. 1973.01, November 9, 2000 ("UWAG Phase I Comment") at 53-72.

[206] *See, e.g.*, *In the Matter of Entergy Nuclear Indian Point 2, LLC and Entergy Nuclear Indian Point 3, LLC*, Interim Decision of the Assistant Commissioner of the N.Y. State Dep't of Envtl. Conservation at 16 (Aug. 13, 2008), available at http://www.dec.ny.gov/docs/legal_protection_pdf/indianpointid.pdf (Exh. 59) ("Entergy maintains that staff may not presume adverse impacts exist, but rather must 'affirmatively establish' the existence of such impacts.").

[207] In pre-filed testimony, dated July 22, 2011, filed with the New York State DEC in regard to the NPDES permit for the Indian Point power plant, Entergy Nuclear argued that the plant's adverse environmental impact, and the efficacy of Entergy's proposed cylindrical wedgewire screens, should be considered at the population level and applied age-one equivalent conversions to represent the adverse impacts of Indian Point on all life stages of fish as part of a single metric; *see also* UWAG Phase I Comment at 58-68.

[208] UWAG Phase I Comment at 66.

[209] For example, FirstEnergy has claimed that the massive fish kills at its Bayshore power plant in Ohio are not significant to the fish population as a whole. *See* Letter from Michael Jirousek, FirstEnergy Generation Corp. to Naajy S. Abdullah, Ohio EPA re FirstEnergy's Comments on Renewal of NPDES Permit for Bay Shore Plant (May 26, 2010) (arguing that overall fish populations are not affected even though, "at face value" the fish kill data from

7. Industry incorrectly argues that only certain fish and shellfish species matter.[210]
8. Industry often has the temerity to argue, incorrectly, that massive fish kills and thermal discharges have a beneficial impact, for example because some of the dead fish are nuisance species or some species prefer warmer water.[211]
9. Industry makes the irrelevant argument that some of the fish they entrained or impinged were dead before they were trapped by the intake structure.[212]
10. Industry incorrectly argues that the percentage of fish being impinged and entrained is small when compared to overall stock size or what indsustry sometimes refers to as the "exploitable population."[213]
11. Industry incorrectly argues or suggests that other causes, for example, fishing or natural conditions, have a more significant impact on fish than intake structures.[214]
12. Industry incorrectly argues that documented fish or shellfish population declines in the vicnity of the plant are unrelated to the operation of their intake structures.[215]
13. Industry incorrectly argues that large numbers of fish survive impingement and/or entrainment unharmed.[216]
14. Industry contends, contrary to legal precedent, that it should get credit for restoration or

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Bayshore suggest "that the number of organisms impacted in the cooling water intake is large.") (Exh. 60); *See also* discussion of "surplus production" arguments in John Boreman, "Surplus Production, Compensation, and Impact Assessments of Power Plants," 3 *Envtl. Sci. & Pol'y* 8445 (2000) [DCN 2-018A] (Exh. 61) and Super and Gordon, "Minimizing Adverse Environmental Impact: How Murky the Waters," *The Scientific World* 229 (2002) (Exh. 62).

[210] FirstEnergy has used this argument to attempt to publicly diminish the significance of its massive fish kills at the Bayshore power plant. *See, e.g.,* Letter from Michael Jirousek, FirstEnergy Generation Corp. to Naajy S. Abdullah, Ohio EPA (May 26, 2010) (killing massive numbers of emerald shiners, sheephead and gizzard shad is less important because there are large populations of these species in Lake Erie) (Exh. 60).

[211] This argument has been made by Midwest Generation with regard to the Crawford and Fisk plants in the Chicago waterway system in Illinois. Similarly, Dayton Power & Light has argued that once-through cooling at its Stuart plant in Ohio is beneficial to the environment because it supports fishing opportunities during the winter. *See* Letter from JoAnne Rau, Director, Environmental Safety and Management, Dayton Power and Light Company to Sean Ramach, US EPA Region 5 (Apr. 28, 2011) (providing DP&L's comments on EPA's rejection of the draft NPDES permit renewal for the J.M. Stuart Electric Generating Station) (Exh. 63). Recently, EPA proposed to object to Ohio EPA's renewal of Stuart's NPDES permit because Ohio EPA does not require compliance with thermal water quality standards and Dayton Power & Light has not provided support for a thermal variance. *See id.*

[212] FirstEnergy has emphasized such deaths in an attempt to diminish the significance of the massive fish kills at its Bayshore power plant.

[213] *See, e.g.*, *In the Matter of Millstone Power Station*, Before the Connecticut Department of Environmental Protection, Office of Adjudications, Application No. 199701876, Applicant's Post Hearing Submittal (May 8, 2009) (Exh. 64).

[214] *Id.* FirstEnergy has also tried to distract the public from the massive fish kills at its Bayshore power plant by pointing to other sources of stress on the aquatic ecosystem in the surrounding area.

[215] *See, e.g.*, *In the Matter of Millstone Power Station*, Before the Connecticut Department of Environmental Protection, Office of Adjusications, Application No. 199701876, Applicant's Post Hearing Submittal (May 8, 2009) (Exh. 64).

[216] *See, In the Matter of Dynegy Northeast Generation, Inc., on behalf of Dynegy Danskammer LLC (Danskammer Generating Station)*, DEC No.: 3-3346-00011/00002, SPDES No.: NY-0006262, Decision of the Deputy Commissioner of the N.Y. State Dep't of Envtl. Conservation at 17 – 18 (May 24, 2006) (Exh. 65) (Dynegy sought to have entrainment mortality figures for Danskammer adjusted for claimed entrainment survival).

mitigation measures.[217]

15. Industry often incorrectly argues that the operational baseline for comparing the performance of technologies should be calculated based on the wholly artificial concept that the plant operates at full capacity 24 hours a day, seven days a week, 365 days a year, and should receive "credit" for the difference between fictional baseline and its normal operation, even in instances where the gap between the fictional baseline and actual operation is 90 percent or more.[218]
16. Industry incorrectly argues that the burden of proof is on state regulators or intervenors to prove that certain technologies are BTA, when, in fact, permittees must prove that they are entitled to a NPDES permit to discharge and to withdraw cooling water from waters of the U.S.[219]
17. Industry often incorrectly argues that their excessive thermal discharges should be ignored because of "mixing zones."[220]
18. Industry invariably argues that they are entitled to a variance under Clean Water Act Section 316(a) from technology-based standards for thermal discharges.[221]
19. Industry incorrectly argues that states cannot or should not require closed-cycle cooling

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[217] *See, e.g., Voices of the Wetlands v. State Water Resources Control Board*, No. S160211, 2011 WL 3558007 (Cal. Supreme Ct. August 15, 2011) at * 7 (state approved $7 million Elkhorn Slough habitat restoration plan as mitigation for entrainment and impingement; parties disputed restoration was a "substitute" for BTA and whether the BTA determination rested on the resoration plan as the basis for its BTA finding). For many years, restoration measures have been the centerpiece of Section 316(b) compliance for PSEG's Salem nuclear plant in New Jersey, despite dubious claims that restoration is not linked to the BTA determination.

[218] Mirant Bowline LLC has sought a full-flow baseline for its Bowline Point Generating Station in recent permit proceedings, despite the fact that, in 2010, the plant generated energy equal to less than 5% of its capacity. *See In the Matter of the Application of Mirant Bowline LLC (Mirant) For a State Pollution Discharge Elimination System Permit Renewal for the Bowline Point Generating Station (Units 1 and 2), DEC # 3-3922-00003/00003, SPDES # NY-0008010*, Post-Issues Conference Brief by the Staff of the New York State Department of Environmental Conservation at 12 (June 29, 2006) (accepting the applicant's argument that the Mirant Bowline plant should be entitled to a full-flow baseline) (Exh. 66); *see also, In the Matter of Dynegy Northeast Generation, Inc., on behalf of Dynegy Danskammer LLC (Danskammer Generating Station)*, DEC No.: 3-3346-00011/00002, SPDES No.: NY-0006262, Decision of the Deputy Commissioner of the N.Y. State Dep't of Envtl. Conservation at 1 (May 24, 2006) (Exh. 65) ("[T]he baseline should be calculated using full-flow"). *But see* New York Independent System Operator, *Gold Book; 2010 Load & Capacity Data* at 42 (April 2010), available at: http://www.nyiso.com/public/webdocs/services/planning/planning_data_reference_documents/2010_GoldBook_Public_Final_033110.pdf (Mirant Bowline's two generating units generated less than 150 GWh of energy in 2010, despite having a combined nameplate capacity of over 1 GW).

[219] Dynegy has sought to reverse the burden of proof with respect to its Danskammer plant, while Entergy has sought to do the same in permit proceedings related to the Indian Point facility.

[220] In the commenters' experience, every power company attempts to make this argument, often by defining the mixing zone in a way that encompasses the entire thermal plume and failing to take an adequate look at the thermal discharges' impacts on aquatic life. *See, e.g.*, Letter from Mark Sanza, Assistant Counsel, NY DEC to the Hon. Maria E. Villa and the Hon. Daniel P. O'Connell, Administrative Law Judges, NY DEC (May 16, 2011) (Exh. 67) (NYS DEC stating letter stating that the Indian Point plant may use a "mixing zone" and that mixing zone will provide reasonable assurances of compliance with the water quality standards – without analyzing impacts on the record of permitting proceeding); Letter from Elise N. Zoli, Attorney for Entergy, to the Hon. Maria E. Villa, Administrative Law Judge, NY DEC (May 17, 2011) (Exh. 68) (power plant operator points to temperature measures in the thermal plume, rather than analyzing impacts to fish, in support of modified mixing zone).

[221] This argument is made by virtually every plant.

under Section 316(b) if closed-cycle cooling is not required under Section 316(a), even though those two subsections operate independently.[222]

20. Industry often incorrectly contends that compliance with BTA standards is too expensive for the company.[223]
21. Industry often incorrectly contends that compliance with BTA standards is too expensive for ratepayers.[224]
22. Industry often includes vague and absurdly excessive expenses in their estimates of compliance costs, such as overhead and indirect expenses.[225]
23. Industry incorrectly argues that it is entitled to special treatment because electricity is an "essential service."[226]
24. Industry incorrectly argues that it provides significant societal benefits that entitle it to special treatment.[227]
25. Industry incorrectly argues that states lack the authority to require plants to curtail operations to meet BTA requirements or to shut down plants that are not complying with such requirements.[228]
26. Industry incorrectly argues that technology retrofits will cause long outages.[229]
27. Industry incorrectly argues that under Section 316(b) all issues have to be "balanced" against one another to arrive at a pareto optimal result.[230]

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[222] *See, e.g.*, UWAG Phase I Comment at 16-20.

[223] Companies (facilities) that have argued that compliance is too expensive include FirstEnergy (Bayshore) and Dayton Power & Light (J.M. Stuart Generating Station). *See* Letter from Joseph M. Reidy, Attorney for Dayton Power & Light to John Sadzewicz, Ohio EPA (July 11, 1989) (comparing costs of cooling towers with other alternatives) (Exh. 69); *see also* Letter from William L. Patberg, Attorney for Dayton Power & Light to Paul Novak, Ohio EPA (Apr. 9, 2003) (arguing that cooling towers would cost a quarter of a billion dollars) (Exh. 70).

[224] Companies (facilities) that have argued that compliance is too expensive include: FirstEnergy (Bayshore) and Dayton Power & Light (Stuart).

[225] For example, in estimating the costs of retrofittng closed-cycle cooling at its E.F. Barrett plant in the South Shore Estuary on Long Island, New York, National Grid included a whopping $30 million for what it vaguely described as "management, "indirects," "indeterminates," and "contingencies." Alden Research Laboratory and Burns Engineering Services, *An Engineering & Cost Assessment of Retrofitting Closed-Cycle Cooling Technologies and E.F. Barrett Power Station* (September 2007) (Exh. 71).

[226] Companies (facilities) claiming they should not be required to retrofit to closed-cycle cooling because they provide an "essential service" include FirstEnergy (Bayshore) and Dayton Power & Light (Stuart).

[227] Companies (facilities) claiming they they are entitled to special treatment because they provide social benefits and therefore should not be required to retrofit to closed-cycle cooling include FirstEnergy (Bayshore) and Dayton Power & Light (Stuart).

[228] Companies (facilities) claiming that the regulator cannot require them to curtail operations to meet BTA requirements include FirstEnergy (Bayshore) and Dayton Power & Light (Stuart).

[229] Companies (facilities) claiming that a retrofit would cause an overly long outage include: FirstEnergy (Bayshore); Dayton Power & Light (Stuart); and Entergy Nuclear (Indian Point).

[230] In the case of Indian Point, Entergy Nuclear has phrased this argument as a need to condition a 316(b) decision on other permitting issues such as adverse air impacts, unacceptable visual impacts, and SEQRA analysis

28. Industry incorrectly argues that cooling system retrofits raise nuclear safety concerns.[231]
29. Industry incorrectly argues there are insurmountable energy concerns from outages, energy penalties, or potential plant retirements.[232]
30. Industry incorrectly argues there are insurmountable concerns relating to fogging, steam plumes or mineral drift from closed-cycle cooling.[233]
31. Industry incorrectly argues that closed-cycle cooling is noisy.[234]
32. Industry incorrectly argues that closed-cycle cooling is unsightly.[235]
33. Industry often incorrectly argues that there is insufficient space for closed-cycle cooling on a given site.[236]
34. Industry often incorrectly contends that closed-cycle cooling at a given site would have to be built to certain oversized specification (based on an overly conservative "approach temperature"), thereby consuming more space and costing more than is reasonably necessary.[237]
35. Industry often vastly overstates the amount of time necessary to install closed-cycle cooling.[238]

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[231] Dominion Nuclear Connecticut has even vigorously opposed conducting biological monitoring near the intake structure at the Millstone Power Station on the dubious grounds that it would raise nuclear safety and security concerns.

[232] Companies (facilities) claiming insurmountable energy concerns include FirstEnergy (Bayshore) and Dayton Power & Light (Stuart). *See, e.g.*, Ohio EPA, Response to comments document relating to FirstEnergy Bayshore plant, National Pollutant Discharge Elimination System (NPDES) permit (Oct. 2010) (Exh. 72) (FirstEnergy claims that it cannot shut down its own facility if a regulator requests it).

[233] *See, e.g.*, UWAG's Brief Challenging EPA's § 316(b) Rule for New Facilities, *Riverkeeper, Inc. v. U.S. Environmental Protection Agency*, No. 02-4005(L) (2d Cir.), July 2, 2003, at 22 (contending that "[w]et cooling towers also make fog, which can affect visibility and an some sites can deposit salt on trees, shrubs, and farmers' fields").

[234] For example, ignoring the availability of ultra low noise fan options, National Grid has incorrectly contended that operation of closed-cycle cooling at its Glenwood power station in Hempstead Harbor in New York might violate a town noise ordinance.

[235] For example, Entergy Nuclear has submitted a visual assessment study concluding that the installation of cooling towers at Indian Point "would present a significant aesthetic impact." Saratoga Associates, *Indian Point Energy Center Closed Cycle Cooling Conversion Feasibility Study Visual Assessment* at 1 (June 1, 2009), available at http://www.dec.ny.gov/docs/permits_ej_operations_pdf/indptvisual1.pdf (Exh. 73).

[236] *See, eg.*, *In the Matter of Dynegy Northeast Generation, Inc., on behalf of Dynegy Danskammer LLC (Danskammer Generating Station)*, DEC No.: 3-3346-00011/00002, SPDES No.: NY-0006262, Decision of the Deputy Commissioner of the N.Y. State Dep't of Envtl. Conservation at 1 (May 24, 2006) (Exh. 65) ("[T]he proposed closed-cycle cooling system retrofit configurations will not fit on the site.").

[237] See the discussion of approach temperatures in the report of Powers Engineering, attached as Appendix D. This position has been taken, for example, by National Grid in their evaluation of closed-cycle cooling at the E.F. Barrett. *See, e.g.*, *An Engineering & Cost Assessment of Retrofitting Closed-Cycle Cooling Technologies and E.F. Barrett Power Station*, Alden Research Laboratory and Burns Engineering Services, September 2007 (Exh. 71)

[238] *See, e.g.*, Enercon Services, Inc., *Engineering Feasibility and Costs of Conversion of Indian Point Units 2 and 3 to a closed-Loop Condenser Cooling Water Configuration, prepared for Entergy Nuclear Indian Point2, LLC, and Entergy Nuclear Indian Point 3, LLC* at *v*, 43 (Feb. 12, 2010) (Exh. 74), *available at* http://www.dec.ny.gov/docs/permits_ej_operations_pdf/convclosloop.pdf. The over-estimate of the time necessary to install closed-cycle cooling is directly related to the tendency of many facilities to argue that technology retrofits

36. Industry often incorrectly contends that closed-cycle cooling does not pass a cost-benefit test.[239]
37. Industry often incorrectly argues that the benefits of closed-cycle cooling must exceed the costs before it can be required.[240]
38. Industry often incorrectly argues that only monetized benefits can be counted.[241]
39. Industry often incorrently argues that a host of so-called "social costs" should be considered as an integral part of the Section 316(b) determination.[242]
40. Industry often incorrectly argues that retrofits should not be required at plants that purportedly have too *little* useful life remaining.[243]
41. Industry often incorrectly argues that retrofits should not be required at plants that purportedly have too *much* useful life remaining (*i.e.*, plants that were recently repowered should be allowed to wait until the next repowering before retrofitting).[244]
42. Industry incorrectly argues that if a Section 316(b) determination was made a long time ago, it should not or cannot be revisited now.[245]

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will cause long outages.

[239] Companies (facilities) claiming that closed-cycle cooling cannot pass a cost-benefit test include FirstEnergy (Bayshore) and Dayton Power & Light (Stuart). *See, e.g.,* Letter from William L. Patberg, Attorney for Dayton Power & Light to Paul Novak, Ohio EPA (Apr. 9, 2003) (arguing that cooling towers would cost a quarter of a billion dollars but that "it is difficult to identify any environmental benefit at all" to their use) (Exh. 70).

[240] *Cf.* Brief of Petitioner Entergy Corp. in Support of Vacatur and Remand of Final Rule *Riverkeeper, Inc. v. United States Environmental Protection Agency*, No. 04-6692-ag(L) (2d Cir.), April 18, 2006, at 47 (arguing that Section 316(b) regulations – and, presumably, site-specific BTA determinations – "should not have net social costs").

[241] *See, e.g.,* Final Brief of Petitioners PSEG Fossil LLC and PSEG Nuclear LLC in Support of Vacatur and Remand of Portions of Final Rule, *Riverkeeper, Inc. v. United States Environmental Protection Agency*, No. 04-6692-ag(L) (2d Cir.), April 17, 2006, at 26-31 (arguing that "EPA improperly required evaluation of 'qualitative' non-use benefits in site-specific cost-benefit analyses").

[242] *See, e.g., In the Matter of Entergy Nuclear Indian Point 2, LLC, Entergy Nuclear Indian Point 3, LLC, and Entergy Nuclear Operations Inc.'s CWA § 401 Application for Water Quality Certification, DEC Application Numbers: 3-5522-00011/00030 (IP2) and 3-5522-00105/00031 (IP3)*, Town of Cortlandt Petition for Party Status in Joint Adjudicatory Hearing for Water Quality Certification (July 9, 2010) at 18 (Exh. 75); *In the Matter of Entergy Nuclear Indian Point 2, LLC, Entergy Nuclear Indian Point 3, LLC, and Entergy Nuclear Operations Inc.'s Joint Application for Water Quality Certification*, DEC Application Numbers: 3-5522-00011/00030 (IP2) and 3-5522-00105/00031 (IP3), Town of Cortlandt Memorandum of Law in Support of Cortlandt's Petition for Party Status (Sept. 23, 2010) (Exh. 76) at 7-8, 14 (in support of power plant, town argued that for consideration of "non-monetary costs" including alleged aesthetic, noise and traffic impacts and alleged impacts to "social fabric and community character").

[243] In the case of Indian Point, Entergy has framed this objection as a claim that closed cycle cooling could not be installed until near the end of its current Nuclear Regulatory Commission license period.

[244] *See, e.g.*, Dynegy Moss Landing, LLC, *State Water Resources Control Board Once-Through Cooling Water Policy Implementation Plan for the Moss Landing Power Plant* at 13-14 (Apr. 1, 2011) (Exh. 77) (arguing that changes to the cooling system are unwarranted in light of recent, large capital investments); *see also* e-mail from John Dennis, LADWP to Jonathan Bishop, California State Water Resources Control Board (Jul. 22, 2010) (Exh. 78) (arguing that LADWP should be allowed additional time for compliance with California's once-through cooling water policy in light of recent investments totaling over $600 million).

[245] In some cases, the claim that 316b decisions were made decades ago and cannot be disturbed now is supported

43. Industry often argues, contrary to the facts, that there is a cheaper alternative to closed-cycle cooling that is almost as protective.[246]
44. Industry often argues, contrary to the facts, there is an alternative to closed-cycle cooling that can be implemented more quickly and will therefore be more protective when time is factored in.[247]
45. Industry incorrectly argues that the receiving water into which the plant discharges is not entitled to Clean Water Act protection.[248]
46. Industry incorrectly argues that the receiving water into which the plant discharges is a commercial/industrial waterway such that water quality standards need not be as stringent as in other waterways.[249]

Given the inability of under-funded, under-staffed regulators at state agencies (or at EPA regional offices) – not to mention interested members of the public – to engage with and respond to the panoply of largely spurious issues raised at every opportunity and supported with opaque technical submittals, it is no wonder that power plants have successfully resisted upgrading their intake structures for decades. This applies to power plants regulated on a case-by-case basis by state agencies as well as those regulated directly by EPA.

For example, in the early 1970s the Atomic Energy Commission (AEC) determined that a

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by state regulators. Both Illinois and Michigan have adopted this unlawful interpretation of the Clean Water Act in multiple proceedings. *See, e.g.*, *In the Matter of the Natural Resources Defense Council (NRDC), the Sierra Club, and the Great Lakes Environmental Law Center (GLELC) on the permit issued DTE Energy, Detroit Edison Company Harbor Beach Power Plant (DTE Energy)*, Respondent Michigan Dep't of Envtl. Quality's Pre-Hearing Statement at 2-3 (Aug. 2, 2011) (a BTA permitting decision made in 1976 need not be revisited) (Exh. 79).

[246] For example, FirstEnergy claims that installing reverse louvers and fine mesh screens at its Bayshore plant would represent a move to the best technology available. At Indian Point, Entergy claims that cylindrical wedgewire screens are an acceptable alternative to closed cycle cooling (despite EPA's finding, in this proceeding, that wedgewire screens are not as effective as closed cycle cooling). And at the Danskammer Generating Station, Dynegy Generation has argued that variable speed pumps and sonic deterrents are effective, at least when viewed against the backdrop calculations of a full-flow baseline. *See In the Matter of Dynegy Northeast Generation, Inc., on behalf of Dynegy Danskammer LLC (Danskammer Generating Station)*, DEC No.: 3-3346-00011/00002, SPDES No.: NY-0006262, Decision of the Deputy Commissioner of the N.Y. State Dep't of Envtl. Conservation at 3 (May 24, 2006) (Exh. 65).

[247] *See* Enercon Services, Inc., *Evaluation of Alternative Intake Technologies at Indian Point Units 2 & 3, prepared for Entergy Nuclear Indian Point2, LLC, and Entergy Nuclear Indian Point 3, LLC* at *v* (Feb. 12, 2010) (Exh. 80), available at: http://www.dec.ny.gov/docs/ permits_ej_operations_pdf/alttechrep.pdf*; see also id. at* n.4 and Attachment 6 (arguing that cylindrical wedgewire screens should be preferred to closed-cycle cooling at Indian Point because they can be implemented more quickly).

[248] Dayton Power & Light, the owner of the Stuart plant in Ohio, claims that Three Mile Creek, into which the Stuart plant discharges, is a "discharge canal" and thus that water quality standards do not apply until the point at which the creek meets the Ohio River, several miles downstream of the discharge point. *See, e.g.*, Public Fact Sheet, Dayton Power & Light, "J.M. Stuart Station NPDES Permit Renewal, Sprigg Township, Ohio" (Spring 2011) (Exh. 81); *see also* Letter from JoAnne Rau, Director, Environmental Safety and Management, Dayton Power and Light Company to Sean Ramach, US EPA Region 5 (Apr. 28, 2011) (providing DP&L's comments on EPA's rejection of the draft NPDES permit renewal for the J.M. Stuart Electric Generating Station) (Exh. 63).

[249] In Clean Water Act proceedings related to setting water quality standards, Midwest Generation has argued that Chicago's waters are less worthy of protection because they are used in commerce and by industry. *See* Midwest Generation, *Appropriate Thermal Water Quality Standards for the Chicago Sanitary and Ship Canal and Lower Des Plaines River* (Mar. 22, 2007) (Exhibit 82).

closed-cycle cooling system would be necessary at the Brunswick power plant in North Carolina to avoid significant environmental damage.[250] After years of battling, in 1980 EPA relented and settled for lesser controls.[251] With only these lesser controls in place, the plant currently kills three to four billion fish annually.[252]

Similarly, in the early 1970s, EPA ordered three Hudson River power plants to retrofit with closed-cycle cooling.[253] In the nearly 30 years since, the cooling water withdrawals at these plants have engendered endless lawsuits, negotiations, settlements and two environmental impact statements. Yet the plants still operate on long-expired permits, and the plants' once through cooling systems continue to kill fish at levels deemed "wholly unacceptable" by the state environmental agency.[254] The NPDES permit renewal for one of these plants, Indian Point, has been in adjuducation since 2004 – only now scheduled for hearing dates to commence in the fall of 2011, and expected to take place over a year or more (with appeals likely).[255] Just as with the Brunswick plant, in the 1970s the AEC had determined that due to the potential for long-term impact, closed-cycle cooling was necessary for Indian Point – yet delay tactics, bureaucratic processing failures, and litigation have resulted in decades of operation of once-through cooling, allowing the plant to kill over a billion fish of all life stages each year.[256]

Notably, many of the plants whose negative environmental impacts spurred passage of the Clean Water Act 39 years ago are still operating today, their cooling water intake structures in much the same condition now as then. Incredibly enough, some of the oldest and most environmentally damaging plants in the country predate not just the 1972 Clean Water Act, but the Federal Water Pollution Control Act of 1948 as well.

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[250] *In the Matter of: Carolina Power & Light Company (Brunswick Steam Electric Plant)*, USEPA Environmental Appeals Board, 1978 EPA App. LEXIS 4 (February 20, 1978) at p. 2 (Exh. 83).

[251] James R. May & Maya K. van Rossum, *The Quick and the Dead: Fish Entrainment, Entrapment, and the Implementation and Application of Section 316(b) of the Clean Water Act*, 20 Vt. L. Rev. 373, 413 (1995). Internal EPA memoranda indicate that the decision not to require closed-cycle cooling was driven by agency resource and political concerns. *The Quick and the Dead*, 20 Vt. L. Rev. at 414, fn. 280 (Exh. 18).

[252] 66 Fed. Reg. at 65,264 (col. 1).

[253] *Consolidated Edison Co. of New York v. New York State Dept. of Environmental Conservation*, 726 F. Supp. 1404, 1407 (S.D.N.Y. 1989).

[254] 66 Fed. Reg. at 65,264 (cols. 1-2).

[255] In the Matter of Entergy Nuclear Indian Point 2, LLC and Entergy Nuclear Indian Point 3, LLC For a State Pollution Discharge Elimination System Permit Renewal and Modification, DEC No. 3-5522-00011/00004, SPDES No,: NY-0004472.

[256] See Letter from William R. Adriance, Chief Permit Administrator, New York State Department of Environmental Conservation, to Dara F. Gray, Entergy Nuclear Operations, (April 2, 2010) at 3 (available at http://www.dec.ny.gov/docs/permits_ej_operations_pdf/ipdenial4210.pdf).

II.

SUMMARY OF THE PROPOSED RULE

A. The Proposed Rule

The Proposed Rule applies to "existing" point sources that have a "Design Intake Flow" (DIF) of over 2 Million Gallons per day (MGD) with the capacity to withdraw more than 2 MGD of water from waters of the U.S. and use at least 25 percent of the water they withdraw exclusively for cooling.[257] However, under the proposal, "water obtained from a public water system, reclaimed water from wastewater treatment facilities or desalination plants, treated effluent from a manufacturing facility, or cooling water that is used in a manufacturing process either before or after it is used for cooling as process water, is not considered cooling water."[258]

Facilities below the thresholds are subject to permitting on a best professional judgment (BPJ) basis.[259] The three main components of the rule are the entrainment provisions, the impingement standards, and standards applicable to what EPA calls "new units at existing facilities."[260] Under the Proposed Rule, a new unit at an existing facility must reduce entrainment mortality to a level commensurate with the performance of a closed-cycle cooling system. Existing units are far less strictly controlled.[261] Each of these components and other key provisions are summarized below.

1. Entrainment Provisions for Existing Facilities (Existing Units)

The proposed rule does not set any specific criteria (numeric or otherwise) for the degree of entrainment reduction that is reflective of the Best Technology Available at any class or classes of existing units. Instead, permitting authorities are to determine BTA on a case-by-case basis.[262] Alternatively, existing facilities can choose to skip the case-by-case BTA analysis process and comply with the entrainment mortality standard that applies to new units at existing facilities.[263]

With respect to entrainment reduction, the only hard and fast "requirements" imposed on existing facilities are information provision requirements. These vary according to the size of

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[257] *See* proposed 40 C.F.R. § 125.91(a), 76 Fed. Reg. at 22,280 (col. 3). Although the rule specifies that an intake pipe is only regulated if at least 25% of its flow is cooling water, EPA leaves permit writers discretion to determine that an intake from which less than 25% of the flow is used for cooling should nonetheless be subject to permitting. *See* 76 Fed. Reg. at 22,193 (col. 2).

[258] Proposed 40 C.F.R. § 125.92, 76 Fed. Reg. at 22,281 (col. 2).

[259] *See* 76 Fed. Reg. at 22,174 (col. 3).

[260] In the proposed rule, EPA draws a critical distinction between what it terms "existing facilities" and "new units at existing facilities." But since every site addressed by this rule is an existing facility, and since a facility can contain multiple electric generating units, some new and some not, it may be more accurate to restate EPA's distinction in terms of existing and new *units*.

[261] *See* 76 Fed. Reg. at 22,196 (col. 1).

[262] *See* proposed 40 C.F.R. § 125.94(c), 76 Fed. Reg. at 22,283 (col. 2).

[263] *See* proposed 40 C.F.R. § 125.94(a)(2), 76 Fed. Reg. at 22,282 (col. 3).

the facility.[264] Applicants are not required to reduce the number of fish and other organisms entrained unless, after reviewing the information provided, the Director determines that efforts to reduce entrainment are warranted.

Facilities with an Actual Intake Flow (AIF) over 125 MGD, must conduct several entrainment-related studies and provide the results to the Director.[265] The Director's BPJ-based permitting review for such facilities relies on these studies.[266] The primary studies are:

- *Entrainment Characterization Study* – a large facility must collect data on entrainment mortality for all species and life stages that it has identified through a 'source water baseline biological characterization study.'[267] But note that as the Proposed Rule is written, the Director may exclude any species from the baseline study or from entrainment monitoring.[268] Thus, the study may not in fact report on all of the fish entrained. The study must be peer reviewed, with reviewers selected in consultation with the Director (who may also appoint additional reviewers). If any significant comments from the peer review process are not accepted, the facility owner must explain why. "Peer reviewers must have appropriate qualifications in biology, engineering, hydrology, or other fields and their names and credentials must be included in the peer review report."[269]

- *Comprehensive Technical Feasibility and Cost Evaluation Study* – "an engineering study of the technical feasibility and incremental costs of candidate entrainment mortality control technologies."[270] This study must be peer reviewed under the same terms as the entrainment characterization study.

- *Benefits Valuation Study* – "an evaluation of the magnitude of water quality benefits, *both monetized and non-monetized*, of the candidate entrainment mortality reduction technologies and operational measures evaluated" in the technical feasibility study.[271] The study must include hard numbers for fish and shellfish mortality and must explain how these averted losses and other water quality benefits are assigned a monetary value.[272] The study must be peer reviewed under the same terms as the other studies, but although the rule requires a monetary valuation of benefits, it does not require that the peer reviewers have expertise in environmental economics.[273]

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[264] *See* proposed 40 C.F.R. § 122.21(r)(1)(ii), 76 Fed. Reg. 22,275 (col. 3).

[265] *See* proposed 40 C.F.R. § 122.21(r)(1)(ii)(B), 76 Fed. Reg. at 22,276 (col. 1)..

[266] *See* proposed 40 C.F.R. § 125.94(a)(2), 76 Fed. Reg. at 22,282 (col. 3).

[267] *See* proposed 40 C.F.R. § 122.21(r)(9), 76 Fed. Reg. at 22,277 (col. 3) (requiring that the plan address "all species and life stages identified under the requirements of paragraph (r)(4) [the source water baseline biological characterization study]").

[268] *See* 40 C.F.R. § 125.98(c)(6), 76 Fed. Reg. at 22,287 (col. 3) (discussed below).

[269] Proposed 40 C.F.R. § 122.21(r)(9)(ii), 76 Fed. Reg. at 22,278 (col. 1).

[270] Proposed 40 C.F.R. § 122.21(r)(10), 76 Fed. Reg. at 22,278 (col. 2).

[271] *See* proposed 40 C.F.R. § 122.21(r)(11), 76 Fed. Reg. at 22,279 (col. 1) (emphasis added).

[272] *See* proposed 40 C.F.R. § 122.21(r)(11)(i),(ii), 76 Fed. Reg. at 22,279 (col. 1).

[273] *See* proposed 40 C.F.R. § 122.21(r)(11)(v), 76 Fed. Reg. at 22,279 (col. 1).

- *Non-water Quality and Other Environmental Impacts Study* – a "discussion of the changes in non-water quality factors and other environmental impacts attributed to each technology and operational measure considered."[274] As with the other entrainment-related studies, it also must be peer reviewed.[275]

Unlike larger plants, the owners and operators of existing facilities with an AIF less than 125 MGD need only provide a subset of the information that larger facilities must provide, i.e., baseline information to the Director about the cooling water intake system, the physical and biological characteristics of the waterbody, and their plans to reduce impingement mortality.[276]

After receiving the information listed above, the Director must determine "the maximum reduction in entrainment mortality warranted"[277] at a particular facility. In setting this so-called BTA standard at an individual facility, the Director must consider at least nine factors:

(1) Numbers and types of organisms entrained;
(2) Entrainment impacts on the waterbody;
(3) Quantified and qualitative social benefits and costs, including ecological benefits and benefits to any threatened or endangered species;
(4) Thermal discharge impacts;
(5) Impacts on the reliability of energy delivery within the immediate area;
(6) Impact of changes in particulate emissions or other pollutants associated with entrainment technologies;
(7) Land availability, inasmuch as it relates to the feasibility of entrainment technology;
(8) Remaining useful plant life; and
(9) Impacts on water consumption.

Based on these nine factors, the Director may reject an otherwise available technology "*if the social costs of compliance are not justified by the social benefits*, or if there are adverse impacts that cannot be mitigated that the Director deems to be unacceptable."[278] The Director must provide a written explanation of the decision. In that explanation, the Director must explain why any measures that perform better than the chosen option were rejected.[279]

It is unclear when (if ever) the analysis process will result in an entrainment reduction determination by the Director or implementation of entrainment controls by the facilities. While the rule sets deadlines for the owners and operators of existing units to provide the various

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[274] Proposed 40 C.F.R. § 122.21(r)(12), 76 Fed. Reg. at 22,279 (col. 1).

[275] *See* proposed 40 C.F.R. § 122.21(r)(12)(x), 76 Fed. Reg. at 22,279 (col. 2).

[276] *See* proposed 40 C.F.R. § 122.21(r)(2)(ii)(A),(B), 76 Fed. Reg. at 22,276 (col. 1) (all existing facilities must submit the basic information required in parts (r)(2)-r(8), but only the largest facilities must comply with the entrainment information requirements in parts (r)(9)-(r)(12)).

[277] Proposed 40 C.F.R. § 125.94(c), 76 Fed. Reg. at 22,283 (col. 2).

[278] Proposed 40 C.F.R. § 125.98(e), 76 Fed. Reg. at 22,288 (col. 1) (emphasis added).

[279] *See* proposed 40 C.F.R. § 125.98(e), 76 Fed. Reg. 22,288 (col. 1).

categories of information demanded to the Director,[280] it does not set an ultimate deadline for entrainment compliance.[281]

2. Entrainment Standards for "New Units at Existing Facilities."

New units at existing facilities must meet entrainment standards based on the use of a closed-cycle cooling system.[282] The entrainment standard for *new units* at existing facilities parallels the two track standard for *new facilities* that EPA developed in the Phase I rule. Thus, the operator of a new unit can choose to reduce the new unit's intake of cooling water to equal that of a closed-cycle cooling system under the same circumstances.[283] Alternatively, under the second compliance track, a higher intake flow is permissible but the facility operator must reduce entrainment mortality at the new unit to at least 90 percent of what would have been achieved had the new unit cut its AIF under the first track.[284] If a new unit opts to maintain a higher flow and plans to reduce mortality sufficiently to compensate, the Director must review the data the owner/operator submits to determine whether it will reduce impingement and entrainment mortality to 90 percent or greater of the reduction that could be achieved through closed-cycle cooling.[285] Finally, the Director also may exempt a new unit from compliance with either track and establish "alternative requirements" if the cost of compliance is "wholly out of proportion" to the costs considered by EPA during the rulemaking process.[286]

3. Impingement Standards for Existing Facilities (Existing Units) and "New Units at Existing Facilities."

The impingement standard offers covered facilities a choice.[287] One option allows the facility operator to choose to ensure that "for all life stages of fish that are collected or retained in a 3/8 inch sieve and held for a period of 24 to 48 hours to assess latent mortality," the mortality rate does not exceed 12 percent on an annual average basis, or 31 percent on a monthly basis.[288] This option is based on "the use of modified traveling screens with a fish handling and return system."[289] EPA concluded that this 12 percent/31 percent level of mortality reduction is almost

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[280] *See* proposed 40 C.F.R. § 125.95(b), 76 Fed. Reg. at 22,284 (col. 1).

[281] *See* proposed 40 C.F.R. § 125.93(b) (requiring compliance "with the applicable BTA standards for entrainment mortality in § 125.94(c) as soon as possible"), 76 Fed. Reg. at 22,282 (col. 2).

[282] *See* proposed 40 C.F.R. §§ 125.93(c), 76 Fed. Reg. at 22,282 (col. 2); 125.94(a)(3), 76 Fed. Reg. at 22,282 (col. 3).

[283] *See* proposed 40 C.F.R. § 125.94(d)(1), 76 Fed. Reg. at 22,283 (col. 2). In quantitative terms, this means demonstrating "total flow reductions approximating 97.5% for freshwater withdrawals and 94.9% for saltwater withdrawals." 76 Fed. Reg. at 22,253 (col. 3). See also proposed 40 C.F.R. § 125.92, 76 Fed. Reg. at 22,281 (col. 2) (defining a closed-cycle recirculating system with reference to these values).

[284] *See* proposed 40 C.F.R. § 125.94(d)(2), 76 Fed. Reg. at 22,283 (col. 3).

[285] *See id.*

[286] *See* proposed 40 C.F.R. § 125.94(d)(4), 76 Fed. Reg. at 22,283 (col. 3).

[287] *See* proposed 40 C.F.R. § 125.94(b), 76 Fed. Reg. at 22,282 (col. 3).

[288] *See* proposed 40 C.F.R. § 125.94(b)(1)(i), 76 Fed. Reg. at 22,282 (col. 3).

[289] *See* 76 Fed. Reg. at 22,197 (col. 2).

always achievable (i.e., 95 percent of the time)[290] through the use of modified traveling screens.[291]

Alternatively, the operator can choose to reduce the intake system's maximum velocity to 0.5 feet/second, which allows organisms to swim away from the intake.[292] EPA acknowledges this velocity reduction can reduce impingement (and thus impingement mortality) to below four percent, which is more effective than the 12 percent mortality level achievable by traveling screen systems option.[293] But EPA chose to identify two different levels of impingement reduction as the BTA level because "EPA's record shows modified traveling screens are available for all facilities, whereas reduced intake velocity may not be available at all locations."[294]

Under both alternatives, operators must also meet ancillary protective requirements. First, any facility that does employ travelling screens or equivalent active screens must incorporate certain protective measures that raise the odds that impinged fish can be safely returned to the source water.[295] Second, all facilities must ensure that there is a means of escape for fish that may get "entrapped" (for example in a forebay) to be returned to the waterbody.[296] Third, in the case of facilities withdrawing from oceans or tidal waters, their performance in reducing shellfish impingement mortality must be at least as good as would be achieved through properly deployed and maintained barrier nets.[297]

All covered facilities must meet the rule's impingement mortality standard on a schedule set by the Director.[298] In all cases, the standard must be met within 8 years of the rule taking

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[290] EPA used "performance corresponding to the 95th percentile of the beta distribution" as the statistical measure to determine the effectiveness of modified travelling screens. *See* 76 Fed. Reg. at 22,203 (col. 1).

[291] *See* 76 Fed. Reg. at 22,203 (col. 1).

[292] *See* proposed 40 C.F.R. § 125.94(b)(2), 76 Fed. Reg. at 22,283 (col. 1).

[293] *See* 76 Fed. Reg. at 22,204 (col. 3) ("the performance of 0.5 feet per second intake velocity is slightly better than the selected technology. . . a design through-screen velocity of 0.5 feet per second would be protective of 96% of motile organisms.").

[294] *See* 76 Fed. Reg. at 22,197 (col. 2).

[295] *See* proposed 40 C.F.R. § 125.94(b)(1)(iii)(B) (for those facilities choosing the 12/31 percent standard), 76 Fed. Reg. at 22,282 (col. 3); 40 C.F.R. § 125.94(b)(2)(v)(B) (for those facilities choosing the velocity limitation), 76 Fed. Reg. at 22,283 (col. 2).

[296] *See* proposed 40 C.F.R. § 125.94(b)(1)(iv)(B) (for those facilities choosing the 12/31 percent standard), 76 Fed. Reg. at 22,283 (col. 1); 40 C.F.R. § 125.94(b)(2)(vi) (for those facilities choosing the velocity limitation), 76 Fed. Reg. at 22,283 (col. 2). EPA has informed us that the term "through-flow" in these sections is a typographical error and should read "dual-flow." *See also* 76 Fed. Reg. at 22,251 (col. 2); 76 Fed. Reg. at 22,275 (col. 1) (discussing "entrapment" provision).

[297] *See* proposed 40 C.F.R. § 125.94(b)(1)(ii) (for those facilities choosing the 12/31 percent standard), 76 Fed. Reg. at 22,282 (col. 1); 40 C.F.R. § 125.94(b)(2)(iv) (for those facilities choosing the velocity limitation), 76 Fed. Reg. at 22,283 (col. 1).

[298] *See* proposed 40 C.F.R. § 125.93(a),(c), 76 Fed. Reg. at 22,282 (col. 2); *see also* proposed 40 C.F.R. § 125.94(a)(1), 76 Fed. Reg. at 22,282 (col. 3).

effect.[299] A facility's owner or operator must submit an Impingement Mortality Reduction Plan to the Director that identifies the approach they will use to meet the BTA standards.[300]

4. Other Provisions

a. Exclusion of Species/"Species of Concern"

On first reading, the language used to describe organisms protected by the rule appears comprehensive. For example, to be in compliance with the entrainment and impingement provisions means to achieve any applicable limitations "for all life stages of fish."[301] Although the definition of "all life stages" allows the Director to exclude moribund and invasive species,[302] it still embraces virtually all fish and shellfish that are actually entrained or impinged.

However, the rule also repeatedly refers to studying and monitoring impingement and entrainment of "species of concern" without defining the term.[303] One possibility is that EPA intends the "species of concern" category to function as it does under the Phase I rule: offering stronger protection to endangered, threatened, or otherwise uniquely valuable species that the rule's uniform standards would provide.[304] This elevated degree of protection is entirely consistent with the Clean Water Act's goals and purposes.

But if read in concert with proposed Part 125.98(c)(6), the phrase could be interpreted to unlawfully permit the Director to exclude various species of fish from protection under the Clean Water Act and lower the standards for a particular facility below the BTA standards that EPA has identified. Part 125.98(c) addresses the Director's responsibilities with respect to species of concern. Under sub-paragraph 6, "[t]he Director may determine invasive species, naturally moribund species, *and other specific species may be excluded from any monitoring, sampling, or study requirements* of 40 CFR 122.21 and § 125.94."[305] Read broadly, this would allow the Director to summarily exempt species from the source water baseline biological characterization

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[299] *See id.*

[300] *See* proposed 40 C.F.R. § 122.21(r)(1)(6), 76 Fed. Reg. at 22,277 (col. 1) (describing the plan). *See also* proposed 40 C.F.R. § 125.95(b), 76 Fed. Reg. at 22,284 (col. 1) (setting dates for submittal of the plan that vary by facility size).

[301] Proposed 40 C.F.R. § 125.94(b)(1)(i), 76 Fed. Reg. at 22,282 (col. 3) (achieve impingement standards for all life stages of fish). *See also* 40 C.F.R. §§ 125.94(b)(1)(iii)(A), 76 Fed. Reg. at 22,282 (col. 2-3) (the owner of a facility must count as impinged "any fish" carried over in screen); 40 C.F.R. § 125.94(d)(2), 76 Fed. Reg. at 22,283 (col. 3) (a new unit at an existing facility complying with the track II entrainment standard must demonstrate reduced entrainment of "all stages of fish and shellfish.").

[302] *See* proposed 40 C.F.R. § 125.92, 76 Fed. Reg. at 22,281 (col. 1).

[303] *See e.g.*, proposed 40 C.F.R. 125.97(a)(4), 76 Fed. Reg. at 22,287 (col. 1) (Entrainment monitoring reports must "describe . . . the species of concern, the counts and percentage mortality of organisms sampled, and other information specified in the permit."). *See also* 76 Fed. Reg. at 22,204 (col. 3) (EPA is considering, as an additional impingement requirement, that facilities opting to reduce intake velocity also show that "species of concern are adequately protected.").

[304] *See* 40 C.F.R. § 125.84(b)(4),(5) (requiring new facilities to take extra measures above and beyond implementation of closed-cycle cooling if necessary to protect "species of concern to the Director.").

[305] Proposed 40 C.F.R. § 125.98(c)(6), 76 Fed. Reg. at 22,287 (col. 3).

study, from the impingement and entrainment reduction studies and plans, and from all monitoring efforts.

b. Monitoring Provisions

Proposed section 125.96(a) would require impingement monitoring "over a 24-hour period and no less than once per month when the cooling water intake structure is in operation."[306] Yet, "EPA assumes the facility would monitor no less than once per week during primary periods of impingement as determined by the Director, and no less than biweekly during all other times."[307]

c. Nuclear Safety

Proposed section 125.94(e), entitled "Nuclear facilities" provides that "[i]f the owner or operator of a nuclear facility demonstrates to the Director, upon the Director's consultation with the Nuclear Regulatory Commission, that compliance with this subpart would result in a conflict with a safety requirement established by the Commission, the Director must make a site-specific determination of best technology available for minimizing adverse environmental impact that would not result in a conflict with the Commission's safety requirement."[308]

d. Exempted Offshore Facilities

The proposed rule exempts three categories of existing offshore point sources with cooling water intakes: offshore liquefied natural gas (LNG) plants, offshore seafood processing vessels, and offshore oil and gas facilities.[309] The preamble explains that EPA has studied these offshore facilities but is not aware of any technologies beyond screens that avoid unacceptably altering the envelope or seaworthiness of vessels and platforms in these categories.[310] Instead, these facilities are subject to case-by-case BPJ-based permitting.[311]

5. Revisions to Phase I Rule

The proposed rule also responds to the Second Circuit's decision in *Riverkeeper I* by removing from the Phase I new facility rule the restoration-based compliance alternative and the associated monitoring and demonstration requirements because EPA lacks the authority to allow compliance with Section 316(b) through restoration measures.[312] The proposed rule also proposes certain relatively minor corrections to the Phase I rule.[313]

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[306] Proposed 40 C.F.R. § 125.96(a)(2), 76 Fed. Reg. at 22,286 (col. 2).

[307] 76 Fed. Reg. at 22,256 (col. 3)–22,257 (col. 1).

[308] Proposed 40 C.F.R. § 125.94(3), 76 Fed. Reg. at 22,284 (col. 1).

[309] *See* proposed 40 C.F.R. § 125.91(d), 76 Fed. Reg. at 22,281 (col. 1).

[310] *See* 76 Fed. Reg. at 22,195 (col. 3).

[311] *See* proposed 40 C.F.R. § 125.91(d), 76 Fed. Reg. at 22,281 (col. 1).

[312] 76 Fed. Reg. at 22,174 (col. 1); Fed. Reg at 22,183 (col. 2). In *Riverkeeper I*, the Second Circuit held that EPA exceeded its authority by allowing new facilities to comply with section 316(b) through restoration measures, and remanded that aspect of the rule to EPA. 358 F.3d at 191.

[313] 76 Fed. Reg. at 22,183 (col. 3).

B. EPA's Option Selection

Section 316(b) of the Clean Water Act requires EPA to establish standards for cooling water intake structures that reflect the "best technology available" to minimize adverse environmental impacts.[314] In determining the best technology available, EPA considered how well various technologies reduced entrainment and impingement. But EPA also evaluated these technologies against a number of other criteria.[315] EPA ultimately set what it considers a BTA standard based on technology that is capable of being implemented universally. In so doing, EPA rejected the possibility of subcategorizing facilities according to the feasibility of control technologies, and rejected the possibility of setting a standard based on a more effective model technology but allowing variances where the model technology is infeasible.

1. In Considering Technological Options, EPA Set a "Universal Availability" Requirement for BTA Candidate Technologies, then Rejected Closed-Cycle Systems and Velocity Limits Because EPA Found that They Are Not Univerally Capable of Being Implemented.

EPA considered a number of flow-reducing technologies, including closed-cycle systems.[316] EPA also evaluated a number of exclusion technologies, including different screens and nets, fish collection systems that safely return excluded fish to a waterbody, and slowing the intake velocity sufficiently for fish to escape the zone of danger.[317] From this review, EPA selected three *best performing* technologies that merited further study: traveling screens, barrier nets, and wet closed-cycle cooling. EPA also determined that velocity reduction to 0.5 feet per second or less was a "candidate" best performing technology.[318]

Ultimately, however, EPA proposed a BTA performance standard based only on technologies that are capable of being implemented by every facility, even if better performing technologies are available and feasible at a subset of facilities.[319] For example, although EPA identified wet closed-cycle cooling "as a *candidate* best performing technology for both impingement mortality and entrainment mortality for new units at existing facilities,"[320] and although "EPA's record shows numerous instances of existing facility retrofits to closed-cycle,"[321] the agency did not propose closed-cycle cooling as the Best Technology Available because EPA asserts they are not capable of being implemented everywhere.[322] Instead, because

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[314] 33 U.S.C. § 1326(b).

[315] *See* 76 Fed. Reg. at 22,197 (col. 1) (EPA considered criteria including: technical availability and economic impacts on facilities of different size, age, type, and location; cost effectiveness; social costs and benefits; effects on energy production, availability, and reliability; and potential adverse environmental effects).

[316] *See* 76 Fed. Reg. at 22,198 (col. 1) - 22,200 (col. 2).

[317] *See* 76 Fed. Reg. at 22,200 (col. 2) - 22,202 (col. 3).

[318] 76 Fed. Reg. at 22,202 (col. 3) - 22,203 (col. 1).

[319] *See* 76 Fed. Reg. at 22,203 (col. 3). *See also* 22,204 (col. 3).

[320] 76 Fed. Reg. at 22,203 (col. 3).

[321] 76 Fed. Reg. at 22,204 (col. 1).

[322] *See* 76 Fed. Reg. at 22,203 (col. 3).

EPA claims "closed-cycle cooling is not practically feasible in a number of circumstances," and because these circumstances "are not isolated or insignificant," the agency decided "that it should not establish closed-cycle cooling as the presumptive BTA entrainment control."[323] Thus, after deciding that the BTA standard must be modeled on a technology capable of being implemented everywhere, EPA determined that closed-cycle cooling did not meet that standard and therefore could not be BTA.

Once it eliminated closed-cycle cooling and several other technologies from consideration, "EPA could identify no single technology that represented BTA [for entrainment] for all facilities" and opted for a case-by-case approach to regulating entrainment at existing units.[324] The agency concluded that closed-cycle technology could not be implemented everywhere for four reasons: local energy reliability; increased air pollution and the difficulty of obtaining air emissions permits for existing facilities in non-attainment areas; land availability; and remaining useful plant life.[325]

Uncertainty about the extent and likelihood of local reliability impacts caused by extended downtime was purportedly an important consideration for EPA.[326] In the preamble, EPA states that it considered establishing a uniform entrainment rule, while giving permitting authorities flexibility to establish extended compliance timelines for utilities to coordinate extended outages and account for reliability concerns. EPA states that it believes that this "would have been consistent with EPA's assessment that, at the national level (rather than local level), closed-cycle cooling would not pose material energy reliability consequences."[327] But EPA claims that it lacks adequate information to establish whether such a flexible approach would sufficiently address local reliability issues.[328]

Perceptions over increased air pollution also drove EPA's finding that closed-cycle cooling cannot be installed everywhere.[329] EPA believes that for new units this is a lesser concern, because their system can be optimized for closed-cycle cooling from the design stage. EPA also states that increased emissions could raise a permitting concern, particularly in non-attainment areas where a plant will need to identify offsets for its increased emissions.[330]

And, although "EPA's record indicated that the majority of facilities have adequate available land for placement of cooling towers . . . , as many as 25 percent of facilities may have one or more constraints on available space that would limit retrofit of cooling towers for the entire facility or would result in increased compliance costs."[331] Finally, EPA believes that

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[323] 76 Fed. Reg. at 22,207 (col. 1).

[324] 76 Fed. Reg. at 22,197 (col. 2).

[325] *See* 76 Fed. Reg. at 22,207 (col. 1).

[326] *See* 76 Fed. Reg. at 22,208 (col. 3).

[327] 76 Fed. Reg. 22,208 (col. 3).

[328] *Id.*

[329] 76 Fed. Reg. at 22,208 (col. 2).

[330] *See* 76 Fed. Reg. at 22,209 (col. 1).

[331] 76 Fed. Reg. at 22,209 (col. 2-3).

"many facilities are nearing the end of their useful life" and the costs of a retrofit to such a plant may not justify the benefits.[332]

Thus, EPA opted for a lowest common denominator strategy – setting no uniform entrainment standard, and basing the impingement standard on traveling screens because they are capable of being installed everywhere. EPA considered but rejected the possibility of subcategorizing "the industry" (actually, several industries) into groups of facilities for which more effective flow reduction technologies are feasible.[333] And moreover, EPA did not establish a presumptive hierarchy of technologies that must be applied if available.

Similarly, regarding impingement, while EPA acknowledges that velocity reduction to 0.5 feet per second is available at many facilities and is more effective at reducing mortality than traveling screens,[334] it proposed an impingement standard that allows a facility to choose between reducing velocity and installing traveling screens. And although EPA found that wedgewire screens "would perform equally as well or better than seasonal deployment of barrier nets" to reduce the impingement of shellfish, EPA did not conduct a full analysis of wedgewire screens in the rulemaking, nor did it require their use where feasible while allowing less effective technologies elsewhere.[335]

2. The Four Regulatory Options EPA Considered

Developing the proposed rule, EPA considered four regulatory options. The proposed rule is EPA's "Option 1": a numerical impingement standard based on the use of modified traveling screens or velocity reductions that applies to all units; flow reduction commensurate with closed-cycle cooling only for new units at existing facilities; and a case-by-case decision making approach to entrainment for all existing units.[336] The other end of the spectrum is EPA's Option 3, which calls for the same impingement standards as Option 1 and requires flow reduction commensurate with closed-cycle cooling by all facilities.[337]

Option 2 is a hybrid of Options 1 and 3. Like those options, it would set a uniform numerical impingement and entrainment standard based on the use of modified traveling screens or velocity reductions for all units, but the closed-cycle-cooling -based entrainment standard would only be required of larger units – those with an actual intake flow of more than 125 MGD. For units with a smaller flow, Option 2 allows the same case-by-case decision making as Option 1.[338]

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[332] *See* 76 Fed. Reg. at 22,210 (col. 1).

[333] *See* 76 Fed. Reg. 22,204 (col. 1).

[334] *See* 76 Fed. Reg. at 22,204 (col. 3) ("the performance of 0.5 feet per second intake velocity is slightly better than the selected technology. . . a design through-screen velocity of 0.5 feet per second would be protective of 96% of motile organisms.").

[335] *See* 76 Fed. Reg. at 22,203 (col. 3).

[336] *See* 76 Fed. Reg. at 22,204 (col. 1).

[337] *See* 76 Fed. Reg. at 22,206 (col. 2).

[338] *See* 76 Fed. Reg. at 22,206 (col. 1).

Finally, shortly before proposal, EPA considered a fourth possibility that is even less protective than Option 1. Option 4 would adopt a case-by-case approach to entrainment and apply the uniform impingement standard only to those facilities with a design intake flow greater than 50 MGD. Facilities with a lower intake capacity would be subject to case-by-case permitting for both impingement and entrainment.

C. The Regulatory Impact Analysis

EPA considered the social costs of the proposed rule and the distribution of those costs across different parts of society (i.e. the "economic impact" of the rule).[339] EPA also considered the social benefits – first by listing the physical impacts of the rule in terms of reduced mortality and other benefits, then by trying to monetize these benefits.

EPA estimates the total social costs of the proposed rule (Option 1) are $384 million.[340] If 100 percent of the rule's costs for electricity providers were borne by the ratepayers, this would amount to an average cost of $1.37 per year per household, or approximately 11.5 cents monthly.[341] By comparison, EPA estimates that the total social cost of the more environmentally protective Option 3 is $4,631 million,[342] or $1.47 monthly per household.[343] In the reverse, if 100 percent of the costs fell upon power companies "the majority of parent entities will incur annualized costs of less than one percent of revenues regardless of the option" that EPA selects.[344] Both of these 100-percent assumptions are highly conservative because, in reality, some (but not all) of the costs would be borne by power companies and some (but not all) would be borne by ratepayers.

EPA also estimated the rule's impact on manufacturers by modeling a manufacturer's after-tax cash flow, assuming, again highly conservatively, that the business had to absorb 100 percent of the rule's costs.[345] EPA found that no facilities would close and, even under Option 3, only 3.4 percent of facilities would experience even "moderate" cash flow impacts.[346]

Finally, EPA estimated the administrative costs that states and territories will incur in implementing the rule at existing facilities. "EPA estimates that the total annualized cost for these activities will be $5.31 million for Option 1, $2.19 million for Option 2, $1.28 million for Option 3, and $4.06 million for Option 4."[347] Thus, the highest administrative costs are imposed by the more site-specific, case-by-case options.

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[339] *See* 76 Fed. Reg. at 22,212 (col. 2)–22,237 (col. 1). EPA also conducted a variety of other analyses required by various acts of Congress, Executive Orders, and Agency initiatives.

[340] *See* 76 Fed. Reg. at 22,218 (col. 2) (in 2009 dollars, discounted at 3%).

[341] *See* 76 Fed. Reg. at 22,227 (col. 3).

[342] *See* 76 Fed. Reg. at 22,218 (col. 2).

[343] *See* 76 Fed. Reg. at 22,227 (col. 3) ($17.60 annually).

[344] *See* 76 Fed. Reg. at 22,226 (col. 3).

[345] *See* 76 Fed. Reg. at 22,220 (col. 2).

[346] *See* 76 Fed. Reg. at 22,221 (col. 2).

[347] *See* 76 Fed. Reg. at 22,270 (col. 3).

In terms of the rule's physical benefits (at least those that can be measured in direct fish and shellfish losses). Option 3 – uniform impingement and entrainment standards based on closed-cycle cooling – would save 1,000 times more fish than the proposed rule. While Option 1 may save 422 million fish, uniform standards would save 407,922 million fish (as well as sea turtles and other endangered and threatened species).[348]

Although the fish-protection benefits of Option 3 are 1000 times greater than Option 1, the agency could not perform a comparable and complete monetary analysis of the options. EPA found that "quantifying and monetizing reductions in I&E mortality losses due to the regulatory options is extremely challenging."[349] Since many benefit categories were not properly monetized, EPA concluded that the monetized values "likely underestimate total benefits, challenging the Agency's ability to base BTA decision making on the relationship of quantified costs and benefits alone."[350]

Still, EPA concluded that the sum of the proposed rule's benefits under Option 1 justified its costs. The agency explained that cost-benefit analysis should not ignore non-monetizable benefits:

> The assessment of benefits must take into account all benefits, including categories such as recreational, commercial and other use benefits, benefits associated with reduced thermal discharges, reduced losses to threatened and endangered species, altered food webs, nutrient cycling effects, and other nonuse benefits. Merely because there is no price tag on those benefits does not mean that they are not valuable.[351]

Thus, although EPA's estimate of the rule's monetized benefits (approximately $18 million per year at a 3 percent discount rate and $16 million per year at a 7 percent discount rate) is smaller than the agency's estimate of its monetized costs (approximately $384 million per year at a 3 percent discount rate and $458 million per year at a 7 percent discount rate),[352] EPA concluded that Option 1 is cost-justified.[353] In the proposed rule and preamble, EPA does not, however, state whether the benefits of Options 2, 3, and 4 that it considered justify the costs.

D. The Rulemaking Process: Changes Made at the Direction of OMB.

Shortly before proposal, EPA submitted a draft of the Proposed Rule to the Office of Information and Regulatory Affairs (OIRA) within the Office of Management and Budget (OMB).[354] Pursuant to Executive Order 12,866, EPA has also released a redlined version of its

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[348] *See* 76 Fed. Reg. at 22,239-40 (Table VIII-2-Baseline I&E Mortality Losses and Reductions for All In-Scope Facilities by Regulatory Option). Expressed in age-one equivalents (A1Es), Option 2 still saves three times as many fish as Option 1 (1982 million vs. 615 million A1Es).

[349] 76 Fed. Reg. at 22,246 (col. 3)-22,247 (col. 1).

[350] 76 Fed. Reg. at 22,247 (col. 2).

[351] 76 Fed. Reg. at 22,211 (col. 3).

[352] 2011 EBA at 12-3, Table 12-2.

[353] 76 Fed. Reg. at 22,206 (col. 3).

[354] *See Documentation of Changes Made During Executive Order 12866 OMB Review – Cooling Water Intakes*

proposed rule, revealing any amendments made to reflect OMB's suggestions and recommendations.[355] The key changes made at the suggestion or recommendation of OMB are as follows.[356]

1. Changes Relating to EPA's National Cost-Benefit Analysis

EPA strongly doubted that a meaningful national cost-benefit analysis is possible, but OMB removed EPA's reservations and expressions of doubt. EPA explained that it did not rely on "a nation-wide comparison of costs and benefits" in proposing a rule because it felt that its efforts to calculate the benefits of the rule were unsatisfactory.[357] Among other problems:

> EPA's calculation of reduced impingement and entrainment benefits of closed-cycle cooling does not account for 97 percent of the direct use A1E [age 1 equivalents[358]] of organisms entrained by cooling water intakes. Moreover, the monetized benefit values do not include the majority of the indirect use and nonuse value of the reductions in I&E mortality, and completely exclude categories such as the non commercial portion of impacts to threatened and

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2040-AE95 NPRM, Document ID: EPA-HQ-OW-2008-0667-1295 (Exh. 84); *see also Document Submitted to Initiate EO 12866 Review - Cooling Water Intakes 2040-AE95 NPRM FRN* [DCN 10-6625A], Document ID: EPA-HQ-OW-2008-0667-1295.1 (first attachment to Document 1295, EPA draft of the Proposed Rule sent to OMB) (Exh. 85).

[355] EPA-HQ-OW-2008-0667-1295 2 with markup showing [DCN 10-6625B], EPA-HQ-OW-2008-0667-1407 [DCN 10-6625B], (Redline-strikeout documenting changes made during EO 12866 review, hereinafter "Redlined Version of Proposed Rule") (Exh. 86).

[356] On May 19, 2011, Riverkeeper submitted a request to OMB under the Freedom of Information Act ("FOIA") asking that OIRA make available for inspection and copying (1) all documents exchanged between OIRA and EPA during the Proposed Rule's interagency review period, and (2) all documents received by OMB from any member of the public regarding the rulemaking. Given the exigencies of the public comment period on the Proposed Rule, which at that time was to close on July 19, 2011, Riverkeeper asked OMB to make all responsive documents available as soon as possible. On May 20, 2011, OMB acknowledged Riverkeeper's request but did not make any documents available. On June 28, 2011, Riverkeeper wrote to OMB again, repeating its document request and again emphasizing that time was of the essence in obtaining documents from OMB because the window to review and use those documents during the public comment would soon close. OMB did not respond to Riverkeeper's second letter. Riverkeeper wrote a third time on July 18, 2011, reiterating its earlier requests and cautioning that unless OMB responded promptly, it would seek a court order compelling OMB to provide all records responsive to Riverkeeper's May 19, 2011 FOIA request. OMB again failed to respond and is therefore in blatant violation of FOIA's mandatory twenty-day response deadline set forth in 5 U.S.C. § 552(a)(6)(A)(i). Consequently, Riverkeeper sued OMB in federal court on July 25, 2011, seeking a court order compelling disclosure of the requested documents. To date, OMB has not responded to the complaint. Accordingly, the commenters reserve all rights with respect to this matter, including the right to submit comments and related documents to EPA after the close of the comment period in light of the failure of the United States to timely comply with the mandatory disclosure requirements under FOIA.

[357] Redlined Version of Proposed Rule at 140-41.

[358] EPA states that "The Equivalent Adult Model (EAM) is a method for converting organisms of different ages (life stages) into an equivalent number of individuals in any single age. For its 316(b) analyses, EPA standardized all I&E mortality losses into equivalent numbers of 1-year-old fish, a value termed age-1 equivalents (A1Es). This conversion allows losses to be compared among species, years, facilities, and regions." 2001 EEBA at 3-2 (internal citation omitted).

> endangered species, the thermal discharge impacts to water quality, and species composition.[359]

EPA thus concluded that, "[u]nder these circumstances, a complete national weighing of costs and benefits is not possible at this time."[360]

However, OMB deleted EPA's concerns and revised the preamble to read ". . . EPA has determined that the benefits of the proposed rule justify its costs. In addition, EPA has explained why consideration of costs and benefits is also appropriate in the site-specific permit setting when establishing entrainment controls."[361] OMB also toned down the language that EPA used to describe the failings of the cost-benefit analysis exercise, removing phrases like "thus, the universe of even ecosystem benefits that [the analysis] can quantify is small."[362]

2. Changes Relating to the Case-by-Case BTA Determination of Entrainment Standards

a. EPA Sought to Require All Facilities to Use the "Best Performing Technology" So Long As its Costs Were Not Wholly Disproportionate to its Benefits.

EPA strongly doubted the value and comprehensiveness of cost-benefit estimates where non-use, non-market values are so important. Therefore, the agency explained that a Director "may" take estimates of social costs and benefits into account when conducting a site-specific BTA analysis, but should keep in mind that these estimates are very uncertain and far from comprehensive.[363] In particular EPA stressed that:

> it is important that the Director recognize that even at [sic] when dealing with only a single site assessment the quantified and monetized estimates of benefits are more uncertain and less comprehensive than the estimates of costs. Important benefit effect categories will very likely not be able to be quantified and monetized . . . . As a result, benefit estimates are likely to underestimate the value that would accrue to society . . . ."[364]

EPA's strong doubts about the validity and meaning of a facility's cost-benefit analysis led the agency to restrict its use, even on a site-specific basis:

> The results of the social cost-benefit analysis should be interpreted in the following way: The Director may not reject an otherwise available technology as

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[359] Redlined Version of Proposed Rule at 141.

[360] Redlined Version of Proposed Rule at 141.

[361] Redlined Version of Proposed Rule at 166; 76 Fed. Reg. at 22,211 (col. 3).

[362] Redlined Version of Proposed Rule at 141.

[363] Redlined Version of Proposed Rule at 343.

[364] Redlined Version of Proposed Rule at 343.

BTA for entrainment mortality requirements unless the social costs of compliance are wholly disproportionate to the social benefits.[365]

EPA called its approach to BTA the "wholly disproportionate" test."[366] Under the "wholly disproportionate" test, a BTA analysis begins with consideration of the best performing and available technology to reduce entrainment or impingement. Only if the Director rejects the best performing technology because its costs were "wholly disproportionate" to the benefits it provided could the Director consider the next most effective technology. And "the test should be applied to the next most costly entrainment technology until the social cost of the proposed entrainment technology no longer violates the wholly disproportionate rule."[367]

b. OMB Directed EPA to Abandon its "Wholly Disproportionate" Test and Let States Reject Any Technology After an Open-Ended, Multi-Factor Evaluation if its Costs "Are Not Justified" by its Benefits.

OMB rejected EPA's "wholly disproportionate" test, thereby fundamentally rewriting the approach that state permit writers must follow in making BTA determinations. OMB also deleted EPA's comment that it has used the wholly disproportionate test to interpret Section 316(b) since the 1970's, and has issued a general counsel opinion supporting its use.[368] Thus, instead of requiring the Director to impose "the best controls whose cost is not wholly disproportionate to their associated benefits,"[369] the proposed rule allows a Director to reject any technology if the costs "are not justified" by the benefits.[370]

EPA's initial draft emphasized performance and environmental protection: the rule text stated that closed-cycle cooling is the best performing technology and should be used unless infeasible or disproportionately costly. Additionally, EPA's "wholly disproportionate rule" ensured that site-specific cost-benefit analyses – analyses that the agency's staff cautioned would be uncertain and imprecise – were relegated to a secondary role of eliminating gross disparities between costs and benefits.

After OMB's revisions, the Director need only require the maximum reductions "warranted" by an open-ended consideration of costs and benefits,[371] and can reject any technology if he determines that its costs "are not justified" by its benefits.[372] Thus, OMB proposes to allow Directors to engage in open-ended consideration of multiple factors so long as the end result is "justified" in the agency's opinion. OMB has significantly altered the case-by-case analysis process, making it far more ambiguous, standardless and discretionary.

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[365] Redlined Version of Proposed Rule at 344.

[366] Redlined Version of Proposed Rule at 344.

[367] Redlined Version of Proposed Rule at 344.

[368] *See* Redlined Version of Proposed Rule at 168-69.

[369] Redlined Version of Proposed Rule at 169; *see also* p. 344, 450.

[370] Proposed 40 C.F.R. § 125.98(e), 72 Fed. Reg. at 22,288 (col. 1).

[371] Proposed 40 C.F.R. § 125.94(c), 76 Fed. Reg. at 22,283 (col. 2).

[372] Proposed 40 C.F.R § 125.98(e), 76 Fed. Reg. at 22,288 (col. 1).

c. EPA Determined that Closed-Cycle Cooling Is the "Best Performing Technology," but OMB Deleted this Conclusion.

EPA's original preamble and rule text stated that "closed-cycle cooling is the best performing technology for reducing entrainment mortality, but it may or may not be the BTA for individual facilities in light of site-specific considerations."[373] Under EPA's original case-by-case analysis as outlined above, because closed-cycle cooling is the best performing technology, a Director would be required to determine whether it is available without considering cost (i.e. "otherwise available") and, if so, the Director would require the use of closed-cycle cooling unless "the social costs of compliance are wholly disproportionate to the social benefits."[374] Thus, EPA intended for closed-cycle cooling to be the default compliance technology nationwide.

However, OMB deleted EPA's conclusion that closed-cycle cooling is the best performing technology,[375] and only left EPA's statement that it had evaluated closed-cycle cooling as a "*candidate* best performing technology."[376]

d. OMB Also Deleted EPA's Statement that Most Facilities Should Install Closed-Cycle Systems.

Having set the "wholly disproportionate" test and selected closed-cycle cooling as the "best performing technology," EPA believed that its case-by-case analysis procedure would lead to the same result as a national closed-cycle cooling standard with variances:

> In theory, EPA believes that site-specific determination of BTA entrainment mortality controls will result in the same reductions – will "minimize adverse environmental impact" – as a one-size-fit-all requirement that included the variances that would be necessary to address the site-specific limitations on installation of closed-cycle.[377]

OMB, once again, deleted this statement. OMB also deleted EPA's suggestion that many facilities would move to closed-cycle cooling:

> In EPA's view, entrainment mortality controls are appropriate in virtually all circumstances. The proposed decision not to establish uniform national entrainment controls was not a decision that no controls are required. The rejection of one-size-fits all does not mean that no-size-fits-all. Rather, the best way to determine entrainment controls is on a site-by-site basis. . . . Thus, EPA expects that, under the proposed approach, *there will be entrainment controls for*

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[373] Redlined Version of Proposed Rule at 428, proposed 40 C.F.R. § 125.94(c).

[374] Redlined Version of Proposed Rule at 344.

[375] Redlined Version of Proposed Rule at 428, proposed 40 C.F.R. § 125.94(c).

[376] 76 Fed. Reg. at 22,203 (col. 3) (emphasis added).

[377] Redlined Version of Proposed Rule at 138.

most facilities and . . . Directors will require many facilities to install closed-cycle cooling to address entrainment.[378]

e. Although OMB Put Cost-Benefit Analysis at the Heart of the Decision Making Process, it Deleted EPA's Guidance on How to Perform Cost-Benefit Analysis.

After deleting EPA's statements about the very significant uncertainties involved in the cost-benefit analysis process, OMB made a highly ambiguous form of cost-benefit analysis the linchpin of the rule. OMB would require monetized cost-benefit analyses wherever possible.[379] But, at the same time, OMB deleted and weakened EPA's guidance statements about how cost-benefit analyses should be performed and reviewed.

For example, the rule calls for cost-benefit analyses that focus on the social costs of reducing impingement and entrainment, not the compliance costs to facilities. OMB deleted EPA's explanation of the difference between social and facility costs of installation downtime and energy penalties, and how these costs should be calculated to avoid overestimating the social costs.[380]

OMB also removed EPA's guidance on discount rates. EPA had called for facilities to use a "social discount rate . . . reflecting society's rate of time preference as opposed to a facility's cost of capital," and suggested 3%, as per existing OMB guidance.[381] OMB replaced this instruction with a general reference to "an appropriate discount rate."[382]

Finally, in the peer review process for the entrainment-related studies, EPA planned to require states to provide an explanation "for any reviewer comments not accepted."[383] OMB changed this, only requiring explanation for "significant" comments that are not accepted.[384]

3. Changes Relating to Definition of New Units

a. OMB Determined that Replacements/Repowerings Are Not New Units and Deleted EPA's Contrary Statements and Rationale.

EPA intended to treat replacements and repowerings as new units, but OMB excluded replacements and repowerings from the definition of new units.[385] Originally, EPA wrote that

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[378] Redlined Version of Proposed Rule at 159-160 (emphasis added).

[379] *See* Redlined Version of Proposed Rule at 310 (OMB suggests that the benefits valuation study should include monetization "to the extent appropriate.").

[380] *See* Redlined Version of Proposed Rule at 338-339.

[381] *See* Redlined Version of Proposed Rule at 340.

[382] *See* Redlined Version of Proposed Rule at 340, 76 Fed. Reg. 22,261 (col. 2).

[383] Redlined Version of Proposed Rule at 401, 406, 408.

[384] *See* proposed 40 C.F.R. §§ 122.21(r)(9),(10),(12), 76 Fed. Reg. at 22,277-79.

[385] *See* Redlined Version of Proposed Rule at 92, 423 (revising 40 C.F.R. 125.92(r) and deleting 125.92(t), which defined repowering).

> a replacement unit or repowered unit, as distinct from constructing an additional unit, would also be treated differently than existing units. Repowering, in contrast to simply constructing a new unit, is rebuilding and replacing the major components of an existing power plant. Repowering is done to improve efficiency, increase or optimize capacity, or minimize operating costs of the existing unit. For example, an electric generating facility may replace boilers, retrofit improved condenser designs, and utilize combined cycle or cogeneration in the repowered unit. The requirements for new units are modeled after the requirements for a new facility in the Phase I rule.
>
> EPA has adopted this approach for the following reasons. Almost two-thirds of the coal fired units are at least 30 years of age, and more than 30 percent of coal units are at least 50 years of age. As these units are retired and replaced based on individual facility circumstances, facilities have the ideal opportunity to design and construct the new units without many of the additional expenses associated with retrofitting an existing unit to closed-cycle. Thus, for example, the timing of retirement and replacement is within the control of the facility and would be dictated strictly by the facility's internal requirements rather than linked to specific regulatory compliance deadlines. Further, the incremental downtime that may be associated with installing closed-cycle cooling may be avoided or minimized. In addition, the condensers can be configured for closed-cycle, reducing energy requirements, and high efficiency cooling towers can be designed as part of the unit replacement, allowing for installation of smaller cooling towers. These advantages may not always be available when retrofitting cooling towers at an existing unit. In consideration of the fact that these repowering, replacement, and additional unit construction decisions rest largely within the control of the individual facility, EPA decided that subjecting these operations to the same national BTA requirements as those applicable to new facilities is warranted.[386]

OMB also deleted EPA's extensive and reasoned explanation of why replacements and repowerings should be considered new units, and why a retrofit to closed-cycle cooling is available for all replacements and repowerings.[387] EPA's summary was trenchant:

> In summary, EPA proposes that, because repowering, replacement, and additional unit installation decisions can be accomplished feasibly and with lower costs than retrofitting an entire existing facility, it is appropriate to require the same entrainment mortality controls at new units as are applicable to new facilities per the Phase I rule. New units are similar to new facilities, regardless of whether that unit is a green field construction, an additional unit, a replacement unit, or a repowered unit. Further, EPA considered that new units would be similar to new facilities in terms of the useful expected plant life and therefore found in general this would mean that closed-cycle cooling would reduce entrainment mortality for

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[386] Redlined Version of Proposed Rule at 92-93.

[387] *See* Redlined Version of Proposed Rule at 143-148.

a longer time than for existing facilities as a whole. Finally, since new units are more likely to be located in areas in attainment for national ambient air quality standards, EPA finds that air permit issues are also minimized for new units. Thus, EPA's analysis shows closed-cycle cooling would be available to such facilities for the reasons described above and are economically achievable (see Section VII).

In developing this proposed rule, EPA considered whether such requirements for new units would serve as a disincentive to replace older units and determined that this would not be the case given closed-cycle cooling's comparable cost relative to once through cooling and its small cost as a percentage of overall costs at the new unit. The capital costs of closed-cycle cooling are comparable to the capital costs of once through cooling with only a modest increase in O&M expenses of the cooling water system. Furthermore, the costs usually comprise less than 1 percent of the total costs of a new unit. Recent experience indicates that the Phase I requirements are not a disincentive for new facility construction, as demonstrated by numerous instances where recently constructed facilities are using closed-cycle; see 66 FR 28856; also see 66 FR 28865.

Further, EPA's analysis shows the generating units projected to close are most likely to do so because they are older, unreliable, less efficient, and therefore generally unprofitable. See Section VII for more information. In some instances, insufficient water exists to continue to operate a facility with once-through cooling, or thermal discharge limitations preclude operation of once-through cooling; these facilities have employed cooling towers, partial towers, and helper towers resulting in an increased reliability.[388]

4. Changes Relating to Regulatory Options

a. OMB Revised the Discussion of Options 2 and 3, and Added a New Option 4.

OMB added Option 4 to the rule.[389] OMB also rewrote EPA's analysis of Options 1, 2, and 3 to play up the benefits of Option 1 and delete any favorable comments about Options 2 and 3. Accordingly, OMB deleted EPA's statement that Option 3 is three times more effective than Option 1:

> A comparison of the baseline and Option 1 adverse environmental impacts as expressed in age-1 equivalents shows that Option 1 reduces AEI by 31 percent. A similar comparison of the baseline to Option 3 shows that Option 3 reduces AEI by 92 percent."[390]

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[388] Redlined Version of Proposed Rule at 147-148.

[389] *See* Redlined Version of Proposed Rule at 125 (removing references to three options and replacing with references to four options), *see also* Redlined Version p. 148-50 (adding a two page description of Option 4 to the preamble).

[390] Redlined Version of Proposed Rule at 163.

And in discussing EPA's cost estimates for Option 2, EPA noted that its decision to allow Directors discretion to give facilities several extra years to come into compliance with the rule may actually reduce compliance costs. OMB deleted this observation as well.[391]

Most importantly, EPA concluded that none of the options it evaluated would have significant effects on national generating capacity. OMB highlighted the fact that Option 1 would have insignificant effects but deleted EPA's very similar conclusion about Options 2 and 3. With respect to Option 1, OMB summarized EPA's electricity market impact analysis by stating that "the early retirements among in-scope facilities under the proposed regulatory option have little impact at the level of national and regional electricity markets."[392] But with respect to Option 2, OMB deleted EPA's conclusion that although more generating units would close, "a large share of the estimated closures occur in generating units that have very low capacity utilization in the baseline" and only "3 percent of closure capacity occurs in generating units that otherwise appear to be reasonable economic contributors to electric power generation."[393]

Finally, OMB directed the addition of a summary of economic impacts which states: "EPA has considered the totality of these measures of economic impacts in concluding that there are no significant economic impacts associated with Option 1 (the preferred option) or Option 4, while there are considerably greater economic impacts associated with Options 2 and 3."[394]

5. Changes to Other Provisions of the Rule

a. OMB Asked for Comment on the Possibility of Weaker Compliance Timelines.

EPA set a firm eight year deadline for impingement compliance, even at facilities where the Director recognized that a plan to install closed-cycle cooling for entrainment compliance would extend beyond the eight year window. EPA recognized that keeping to a firm window might require some facilities to install impingement controls that become redundant when the closed-cycle cooling retrofit comes online, but EPA stated firmly that it "does not intend for the facility to do nothing to reduce [impingement] until the technologies for [entrainment] have been implemented."[395] OMB inserted a specific request for comments on this firm deadline.

b. OMB Removed Firm Monitoring Requirements and Replaced Them with Suggestions.

In the draft sent to OMB, EPA set firm impingement monitoring requirements that included weekly monitoring during peak periods of impingement and bi-weekly monitoring at other times. OMB changed this, writing that monitoring frequencies would be specified on a

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[391] *See* Redlined Version of Proposed Rule at 134-35.

[392] Redlined Version of Proposed Rule at 240.

[393] Redlined Version of Proposed Rule at 242.

[394] Redlined Version of Proposed Rule at. 253.

[395] Redlined Version of Proposed Rule at 291.

case-by-case basis by the Director, but that EPA "assumes" that the weekly/bi-weekly schedule would be common.[396] Similarly, EPA required facilities to stratify collections so that they cover the entire daily cycle (and tidal cycles where appropriate). Again, OMB changed this from a hard requirement to an assumption.[397] OMB then added a request for comment "on whether EPA should specific [sic] minimum sampling frequencies or leave this determination to the Director."[398]

c. OMB Removed Extra Protection for Species of Concern.

EPA had originally required facility operators who reduce intake velocity to 0.5 feet/second or less to document that this measure adequately protected species of concern. OMB removed this requirement.[399]

d. OMB Altered the Nuclear Safety Exception.

EPA created an exception to the entrainment mortality requirements for nuclear facilities if compliance "would result in a conflict with a safety requirement established by the [Nuclear Regulatory] Commission."[400] However, OMB deleted EPA's clarifying statement that the exception was narrow and that "[t]echnical infeasibility, and not cost, is the only consideration in evaluation of a potential conflict with Commission safety requirements."[401] OMB also broadened the exception such that it applies to the determination of BTA requirements generally, not just entrainment mortality.[402]

e. OMB Created a New Exception for New Units at Existing Facilities with Costs "Wholly out of Proportion" to the Costs Considered by EPA.

OMB added the "compliance costs wholly out of proportion" exemption to the rule's entrainment requirements at § 125.94(d)(4).[403] EPA originally exempted only facilities that could show that installing closed-cycle cooling would result in significant adverse impacts on local air quality.[404]

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[396] *See* Redlined Version of Proposed Rule at 318, *see also* redlined version p. 442 (revisions to 40 C.F.R. §§ 125.96(b),(c)).

[397] Redlined Version of Proposed Rule at 320.

[398] Redlined Version of Proposed Rule at 322.

[399] *See* Redlined Version of Proposed Rule at 397.

[400] Redlined Version of Proposed Rule at 431, proposed 40 C.F.R. § 125.94(e), 72 Fed. Reg. at 22,284 (col. 1).

[401] Redlined Version of Proposed Rule at 431.

[402] *Id.*

[403] Redlined Version of Proposed Rule at 56.

[404] *See* Redlined Version of Proposed Rule at 430.

f. OMB Would Allow Facilities to Prove that, at Their Site, Entrainment Mortality Is Less Than 100 Percent.

OMB added a sentence to the preamble stating that the Proposed Rule allows facilities to demonstrate that entrainment mortality is less than 100 percent at their site.[405]

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OMB thus took a weak and illegal rule and made it much weaker, more arbitrary and capricious, and much further from being compliant with the law.

[405] *See* Redlined Version of Proposed Rule at 62.

III.

THE PROPOSED RULE FALLS WELL SHORT OF THE CLEAN WATER ACT'S STATUTORY MANDATE, IS ARBITRARY, CAPRICIOUS, AN ABUSE OF DISCRETION, AND OTHERWISE NOT IN ACCORDANCE WITH LAW, IS SIGNIFICANTLY WEAKER THAN EPA'S PRIOR 316(b) RULES, AND WILL NOT PROTECT AQUATIC RESOURCES UNLESS IT IS SIGNIFICANTLY STRENGTHENED

In introducing the Proposed Rule's BTA determination, EPA stated that it "has decided not to re-propose requirements similar to those of the final Phase II rule, but would adopt, for the reasons explained in [the] preamble, *a new framework*."[406] Unfortunately, that "new" framework, while it differs from the Phase II rule in certain respects, is not new at all; instead, it largely codifies existing practice and thereby perpetuates the highly unfortunate vacuum of federal leadership on this issue that has persisted for four decades since Congress first directed EPA to take action. For the reasons explained below, the Proposed Rule is both illegal and poor policy, worse in many ways than the Phase II framework (which was itself impermissibly weak, but at least purported to establish national categorical standards), and will continue the longstanding bureaucratic paralysis that has left impingement and entrainment as one of the last remaining unaddressed problems that the 1972 CWA was designed to correct.[407]

A. EPA's Interpretation of Section 316(b) and its "Approach to BTA" Contradicts the Plain Meaning of the Act and Congress's Clearly Expressed Intent.

Section IV.A. of the Preamble is entitled "EPA's Approach to BTA" and sets forth EPA's interpretation of Section 316(b) and the court decisions that interpreted and applied that provision.[408] EPA's interpretation is, however, deeply flawed and plainly contradicts the statute in several important respects; many of the Proposed Rule's fundamental flaws spring directly from the Agency's misunderstanding of its own authority.

1. When Making BTA Determinations Under Section 316(b) and Setting Parameters for Permit Writers to Do So, EPA Does Not Have Authority to Eschew Congress's Fundamental Intent for the CWA's Technology-Based Regulatory Program.

EPA takes the mistaken view that the integration of Section 316(b) with sections 301 and 306 is no more than an invitation from Congress to look to the factors considered in those other sections when establishing standards for Section 316(b), leaving the agency free to ignore any and all of the Congressional mandates on which the CWA's technology-based program rests.

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[406] 76 Fed. Reg. at 22,196 (col. 2) (emphasis added).

[407] EPA states that "[f]ollowing promulgation of the 2004 Phase II rule," the agency "became aware of certain elements of the 2004 rule that were particularly challenging or time-consuming to implement." 76 Fed. Reg. 22, 185 (col. 2). Unfortunately, the Proposed Rule does not improve upon the Phase II framework, but instead moves in the opposite direction, perpetuating the case-by-case approach, which will be impossible to implement.

[408] 76 Fed. Reg. at 22,196 (col. 2)–22,197 (col. 2).

For example, referring to the Second Circuit's decisions in *Riverkeeper I* and *Riverkeeper II*, EPA states: "courts have held that, given Section 316(b)'s reference to sections 301 and 306 of the Act, EPA may look to the factors considered in those sections in establishing those standards for Section 316(b) standard setting."[409] And referring to the *Entergy* decision, EPA states that "[t]he Supreme Court noted that, given the absence of any factors language in Section 316(b), EPA has more discretion in its standard setting under Section 316(b) than under the effluent guidelines provisions."[410] In fact, while EPA may look to the factors set forth in sections 301 and 306 (and, by extension, section 304) in formulating the substantive content of BTA regulations, EPA is not free to disregard the fundamental regulatory principles inherent in the basic fabric which underlies all of the BAT, BPT, BCT, and BADT standards promulgated pursuant to those sections. Put slightly differently, while BTA requirements may impose a different substantive standard than the effluent limitations – indeed, *each* type of effluent limitation embodies a different substantive standard – BTA regulations must follow the same basic regulatory approach as Congress required for technology-based standards as a whole.[411]

This conclusion is made inescapably clear in the court decisions to which EPA refers, namely *Riverkeeper I* and *Riverkeeper II*, which, while finding that EPA need not follow certain directives that are particular to one or another of the effluent limitations (such as section 306's prohibition against variances), nevertheless held that BTA standards must adhere to Congress's intent for the entire technology-based program. For example, in *Riverkeeper I* the court began by explaining that "review [of] the entire statutory scheme … [and] its development assists in interpreting the narrow statutory provision [i.e., Section 316(b)] before us."[412] Similarly, in *Riverkeeper II*, the court began by noting that its "interpretation of Section 316(b) is informed by the two provisions it cross-references, CWA sections 301 and 306."[413]

The Second Circuit in both of those cases went on to remand the restoration measures provisions in Phase I and Phase II rules, in part, because "Congress rejected a regulatory approach that relies on water quality standards, [such as] … focusing on fish populations and consequential environmental harm,"[414] and restoration measures "are inconsistent with Congress's intent that the 'design' of intake structures be regulated directly, based on the best technology available, and without resort in the first instance to water quality measurements"[415] because they "resemble the pre-1972 approach to water pollution, which regulated point sources based on their effect on the surrounding water and allowed sources to discharge pollutants provided the discharge did not cause water quality to dip below an acceptable level."[416] In *Riverkeeper II* the court also relied on the CWA's "technology-forcing principle" in its rejection

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[409] 76 Fed. Reg. at 22,196 (col. 3).

[410] 76 Fed. Reg. at 22,196 (col. 3).

[411] That regulatory approach is discussed above in Sections I.B.2 and I.B.3 of these comments.

[412] *Riverkeeper* I, 358 F.3d at 184. EPA itself has stated that "CWA § 316(b), like other provisions of the statute, should be construed with Congress' ambitious overarching statutory purposes in mind." EPA, *Clean Water Act NPDES Permitting Determinations for Thermal Discharge and Cooling Water Intake from Brayton Point Station in Somerset, MA*, NPDES Permit No. MA 0003654, at 7-2 (July 22, 2002) (Exh. 87).

[413] *Riverkeeper II*, 475 F.3d at 91.

[414] *Riverkeeper I,* 358 F.3d 196.

[415] *Riverkeeper I*, 358 F.3d at 190; *see also Riverkeeper II*, 475 F.3d at 108-09.

[416] *Riverkeeper I*, 358 F.3d at 189, citing *CPC Int'l, Inc. v. Train*, 515 F.2d 1032, 1034-35 (8th Cir. 1975).

of the Phase II restoration measures provision.[417] And that decision also remanded one of EPA's site-specific compliance options because, as the court explained, "Congress changed its approach in 1972, [and] … [t]he Act now regulates discharges from point sources rather than water quality."[418]

Nothing in the Supreme Court's *Entergy* decision affected those holdings, as that court merely considered whether Congress had prohibited cost-benefit analysis for BTA, despite requiring it for BPT.[419] Thus, that decision, which explicitly left undisturbed all of the Second Circuit's other holdings,[420] concerned the differences between the various technology-based standards rather than the regulatory approach common to all of them.

The fundamental precepts that apply to BTA requirements as well as all of the effluent limitations reflect the shift in regulatory approach embodied in the 1972 CWA amendments, including but not limited to (i) Congress's direction to EPA to establish uniform, national, categorical, technology-based and technology-forcing regulations, (ii) Congress's intent to avoid lengthy indeterminate studies in the context of permitting, (iii) the focus on readily applied, readily monitored and readily enforced "end-of-pipe" restrictions, and (iv) the assessment of consequential water quality effects only as a secondary task and only to make the requirements stricter than is dictated by technology considerations. As discussed herein, EPA has ignored all of those dictates in fashioning its current "approach to BTA" and "new framework."

2. EPA's Interpretation of the Statutory Term "Available" Is Unlawful.

In one instance of this derogation of Congress's intent and the plain language of the statute, EPA has applied an unlawful interpretation of the term "available" in Section 316(b). Specifically, EPA proposes to rule out several candidate "best performing technologies" because they cannot be implemented at every regulated facility in the United States. Thus, EPA rejected closed-cycle cooling as BTA and avoided setting a nationally uniform entrainment standard because it could not identify "a single technology that represented BTA for all facilities."[421] Likewise, EPA rejected a velocity limit of 0.5 feet/second as the basis for a national impingement standard "because it is not available at all facilities."[422]

However, it is impermissible for EPA to reject any technology "because it is not available at all facilities."[423] The language, structure, and legislative history of the Clean Water Act indicate that Congress did not intend for EPA to consider whether a candidate technology is capable of being implemented universally when setting technology-based standards.

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[417] *Riverkeeper II*, 475 F.3d at 110.

[418] *Riverkeeper II*, 475 F.3d at 114-15.

[419] *Entergy Corp. v. Riverkeeper, Inc.*, 129 S. Ct. 1498, 1510 (2009).

[420] *Id.* ("We of course express no view on the remaining bases for the Second Circuit's remand which did not depend on the permissibility of cost-benefit analysis").

[421] 76 Fed. Reg. at 22,197 (col. 2).

[422] 76 Fed. Reg. at 22,203 (col. 1).

[423] 76 Fed. Reg. at 22,203 (col. 1).

3. EPA's Understanding of its Cost-Benefit Authority is Incorrect.

As discussed above, the Clean Water Act also restricts (albeit does not deny entirely) the authority of EPA and delegated states to rely on cost-benefit considerations in establishing BTA standards under Section 316(b). Moreover, cost-benefit analysis is, at best, optional under Section 316(b). Indeed, EPA has not always employed cost-benefit analysis when regulating cooling water intake structures. The Phase I rule, the Phase III rule for oil rigs, and the "new units" provisions in the Proposed Rule each set Section 316(b) standards primarily based on technological and cost considerations, but not a strict cost-benefit approach, and none of them authorize permit writers to undertake cost-benefit analyses on a site-specific basis.[424] In *ConocoPhillips*, the Fifth Circuit upheld EPA's decision not to perform a cost-benefit analysis for the Phase III rule.[425] Because cost-benefit analysis is optional, and, in the circumstances presented here, frustrates, rather than promotes the intent of the statute, we urge EPA not to rely on cost-benefit considerations for this rule, and even more importantly, not to authorize permit writers to consider cost-benefit considerations on a site-specific basis.

Nevertheless, to the extent EPA chooses to engage in cost-benefit analysis for the final rule, as it did in developing the proposal, the agency's understanding of its authority in this regard is also mistaken. In explaining its approach to BTA, EPA states that:

> because the Supreme Court has concluded that EPA may permissibly consider costs and benefits in its BTA determination and E.O. 13563 directs EPA only to propose regulations based on a reasoned determination that the benefits justify the costs, EPA has taken costs and benefits into account in this proposal. EPA has concluded that the benefits of the proposed option justify its costs.[426]

That blithe statement, however, completely ignores the limitations that the CWA imposes, as Justice Breyer explained in *Entergy* and EPA has previously recognized. In particular, the statute restricts EPA's investigation of, and reliance upon, cost-benefit analysis in choosing a regulatory option, establishing nationwide performance standards and procedures for them to be applied in permits. Justice Breyer explained that EPA is required to "describe environmental benefits in non-monetized terms," "avoid lengthy formal cost-benefit proceedings and futile attempts at comprehensive monetization," and "take account of Congress' technology-forcing objectives," while merely using cost-benefit analysis to "prevent results that are absurd or unreasonable in light of extreme

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[424] *See e.g.,* 66 Fed. Reg. at 65,312 (cols. 2-3) (In responding to comment on why the agency did not rely on cost-benefit considerations for the Phase I rule, EPA stated that "it is neither required nor prudent for EPA to develop empirical estimates of benefits where data limitations or other critical constraints preclude doing so in a credible and reliable manner"); *ConocoPhillips Co. v. EPA,* 612 F.3d 822, 829 (5th Cir. 2010) ("For new Phase III facilities, the EPA concluded that it was impossible to compare the costs incurred by individual facilities to the benefits of those facilities because those facilities have not yet been built. Instead, the EPA calculated the expected costs of compliance under the national uniform standards and determined whether those costs would result in a barrier to entry for new operations and whether those costs could be reasonably borne by the industry.") (internal footnotes omitted); *see also* 71 Fed. Reg. at 35,025-29, 35,034; proposed 40 C.F.R. § 125.94(d); 76 Fed. Reg. at 22,283 (cols. 2-3).

[425] *See ConocoPhillips Co. v. EPA*, 612 F.3d at 842.

[426] 76 Fed. Reg. at 22,196 (col. 3).

disparities between costs and benefits."[427] This can be done through EPA's traditional wholly disproportionate test, so long as the analysis is a "limited" and "relatively subsidiary task" rather than a "primary" or "paramount" factor, in light of the "difficulty of quantifying all the benefits of minimizing the adverse impacts of cooling water intake structures" (to use the agency's own words), and so long as permit writers do not conduct a second cost-benefit analysis of any kind – whether the wholly disproportionate test or otherwise – in implementing the standards that EPA establishes.

For a much fuller description of the numerous fatal flaws in EPA's cost-benefit analysis please see Section III.F., below, and Appendix A.

B. EPA Should and Must Establish a National Categorical Entrainment Standard Based on Closed-Cycle Cooling.

EPA should completely jettison the case-by-case site-specific approach to setting entrainment standards and instead establish a national categorical entrainment standard based on closed-cycle cooling. EPA considered two such options: Option 3 which applies closed-cycle cooling to all facilities subject to the rule, and Option 2 which has a 125 MGD actual intake flow threshold. Because Option 3 is superior in all respects, and will protect aquatic resources with minimal difficulty, EPA should select that option for the final rule in place of the proposed option, Option 1.

1. Option 1's Entrainment Provisions Represent a Complete Abdication of EPA's Responsibility to Minimize Adverse Environmental Impact.

Despite the widespread availability of closed-cycle cooling, EPA plans to require states to set entrainment controls on a case-by-case basis. This violates a clear Congressional directive to adopt effective, national, and uniform standards. Further, it is arbitrary and capricious of EPA to claim that it will fulfill its statutory duty to minimize the adverse environmental impact of cooling water intakes by delegating BTA decisions to the states. Forty years of experience shows that states cannot make these permitting choices, and the states have told EPA as much. EPA's Proposed Rule will therefore continue a woefully inadequate permitting process that has, for decades, allowed power plants to operate across the country pursuant to long-expired or impermissibly weak permits.

Not only does the Proposed Rule unlawfully and arbitrarily create a case-by-case standard-setting regime, the particular case-by-case regime that EPA has designed is particularly egregious in its legal infirmity. It leaves state permitting authorities unfettered discretion in setting standards, effectively allowing industry to self-regulate by proposing controls that overburdened state regulators lack the oversight capacity to meaningfully review.

[427] *Entergy*, 129 S. Ct. at 1515; see also *Entergy Corp. v. Riverkeeper, Inc.*, 129 S. Ct. 1498, Transcript of Oral Argument (Dec. 2, 2008) (Exh. 88).

a. EPA's Failure to Set Uniform National Standards for Entrainment Violates the Plain Language of Section 316(b) and Congress's Clearly-Expressed Intent.

As explained above, the Clean Water Act requires EPA to adopt uniform, national, categorical, technology-based and technology-forcing BTA standards for cooling water intake structures. Beyond the explicit directive to establish "standards" in the text of Section 316(b), the fact that Section 316(b) standards are promulgated under CWA sections 301 and 306 also indicates that, like the Act's other technology-based standards, Section 316(b) standards must be implemented on a nationwide, uniform basis.

Further, national technology-based standards are consonant with several significant Congressional objectives that underpin the Clean Water Act: standardizing permitting procedures; limiting and revising the water-quality based approach to pollution control that rendered effective regulation impossible from 1948 to 1972; setting a federal floor for environmental protection in order to avoid a "race to the bottom" by state regulators; and promoting the Congressional interest in "horizontal equity," *i.e.*, that similar facilities be treated similarly under the CWA insofar as possible. Congress made it abundantly clear that, to meet these objectives, EPA must set uniform, national, technology-based standards to minimize the adverse environmental impact of cooling water intake structures.

The record shows that EPA can and should establish a uniform national standard based on the use of closed-cycle cooling technology: EPA determined that closed-cycle cooling is a best performing technology[428] and that numerous existing facilities had retrofitted to closed-cycle.[429] EPA is concerned that "closed-cycle cooling is not practically feasible in a number of circumstances" that "are not isolated or insignificant."[430] But it is unlawful for the agency to decide on this basis "that it should not establish closed-cycle cooling as the presumptive BTA entrainment control."[431] As noted above, Congress gave EPA the ability to subcategorize the regulated industry and/or to offer variances precisely to address such concerns.[432] And properly crafted variance provisions have been upheld under Section 316(b) before.[433]

It is feasible to set uniform national standards because closed-cycle cooling and other technologies are available to the industry as a whole and EPA has the ability to issue variances in the rare case where it is technically infeasible. And, as outlined above, a case-by-case approach directly contradicts Congress' general intent to end site-specific permitting under the Clean Water Act, and it contradicts Congress' specific intent to require uniform standards under Section 316(b).

Setting a uniform standard with a variance is also consistent with Congress's most

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[428] *See* 76 Fed. Reg. at 22,203 (col. 3).

[429] *See* 76 Fed. Reg. at 22,204 (col. 1).

[430] 76 Fed. Reg. at 22,207 (col. 1).

[431] *Id.*

[432] *See* 33 U.S.C. § 1311(n) (fundamentally different factors variance).

[433] *See Riverkeeper I*, 358 F.3d at 193-94.

fundamental objective in passing the Clean Water Act: "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."[434] A uniform standard provides a strong baseline of environmental protection and helps maintain water quality by placing the burden of proof for any downward variance upon the polluter.

If EPA is concerned about setting a categorical standard for the more than 1,200 facilities with cooling water intake structures affected by this rule, it must nevertheless undertake a thorough effort to craft national standards by looking at various thresholds and options for subcategorizing. EPA cannot aggregate all industries using intake structures and then default to a case-by-case regulatory approach, merely because it cannot find one technology that it believes all 1,200 facilities can install.

b. EPA Is Unlawfully Requiring State Permit Writers to Set Entrainment Controls Based In Large Part on Water Quality Considerations Rather than Technological Considerations.

Under EPA's Proposed Rule, before a state may set entrainment controls at a particular site, the state permitting Director must consider the entrainment impacts on the waterbody, the ecological costs and benefits of the BTA candidate technologies (including to any threatened or endangered species), and the thermal discharge impacts of the candidate BTA technologies.[435] Additionally, to determine the environmental impacts of entrainment on the waterbody, the state permitting authority must also review "source water physical data" and "source water baseline biological characterization data."[436] Only once the state has adequately evaluated these water-quality based concerns may it make a BTA determination. To the extent that this requires, or merely allows, states to analyze the consequential impact of its decision on the quality of the affected waters in the first instance, it is illegal because it is diametrically opposed to the approach to BTA envisioned by Congress and required under the Clean Water Act. As noted above, "Congress [intended] that the 'design' of intake structures be regulated directly, based on the best technology available, and without resort in the first instance to water quality measurements."[437] It deliberately established the NPDES program to relieve permitting agencies of the need to conduct costly, lengthy, and indeterminate ecological studies to issue permits. Improving water quality is, of course, the goal of the Clean Water Act and its implementing regulations, but charactering on a site-specific basis the full extent of consequential damage caused to the waterbody by each intake structure's fish kills is not a prerequisite to the imposition of technological controls.

The principled use of technology-based standards and rejection of the pre-existing water-quality based analyses applies equally in the Section 316(b) context as it does to effluent

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[434] 33 U.S.C. § 1251(a).

[435] *See* proposed 40 C.F.R. § 125.98(e), 76 Fed. Reg. at 22,288 (col. 1).

[436] *See* proposed 40 C.F.R. § 125.98(e), 76 Fed. Reg. at 22,288 (col. 1) ("The Director must establish case-by-case BTA standards for entrainment mortality for any facility subject to such requirements after reviewing the information submitted under 40 CFR 122.21(r)"); *see also* proposed 40 C.F.R. §§ 122.21(r)(2), (r)(4), 76 Fed. Reg. at 22,276 (col. 1-2) (requiring facilities to submit source water physical data and source water biological characterization data).

[437] *Riverkeeper I,* 358 F.3d at 190.

limitations. The Second Circuit explained in *Riverkeeper I* and again in *Riverkeeper II* that "Congress rejected a regulatory approach that relies on water quality standards, [such as] … focusing on fish populations and consequential environmental harm."[438] Congress retained water quality standards in the Clean Water Act only as a supplementary mechanism that can be used to set limitations stricter, but not more lenient, than technology-based limitations.[439] EPA is permitted to give consideration to the environmental benefits of its regulations at the national level.[440] But Congress forbade EPA from using site-specific water quality considerations as the basis for case-by-case standard setting or as the basis to weaken requirements that are based on technology considerations; yet that is precisely what EPA demands of state permitting authorities today.

The Clean Water Act directs EPA to set categorical standards on the basis of the best technology available to minimize adverse environmental impact without respect to water quality (except that water quality can be considered where necessary to make the requirements stricter). And as the next section points out, it is precisely EPA's failure to set such categorical standards under Section 316(b) that, since the 1970's, has paralyzed state decision making. For EPA to abdicate its responsibility to set national technology-based standards and instead order states to set water quality-based standards not only violates the law but marks a return to the pre-1972 regulatory approach that Congress sought to eliminate.

c. EPA's Decision to Require State Permit Writers to Set Entrainment Controls on a Case-by-Case Basis Is Arbitrary and Capricious and Will Perpetuate Bureaucratic Paralysis.

EPA knows full well that the states will not meet the case-by-case decision making and cost-benefit analysis obligations that this Proposed Rule imposes. EPA thus abuses its discretion by claiming that this empty delegation of responsibility – which simply continues the current, failed site-specific permitting system – is adequate to meet the agency's obligation to set BTA standards that minimize adverse environmental impact. EPA's rule will not minimize adverse environmental impacts, and it will do little or nothing to change the status quo.

(1) States Cannot Complete Case-By-Case BTA Determinations.

EPA's conclusions that (1) requiring state permitting authorities to set entrainment controls on a site-specific basis "represents the best technology available for minimizing the adverse environmental impacts associated with intake structures"[441] and that (2) "[s]ite specific proceedings are the appropriate forum for weighing all relevant considerations in establishing

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[438] *Riverkeeper I*, 358 F.3d at 196; *see Riverkeeper II*, 475 F.3d at 114 ("[I]n enacting the CWA, Congress rejected regulation by reference to water quality standards.").

[439] *EPA v. California,* 426 U.S. at 205 n. 12; *Riverkeeper*, 358 F.3d at 185 n. 10, 190; *Weyerhaeuser*, 590 F.2d at 1043.

[440] *Entergy*, 129 S.Ct. at 1505-1506 (in setting uniform, national standards under Section 316(b), EPA may consider the benefits that derive from a "reduction in adverse environmental impacts" and the costs of achieving that reduction).

[441] 76 Fed. Reg. at 22,210 (col. 2).

BTA entrainment mortality controls"[442] are arbitrary, capricious, and an abuse of the agency's discretion under the Clean Water Act. The Proposed Rule would require plant operators to submit, and permit writers to evaluate, at least the following studies:

- Source Water Physical Data;
- Cooling Water Intake Structure Data;
- Source Water Baseline Biological Characterization Data;
- Cooling Water System Data;
- Proposed Impingement Mortality Reduction Plan;
- Performance Studies;
- Operational Status;
- Entrainment Characterization Study;
- Comprehensive Technical Feasibility and Cost Evaluation Study;
- Benefits Valuation Study; and
- Non-Water Quality Impacts Assessment[443]

However, experience shows that state permitting authorities cannot meaningfully review studies of this sort and cannot make site specific BTA determinations at all, much less in the timely manner required under the Clean Water Act.

Since 1972, site-specific proceedings have resulted in uneven and conflicting rulings, the widespread use of inferior technology, as well as enormous, unnecessary aquatic mortality, all of which run contrary to the goals of the Clean Water Act and the direct mandate of Section 316(b). On December 13, 1976, EPA issued its first cooling water intake regulation to implement Section 316(b). Industry filed suit and, without reviewing its merits, the Fourth Circuit remanded the regulation because of procedural defects.[444] EPA subsequently withdrew the regulation, and for more than two decades failed to propose or adopt any new cooling water intake regulations.

In the absence of national regulations, cooling water intake standards have been relegated to *ad hoc* determinations by individual permit writers, typically state agencies, exercising "best professional judgment."[445] EPA's own assessment is that these case-by-case, site-specific Section 316(b) proceedings, which involve a complex assessment of the local marine ecosystem and fishery population dynamics to determine best technology available, impose a significant burden on permitting agencies:

> The historical case-by-case approach requires significant resources on the part of the regulatory authorities that must implement Section 316(b) requirements. …

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[442] 76 Fed. Reg. at 22,207 (col. 1).

[443] *See e.g.,* proposed amended 40 C.F.R. 122.21(r); 76 Fed. Reg. 22,275 (col. 1)-22,279 (col. 2).

[444] *Appalachian Power Co. v. Train,* 566 F.2d 451, 459 (4th Cir. 1977).

[445] 66 Fed. Reg. at 65,262 (cols. 1-2). Where EPA has not yet promulgated national technology-based standards for a category of point sources, the permit writer must use, on a case-by-case basis, his or her best professional judgment to impose such conditions as he or she determines are necessary to carry out the provisions of the Clean Water Act. 33 U.S.C. § 1342(a)(1)(B); *NRDC v. EPA*, 863 F.2d 1420, 1424 (9th Cir. 1988).

> [E]ach regulated facility must develop, submit, and refine [multi-year, multi-disciplinary] studies that characterize or estimate potential adverse environmental impact. … [G]iven the iterative nature of the assessment process, industry as well as EPA regional and State regulatory authorities must expend significant resources assessing study plans and methods for characterizing the environmental impact occurring at each facility and evaluating those data to determine what constitutes BTA for each specific facility.[446]

EPA also acknowledges that "site-specific options increase the likelihood that each significant cooling water intake permitting issue would become a point of contention between the applicant and permit writer, which EPA's experience indicates slows the permitting process, makes it more resource intensive, and makes it more costly."[447] And EPA has been clear that site-specific consideration of biological and ecological conditions is one of the key drivers of this complexity, controversy, imprecision and substantial delay:

> [B]ecause of the complexity of biological studies, it is very difficult to assess the cause and effect of cooling water intake structures on ecosystems or on important species within an ecosystem. An overwhelming majority of scientists have stated that biological studies can take multiple years because of the complex nature of biological systems. Moreover, unlike in the laboratory, where conditions are controlled, a multitude of confounding factors make biological studies very difficult to perform and make causation, in particular, difficult to determine.[448]

Biological complexity and the lack of categorical standards make industry's superior resources a critical strategic advantage. Many states, including New York, New Jersey, Texas, Louisiana, Michigan, Wisconsin, Minnesota, and Kansas, have complained to EPA of the extreme burdens of making these decisions on a case-by-case, site-specific basis. For example, the New York State Department of Environmental Conservation has informed EPA of the "potentially endless, expensive studies that usually yield ambiguous or debatable results … because it is impossible to identify, measure, and attribute the impact of each the [sic] many variables affecting populations on each of the impacted species."[449] New York thus asked EPA to promulgate "clear performance-based requirements" that set "nationally-applicable minimum standards" so that "companies and regulators could put their staff and monetary resources into reducing impacts instead of into studies and rebuttals."[450] Similarly, New Jersey has explained that:

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[446] 65 Fed. Reg. at 49,079 (col. 2). *See also* 66 Fed. Reg. at 65,262 (cols. 1-2) (EPA noting that site-specific determinations impose "significant resource demands on permitting agencies") and 66 Fed. Reg, 28,853, 28,865 (cols. 2-3) (May 25, 2001) (in some States' view, site-specific approach requires "burdensome expenditure of resources to develop section 316(b) requirements for each new facility.").

[447] 69 Fed. Reg. at 41,607-608 (footnote and citations omitted).

[448] 66 Fed. Reg. at 65,285 (col. 2)

[449] Statements of NYS Dept. of Env. Cons., Division of Fish, Wildlife, and Marine Resources, provided to U.S. EPA, re Public Meeting to Discuss Adverse Environmental Impacts resulting from Cooling Water Intake Structures, p.1 [DCN 1-5025-PR] (June 29, 1998) (Exh. 89).

[450] Phase II Comment Letter from Peter Duncan, Deputy Commissioner of the Office of Natural Resources, NYS DEC, to EPA Proposed Rule Comment Clerk, re the NPDES Proposed Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities, August 7, 2002, Comment 1.38, p. 2 (Exh. 90).

> State agencies and permitting authorities could engage in a debate for years as to the population measure of a given fish species, let alone many fish species. The results of biological population studies and modeling can be very subjective because it is difficult to identify, measure, and attribute the impact of each of the many variables…affecting populations of each of the impacted species.[451]

More pointedly, Louisiana DEQ has stated: "In our opinion EPA vastly under estimated the resources necessary … to implement the 316(b) requirements.… Throughout the proposed regulations, reference is made to site-specific determination of best technology available.… Where will the states and/or EPA get the resources to review all the submittals…?"[452] Michigan's Department of Natural Resources has notified EPA that it has "experienced considerable inaction in the adoption of technology because of disagreement among power producers and agency biologists" regarding the minimization of cooling water intake structure impacts.[453] Likewise, the surface water permitting chief at the Michigan DEQ (which implements the NPDES program in that state) has complained of the:

> considerable burden on the NPDES permitting program in Michigan if the 316(b) regulations … require environmental effects studies at individual facilities. My experience indicates that studies of the effects of cooling water intake structures on the receiving water fisheries are extremely difficult to do and the results are difficult to interpret. The burden would be considerably reduced if the regulations require specific cooling water intake structure technology. Also, this approach would seem to me to be consistent with the intent of Section 316(b).[454]

As of July, 2011, several states had already taken the opportunity to reemphasize to EPA during the current comment period that a site-specific approach to BTA determinations imposes considerable and unrealistic administrative burdens on them. For example, the Texas Commission on Environmental Quality told EPA that it:

> is not aware of any other situation in the NPDES permitting scheme with such excessive resource expectations on the permitting authority. . . . At a minimum, TCEQ has significant concerns related to the level of expertise necessary to

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[451] Phase II Comment Letter from Dennis Hart, Assistant Commissioner, Environmental Regulation, New Jersey Department of Environmental Protection, to EPA Proposed Rule Comment Clerk, re Cooling Water Intake Structures (New Facilities), November 9, 2000, DCN Comment 1.54, p. 4 (Exh. 91); see also Phase II Comment Lettr from Bradley M. Campbell, Commissioner, New Jersey Department of Environmental Protection, to EPA Proposed Rule Comment Clerk, re Cooling Water Intake Structures (Existing Facilities), Aug. 8, 2002, Comment 2.002 (Exh. 92) (explaining that site-specific options are "likely to result in protracted dialogue between the permitee and the regulatory agency, undue and wasted effort, and delayed implementation of the required improvements.").

[452] Phase II Comment Letter from Gary Aydell, Technical Advisor, Office of the Secretary, Louisiana Department of Environmental Quality, to EPA Proposed Rule Comment Clerk, re Cooling Water Intake Structure (Existing Facilities: Phase II) Proposed Rule, August 8, 2002, DCN Comment 2.1, p. 1 (Exh. 93).

[453] November 7, 2000 letter from Michigan Dept. of Natural Resources to EPA.

[454] Phase II Comment Letter from Bill McCracken, Chief of Permits Section, Surface Water Quality Division, Michigan Department of Environmental Quality, re 316(b) Burden, January 24, 2002 [DCN 4-0049] (Exh. 94).

> review the required information in some of the studies and reports (such as noise, grid reliability, air emissions, social benefits). . . . TCEQ is also concerned that the inconsistency of reviews from state to state and region to region will allow for further inequities.[455]

Similarly, Kansas warns that "[r]educed state funding resources resulting from state budget restraints, expected reductions in EPA program funding, reduced program staffing because of funding restraints over the last several years, and increased workloads in the NPDES arena make simplification of the proposed 316(b) Rule provisions imperative."[456]

According to the Minnesota Pollution Control Agency (MPCA), EPA's rules force permitting agencies:

> to play a critical role in the preparation of these application materials, in addition to the final review of the application materials and peer review comments during the permit development process. The MPCA believes that this proposed regulation requires expenditure of agency resources on permits falling under Section 316(b) .... This approach effectively requires state permitting authorities to undertake a level of effort, *on par with a rulemaking*, with each and every permit action that requires entrainment mortality reductions instead of specifying reductions within these proposed regulations.[457]

Instead of onerous case-by-case decision making, "the MPCA is in support of establishing nation-wide performance standards for minimizing adverse environmental impacts resulting from cooling water intake structures."[458]

Similarly, Wisconsin stated that "[s]pecific performance standards ... make BTA decisions easier. . . . For example, if cooling towers are the ideal, why not set this as the EM [entrainment mortality] standard but allow for permittees to demonstrate why this will not work for a given situation?"[459]

The lesson learned in these states and around the country in the nearly four decades since Section 316(b) was enacted is that state permit writers lack the resources and expertise to permit intake structures in the absence of national categorical requirements, while applicants can use site-specific standard setting procedures to bring permitting to a grinding halt. The electricity industry has long and vigorously urged site-specific approaches and cost-benefit tests for Section

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[455] Phase II Comment Letter from Mark Vickery, P.G., Executive Director, Texas Commission on Environmental Quality to EPA, July 19, 2011, at p. 4 (EPA-HQ-OW-2008-0667-1970).

[456] Phase II Comment Letter from Donald R. Carlson, P.E., Chief, Industrial Programs Section, Bureau of Water, Kansas Department of Health and Environment to EPA, July 1, 2011, p. 6 (EPA-HQ-OW-2008-0667-1598).

[457] Letter from Jeff Udd, Acting Supervisor, Industrial Water Quality Permits Unit, Minnesota Pollution Control Agency to EPA, June 30, 2011, at p. 1-2 (EPA-HQ-OW-2008-0667-1631) (emphasis added).

[458] *Id.* at p. 1.

[459] Letter from Susan R. Sylvester, Acting Director, Bureau of Watershed Management, Wisconsin Department of Natural Resources to EPA, July 13, 2011, p. 4-5 (EPA-HQ-OW-2008-0667-2063).

316(b) permitting.[460] Power plant owners have perfected the technique of inundating regulators with site-specific information and then contesting every aspect of the permitting process so as to avoid technological upgrades. (As just a few examples of the many power plants whose permitting proceedings have been confounded by the lack of national intake structure regulations and the resulting case-by-case approach, see Section I.C., above.)

Nationwide, there are more than 600 existing power plants subject to the Proposed Rule, and an enormous number of them are already significantly overdue for re-permitting. At coal-fired power plants alone, more than 87 million MWh of generation operates without an up-to-date permit, and nationwide, 255 existing power plants have expired permits. Many of these permits (at least 65) have been expired for more than an entire five-year permit cycle,[461] and at least seven plants that we are aware of are operating with permits that expired in 1995 or earlier.[462] States cannot even re-issue permits in a timely manner, therefore, it is clear that they are unable to complete the expensive and labor-intensive technology review required by the proposed rule.

This problem will only get worse as those state agencies are subject to ever-worsening budget cuts. In 2011 alone, state funding for environment and energy agencies in New York was cut by ten percent,[463] and state funding for the North Carolina Department of Environment and Natural Resources was cut by more than twelve percent.[464] In Arizona, the state funding for the Department of Environmental Quality has been cut in half in the last two years, dropping from $19.7 million in 2009 to $7 million for 2011, and the budget for the Arizona Department of Water Resources has been cut by almost two-thirds.[465]

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[460] *See Riverkeeper I*, 358 F.3d at 196 (utility industry arguing that "EPA should only have sought to regulate impingement and entrainment where they have deleterious effects on the overall fish and shellfish populations in the ecosystem, which can only be determined through a case-by-case, site-specific regulatory regime."); 67 Fed. Reg. at 17,162 (describing two wholly site-specific regulatory frameworks proposed by a utility association and a power company).

[461] *See* NPDES Permit Expiration Date spreadsheet (listing 47 coal plants with cooling water intakes operating on permits that expired in 2005 or earlier and had not been renewed by 2011; 18 of these were more than 10 years overdue) (Exh. 95).

[462] *See* NPDES Permit Expiration Date spreadsheet (lisitng four coal plants – Indian River, Cayuga, Schiller, and Valley – with pernits expired in 1995 or earlier). In addition, the Indian Point, Bowline and Roseton facilities on the Hudson River are operating under NPDES permits that were issued in 1987 and expired in 1992. *See also* Abt Associates, Inc., P2F Compliance Years, dated February 13, 2004 ("[2004] Compliance Years List") (listing 57 plants with cooling water intakes operating on permits that expired in the 1990s or earlier and had not been renewed by 2003; 15 of these were more than 10 years overdue) [DCN 6-4036-N] (Exh. 96); *See also* Attachment to EPA Memorandum re Implementation of Section 316(b) in NPDES Permits, Feb. 27, 2003 ("2003 NPDES Permit List") (listing 67 plants with cooling water intakes operating on permits that expired in the 1990s and had not been renewed by 2003; 13 of these were more than 10 years overdue) (Exh. 97).

[463] Mary Phillips-Sandy, "New York Budget: The 5 Most Painful Cuts," *AOL NEWS* (Feb. 1, 2011) (Exh. 98) *also available at* http://www.aolnews.com/2011/02/01/new-york-budget-the-5-most-painful-cuts/.

[464] Gary Robertson and Martha Waggoner, "Final NC budget takes aim at environmental policy," *Bloomberg Business Week* (June 3, 2011) (Exh. 99) *also available at* http://www.businessweek.com/ap/financialnews /D9NKE8N80.htm.

[465] Shaun McKinnon, *Arizona budget cuts hurting water and air agencies*, THE ARIZONA REPUBLIC (May 4, 2010) (Exh. 100) *also available at* http://www.azcentral.com/arizonarepublic/news/articles/2010/05/04/20100504arizona-budget-cuts-hurting-water-and-agencies.html.

The federal funding for state environmental agencies has also been cut. The EPA's budget for the 2011 fiscal year was cut by 16 percent, and EPA passed that loss on to the states by cutting the federal funding given to state environmental agencies. Experts predict that the EPA's budget will be cut again during the next appropriations cycle, which will likely result in more cuts to state funding.[466] As a result of these drastic cuts, state officials have millions of dollars less to implement and enforce environmental laws than they did a few years ago.[467] These cuts have left state environmental agencies seriously shorthanded, making it even unreasonable to believe that they can complete the resource intensive review required by this permitting process.

EPA recognizes that Section 316(b) requires it "to establish standards for cooling water intake structures that reflect the 'best technology available for minimizing adverse environmental impact.'"[468] EPA also knows that state permitting authorities almost never complete site-specific determinations in a timely manner, and in many cases do not complete them at all. The simple reality is that most state permit writing agencies do not have sufficient financial or technical resources to meaningfully address cooling water impacts in the absence of national categorical requirements. Experience over the last four decades has shown that a case-by-case approach simply will not work. Instead, it is guaranteed to mire the NPDES permitting process in an endless cycle of paperwork and litigation that will leave waterbodies across the country unprotected. Any cooling water rule EPA promulgates cannot be effective unless it is simple and straightforward to implement, and does not require case-by-case determination of BTA requirements for each facility. Accordingly, the agency's conclusion that entrainment controls determined by state permitting authorities on a site-specific basis "represent[] the best technology available for minimizing the adverse environmental impacts associated with intake structures"[469] is irrational and illegal.

(2) States Cannot Conduct, or Meaningfully Review, Site-Specific Cost-Benefit Analyses.

Similarly, and more particularly, it is arbitrary, capricious, and an abuse of discretion for EPA to require states to perform the task that it knows, above all, they cannot possibly accomplish: evaluating the consequential, monetized and social benefits of entrainment controls on a site-specific basis.[470] Under the Proposed Rule, state permitting authorities must not only oversee the development of hundreds of case-by-case, cost-benefit analyses, they also must

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[466] *Id.*

[467] Juliet Eilperin, *EPA budget cuts put states in bind*, THE WASHINGTON POST (June 20, 2011) (Exh. 101) *also available at* http://www.washingtonpost.com/national/environment/epa-budget-cuts-put-states-in-bind/2011/06/08/AGbVpYdH_story.html.

[468] 76 Fed. Reg. at 22,196 (col. 2)

[469] 76 Fed. Reg. at 22,210 (col. 2).

[470] *See* 76 Fed. Reg. at 22,204 (col. 2) ("the facility would provide detailed information on the other factors relevant to the Director's site-specific BTA determination. These would include . . . both the monetized and non-monetized benefits of such controls."); *see also* 76 Fed. Reg. at 22,210 (col. 3) ("[T]he facility's permit application must include the following information: . . . a detailed discussion of the magnitude of water quality benefits, both monetized and non-monetized, of the candidate entrainment mortality reduction technologies evaluated.").

conduct a meaningful review of each applicant's studies that includes both quantitative and qualitative assessments of environmental benefits and, more problematic still, estimates of the monetized value of these benefits.[471] That task simply cannot be done by state permitting agencies – not under the relatively flush times of years past, and most certainly not in today's leaner times as state agency resources are stretched ever thinner – and EPA knows it. The rule's site-specific cost-benefit analysis requirements will thus only impede the permitting process, reduce environmental protection, and lead to ineffective and wildly inconsistent permitting decisions – exactly the opposite of what Congress expected when it ordered EPA to set standards under Section 316(b) and what Administrator Jackson promised in asserting the rule would provide "regulatory certainty."

It is clear that states cannot conduct cost-benefit analysis under section 316(b) because, even with the resources of the federal government at its disposal, EPA itself could not do it. EPA was incapable of making meaningful cost-benefit determinations for fundamental reasons: considerable uncertainty in quantifying the physical benefits of the rule, and beyond that, an inability to assign meaningful and accurate monetary values to those benefits. Tellingly, in the draft of this rule that EPA originally sent to OMB, EPA candidly admitted that it did not rely on the results of a cost-benefit analysis in setting standards because "a national *weighing of costs and benefits is not possible* at this time."[472] It is irrational to think that what EPA cannot complete once, the states can do hundreds of times.

The first problem that EPA encountered lay in quantifying the benefits of the rule within acceptable bounds of uncertainty. There are some categories of benefits that EPA admits it was entirely unable to quantify, although the agency acknowledges that they exist and are important. For example, "[w]hile EPA can identify and hypothesize regarding the direction and relative importance of impacts of CWISs on the totality of the aquatic ecosystem …, EPA is currently unable to connect these effects with quantifiable environmental benefits. Thus, it is highly likely that the total environmental and monetary impacts of CWISs are significantly underestimated…"[473]

EPA also believes that its calculations underestimate the environmental impacts of intake structures in other ways. For example, EPA confirmed that at least 15 threatened and endangered species are currently killed by cooling water intake structures.[474] But EPA states that 15 species "may be an underestimate" because it has documented cases of intakes killing non-endangered organisms from the same genus as a threatened and endangered species, and the range of the endangered species is sufficiently similar to that of the other member of its genus that it includes the zone of danger near a reporting facility's intake structure.[475] In all, EPA

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[471] *See* 76 Fed. Reg. at 22,205 (col. 3) (the state permitting authority's "written explanation would provide a review of the social costs . . . of the various technologies; a review of the potential reductions in entrainment and entrainment mortality; and a review and analysis of monetized and non-monetized benefits.").

[472] Redlined Version of Proposed Rule, p. 166 (emphasis added).

[473] 2011 EEBA, p. 2-22.

[474] 76 Fed. Reg. at 22,244 (col. 1).

[475] 76 Fed. Reg. at 22,244 (col. 3).

identified 88 threatened and endangered species whose ranges overlap with cooling water intakes affected by this Rule.[476]

After grappling with the physical uncertainties, EPA was then faced with the even more difficult task of assigning meaningful and accurate dollar figures to the estimated 98 percent of the rule's benefits that have no established market value benefits to wildlife, ecosystem stability, and endangered species. Here, EPA admits a near-complete failure:

> EPA's analysis does not fully quantify or monetize certain potentially important categories of benefits, such as existence values for threatened and endangered species, secondary and tertiary ecosystem impacts, benthic community impacts, shellfish impacts and the impacts arising from reductions in thermal discharges that would be associated with closed-cycle. Changes in fish assemblages due to impingement, entrainment and thermal effects are also not fully valued.[477]

The problem is not a lack of effort or resources on EPA's part, but fundamental methodological and data gathering obstacles:

> Consideration of benefits in particular is complicated by the absence of well-developed tools or data to fully express the ecological benefits in monetized terms. EPA has, however, used the best currently available science to monetize the benefits of the various options in four major categories: Recreational fishing, commercial fishing, nonuse benefits, and benefits to threatened and endangered species.[478]

Even a (comparably) well resourced federal agency applying "the best currently available science" was forced to conclude that its estimates of non-use benefits and benefits to threatened and endangered species "are incomplete."[479] And since it was unable to monetize many categories of benefits, EPA's ability to base BTA decision making on the relationship of quantified costs and benefits alone was, by the agency's own admission, "challenging."[480]

The fact that EPA encountered such difficulties is unsurprising. They stem, in part, from the fact that monetizing the estimated benefits of this rule requires EPA to make difficult, sensitive, value-laden, and highly subjective assumptions. This comment letter summarizes key points from a more extensive environmental economic report prepared by two of Stockholm Environment Institute's senior economists, Frank Ackerman and Elizabeth Stanton.[481] The full Stockholm Environment Institute (SEI) report is attached to these comments as Appendix A.

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[476] *See* 76 Fed. Reg. at 22,244 (col. 3).

[477] 76 Fed. Reg. at 22,207 (col. 2-3).

[478] 76 Fed. Reg. at 22,197 (col. 1).

[479] 76 Fed. Reg. at 22,197 (col. 1).

[480] *See* 76 Fed. Reg. at 22,247 (col. 2).

[481] Comments of Frank Ackerman, Ph.D., and Elizabeth A. Stanton, Ph.D., Stockholm Environmental Institute-U.S. Center, Aug. 18, 2011, hereinafter ("SEI Report"), attached as Appendix A.

That report suggests that it may be impossible to infer accurate and meaningful measures of the value society places upon aquatic ecosystems from human behavior in markets:

> [e]thical statements about nature, environmental integrity, and obligations to protect ecosystems and biodiversity, which are at stake for many people, are only awkwardly translated into the language of monetized non-use values. The beliefs of many stakeholders may be distorted beyond recognition in this process (or ignored for lack of research meeting rigid specifications) – which is why cost-benefit analysis is poorly suited for this case.[482]

States that must oversee, review, and rely upon intensive cost-benefit analyses of the sort that EPA attempted will have no more success (and likely far less success) than EPA in their efforts to set clear entrainment standards. To conduct a fine-grained and monetized cost-benefit analysis of the kind that EPA attempted, the applicants (who are required to conduct the cost-benefit study in the first instance) will first need to accurately estimate the number of fish of different species and different life stages lost to cooling water intake structures. As the significant flaws in EPA's quantitative data show,[483] this is itself a difficult task. States will then need to provide applicants with methods to standardize fish counts across different life stages. To value forage fish species in terms of their impact on commercially and recreationally valued species, states will need to adapt trophic transfer models to the particular water bodies in their jurisdiction (since trophic transfer rates range from 2% to 24%) or will have to require applicants to study trophic transfer rates in their particular waterbody.[484]

States will also need to carefully police the way that regulated facilities monetize their benefit estimates. Valuing commercial fishing benefits entails retaining economists, assessing regional fish market price data, and evaluating economic models of producer and consumer surplus, taking into account any price shifts due to increased supply. To value breeding stocks for the ecosystem as a whole, states will have to assess fish population dynamics.[485] To value recreational fishing, applicants will have to attempt something akin to EPA's "Random Utility Model" (RUM). For ecosystem benefits, either the applicants or the States will need to conduct original stated preference studies or attempt a benefits transfer approach, which even EPA could not do. And the entire approach of treating non-use values as monetizable values rather than as ethical constraints is problematic for most people.

In short, EPA found it incredibly difficult to quantify the environmental benefits of this rule and can scarcely begin to estimate their monetary value. EPA admits that its efforts are awkward and its results are freighted with a great deal of uncertainty. Showing appropriate humility and honesty, EPA forthrightly admitted in its earlier draft (before OMB's intervention) that it lacked confidence in its cost-benefit analysis and could not rely upon it in making a BTA

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[482] Stockholm Environment Institute report.

[483] *See* discussion of EPA's undercounts in Section III.F.2.a.

[484] *See* Stockholm Environment Institute report.

[485] *See* 69 Fed. Reg. at 41,660 (Col. 1) (EPA acknowledging that its own analysis failed to account for the progeny of fish killed by impingement and entrainment and that "given the complexities of population dynamics, the significance of this omission is not clear.").

determination. The problems that frustrated EPA will plague the states as well. EPA's inability to complete a cost-benefit analysis provides specific, recent empirical evidence that states cannot conduct cost-benefit analyses of the kind that EPA envisions.

None of this comes as news to EPA. The states themselves, and others, have repeatedly told the agency that their inability to implement Section 316(b) without national standards is most pronounced when it comes to cost-benefit analysis. The Atlantic States Marine Fisheries Commission told EPA that "state permitting agencies do not have the appropriate staff to properly evaluate … comprehensive cost-benefit analyses."[486] In commenting on the Phase II rule, New York State wrote that site-specific cost-benefit analysis "could effectively negate the value of the entire Phase II rule … [because] the task of placing an accurate dollar value on aquatic resource impacts is rife with ecological and economic challenges; there is no widely accepted methodology."[487] Likewise, California informed EPA of its "experience … that it is difficult to obtain agreement on costs or benefits. The result is a long series of arguments involving dueling cost/benefit analyses."[488]

Site-specific and monetized cost-benefit analysis gives existing facilities a powerful tool to evade regulation by converting NPDES permitting into a lengthy, controversial and ultimately futile debate about fishing yields and fish prices, and how much environmental protection is worth to the public. Such delays are an enormous impediment to protecting the natural resources Congress intended to EPA to safeguard. As the D.C. Circuit explained in affirming EPA's refusal to consider receiving water quality in setting effluent limitations for the pulp and paper industry, "Congress clearly intended … to avoid such problems of proof so that a set of regulations with enforceable impact is possible."[489]

Accordingly, EPA should not require state agencies to conduct site-specific cost-benefit analyses in the context of permitting. It is arbitrary, capricious, and an abuse of discretion for EPA to demand that state permit writers undertake a task that it knows they cannot complete.

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[486] Letter from John V. O'Shea, Executive Director, Atlantic States Marine Fisheries Commission to Proposed Rule Comment Clerk, EPA, re: Cooling Water Intake Structure (Existing Facilities: Phase II), Aug. 7, 2002, at 1, Comments 1.059 (Exh. 102).

[487] Phase II Comment Letter from Peter Duncan, Deputy Commissioner of the Office of Natural Resources, NYS DEC, to EPA Proposed Rule Comment Clerk, re the NPDES Proposed Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities, August 7, 2002, Comment 1.38, p. 3-4 (Exh. 90).

[488] Letter from Celeste Cantu, Executive Director of the California State Water Resources Control Board, to EPA Proposed Rule Comment Clerk-W-00-32, re Comments on National Pollution Discharge Elimination System Proposed Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities (Proposed Rule), August 5, 2002, at 4 (Exh. 103); *see also* Letter from Denise Sheehan, Executive Deputy Commissioner, New York DEC to Water Docket, EPA, re New York State Department of Environmental Conservation comments regarding the Proposed Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities; Notice of Data Availability (NODA), dated March 19, 2003 (June 2, 2003) (Exh. 104); NY DEC, Further Comments to the U.S. Environmental Protection Agency on its "Issues for Discussion at the Public meeting on September 10 and 11, 1998, Regarding §316(b) Rulemaking" held in Alexandria, VA (Oct. 5, 1998) (Exh. 105).

[489] *Weyerhaeuser*, 590 F.2d at 1044.

d. The Open-Ended Case-By-Case Format EPA Proposed (Based on Substantial Last-Minute Changes by OMB) Is Very Poorly Designed.

As discussed, EPA's decision to require states to set standards for entrainment controls on a case-by-case basis violates the Clean Water Act and is arbitrary, unworkable, and an abuse of discretion. In addition, the particular type of case-by-case decisionmaking format that EPA has proposed here is deeply flawed for many reasons.

First, under the Proposed Rule, studies that are highly sensitive to esoteric, value-laden assumptions about discount rates, valuation methodologies, and other issues will be bought and paid for by the regulated entities – as will the "independent" reviews of these studies. It will be critical, but impossible, for states to meaningfully oversee and review the work of consultants and industry experts. Regulated entities will end up self-regulating because they pay for the studies underpinning the state's entrainment control decision, pay for the review of those studies, and the state permitting authorities lack the capacity to provide a meaningful review of industry's submittals.

Second, the Proposed Rule leaves permit writers with unfettered discretion to set standards and reject better performing technologies. The Proposed Rule can be read to allow a permitting authority to consider an unlimited set of factors and then to reject *any* technology based on *any* of those criteria. Although EPA has set forth nine criteria that must be considered, the Director can consider any other criteria as well. And although they must all be "considered," there is no indication of which criteria are more important than others, and in any case, all of them can simply be overruled by an additional tenth criterion added by the state. This is an open-ended balancing test in which permit writers have unfettered discretion to reach and justify any decision at all on any grounds that they please. By leaving permit writers with unlimited discretion to make case-by-case decisions, EPA is not only failing to set a standard, but experience with unconstrained case-by-case decision making under Section 316(b) shows that it will invariably lead to inconsistent decisions from state to state, and this delegation of unfettered discretion is illegal because it conflicts "with the Act's goal of uniform standards within an industry."[490]

Third, EPA (actually, OMB) has proposed that states should perform an unlawful form of cost-benefit analysis. After OMB's revisions, the Proposed Rule abandons EPA's "wholly disproportionate" standard for cost benefit analysis, and allows permit writers to reject *any* superior technology if its benefits "do not justify" its costs.[491] This is problematic because it could allow permit writers to engage in a more searching and rigorous form of cost benefit analysis than is authorized even under the Act's weakest technology-based standard, the BPT standard.[492] As discussed above in Section III.A.3, the Clean Water Act severely limits EPA's discretion with respect to the type of cost-benefit test that it may employ under Section 316(b) and prohibits the establishment of BTA requirements on the basis of certain types of cost-benefit

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[490] *NRDC v. U.S. EPA*, 863 F.2d 1420, 1432 (9th Cir.1988).

[491] *See* proposed 40 C.F.R. § 125.98(e), 76 Fed. Reg. at 22,288 (col. 1).

[492] *See Entergy*, 129 S.Ct. at 1508 ("Other arguments may be available to preclude such a rigorous form of cost-benefit analysis as that which was prescribed under the statute's former BPT standard . . . .").

analyses.[493] In particular, "the courts of appeal have consistently held that Congress intended Section 304(b) . . . to preclude the EPA from giving the cost of compliance primary importance."[494]

The "limited" cost-benefit analysis performed in setting the BPT standards was simply a comparison of the degree of effluent reduction with the costs to the affected industry of attaining such reduction.[495] The analogy to this approach in the context of Section 316(b) would be a comparison of the degree of reduction in impingement and entrainment with the costs of attaining such reduction. For the Proposed Rule, however, EPA is authorizing states to perform a second analysis quite different from anything contemplated by Congress for BPT: a comparison of monetized social benefits, calculated based on an assessment of consequential water quality effects, with monetized social costs.

EPA's use of the phrase "benefits justify the costs" may be lawful only as a reformulation of its long-standing "wholly disproportionate" test. But if, as appears to be the case, EPA (or OMB) is allowing the use of forms of cost-benefit analyses that elevate economic considerations to a degree of primary importance, then the new standard violates the Clean Water Act.

OMB removed from the Proposed Rule the few provisions that would have helped mitigate the problems noted here. EPA originally designed a case-by-case analysis format in which state permitting authorities would begin with a rebuttable presumption that the best-performing technology – closed-cycle cooling – was the best technology available. EPA also avoided making cost-benefit analysis a primary consideration, using it only to eliminate extreme results: it wrote that a state may not reject "an otherwise available technology . . . unless the social costs of compliance are wholly disproportionate to the social benefits."[496] But OMB changed that to allow a state to reject an otherwise available technology "if the social costs of compliance are not justified by the social benefits…"[497]

As a result, the rule creates an evidentiary quagmire for regulators, antithetical to NPDES permitting, which allows applicants to avoid installing environmentally protective controls for years, or even decades. If promulgated as proposed, the case-by-case entrainment provisions will sanction precisely the kind of regulatory uncertainty that Congress intended NPDES

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[493] *See* EPA's understanding of its cost-benefit authority, supra section III.A.3.

[494] *Chemical Mfrs. Ass'n v. EPA*, 870 F.2d 177, 204 (5th Cir. 1989). *See also American Iron & Steel Inst. v. EPA*, 526 F.2d 1027, 1051 (3d Cir. 1975) ("even with that 1977 [BPT] standard, the cost of compliance was not a factor to be given primary importance."); *BASF Wyandotte Corp.*,598 F.2d at 637, 656 (1st Cir. 1979) (In determining the BPT standard, "[c]ost, however, is not a paramount consideration. Congress self-consciously made the legislative determination that the health and safety gains that achievement of the Act's aspirations would bring to future generations will in some cases outweigh the economic dislocation it causes to the present generation. The obligation the Act imposes on EPA is only to perform a limited cost-benefit balancing to make sure that costs are not 'wholly out of proportion' to the benefits achieved.") (quotations and citations omitted).

[495] *Appalachian Power Co. v. EPA*, 671 F.2d. 801, 809 n.3 (4th Cir. 1982) ("[T]he 'benefits' that are to be related to 'costs' under § 304(b)(1)(B) are simply the benefits *assumed to result* ... from any reduction in the level of effluents being discharged.") (emphasis added).

[496] Redlined Version of Proposed Rule p. 344.

[497] *Id., see also* 76 Fed. Reg. at 22,262 (col. 2).

technology standards to eliminate. Because of the myriad uncertainties involved in determining the effects on waterbodies – as state agencies have explained and EPA acknowledges – permit writers will have unfettered discretion to unlawfully reject better performing technologies based on an open-ended balancing of factors, and to elevate cost and water quality considerations above technological efficacy. They will undoubtedly face substantial pressure to reduce the requirements for protection, given the lack of standards and the resources industry brings to bear in these proceedings. This is squarely at odds with the national technology-based scheme intended by Congress.

2. EPA Should Select Option 3's Entrainment Standard for the Final Rule.

a. Establishing National Categorical Standards Based on Closed-Cycle Cooling for Virtually All Existing Facilities, as the Agency Did a Decade Ago for New Facilities, Would Minimize Adverse Environmental Impacts.

In developing the Proposed Rule, "EPA concluded that closed-cycle cooling reduces impingement and entrainment mortality to the greatest extent."[498] That conclusion should come as no surprise because for more than a decade, EPA as well as state agencies, Congress, and virtually everyone else to have seriously considered the issue has come to the same conclusion that closed-cycle cooling (wet or dry) is most effective at reducing fish kills because it reduces intake flow to such a great extent. In addition to reducing impingement and entrainment, closed-cycle cooling also reduces thermal pollution, protect endangered species and the biological integrity of ecosystems, increase fish populations and fishing yields, increase the reliability of power plants in areas prone to drought, reduce competition for scarce water resources in these areas, and free power plants from the need to be located on waterfront lands, among other things.

No other technology comes anywhere close to the effectiveness and environmental benefits of closed-cycle cooling and EPA has not concluded, or even suggested otherwise. By EPA's own calculations (which are significant underestimates due to the age of the data and other factors), Option 3 would save more than 500 billion of individual aquatic organisms per year[499] and result in estimated increases to fishery yields from two to more than 100 times greater than those under Option 1, depending on the region.[500] In the 2001 Phase I Rule and in the requirements for new units at existing facilities proposed as a component of the Proposed Rule, EPA set or proposes to set a national categorical standard requiring those facilities to reduce their intake flow to a level commensurate with that which could be achieved with a closed-cycle recirculating cooling system.[501] Doing so here would minimize the adverse environmental impacts of cooling water intake structures at existing facilities, as Congress intended, and would not cause any collateral problems, contrary to industry's hyperbolic claims.

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[498] 76 Fed. Reg. at 22,207 (col. 1).

[499] 76 Fed. Reg. at 22,239.

[500] 2011 EEBA at 3-6 to 3-15.

[501] 40 C.F.R. § 125.84(b)(i); proposed 40 C.F.R. § 125.94(d)(i); 76 Fed. Reg. at 22,283 (col. 2).

b. The Rulemaking Record Demonstrates that Closed-Cycle Cooling is Available to the Existing Facilities Because Retrofits are Feasible and Inexpensive.

As noted in the preamble, "EPA's record shows numerous instances of existing facility retrofits to closed-cycle."[502] For example, retrofits of closed-cycle cooling on existing plants were completed many years ago at a gas-fired plant on a west coast estuary (Unit 7 of the 751 MW gas-fired Pittsburg Power Plant in Contra Costa County, California); a nuclear plant on a Great Lake (812 MW Palisades Nuclear Plant in Michigan), and coal-fired plants on eastern seaboard rivers (490 MW coal-fired Canadys Steam Plant and 346 MW Jefferies Coal Plant in South Carolina).[503] More recently, retrofits were completed at the McDonough (520 MW coal) and Yates (1250 MW, coal) plants on the Chattahoochee River in Georgia and at the Wateree Station (772 MW, coal) on the Wateree River in South Carolina, and are well underway at the Brayton Point power station (1500 MW, coal/oil) in Somerset, Massachusetts.

As discussed above, "technology-forcing" standards like BTA must compel industry to meet ever more stringent limitations and therefore must be established with reference to the best performer in any industrial category – "not the average plant, but the optimally operating plant, the pilot plant which acts as a beacon to show what is possible."[504] Thus, the fact that the technology is widely available to existing facilities makes it "available" as that term is used in Section 316(b).

Further, the costs of retrofitting to closed-cycle cooling are minimal from both a microeconomic and a macroeconomic perspective. At the company level, EPA estimated that, at the very most, 1.5 percent of existing power units would retire as a result of the compliance costs, and this is clearly an overestimate because EPA assumed for purposes of that analysis that companies would absorb all the costs, rather than passing any of them on to consumers. Looking at the economy as a whole, as the SEI Report explains, the costs are small by any reasonable measure because the annualized total cost of Option 3 at a 7 percent discount rate, the highest cost estimate in the analysis, is $4.86 billion, or 0.033 percent (1/30 of one percent) of the $14 *trillion* US GDP.

Moreover, the potential hurdles identified by EPA as potentially making closed-cycle cooling retrofits somewhat more difficult in some locations are not only legally irrelevant (for the reasons just described), but also dramatically overstate the extent of the potential problems.

(1) There Is Adequate Space for Closed-Cycle Cooling at Virtually Any Plant Site.

In the preamble, EPA found that "the majority of facilities have adequate available land for placement of cooling towers."[505] Further, even where facilities have constraints in this

[502] 76 Fed. Reg. at 22,204 (col. 1).

[503] 67 Fed. Reg. at 17,155 (col. 1) (Apr. 9, 2002); Phase II TDD, pp. 4-1 to 4-6.

[504] *Kennecott v. EPA*, 780 F.2d 445, 448 (4th Cir. 1985), citing legislative history *See A Legislative History of the Water Pollution Control Act Amendments of 1972*, 93d Cong., 1st Sess. (Comm. Print 1973), at 798.

[505] 76 Fed. Reg. at 22,209 (col. 2).

regard, "[b]ased on [EPA's] site visits, EPA has found that several facilities have been able to engineer solutions when faced with limited available land."[506] Allowing potential space-constraint considerations at some sites to justify a case-by-case approach for all facilities, as EPA has done in the Proposed Rule, is arbitrary and capricious. As explained in the attached engineering report prepared by Powers Engineering, EPA's estimate that as many as 25 percent of facilities might have space constraints that would limit retrofit of closed-cycle cooling for the entire facility or increase compliance costs is vastly overblown because EPA's assessment is based on the use of land-intensive in-line cooling cells, not the much more space efficient back-to-back cooling cell configuration.[507] A back-to-back cooling cell configuration requires about 17 percent of the space needed for two in-line towers for the same cooling capacity, assuming the spacing recommended for parallel banks of in-line towers.[508] Because cooling cells can be installed in a back-to-back configuration at virtually any site, EPA should not set a "limited acreage" exemption (such as the 160 acres per gigawatt threshold the agency is exploring) and should acknowledge that closed-cycle cooling is an available technology for the industry as a whole. Finally, even if there is are arguable site constraints, the use of eminent domain for matters relating to power transmission and generation (as well as a variety of other public goods and services) is well-established and should not be ruled out in this context.[509]

(2) Remaining Useful Life is Not Quantifiable, Certain, Binding or Relevant Unless a Plant Owner Has Committed to a Closure Date.

EPA's argument that it is impractical to ask plants with a very short remaining useful life to undertake a closed-cycle cooling retrofit is reasonable only to the extent that a plant owner makes a legally binding commitment to permanently retire the once-through cooled units within a 5-year period. If a plant operator cannot make a legally binding commitment to permanently retire the units within that timeframe, then the units should get no special consideration from the

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[506] 76 Fed. Reg. at 22,209 (cols. 2-3).

[507] *See* TDD at 8-23 ("The EPRI worksheet contains numerous assumptions and default values that can be modified using site-specific data. Specific relevant assumptions and default values are listed below . . . Tower configuration was in-line rather than back-to-back, meaning towers are oriented in single rows rather than rows of two towers side by side.").

[508] *See* Powers Report.

[509] For example, in New York, the state's general power of eminent domain has been previously used for, *inter alia*, Urban Renewal (*Jackson v. New York State Urban Dev. Corp.,* 503 N.Y.S.2d 298); public roadways and intersections (*Waldo's, Inc. v. Village of Johnson City,* 544 N.Y.S.2d. 809); maintaining the public shoreline (*Pfohl v. Village of Sylvan Beach,* 809 N.Y.S.2d. 367); providing electrical power (*Bergen Swamp Preserve Socy. v. Village of Bergen,* 741 N.Y.S.2d. 363); constructing water tunnels (*City of New York [Third Water Tunnel, Shaft 30B],* 795 N.Y.S.2d 229, affd. 814 N.Y.S.2d 592); controlling sewage (*Ranauro v. Town of Owasco,* 735 N.Y.S.2d 332); providing a site for a general hospital (*In Re Site for New General Hospital,* 112 N.Y.S.2d 101, affd. 305 N.Y. 835); expanding airports (*First Broadcasting Corp. v. City of Syracuse,* 435 N.Y.S.2d. 194); protecting the public from fire damage (*Engels v. Village of Potsdam*, 727 N.Y.S.2d 202); providing necessary public parking (*Salvation Army v. Central Islip Fire Dist.*, 646 N.Y.S.2d 558); developing blighted areas (*Murray v. LaGuardia*, 52 N.E.2d 884); expanding/creating public parks (*Woodfield Equities LLC v. Incorporated Vil. of Patchogue*, 813 N.Y.S.2d 184 (2006)); expanding municipal buildings (*Stankevich v. Town of Southold,* 815 NYS2d 225 (2006)); providing affordable housing to local residents (*Keegan v. City of Hudson*, 803 N.Y.S.2d 279); and building a sport stadium (*Murphy v. Erie County*, 28 N.Y.2d 80 (1971)).

EPA regarding remaining useful life. In the 1970s, and in every decade since then, power plant operators have made the argument that they have insufficient useful life remaining to impose significant capital costs, whether for closed-cycle cooling or other pollution control equipment. And for those forty years, the plants have continued to operate, killing fish and causing other forms of pollution with the same antiquated equipment.[510] If, however, a plant operator is willing to back up its claim of limited useful life by making the closure date binding, as the Oyster Creek nuclear plant in New Jersey recently did, and the closure date is reasonably close in time, then the remaining life becomes relevant and can be taken into consideration. Because so few plants have committed to a closure date, and experience shows that plants continue to operate well beyond the end of their expected useful life, remaining life is not an obstacle to the availability of closed-cycle cooling.

Ironically, some newer plant operators may even attempt to make the argument that consideration of "remaining useful life" excuses them from compliance with any sort of upgrade, as the operator has not yet been able to recoup original construction costs.[511] This is the argument made by the Los Angeles Department of Water and Power in its current attempt to avoid compliance.[512] Yet this cannot be what EPA intends by allowing "remaining useful life" considerations, otherwise it would always be both too early and too late to require plants to modernize their cooling systems, and Section 316(b) would be drained of all its meaning.

c. The Rulemaking Record Demonstrates that Requiring Antiquated Plants to Install the Same Cooling Technology as their Modern Counterparts Would Not Cause Any Significant Adverse Impacts on Energy Supplies, the Economy or the Environment.

(1) Requiring Closed-Cycle Cooling Would Not Cause Electricity Shortages.

There will be no adverse reliability impact to the electric sector from adoption of Option 3. EPA's electric system modeling analyses demonstrate that Option 3 would cause very few, if any, plant retirements and any consequential retirements will not adversely affect system reliability. According to EPA's estimates, the additional retirements (whether full or partial) caused by Option 3 would total only 17 gigawatts, which represents less than 1.5 percent of total capacity in 2028.[513] Moreover, even this estimate drastically overstates the extent of actual retirements for a number of reasons.

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[510] *See, e.g.,* Press Release "Nuclear Regulatory Commission, Department of Energy and Nuclear Energy Institute Sponsor February Workshop on Extended Operation for Nuclear Power Plants," December 22, 2010 (Exh. 106).

[511] *See, e.g.,* Dynegy Moss Landing, LLC, "State Water Resources Control Board Once-Through Cooling Water Policy Implementation Plan for the Moss Landing Power Plant" at 13-14 (April 1, 2011) (Exh. 107) (arguing that changes to the cooling system are unwarranted in light of recent, large capital investments).

[512] *See* e-mail from John Dennis, LADWP to Jonathan Bishop, California State Water Resources Control Board (Jul. 22, 2010) (Exh. 108) (arguing that LADWP should be allowed additional time for compliance with California's once-through cooling water policy in light of recent investments totaling over $600 million).

[513] *See* EPA, Economic and Benefits Analysis for Proposed 316(b) Existing Facilities Rule (2011), (hereinafter "2011 EBA") at Table 6-3.

First, EPA assumed for purposes of this analysis that none of the costs of the regulation would be passed on to consumers, an obviously incorrect and highly conservative assumption.[514] In fact, because plants will attempt to pass on as much of the costs as they can, and because in regulated states this happens relatively automatically, there will be far fewer retirements than EPA estimated.[515]

In addition, several other reasons why there will no adverse reliability impacts are discussed in a report prepared by Schlissel Technical Consulting, Inc. The full report is attached to this comment letter as Appendix C. As the attached report explains in more detail, EPA used out-of-date demand forecasts. Under current forecasts, demand is lower than EPA estimated and there is less need for the 1.5 percent of capacity that EPA (over)estimated might retire.[516]

Even if a few existing generating units were to retire as a result of Option 3, system operators and utilities will have long lead times to construct any needed replacement capacity for any retirements that might occur. Moreover, new energy efficiency, demand side measures and renewable resources can meet future electricity demands while maintaining electric system reliability.[517] Additionally, the Schlissel report also notes that EPA's analysis shows that all NERC regions will comfortably exceed their required reserves in off-peak periods even with outages related to retrofits.[518]

(2) Requiring Closed-Cycle Cooling Would Not Increase Electricity Prices.

EPA estimated that under Option 3, the average annual cost per residential household in 2015 would be less than $1.47 per month ($17.60 per year).[519] And even this very modest sum is, by EPA's own admission, an overestimate of the actual costs because EPA assumed "full pass-through of all compliance costs to electricity consumers,"[520] which is certain not to be the case in deregulated states where costs are not automatically passed on. As EPA admitted, "at least some facilities and firms are likely to absorb some of these costs, thereby reducing the impact of today's proposed rule on electricity consumers."[521] The extent to which power companies will absorb closed-cycle cooling costs (with negligible effects on their bottom line) is illustrated in a report by the economist Robert McCullough, entitled the *Economics of Closed-*

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[514] 76 Fed. Reg. at 22,223 (col. 2) ("For these two analyses, the Agency assumed that none of the compliance costs will be passed on to consumers through electricity rate increases and will instead be absorbed by complying facilities and their parent entities.").

[515] As discussed below, when estimating effects on electricity prices, EPA made the opposite (but equally unrealistic and conservative assumption), that 100 percent of the costs would be passed on to consumers.

[516] Schlissel report.

[517] *See* M.J. Bradley & Analysis Group, *Ensuring a Clean, Modern Electric Generating Fleet while Maintaining Electric System Reliability* (2010), at 3-5 (Exh. 109); Bipartisan Policy Center, *Environmental Regulation and Electric System Reliability*, at 39 (2011) (Exh. 110); J. McCarthy and C. Copeland, Congressional Research Service, *EPA's Regulation of Coal-Fired Power: Is a "Train Wreck" Coming?*(July 11, 2011) (Exh. 111).

[518] Schlissel report, citing 2011 EBA, Table 5-8.

[519] 76 Fed. Reg. at 22,228 (Exhibit VII – 10).

[520] 76 Fed. Reg. at 22,228 (Exhibit VII – 10, footnote "a").

[521] 76 Fed. Reg. at 22,228 (col. 1).

Cycle Cooling in New York. That report shows that the change in electricity prices as a result of requiring closed-cycle cooling for all existing plants in New York state would be minimal (less than 1 percent) because for the vast majority of the time, the market clearing price of electricity in New York (the price that all plants are paid for electricity regardless of their costs or the price they bid) is set by plants with closed-cycle cooling.[522] Thus, New Yorkers are *already* paying for closed-cycle cooling, and existing plants that still use once-through cooling are pocketing the difference. The same is likely true to a certain extent in other deregulated states. Accordingly, any increase in electricity prices would be negligible and barely noticed by consumers.

(3) Requiring Closed-Cycle Cooling Would Create Jobs and Improve the Economy.

A review of EPA's economic impact analysis by economists Professor Frank Ackerman and Dr. Elizabeth Stanton shows that a closed-cycle cooling standard would increase GDP and create jobs. EPA found, unambiguously, that stronger environmental protection leads to a greater GDP boost and a larger immediate spike in job creation. While Option 1 would *reduce* economic output by $194 million, Option 3 would increase GDP by over $4.2 billion.[523]

EPA wrongly concluded, however, that the initial job creation impact of Option 3 is outweighed, over time, by jobs losses caused by rising electricity prices. As Prof. Ackerman and Dr. Stanton's report explains, EPA's analysis is based on two significantly flawed assumptions. First, EPA wrongly assumes that all compliance costs will translate into higher electricity prices because electric generators will be able to pass on 100 percent of the rule's costs to customers. In fact, a better assumption is that, in deregulated states, only about half of compliance costs are likely to be passed on to consumers. In deregulated energy markets, infra-marginal producers will absorb rising costs as reductions in producer surplus. Second, EPA arbitrarily assumes that cost recovery occurs at a constant annual rate from 2013 through 2056. But traditional utility rate regulation would impose a phase-in period for cost recovery so that compliance costs are recovered as they are incurred, not before. This pushes the cost recovery back in time compared to EPA's estimate, thereby reducing its net present effect. After only partially correcting for these flaws, Ackerman and Stanton find that Option 3 would create over 2,000 new jobs.[524]

(4) Requiring Closed-Cycle Cooling Would Not Cause Air Pollution or Any Other Significant Adverse Environmental Impacts.

In the preamble to the proposed rule, EPA states that requiring closed-cycle cooling retrofits will impose energy penalties that result in increased air emissions of various pollutants to produce the same amount of power.[525] EPA argues that increased air pollution may render closed-cycle cooling infeasible on a local basis in some places because it will have adverse

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[522] R. McCullough, *Economics of Closed-Cycle Cooling in New York* at 20 (June 3, 2010) (Exh. 112).

[523] *See* Stockholm Environment Institute Report.

[524] *See* Stockholm Environment Institute Report.

[525] *See* 76 Fed. Reg. at 22,208-09.

health effects and "it may be difficult or impossible to obtain air permits for cooling towers at existing facilities located in nonattainment areas or attainment areas with maintenance plans."[526]

In fact, as the Powers Report explains, overall air emissions from U.S. power plants will not increase as a result of closed-cycle cooling retrofits. EPA admits that its estimates of future air pollution are overstated because they ignore the effects of new regulations that, by EPA's count, will reduce power plant sulfur dioxide emissions by 71%, nitrogen oxide emissions by 52%, and mercury emissions by 29%. Additionally, over the past few decades, electricity production in the United States has consistently shifted from coal plants to much cleaner natural gas-fired plants for economic reasons.[527] In reality, air emissions from U.S. power plants may decrease slightly less dramatically as a result of closed-cycle cooling retrofits, but they will not increase.

Further, EPA should assume that any additional power needed to compensate for energy penalties at older, coal-fired power plants will come from natural gas-fired sources whose primary function is to provide load following and peaking power. In comparison to these older coal plants, air emissions from modern natural gas-fired plants are exceptionally low. Additional power will also likely come from uprates at existing nuclear power plants and from the rising number of renewable energy sources in the United States. Generally, all of these sources have lower emissions than older existing facilities.

Air emissions also may decrease because some existing facilities will choose to repower to more efficient combined cycle natural gas as a consequence of this rule. In the Final Substitute Environmental Document for the Water Quality Control Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling ("Calif. OTC Policy SED"), the State of California determined that, in the most realistic scenarios, some existing facilities would respond to a closed-cycle cooling mandate by repowering.[528] The assumption is likely realistic at the national level too. (The California analysis is further explained below in Section III.E.5.c. of these comments.)

To avoid upgrading their plants, industry frequently claims that closed-cycle cooling itself has significant adverse environmental impacts, including air emissions and visual, aesthetic, and noise-related concerns, as well as fogging and salt drift from cooling cells,, which, in their view, should prevent closed-cycle cooling from being considered the Best Technology Available. That transparently false claim was rejected by EPA a decade ago in the context of the Phase I rule for new facilities. There industry raised all the same charges about these impacts, and EPA considered and rejected them (as did the reviewing court). In *Riverkeeper I*, the Second Circuit explained:

> [The electric power industry argues that] by focusing on impingement and entrainment, the EPA ignored other adverse environmental impacts and failed to consider whether its regulations will yield a net environmental benefit. … As for other environmental impacts,

[526] 76 Fed. Reg. at 22,208 (col. 3).

[527] *See* Powers Report.

[528] *See* Calif. OTC Policy SED, at 119 (Exh. 3).

> [industry] does not attempt to demonstrate what the EPA overlooked, except through vague and speculative references to "local air quality, water resources, [and] energy markets" (which, as noted[,] … EPA did consider) and the suggestion that closed-cycle cooling may require increased land use and have undesirable "aesthetic" impacts. The EPA considered [and rejected] all of the factors that [industry] now raises…. *See, e.g.*, Public Comment & Response Nos. 062.026 at 1077, 056.012 at 927, 068.100 at 2137-41, 014.019 at 1098-1102.[529]

Thus, the debate – if there ever was a debate – about the environmental superiority of closed-cycle cooling was settled long ago.

(5) Requiring Closed-Cycle Cooling Would Cause Some Facilities to Repower their Plants, Yielding Additional Environmental and Economic Benefits.

Experience has shown that when power companies operating older, inefficient and, therefore, marginal plants are directed to upgrade their cooling systems, they will often choose to repower rather than retrofit or shut down. Repowering a heavily-polluting plant into a state-of-the-art modern facility that can produce electricity cleanly, efficiently and at lower cost is a win-win for the environment and the economy.

For example, as California developed a statewide policy for phasing out once-through cooling in recent years, "four of the original 21 coastal power plants have re-powered or are proceeding with re-powering projects that eliminate the use of once-through cooling water, either in whole or in part – Humboldt Bay, Long Beach, El Segundo, and Encina. A fifth closed-cycle cooled plant, Gateway, is being developed adjacent to the existing Contra Costa Plant."[530] These projects will produce more power using advanced control technology to reduce air emissions and virtually eliminate water withdrawals. Other examples exist, as well.

In New York, the state environmental agency generally seeks to require new power plants to use dry cooling and existing or repowered power plants to use wet closed-cycle cooling. As a result, when an independent power company purchased the Albany Steam Station on the Hudson River from a traditional utility in the early 2000s as a result of de-regulation, the company chose to repower the old plant and add closed-cycle cooling as part of the repowering, thereby reducing both its fish kills and air pollution emissions by more than 95 percent and increasing its capacity from 400 MW to 750 MW. As New York State DEC explained:

> Where impacts are large, the optimal approach from our standpoint is to repower an existing facility into a state-of-the-art power plant. The facility can thus be redesigned into an efficient new station (e.g. using combined cycle technology) that will reduce fuel use, greatly increase thermal efficiency and minimize

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[529] *Riverkeeper I*, 358 F.3d at 196-97 (internal citations omitted).

[530] *See* Calif. OTC Policy SED, at 122. *See also* El Segundo Homepage website, Modernizing El Segundo's Power Generating Station (Exh. 113) *also available at* http://www.elsegundorepowering.com/ and Sejal Choksi, "Alternatives to Once-Through Cooled Power Plants," *San Francisco Bay Crossings* (July 2009) (Exh. 114), *also available at* http://www.baycrossings.com/dispnews.asp?id=2192.

> impacts to air and water. … The old 400 MW Albany Steam Generating Station, a once-through cooled plant was successfully repowered into the Bethlehem Energy Center (BEC), a 750 MW highly efficient, combined cycle station. Through use of the combined cycle process and mechanical draft cooling towers, cooling water was reduced from approximately 500 MGD to less than 10 MGD. The new BEC began commercial operation in mid 2005. Almost twice as much electricity is now being produced at far lower impacts to the aquatic resource.[531]

Similarly, the Bergen power station, originally constructed in 1959 as a coal-fired plant at the confluence of the Hackensack River and Overpeck Creek in Ridgefield, New Jersey, once withdrew more than half a billion gallons of river water per day through its once-through cooling system, but was repowered and converted from coal to gas in 1993. It has completely eliminated those withdrawals by retrofitting with closed-cycle cooling and running a pipeline under the river to a sewage treatment plant from which it now draws treated effluent for cooling.

Because repowering would play a highly significant role in the market response to a closed-cycle cooling mandate, the net effect of Option 3 would very likely be a decrease in air pollution emissions, virtually across the board. This result is confirmed by an analysis conducted by the State of California in conjunction with the development of its statewide BTA policy. In a section entitled "Effects on Electric Reliability," the Final Substitute Environmental Document for the Water Quality Control Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling explained that, while "predicting the future operation of any *one* plant is conjecture at best," when looking at the industry as a whole "certain trends are evident," in particular that, faced with a requirement to install closed-cycle cooling, plant owners may "retrofit their OTC [once-through-cooled] plants with an alternative form of cooling, [b] repower their plants by essentially building a new plant using alternative cooling and then decommissioning the old one, or [c] shut the plant down, either permanently and convert to another use, or temporarily while waiting for more favorable economics for repowering or retrofitting."[532] The environmental assessment continued:

> The *most realistic scenarios* examined, in which some OTC plants would be retired while others repower or convert their cooling systems, *showed potential for significant benefits to the environment because the overall power sector would be more efficient and produce fewer emissions*, and because marine ecosystem impacts caused by use of OTC technology would be greatly reduced.[533]

Analyzing one of these "most realistic scenarios," termed "Scenario 3," in which all fossil fuel units are repowered to combined-cycle systems with dry cooling (as several plants in California already have) and the nuclear units are retrofitted to wet cooling, with replacement generation provided by new combined-cycle units, California estimated that fuel usage by power plants and resulting emissions of SO2, NO2, CO2, CO, TOG, and ROG would all *decrease, by 3*

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[531] New York State Department of Environmental Conservation, Aquatic Habitat Protection website, at 4 (Exh. 115), *also available at* http://www.dec.ny.gov/animals/32847.html (last visited, Aug. 2011).

[532] Calif. OTC Policy SED, p. 118 (emphasis added).

[533] Calif. OTC Policy SED, at 119 (emphasis added).

percent to 26 percent over current levels.[534] Those results are shown in the following table, which appears on page 110 of the Calif. OTC Policy SED:

Scenario 3: All fossil fuel units are repowered to combined-cycle systems with dry cooling. Nuclear units are retrofitted to wet cooling, with replacement generation provided by new combined-cycle units (Table 25).

Table 25. Estimated Stack Emission: Scenario 3

	Fuel Usage (MMBTU)	SO_2 (tons)	NO_2 (tons)	CO_2 (tons)	CO (tons)	TOG (tons)	ROG (tons)	PM10 (tons)
Baseline	151,648,525	53	557	9,070,258	3,116	413	116	262
Repowered Fossil [a]	118,351,861	43	402	7,030,961	2,104	280	104	267
Retrofitted Nuclear	12,760,349 [b]	5	63	757,965	321	28	9	20
Net Change	**-14%**	**-9%**	**-17%**	**-14%**	**-22%**	**-26%**	**-3%**	**10%**

Notes:
a. Based on average emission factors for new, dry-cooled combined-cycle units.
b. Fuel usage for retrofitted nuclear facilities refers to the additional fuel that would have to be consumed by a combined-cycle fossil unit to replace the generating shortfall from the nuclear facilities.

Accordingly, requiring closed-cycle cooling would cause some facilities to repower their plants, yielding additional environmental and economic benefits, particularly reductions in air pollution emissions.

3. Option 2's Entrainment Standard Is Far Superior to Option 1 and Option 4 in All Respects.

While Option 3 saves more fish and other aquatic organisms than Option 2 (the option which requires closed-cycle cooling for all facilities with an actual intake flow greater than 125 MGD), the costs of Option 3 and therefore the overall burden on industry is not much greater than that of Option 2. Further, the administrative burden on states is least for Option 3 because it does not require extensive consideration of technological, biological and economics studies as do Options 1 and 4 (to a tremendous degree) and Option 2 (to a somewhat lesser degree). Option 2, however, is far superior to Options 1 and 4, and would provide some, but not all, of the benefits of Option 3 and avoid some, but not all, of the fatal flaws of Options 1 and 4.

4. EPA Should Shorten the Entrainment Compliance Timelines.

EPA's extended implementation schedule for closed-cycle cooling retrofits is unnecessarily long. EPA's proposed schedule for information submittal is entirely too long and should be cut in half. As EPA noted in the Proposed Rule, facilities with a DIF greater than 50 MGD were previously subject to the withdrawn Phase II rule and therefore should have already compiled much of the proposed application data which can be used to meet many of the information submittal requirements.[535] Furthermore, the start-to-finish application process for

[534] Calif. OTC Policy SED at 110.

[535] *See* 76 Fed. Reg. at 22,254 (col. 2).

closed-cycle cooling conversions should be no more than 24 months. Competition of closed-cycle cooling retrofits should be required no later than 36 months after approval of the application at fossil plants, and no more than 48 months after approval at nuclear plants (nuclear plants may need additional time to synchronize the retrofit outage with a refueling outage).[536] The attached engineering report concludes that if EPA applies the suggested downtime estimates of 1 and 2 months for fossil and nuclear plants respectively, there is no technical justification for EPA's proposed extended implementation schedule for closed-cycle cooling retrofits.[537]

This schedule is consistent with what EPA required for the Brayton Point plant, where the final compliance order required the company to complete construction of closed-cycle cooling within 29 months of getting all permits and to fully meet the closed-cycle-cooling-based permit limits seven months after that, for a total of 36 months from permitting to final compliance.[538]

5. Any Variance EPA Includes as Part of a Categorical Entrainment Standard Must Clearly Delineate What Issues May Be Considered by the Director and How They Are to Be Considered.

Although OMB deleted it, in the version of the Proposed Rule EPA sent to OMB shortly before proposal, EPA stated:

> The Agency could have developed a proposed rule based on closed-cycle cooling as BTA that provides exceptions to take into account each of these four factors [i.e., energy reliability, air emissions, land availability, and remaining useful plant life] individually. In other words, EPA could have developed an option that would require closed-cycle cooling, but the rule would also necessarily provide numerous alternatives and exceptions to specifically address each of the identified factors.[539]

As discussed above, EPA should promulgate a rulemaking option that requires closed-cycle cooling (e.g., Option 3), and to the extent that such option includes a variance, EPA should carefully tailor that variance and set rules for the Director to follow in applying that variance.[540] In particular:

- The burden of proof must be placed squarely on the permit applicant to demonstrate entitlement to any variance.

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[536] *See* Powers Report.

[537] *See* Powers Report.

[538] U.S. EPA, Region I – New England, *In the Matter of Dominion Energy Brayton Point, LLC, Brayton Point Power Station, Somerset, Massachusetts, NPDES Permit No. MA0003654, Docket No. 08-007, Findings and Order for Compliance* at 6 (Exh. 116).

[539] Version of Proposed Rule Sent to OMB, p. 139 of 383 (Exh. 85).

[540] It should be noted that EPA's Fundamentally Different Factors (FDF) variance is designed to operate in both directions. That is, the FDF variance allows national standards to be made "*either more or less stringent*" on application by "[a]ny interested person." 40 C.F.R. § 125.30(b) (emphasis added).

- There should be no cost-benefit variance or any other site-specific cost-benefit analysis.
- Any calculation baseline must use an "actual flow" not a "full flow" operational baseline.
- Directors should be directed to find that there is adverse environmental impact (AEI) whenever there is impingement or entrainment and, further, AEI is not to be measured at the fish population level, or with adult-equivalent calculations such as age-1 equivalency.
- Fishery managnent models may not be used to assess the effects of impingement and entrainment.
- Density dependent models and the ecologically baseless concept of "surplus production" may not be considered in permitting proceedings.
- All species must be considered.
- Species of special concern, *e.g.*, not only threatened and endangered species, but also those awaiting listing and other sensitive, keystone or otherwise important species are entitled to enhanced protection.
- Arguments that some of entrained or impinged fish were dead before they were trapped by the intake structure may not be considered due to the difficulty in proving this.
- The degraded quality of source or receiving waterways may not be considered in permitting proceedings.
- Other aspects of source or receiving water quality may be considered only to make technology-based standard stricter, not to relax them.
- No waters of the U.S. are exempt from Clean Water Act protection or are deserving of lesser protection than others.
- Waterways that have been dammed by plant owners for use as cooling water reservoirs remain waters of the U.S.
- The impact on aquatic organisms from other sources may not be considered as a reason not to regulate intake structures or as a reason to regulate them less stringently.
- Entrainment survival claims may not be considered.
- As the courts have clearly held, restoration or mitigation measures may not be considered under Section 316(b).
- Section 316(b) requirements must be considered independently of any Section 316(a) variance application.
- The compliance costs or social costs to be considered may include only capital expenditures, operation and maintenance, and energy penalty, not speculative, indirect add-on costs.

- Arguments by permit applicants related to air quality issues must be evaluated by the Director in the context of the fact that, as EPA noted, most impacts from closed-cycle cooling itself are so localized as to occur wholly on the property of the plant itself;[541] and the fiinal air permitting analysis should be evaluated with the expectation that it would be the last step in the permitting process (due to ongoing changes in the classification of areas in "non-attainment" status and the regulatory procedure for air permits which allows only for a one-year duration before a new air permit must be sought).
- Arguments that the power industry is entitled to special treatment may not be considered.
- Projections of a plant's remaining useful life should not be considered unless a plant operator makes a binding and enforceable commitment to close a plant within a 5-year time frame.
- Arguments that retrofits should not be required at a plant that was recently built or refurbished may not be considered.
- Arguments that an older Section 316(b) determination should not be revisited now cannot be considered.
- The implementation time for BTA measures cannot be considered as a reason for requiring a less protective technology over a more protective one; instead, less protective technologies that can be implemented more rapidly should be considered as interim measures to reduce impacts while more protective technologies are being installed.

C. Although the Establishment of National Categorical Standards for Impingement Is Necessary and Appropriate, the Proposed Standards Are Impermissibly Weak and Problematic in Numerous Respects.

1. EPA Should Establish a National Categorical Impingement Standard Based on Closed-Cycle Cooling.

In the Proposed Rule "EPA concluded that closed-cycle cooling reduces impingement and entrainment mortality to the greatest extent."[542] As discussed above, EPA should set a national standard based on closed-cycle cooling for entrainment and establish a similar standard as the first component of the rule's impingement standards, as well.[543] Moreover, as explained below, while EPA did propose national standards for impingement, those standards are also insufficient because EPA did not primarily base them on velocity reduction.

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[541] 76 Fed. Reg. at 22,209 (cols. 1-2).

[542] 76 Fed. Reg. at 22,207 (col. 1).

[543] It should be noted, however, that even though "virtually all facilities with wet cooling towers have a maximum intake velocity of 0.5 feet per second" (76 Fed. Reg. at 22,258 (col. 2)), a closed-cycle cooling standard is not alone sufficient for impingement. *Id.*

2. EPA's Rejection of the 0.5 Ft/S Velocity Limitation as the Primary National Standard Is Illegal.

a. EPA Has Found in Each Previous Section 316(b) Rulemaking, and Again for this Rule, that a 0.5 Ft/S Velocity Limitation Would Protect Approximately 96 Percent of Fish from Impingement and that Many Existing Facilities Already Meet that Standard.

As EPA has explained, "impingement is generally correlated to three factors: intake flow, intake velocity, and fish swim speed" and "[t]he latter two factors are closely related, as the ability of fish to evade impingement depends on the swimming ability of the individual fish and the intake velocity against which it is attempting to escape.[544] Based on this analysis, "EPA has consistently recognized that regulating the intake velocity at cooling water intake structures (CWIS) is an effective way to minimize impingement impacts."[545]

Accordingly, in the Phase I rule, EPA set a national categorical standard requiring all new facilities to have a maximum design intake velocity of 0.5 feet per second (ft/s or fps).[546] EPA established 0.5 ft/s as the appropriate minimum velocity requirement based on technical and scientific literature, state and federal studies, and an analysis of data from studies on fish swim speeds suggested that a 0.5 ft/s velocity would protect 96 percent of the tested fish.[547] EPA documented that 73 percent of manufacturing facilities and 62 percent of power plants constructed in the prior 15 years met the 0.5 ft/s through-screen velocity requirement.[548]

In addition, the record shows that in 2000, the Electric Power Research Institute (EPRI) submitted a report in which it "agreed that intake velocity was an appropriate regulatory criterion, and … that a limit of 0.5 fps was a useful threshold for screening out significant impingement events at CWISs.[549] Nevertheless, in *Riverkeeper I*, the power industry (UWAG) challenged the velocity requirement, arguing that there was insufficient support in the record for a through-screen velocity limit of 0.5 ft/s.[550] The Second Circuit rejected that challenge, finding that "EPA's choice of velocity limit was reasonable."[551]

"The Phase II rule used the same data, analyses and conclusions presented in Phase I to support a compliance alternative where an intake at a facility with a design through-screen velocity of 0.5 fps meets the impingement requirements."[552] Similarly, the proposed Phase III rule utilized the same regulatory framework as the Phase II rule, including the 0.5 fps intake

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[544] Memo to Paul Shriner, EPA from Kelly Meadows, Tetra Tech, Subject: Analysis of swim speed data (hereinafter "Swim Speed Data Memo") December 8, 2008, at 1 (DCN 10-6705A) (EPA-HQ-OW-2008-0667-0660) (Exh. 117); *see also,* 69 Fed. Reg. at 41,612 (col. 2); *see also* Pisces Report.

[545] Swim Speed Data Memo at 1.

[546] *See* 40 C.F.R. § 125.84(b)(2) and (c)(1).

[547] 66 Fed. Reg. at 65,274 (cols. 2-3).

[548] 66 Fed. Reg. at 28,864 (col. 3.); see also Swim Speed Data Memo at 3, citing DCN 2-030.

[549] Swim Speed Data Memo at 3.

[550] *Riverkeeper I*, 358 F.3d at 198.

[551] *Id.*, 358 F.3d at 199.

[552] Swim Speed Data Memo at 3.

velocity threshold.[553] "In the final Phase III rule, EPA opted not to regulate land-based facilities, but continued to impose the intake velocity requirements on certain offshore facilities."[554] Industry did not specifically challenge the 0.5 ft/s standard in *Riverkeeper II* or in its challenge to the Phase III rule, *ConocoPhillips, et al. v. EPA*.

For the current rulemaking, EPA briefly re-examined the basis for the 0.5 ft/s threshold to ensure that it was still valid and conducted additional screening analyses. Based on that updated examination, EPA's technical consultant concluded:

> In reviewing the swim speed data in the record, the previous conclusions continue to be supported by the data. … 0.5 ft/sec through-screen velocity would be protective of 96% of species. … Given the potential for screen clogging and debris loading (which would reduce the open area of the screen and increase the through-screen velocity even further), the 0.5 fps threshold also provides for an appropriate safety margin for aquatic organisms. … Analyses were conducted to determine if the velocity threshold should vary by waterbody type. The swim speed data from the EPRI report was plotted by fish assemblage, a categorization of fish species by waterbody type (e.g., Pacific Ocean, rivers in the Eastern U.S., etc.). … These plots did not show any clear differentiation of swimming ability between fish in the various waterbodies nor did any waterbody type appear to be any more vulnerable than another; it is therefore reasonable to conclude that the 0.5 fps national intake velocity limit is appropriate for all waterbody types.[555]

EPA thus concluded that "a design through-screen velocity of 0.5 feet per second would be protective of 96% of motile organisms" and would therefore be "better than the selected technology," *i.e.*, modified travelling screens.[556]

In addition, EPA's updated analysis also showed, once again, that "many intakes already meet this standard, thereby reducing the burden of meeting the requirement."[557] Specifically, "[a]ccording to data from EPA's 2000 industry questionnaire, approximately 18% of intake structures meet the 0.5 fps threshold. Another 21% are less than 1.0 fps."[558] Moreover, "many intake technologies installed today (e.g., cylindrical wedgewire screens) are specifically designed to meet the 0.5 fps threshold."[559]

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[553] *Id.*

[554] *Id.,* citing 125.134(b)(2).

[555] *Id.* at 4.

[556] *See* 76 Fed. Reg. at 22,204 (col. 3). As discussed in the Pisces report attached as Appendix B, while the 0.5 ft/s velocity limit is more protective than modified travelling screens, it may not be as protective as EPA believes because not all fish with swim speeds faster than the velocity of the intake structure can and will actually avoid the intake. Thus, a 0.5 ft/s velocity limit should be one primary component of the impingement standards, but it is not itself sufficient.

[557] Swim Speed Data Memo at 4.

[558] Swim Speed Data Memo at 4, citing DCN 4-4023C "Preliminary Data Analyses Using Responses from the Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures (Draft)."

[559] Swim Speed Data Memo at 4.

b. EPA Lacks a Legitimate Legal or Evidentiary Basis for Rejecting the 0.5 Ft/S Velocity Limit.

Having found that a 0.5 ft/s velocity limit is an appropriate and highly protective standard, EPA did not, however, require existing facilities to meet it. Instead, the Proposed Rule gives facilities the option of choosing to meet the 12-percent-annual/31-percent-monthly impingement mortality reduction standard, which is a less protective standard and is inferior in many ways, as discussed below. EPA states that it did so because "EPA's record shows modified traveling screens are available for all facilities, whereas reduced intake velocity may not be available at all locations."[560] That is illegal for at least two reasons. First, as discussed above, EPA applied an unauthorized interpretation of the statutory term "available" and an improper approach to BTA. Second, analysis or evidence in the record to support a conclusion that reduced intake velocity is not cabable of being implemented at all locations appears to be lacking. To the contrary, the record evidence shows not only that 18 percent of intake structures presently meet the 0.5 ft/s velocity limit but also that many existing facilities can meet it.[561] As the Second Circuit stated in upholding that limit in *Riverkeeper I*: "The fact that a minority of facilities do not presently meet this requirement, of course, says nothing about whether the required technology is the 'best' or 'available.'"[562]

3. The 12 Percent/31 Percent Impingement Mortality Reduction Requirement Is Problematic In Numerous Respects.

As noted above, the 0.5 ft/s velocity limit is more effective than the technology on which the 12/31 percent standard is based, assuming that both restrictions operate as they are intended. Additionally, because those two standards work in very different ways, the 12/31 percent limit is also inferior in other ways. A velocity limit allows fish to swim away from the intake and avoid impingement altogether. The 12/31 percent limit allows an unlimited number of fish to be impinged, and instead requires that enough impinged fish be returned to the waterbody such that no more than 88 percent (the reciprocal of 12 percent) die over the course of a year and no more than 69 percent (the reciprocal of 31 percent) die in any given month.

A standard based on reduced impingement is superior to one based on impingement mortality because the former avoids the difficulties and uncertainties of determining how many fish of which species have survived impingement. In addition, the former also avoids sub-lethal harm to impinged fish. For many reasons, it is far more practical, certain and effective to address an environmental problem before it happens (which, in this case, means preventing impingement through a velocity limit) rather than to let it happen and attempt to mitigate the consequences (which, in this case, means allowing unlimited impingement and trying to return the impinged fish to the waterbody alive). In this regard, the velocity limit is simple, effective, and relatively

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[560] *See* 76 Fed. Reg. at 22,197 (col. 2).

[561] TDD, Ch. 6.

[562] 358 F.3d at 199.

easy to measure compliance with, while the impingement mortality limit is not. Several related problems emerge here, as discussed below.

For a more extensive discussion of the problems with the Proposed Rule's 12/31 percent standard and the associated monitoring requirements, please see the report on biological issues prepared by PISCES Conservation, Ltd., and attached hereto as Appendix B.

a. Impingement Mortality Monitoring Is Inherently Difficult, Controversial, and Uncertain.

Facilities seeking to meet the 12/31 percent standard must develop and submit a "Proposed Impingement Mortality Reduction Plan." The plan must include a proposed biological sampling protocol for monitoring both impingement and impingement mortality and thereby demonstrating that the 12/31 percent standard is being met. Specifically, the plan must propose, at a minimum: (1) the duration and frequency of monitoring; (2) the monitoring location; (3) the organisms to be monitored; (4) the method in which naturally moribund organisms would be identified and taken into account; and (5) a latent mortality assessment procedure. This last item must involve a method for handling the organisms in a collection device "as little as possible," transferring them to a "holding area with conditions as close as practicable to the source water," and retaining them for 48 hours, at which time the number of dead organisms would be counted.[563] EPA envisions that the permitting authority would then review and approve the Impingement Mortality Reduction Plan, after making a determination that each of these issues has been properly addressed.

In practice, however, these issues are enormously complicated and controversial and will inevitably lead to disputes among the permitting authority, the permittee and others. As EPA acknowledges, "there are no standard methods for conducting impingement and entrainment studies and that there can be variability in designing a sampling plan between sites."[564] That variability, along with the complexity of the biological issues involved, will inevitably lead to disputes, delays and uncertainty. For example, because sampling is an expense that plant operators will want to minimize, they have every incentive to propose minimal sampling frequencies and to scale down the extent of monitoring in every other way. Unfortunately, permit writers will often oblige them so as to not burden industry or ratepayers. Moreover, while there is significant potential for disputes over the design of the sampling and the interpretation of the results, state agencies (as well as the general public) lack the resources to fully and properly evaluate the sampling plans being submitted.

In particular, disputes are highly likely to emerge with respect to the number of sampling events, the species to be monitored, how to properly account for periods when the plant is running at low capacity or when fish are relatively abundant or sparse in the waterbody and whether organisms died as a result of impingement or are naturally moribund (or plant operators may argue that organisms died as a result of the transferring and holding process). Especially controversial and fraught with difficulty is the latent mortality determination, whereby plant

[563] 76 Fed. Reg, at 22,257 (col. 2).

[564] *Id.* at n.103.

operators must seek to retain the samples for 48 hours in a manner that will minimize mortality from the holding itself. Significantly, latent mortality may occur after more than 48 hours, and while EPA is not proposing a longer latency period because of the potential for greater mortality as a result of the holding, the fact remains that mortality which occurs 72 or 96 hours after the impingement event would not be measured at all under the Proposed Rule. Consequently, the sampling results are likely to be disputed, leaving substantial uncertainty as to whether impingement mortality has been actually reduced to the levels suggested by monitoring.[565]

In contrast, determining the maximum velocity of an intake structure is far more straightforward. While it is unlikely that 96 percent of fish will be protected at every intake structure meeting the velocity limit, the statistical analysis underpinning that figure has already been conducted by EPA, used in four rulemakings, and upheld by the courts, and thus there is no reason to revisit it on a plant-specific basis. For that reason, extensive biological monitoring with latency holding periods is not required to determine compliance with the velocity limit, no sampling protocols to be developed, assessed, debated, approved, and ultimately disputed, and no holding period for assessment of latent mortality.

b. The 12 Percent/31 Percent Standard is Further Weakened by the Provision Allowing the Director to Exclude Certain Species from the Standard.

While the Proposed Rule provides that compliance with the entrainment and impingement provisions means achieving any applicable limitations "for all life stages of fish,"[566] the Proposed Rule also contains a provision stating that "the Director may determine invasive species, naturally moribund species, *and other specific species* may be excluded from any monitoring, sampling or study requirements of 40 CFR 122.21 and § 125.94."[567] This provision will invite plant operators and some regulators to seek to exclude certain species – in addition to species deemed to be "invasive"[568] or organisms that are determined to be naturally moribund – from the calculations in order to make a non-compliant facility appear to be compliant. For example, because certain fish species are more delicate than others and therefore less likely to survive impingement, by excluding those species from the monitoring requirements a facility that was not meeting the 12/31 percent limit would suddenly be deemed to be in compliance. Indeed, it is unclear whether the 12/31 percent standard can be met at every location using modified travelling screens unless the plant operator is able to convince the

[565] Relatedly, because the 12/31 percent standard allows plants to impinge as many fish as they can it provides no incentive to reduce impingement, only impingement mortality. In fact, because the baseline is the number of fish impinged, the more fish that a plant impinges, the more it can kill. That may give permitees a perverse incentive to increase rather than decrease impingement. While plant operators would not likely seek to increase their impingement across the board, one can envision circumstances where increasing impingement of relatively robust fish species more likely to survive impingement (or sampling when those species are more likely to be present) becomes a strategy for increasing a plant's average impingement survival results.

[566] Proposed 40 C.F.R. § 125.94(b)(1)(i), 76 Fed. Reg. at 22,282 (col. 3) (achieve impingement standards for all life stages of fish). *See also id.* §§ 125.94(b)(1)(iii)(A), 76 Fed. Reg. at 22,282 (col. 2-3) (the owner of a facility must count as impinged "any fish" carried over or removed from a screen).

[567] Proposed 40 C.F.R. § 125.98(c)(6) (emphasis added), 76 Fed. Reg. at 22,287 (col. 3).

[568] Allowing "invasive" species to be excluded is also problematic because there is no unanimity as to what species are considered invasive or whether all of those species are harmful.

director to exempt delicate species that would otherwise increase impingement mortality above the specified levels. In contrast, the 0.5 ft/s velocity limit will protect 96 percent of all fish. As discussed below, the director should not be allowed to exclude species from impingement monitoring or any other study, but the potential for such exclusion is further reason why the velocity limit is far more protective.

4. EPA Should Select the 0.5 Ft/S Velocity Limit as the Impingement Standard for the Final Rule.

In the Final Rule, EPA should abandon the 12-percent-annual/31-percent-monthly impingement mortality standard and instead set a national standard for impingement mortality at all existing in-scope facilities based on the 0.5 ft/s velocity limit. In addition, EPA should retain the additional fish-return, fish-entrapment, and shellfish barrier net requirements currently in the proposed rule. The maximum time frame for compliance should be shortened to three years or less. To the extent that some covered facilities might not be capable of meeting the velocity limit, a properly-crafted and properly-limited variance, consistent with that allowed under the Clean Water Act in these circumstances would be appropriate. Accordingly, 40 C.F.R. § 125.93 (a) should read:

> **§ 125.93 Compliance.**
>
> (a) The owner or operator of a facility subject to this subpart must comply with the applicable BTA standards for impingement mortality in § 125.94(b) as soon as possible based on the schedule of requirements set by the Director, but in no event later than [date 3 years after the effective date of the final rule].

And 40 C.F.R. § 125.94(b) should read:

> **§ 125.94 As an owner or operator of an existing facility, what must I do to comply with this subpart?**
>
> (b) *BTA Standards for Impingement Mortality*. By the dates specified in § 125.93(a), the owner or operator of an existing facility subject to this subpart must achieve the impingement mortality standards provided in paragraphs (b)(1) and (2) of this section:
>
> (1) The owner or operator of an existing facility must demonstrate to the Director that its cooling water intake system has a maximum intake velocity of 0.5 feet per second.
>
> (2) In addition, you must meet the following criteria:
>
> (i) The maximum velocity must be demonstrated as either the maximum actual intake velocity or the maximum design intake velocity as water passes through the structural components of a screen measured perpendicular to the screen mesh;

(ii) The maximum velocity limit must be achieved under all conditions, including during minimum ambient source water surface elevations and during periods of maximum head loss across the screens or other devices during normal operation of the intake structure. If the intake does not have a screen, the maximum intake velocity perpendicular to the opening of the intake must not exceed 0.5 feet per second during minimum ambient source water surface elevations;

(iii) Each intake must be operated and maintained to keep any debris blocking the intake at no more than 15 percent of the opening of the intake. A demonstration that the actual intake velocity is less than 0.5 feet per second through velocity measurements will meet this requirement;

(iv) The owner or operator of a facility that withdraws water from the ocean or tidal waters must also reduce impingement mortality of shellfish at a minimum to a level comparable to that achieved by properly deployed and maintained barrier nets. Passive screens such as cylindrical wedgewire screens, and through-flow or carry-over free intake screens such as dual-flow screens and drum screens, will meet this requirement;

(v) The owner or operator of a facility that employs traveling screens or equivalent active screens must incorporate protective measures including but not limited to: modified traveling screens with collection buckets designed to minimize turbulence to aquatic life, addition of a guard rail or barrier to prevent loss of fish from the collection bucket, replacement of screen panel materials with smooth woven mesh, a low pressure wash to remove fish prior to any high pressure spray to remove debris on the ascending side of the screens, and a fish handling and return system with sufficient water flow to return the fish to the source water in a manner that does not promote predation or re-impingement of the fish; and

(vi) The owner or operator of the facility must ensure that there is a means for impingeable fish or shellfish to escape the cooling water intake system or be returned to the waterbody through a fish return system. Passive screens such as cylindrical wedgewire screens, and through-flow or carry-over free intake screens such as dual-flow screens and drum screens, will meet this requirement.

In addition, since fish with swim speeds faster than 0.5 ft/s may nevertheless be impinged, particuarly at larger intake structures,[569] the rule should also require facilities to

[569] *See* PISCES report, Appendix B. For example, even a fast-swimmig fish may not be able to perceive that it is being impinged and in which direction safety lies until it is too late. *Id.*

conduct biologival monitoring to verify that the 0.5 ft/s limitation is effective. Such monitoring would not involve an assessment of impingement mortiality and would not require holding fish for a latency period, but would instead be used to verify whether fish species and life stages with faster swim speeds are being impinged in any appreciable numbers.

D. All Repowered, Replaced, or Rebuilt Facilities Must Be Subject to the Same Closed-Cycle-Cooling-Based Requirements as New Units at Existing Facilities.

1. Although the Closed-Cycle Cooling Standard for New Units at Existing Facilities Should Be Retained, the Definitions of New Unit and Existing Facility Are Problematic.

In Phase I, EPA required *new facilities* to reduce intake flows to a level commensurate with the performance of closed-cycle cooling systems, but deferred regulation of all existing facilities – meaning all facilities that did not fit EPA's strict definition of a "new facility"[570] – until the present rule.[571]

EPA promulgated a two-part definition of a new facility. The first part of the "new facility" test essentially restates EPA's definition of a "new source" of water pollution that is subject to new source performance standards under Section 306 of the Act.[572] In particular, a facility is only considered new if:

(i) It is constructed at a site at which no other source is located; or

(ii) It totally replaces the process or production equipment that causes the discharge of pollutants at an existing source; or

(iii) Its processes are substantially independent of an existing source at the same site.[573]

Under the second part of EPA's test, a new facility also has another essential characteristic: it either uses a new cooling water intake or an existing intake "whose design capacity is increased to accommodate the intake of additional cooling water."[574]

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[570] An existing facility is any facility that is not a "new facility." *See* proposed 40 C.F.R. § 125.92, 76 Fed. Reg. at 22,281 (col. 3) ("*existing facility* means any facility that commenced construction . . . on or before January 17, 2002; and any modification of, or any addition of a unit at such a facility that is not a new facility at § 125.83."); *see also id.* at 22,193 (col. 2) ("EPA's definition of an 'existing facility' in today's proposed regulation is intended to ensure that all sources excluded from the definition of new facility in the Phase I rule are captured by the definition of existing facility in this proposed rule.").

[571] *See* 66 Fed. Reg. at 65,256 (col. 3).

[572] *See* 40 C.F.R. §§ 122.2, 122.29.

[573] *See* 40 C.F.R. § 125.83. In determining whether these processes are substantially independent, the Director shall consider such factors as the extent to which the new facility is integrated with the existing plant; and the extent to which the new facility is engaged in the same general type of activity as the existing source. *Id.*

[574] 40 C.F.R. § 125.83.

Thus, under EPA's Phase I rule, a facility is only "new" if it is both a "new source" and also uses a new or expanded intake.[575] In 2001, when it promulgated the Phase I rule, EPA reported that some commenters expressed a "well founded" concern with this two-part definition because "an existing facility could rebuild its whole facility behind the cooling water intake structure and not be subject to the requirements applicable to a new facility."[576] EPA admitted that, indeed, it was possible to "completely demolish an existing source, replace it with a smaller-capacity new source, and not be regulated under today's rule as a new facility."[577] However, EPA promised that to the extent any commenters "assert some inequity of treatment between new facilities and certain existing facilities, EPA will address this comment when it addresses what substantive requirements apply to existing facilities."[578]

In the current rule, EPA proposes to bring new units at existing facilities up to the level of control applied to new facilities.[579] In the preamble, EPA explains that a new unit at an existing facility should be treated like a new unit at a new facility for several reasons:

1. "As new units are built at existing facilities to provide additional capacity, facilities have the ideal opportunity to design and construct the new units without many of the additional expenses associated with retrofitting an existing unit to closed-cycle."

2. "The incremental downtime that can be associated with retrofitting to closed-cycle cooling is avoided altogether at a new unit."

3. "In addition, when new units are added, the condensers can be configured for closed-cycle, reducing energy requirements, and high efficiency cooling towers can be designed as part of the new unit, allowing for installation of smaller cooling towers. Thus, the capital costs for closed-cycle cooling at new units are lower than the capital costs for once-through cooling. These advantages may not always be available when retrofitting cooling towers at an existing unit."

4. "In consideration of the fact that additional unit construction decisions rest largely within the control of the individual facility, EPA decided that subjecting new units to the same national BTA requirements as those applicable to new facilities is warranted."[580]

In theory, all new units will now be required to approximate the performance of a closed-cycle cooling system – whether they are built at new or existing facilities. But in practice, many new units will not be subject to environmentally protective requirements because, in defining a "new unit," the proposed rule only counts additional units added to an existing facility to increase the facility's capacity. The definition of "new unit" excludes all other major changes at

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[575] 40 C.F.R. § 125.83, *see also* 66 Fed. Reg. at 65,259 (col. 1).

[576] 66 Fed. Reg. at 65,286 (col. 2).

[577] *Id.*

[578] 66 Fed. Reg. at 65,286 (col. 1).

[579] *See* 76 Fed. Reg. at 22,196 (col. 1-2) ("The requirements for new units are modeled after the requirements for a new facility in the Phase I rule.").

[580] 76 Fed. Reg. at 22,196 (col. 2).

an existing facility, including total replacements and repowerings, and even if the replacement unit adds capacity compared to the prior unit:

> new unit refers to newly built units added to increase capacity at the facility and *does not include any rebuilt, repowered or replacement unit,* including any units where the generation capacity of the new unit is equal to or greater than the unit it replaces."[581]

This is precisely the problem that commenters identified in 2001 and that EPA indicated it would address in this rule: under the proposed rule, a facility operator can completely demolish every part of a site behind the cooling water intake structure and rebuild an entirely new plant, yet potentially evade the protective standards imposed upon all other new units.

EPA's decision to call only units added in order to increase a facility's capacity "new units" and exclude other kinds of new units at existing facilities from comparable regulation is irrational, arbitrary, and capricious.[582] Replacements and repowerings are construction projects in which all of the significant equipment at an "existing facility" is removed and completely new equipment is installed. The electric generating unit that emerges from a replacement or repowering is, by any reasonable standard, a "new unit." Thus, replacement and repowered sites are new units and should be subject to the same standards as "additional" units.

Neither the rule, nor the preamble, provide any justification for singling out "additional" units as "new units" and not treating replaced, repowered, or rebuilt facilities as new units. The reasons that EPA gave for strictly regulating additional units apply equally to total replacements and repowerings (as do the reasons EPA gave for strictly regulating new facilities back in 2001, in the Phase I rule). The rule irrationally distinguishes between two total replacements of a facility. If an owner replaces every inch of the site, it is a new facility. But if the owner completely demolishes and replaces everything at the existing facility except for the cooling water intake structure itself, it is an existing facility. Yet all the equipment necessary to meet a closed-cycle cooling standard (cells, different piping, etc.) is built behind the cooling water intake structure. Significantly, EPA's technical experts agreed that the reasons for considering an additional unit to be a new unit apply equally to replacements and repowerings, but they were overruled by OMB. OMB has not justified its proposed change, and in any case the office does not have technical expertise thus its technical decision merits no deference. For EPA to accept OMB's unjustifiable modification to the rule would be arbitrary and unreasonable; it is also inconsistent with Congress's intent to control mortality at cooling water intakes.

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[581] Proposed 40 C.F.R. § 125.92, 76 Fed. Reg. at 22,282 (col. 1-2) (emphasis added).

[582] In *Riverkeeper II*, the Second Circuit found that EPA had illegally "expanded the scope of what may be classified as a 'new unit' while narrowing the Phase I definition of 'stand-alone' facility. Moreover, by including a potentially expansive definition of 'new unit' in the preamble to the Phase II Rule, the EPA has interpretively modified the definitions that appeared in the Phase I Rule without providing interested parties an opportunity for notice and comment."[582] EPA has (at the direction of OMB) once again improperly used the definitions of "new" and "existing" to narrow the class of facilities required to meet a closed-cycle-cooling-based standard.

2. All Repowered, Replaced, or Rebuilt Facilities Must Be Subject to the Same Closed-Cycle-Cooling-Based Requirements as "New Units at Existing Facilities."

Fixing the new units provision is simple: EPA should restore the Section 125.92(r) definition of "new unit" contained in the version of the Proposed Rule it submitted to OMB shortly before the proposal, which read:

> (r) *New unit* means any addition of an operating unit at an existing facility where the construction begins after [insert effective date of this rule], including but not limited to a new unit added to a new or existing facility for the same general industrial operation, but that does not otherwise meet the definition of a new facility at § 125.83. *New unit* includes any additional, rebuilt, repowered, or replaced unit where that unit is not subject to the requirements of Subpart I. For purposes of this definition, rebuilt refers to major modifications affecting operation of the cooling water intake structure such as replacement of the turbine, boiler, or condensers.[583]

In addition, EPA should restore the Section 125.94(d)(1) and (2) "BTA Standards for Entrainment Mortality for New Units at Existing Facilities" contained in the version of the Proposed Rule it submitted to OMB shortly before proposal, with an addition required by the *Riverkeeper I* decision (shown in italics). The necessity for that addition is further explained in Section V, below, in the context of the Phase I rule:

> **(d) BTA Standards for Entrainment Mortality for New Units at Existing Facilities.** The owner or operator of a new unit at an existing facility must achieve the entrainment standards provided in either § 125.94(d)(1) or § 125.94(d)(2).
>
> (1) The owner or operator of a facility must reduce actual intake flow (AIF) at a new unit, at a minimum, to a level commensurate with that which can be attained by the use of a closed-cycle recirculating system for the same level of cooling. The owner or operator of a facility with a cooling water intake structure that supplies cooling water exclusively for operation of a wet or dry cooling tower(s) and that meets the definition of closed-cycle recirculating system at 125.92(c) meets this entrainment mortality standard.
>
> (2) The owner or operator of a facility must demonstrate to the Director that it has installed, and will operate and maintain, technologies for each intake at the new unit that reduce entrainment mortality of all stages of fish and shellfish that pass through a 3/8 inch sieve. The owner or operator of a facility must demonstrate entrainment mortality reductions equivalent to 90 percent or greater of the reduction that could be achieved through compliance with § 125.94(d)(1). *In seeking to comply with the requirement set forth in this subsection, a facility must aim for 100 percent, and if it falls short within 10 percent, that will be acceptable. It may not, however, aim for 90 percent and achieve only an 89 percent reduction in entrainment mortality.*

[583] EPA Version of Proposed Rule submitted to OMB, at 360-61 of 383 (Exh. 85); *see also* Redlined Version of Proposed Rule, at 423 (Exh. 86).

E. Other Critical Provisions Should Be Revised.

1. EPA Should Clarify the Meaning of the Term "Species of Concern" and Restore Additional Protections for These Species.

The proposed rule repeatedly refers to "species of concern,"[584] but does not define the term. Presumably, EPA now assigns the same meaning to "species of concern" that it assigned in the earlier Phase II rule: "those species that might be in need of conservation actions, but are not currently listed as threatened or endangered under State or Federal law."[585] This definition is consistent with EPA's practice under the Phase I rule of offering stronger protection to "species of concern" than the rule's uniform standards would otherwise provide.[586] To be clear, EPA should set forth this meaning of "species of concern" as a definition in the regulatory text.

EPA should also extend additional protection to species of concern. Originally, EPA proposed to require facility operators who reduce intake velocity to 0.5 feet/second or less to document that this measure adequately protected "species of concern" and left Directors with discretion to impose additional requirements if the velocity limit was inadequate to the task.[587] But OMB suggested that this requirement should be deleted, and EPA now seeks comment on the wisdom of such a provision.[588] EPA should restore the provision as originally drafted.

Protection for species of concern is important because hundreds of candidate threatened and endangered species are caught in a regulatory backlog that, in many cases, has extended for decades.[589] Although the intake velocity limit is protective of the majority of species, some species of concern may be adversely affected even by a slow-speed intake. If the best available science shows that a particular species requires support from stronger conservation measures to survive, including more stringent protection from impingement and entrainment, then the species should not be denied vital support because of administrative shortcomings. Recognizing and restoring additional protections for species of concern is a way for EPA to address a governance failure within the Department of Interior and fulfill its mandate to protect the health and biological diversity of the nation's waters.

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[584] *See e.g.*, proposed 40 C.F.R. 125.97(a)(4) (Entrainment monitoring reports must "describe . . . the species of concern, the counts and percentage mortality of organisms sampled, and other information specified in the permit."). *See also* 76 Fed. Reg. at 22,204 (col. 3) (EPA is considering, as an additional impingement requirement, that facilities opting to reduce intake velocity also show that "species of concern are adequately protected.").

[585] 69 Fed. Reg. at 41,587 (col. 1).

[586] *See* 40 C.F.R. § 125.84(b)(4),(5) (requiring new facilities to take extra measures above and beyond implementation of closed-cycle cooling if necessary to protect "species of concern to the Director.").

[587] *See* Redlined Version of Proposed Rule at 397.

[588] *Id.*

[589] See, e.g., Columbia Basin Fish & Wildlife News Bulletin, "USFWS Announces Work Plan to Deal With Backlog of ESA Listing Determinations" (May 13, 2011) (Exh. 118).

2. EPA Should Prevent Directors from Excluding Any Species from the Rule's Scope.

EPA should delete its proposed Sections 125.98(c)(6) – the provision that allows a Director unfettered discretion to exclude any species, without limits and without standards, "from any monitoring, sampling, or study requirements of 40 CFR 122.21 and § 125.94."[590] Currently, Section 125.98(c)(6) provides an exception that could swallow the Clean Water Act. The proposed rule requires all existing units to reduce impingement mortality to 12 percent annually, and some units must also meet an entrainment standard based on the performance of closed-cycle cooling systems; others will use studies to propose entrainment standards. These standards are not met if a facility kills millions of fish that are simply not monitored or counted because they have been excluded by the Director. Under the Act, EPA and implementing state agencies are directed to minimize adverse environmental impacts – not ignore them.

3. EPA and States Should Maintain an Assumption of 100 Percent Entrainment Mortality in All Site-Specific Proceedings.

EPA is considering "allow[ing] facilities to demonstrate, on a site specific basis, that entrainment mortality of one or more species of concern is not 100 percent."[591] In general, neither EPA nor the states should be making entrainment decisions on a site-specific basis – EPA should set a national, uniform entrainment standard based on the performance of closed-cycle cooling systems. Such a standard would obviate virtually all biological monitoring requirements. But in any instance where entrainment monitoring is conducted, EPA should not allow permitees to attempt to demonstrate that entrainment mortality is less than 100 percent at their particular site. Assessing entrainment mortality on a site-specific and species-specific basis is administratively unworkable and will lead to significant delays in the permitting of cooling water intake structures for little gain.

An adequate demonstration of less than 100 percent entrainment mortality would require yet another study that states are not equipped to evaluate. Facilities would need to hold individuals after entrainment for days to ensure that apparent survivors do not succumb to latent mortality – for example, being so drastically weakened or injured that they die slowly or fail to develop properly into juvenile fish. There are, however, no objective criteria for entrainment mortality studies and this means that there inevitably would be disputes between permit applicants and regulators (and intervenors) about how long to hold samples to determine overall mortality, whether sampled individuals were dead before being entrained, and whether individuals who died after being entrained died because of the entrainment or for other reasons. The net effect will be to open a new set of biological controversies that delay effective permitting.

Further, there is little to be gained through the site-specific inquiry. As EPA noted, while *some* eggs of *some* species have been shown to survive entrainment under *some* conditions, there is no data to suggest that either the most common or the most endangered species are amongst

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[590] Proposed 40 C.F.R. § 125.98(c)(6), 76 Fed. Reg. at 22,287 (col. 3).

[591] 76 Fed. Reg. at 22,273 (col. 3).

these lucky few.[592] And it is the most common entrained and most endangered species that drive the entrainment standard – the endangered because their protection can drive more stringent standards, and the most commonly entrained because they often die in simply overwhelming numbers. As a consequence, tinkering with the mortality rate for another species will have only a vanishingly small effect on overall entrainment mortality. Like EPA's proposal to engage in intensive site-specific cost-benefit analyses, this is yet another information gathering effort whose costs significantly outweigh its benefits. Accordingly, EPA should adhere to its presumption that any individual entrained is killed.

4. EPA Should Specify Minimum Monitoring Requirements.

EPA has requested comments on the monitoring requirements for impingement mortality. EPA should specify minimum monitoring requirements that meet the expectations it laid out in the preamble, rather than leaving monitoring terms to be determined by the Director. For example, EPA expects that regulated facilities will monitor impingement at least once weekly during primary periods of impingement, and that they will practice continuous monitoring in 6 to 8 hour shifts that cover an entire 24 hour cycle.[593] To ensure this expectation is met, EPA should codify the requirement in the final rule as a default practice. It is inefficient for each state to reinvent monitoring requirements (as EPA would have it) dozens of times – once for each facility. Moreover, as discussed above, since latent impingement mortality may occur up to 96 hours after an impingement event, if EPA retains the 12-percent impingement mortality standard, EPA should require facilities to retain impinged fish for 96 hours in order to determine the extent of latent mortality. EPA should specify uniform minimum monitoring requirements that meet the expectations it laid out in the preamble.

5. EPA Must Prohibit the Use of Freshwater for Once-Through Cooling in Arid Regions or Those at Risk of Drought.

EPA has requested comment on proposed regulatory provisions to encourage the use of recycled or reclaimed water as cooling water.[594] We support EPA's general belief that the use of reclaimed water for cooling can be beneficial to water resources.[595] However, defining BTA in any meaningful way requires more than merely providing an exception from regulation for existing and new units that may choose to use reclaimed water.[596] Instead, BTA must be defined to *require* reclaimed water use. Every gallon of reclaimed water used is one less gallon withdrawn. The potential benefits of using reclaimed water for power plant cooling are immense and would result in additional environmental protection and water savings and improved reliability at both once-through and closed-cycle facilities that utilize freshwater intake.

EPA's proposed approach fails to fully recognize either the availability of reclaimed water or the public and environmental benefits of using reclaimed water for cooling. Indeed,

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[592] 76 Fed. Reg. at 22,273 (col. 3).

[593] *See* 76 Fed. Reg. at 22,257 (col. 1).

[594] 76 Fed. Reg. at 22,274.

[595] *See, e.g.*, *id.* at 22,199.

[596] *See* 40 CFR 125.91(c) & 125.93(d)(3).

EPA's weak case-by-case approach fails to explicitly require local consideration of this readily available option at all.[597] It is arbitrary, capricious and an abuse of discretion for EPA to fail to require the use of reclaimed water where it is available, particularly given that water availability threats are well known, and that widespread use and availability of reclaimed water can address both withdrawal and consumption impacts from power plant cooling.

a. Use of Reclaimed Water is a Proven Technology for Power Plant Cooling.

Reclaimed (or treated) wastewater is a viable alternative to the use of freshwater or saltwater for cooling, and it eliminates the intake issues associated with once-through cooling and the consumptive use issues associated with closed-cycle cooling.

The use of reclaimed water for power plant cooling dates back as early as 1967.[598] Today, as shown in Appendix H, approximately 67 U.S. power plants use reclaimed wastewater for cooling purposes.[599] The volume of treated wastewater used at these facilities ranges from 0.1 MGD to 55 MGD, with the average facility using between 0.5 MGD and 5 MGD.[600] The largest current user of reclaimed water is the Palo Verde Nuclear Plant in Wintersburg, Arizona, which uses 55 MGD of reclaimed water for closed-cycle cooling makeup water. The 3.3 GW facility obtains its water from two wastewater treatment plants in Phoenix and Tolleson.

The majority of power plants relying on reclaimed water for cooling are coal-powered, although several are geothermal and nuclear. The states with the largest numbers of facilities using reclaimed water are Florida, California, Texas, and Arizona.[601] And while the use of reclaimed water generally tends to occur most in areas where water shortages are more severe, power plants in many other states have taken advantage of the benefits of reclaimed water for power plant cooling.

For U.S. power plants currently using reclaimed water, the distance between the power plant and the treatment facility ranges from 0 miles (the treatment facility is onsite) to approximately 56 miles, with over 90% of the plants using reclaimed water from a facility within 25 miles. The average distance of all facilities from their reclaimed water source is approximately 7.5 miles.[602]

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[597] While 40 CFR 125.98(e) mentions "impacts on water consumption" as a mandatory factor for local consideration, it does not require the Director to examine availability of reclaimed or recycled water in making any entrainment control determination.

[598] J.A. Veil, Argonne National Laboratory, *Use of Reclaimed Water for Power Plant Cooling* at 9 (Aug. 2007) (Exh. 119) *also available at* http://www.netl.doe.gov/technologies/coalpower/ewr/pubs/reclaimed%20water.pdf.

[599] *Id.* (with further analysis by Jenna Schroeder (e.g., some plants listed by Veil were proposed and never completed)). After research using the Energy Information Agency's 2009 EIA-860 data and cross-referencing with monthly EIA updates from 2010 and 2011, fourteen facilities were identified in addition to those listed by Veil.

[600] *Id.* One additional facility worth noting is the West County Energy Center, which is located in Palm Beach Florida and run by Florida Power and Light. It is reported on their website that as of early 2011, the facility will be using treated wastewater for all its cooling needs. However, repeated attempts to confirm this via phone and email were unreturned.

[601] *Id.*

[602] Jenna Schroeder, "Reclaimed Facilities Data" (attached hereto as Appendix H).

The level of treatment for the reclaimed water also varies by utility. All utilized reclaimed wastewater is treated to at least secondary treatment. Many power utilities enter into agreements with the wastewater treatment plant they are obtaining water from in order to have them conduct further (tertiary) treatment. Conversely, some facilities further treat the water onsite themselves. Under either scenario, effective measures, such as the addition of compounds to the reclaimed water, can be employed to prevent scaling, corrosion, and biofouling of the utility's infrastructure.[603]

b. Reclaimed Water is Widely Available for Cooling at Existing Once-Through Facilities.

Significant studies demonstrate widespread opportunities for treated wastewater to be used at power plants. A 2009 NETL study concluded that "[r]eclaimed water (treated municipal wastewater) is widely available in communities throughout the United States in sufficient volumes and is reliable enough to supply power plant cooling water."[604] Similarly, a 2008 study by EPRI found that "[m]unicipal effluent due to its abundance and quality is a viable alternative source for cooling water supply."[605]

Chief among the detailed studies on use and availability is Vidic (2009), a 445-page, multi-year report that painstakingly details the widespread availability and feasibility of using reclaimed water at both new and existing coal-burning power plants.[606] For existing plants in particular, Vidic showed that 75 percent of existing coal-burning power plants are within 25 miles of a wastewater treatment plant that could provide water for cooling. The Vidic report, conducted for the Department of Energy, further concluded that "finding alternative water resources to replace freshwater demand for cooling purposes is inevitable and urgent." According to DOE, the results from the Vidic study indicate it is feasible to use secondary treated municipal wastewater as cooling system makeup water.[607]

In addition to supporting the Vidic study, DOE's NETL is in the process of creating a GIS-based interface of non-traditional sources of water and coal-fired power plants.[608]

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[603] Radisav D. Vidic & David A. Dzombak, University of Pittsburgh Department of Civil and Environmental Engineering, *Reuse of Treated Internal or External Wastewaters in the Cooling Systems of Coal-Based Thermoelectric Power Plants* at 5-27 (2009) (Exh. 120) *also available at* http://www.netl.doe.gov/technologies/coalpower/ewr/water/pp-mgmt/pubs/06550/42722FSRFG063009.pdf.

[604] National Energy Technology Laboratory, *Use of Non-Traditional Water for Power Plant Applications: An Overview of DOE/NETL R&D Efforts* at viii (2009) (Exh. 121) *also available at* http://www.netl.doe.gov/technologies/coalpower/ewr/water/pdfs/Use%20of%20Nontraditional%20Water%20for%20Power%20Plant%20Applications.pdf.

[605] Electric Power Research Institute, *Use of Alternative Water Sources for Power Plant Cooling* at 2-23 (2008) (Exh. 122).

[606] Radisav D. Vidic & David A. Dzombak, University of Pittsburgh Department of Civil and Environmental Engineering, *Reuse of Treated Internal or External Wastewaters in the Cooling Systems of Coal-Based Thermoelectric Power Plants* at 5-27 (2009) (Exh. 120).

[607] U.S. Department of Energy, Office of Fossil Energy, "Project Fact Sheet" (Exh. 123) *also available at* http://fossil.energy.gov/fred/factsheet.jsp?doc=6251&projtitle=Use%20of%20Treated%20Municipal%20Wastewater%20as%20Power%20Plant%20Cooling%20System%20Makeup%20Water:%20Tertiary%20Treatment%20versus%20Expanded%20Chemical%20Regimen%20for%20Recirculating%20Water%20Quality%20Management.

[608] U.S. Department of Energy, Office of Fossil Energy, *Internet-Based GIS Catalog of Non-Traditional Sources for Cooling Water for use at America's Coal-Fired Power Plants* (2009) (Exh. 124) *also available at*

Expected to be completed in the fall of 2011, the primary goal of the project is "to reduce/minimize high-quality freshwater withdrawal and consumption by creating an internet-based, GIS catalog of non-traditional sources of cooling water for coal-fired power plants." As stated in the NETL Fact Sheet, "[b]y pairing non-traditional water sources to power-plant water needs, the research will allow power plants that are affected by water shortages to continue to operate at full capacity without adversely affecting local communities or the environment."[609] Preliminary data available on the internet indicate that a significant number of existing, coal-fired power plants could benefit from the use of nearby non-traditional sources of cooling water.[610]

Carnegie Mellon and the University of Pittsburgh also continue to evaluate the most efficient way to treat reclaimed water for power plant cooling. The study is an economic and social analysis comparing tertiary treatment of reclaimed water to reclaimed water treated with an expanded chemical regimen. This study is currently underway.[611]

EPA should incorporate the findings from all of these studies into the proposed cooling water rule and require power plants to utilize available reclaimed water for the cooling water and environmental benefits it provides.

c. EPA's Stated Concerns About Reclaimed Water Availability are Unsupported and Unwarranted.

In the 2011 TDD at page 6-18, EPA claims, "many facilities substantially outpace the volume of water available to them from alternate sources." EPA relied on a single study in California in reaching this conclusion. However, EPA's conclusion is both erroneous and misses the point.

First, EPA appears to ignore important studies on the availability of reclaimed water for cooling water, including NETL 2009, EPRI 2008, Vidic 2009 and the latest GIS information from All Consulting. Vidic reported approximately 27.5 billion gallons a day of wastewater flow available in eleven of the thirteen original NERC regions in the United States, from approximately 18,000 wastewater treatment facilities.[612] As is noted above, Vidic also found that approximately 50 percent of *existing* coal-fired power plants had sufficient reclaimed water available within a 10 mile radius, and 75 percent had sufficient reclaimed water available within

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www.netl.doe.gov/publications/factsheets/project/Proj522.pdf.

[609] *Id.* at 2.

[610] *See* ALL Consulting, *GIS Catalog of Non-Traditional Sources of Cooling Water for Use at America's Coal-Fired Power Plants* (Exh. 125) *also available at* http://www.all-llc.com/projects/coal_water_alternatives/page.php?13 (last visited Aug. 17, 2011).

[611] National Energy Technology Laboratory, *Use of Treated Municipal Wastewater as Power Plant Cooling System Makeup Water: Tertiary Treatment Versus Expanded Chemical Regimen for Recirculating Water Quality Management* (Exh. 126) *also available at* http://www.netl.doe.gov/technologies/coalpower/ewr/water/pp-mgmt/wastewater.html.

[612] Radisav D. Vidic & David A. Dzombak, University of Pittsburgh Department of Civil and Environmental Engineering, *Reuse of Treated Internal or External Wastewaters in the Cooling Systems of Coal-Based Thermoelectric Power Plants* at 5-27, at 2-5 and 2-6 (2009) (Exh. 120).

a 25 mile radius.[613]

A 1995 report from the USGS estimated 41 BGD of treated wastewater from 16,400 facilities nationwide.[614] Of this 41 BGD, 2.4 percent (or 983 MGD) was reclaimed and used, which means the vast majority, approximately 97.6 percent or 40 BGD, was potentially available for use elsewhere, such as for power plant cooling. All of these studies demonstrate sufficient availability of reclaimed water for use as cooling water.

Second, EPA improperly characterizes the results of the California study. The California report cited by EPA evaluated 15 coastal power generation facilities that use once-through cooling to gauge the feasibility of converting these facilities to closed-cycle cooling. The report repeatedly states that it is the intent of the state to encourage alternate cooling methods whenever possible. Given this preference, the authors evaluated whether a sufficient volume of reclaimed water existed to meet the cooling needs at existing once-through facilities. This assessment was made assuming the facilities would maintain their *once-through* cooling configuration, not the closed-cycle needs of the upgrades they planned to undertake at these facilities. This is significant because, as the report states, the projected decrease in cooling water volume needed after the conversion would be between 93 percent and 98 percent, depending on the facility. For EPA to make a conclusion that using reclaimed water is not a feasible option because there is not sufficient volume available to replace *all* of the *original* once-through cooling needs is therefore incorrect and misguided. In fact, if one looks at the 15 facilities evaluated in the California report, the vast majority of plants could be serviced entirely by reclaimed water after their conversion to closed-cycle cooling, with the available volume often orders of magnitude greater than needed.[615]

Furthermore, even in areas where the once-through cooling water needs of facilities could not be met *entirely* by reclaimed sources, these reclaimed water sources oftentimes can provide a substantial portion, even a majority, of the cooling water needed under a once-through cooling configuration. For EPA to discount using reclaimed water as a cooling water source in these instances misses an important opportunity to conserve large volumes of water, as well as avoid the impacts procuring this water creates, such as impingement and entrainment of wildlife.

The use of reclaimed water should not be viewed as an all-or-nothing proposition, such that if there is not sufficient reclaimed water available for all cooling needs then reclaimed water cannot and should not be used at all. Even a 30 percent reduction in freshwater withdrawals for thermoelectric power generation using once-through cooling would result in withdrawal reductions of approximately 43 billion gallons a day,[616] nearly the same amount of reclaimed water available in the U.S., as reported by the USGS for 1995 .[617]

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[613] *Id.* at 2-22 and 2-23.

[614] U.S. Geological Survey, *Estimated Water Use in the United States in 1995* at 58 (1998) (Exh. 127) *also available at* http://water.usgs.gov/watuse/pdf1995/pdf/wastewater.pdf. 1995 was the last year USGS kept track of this statistic.

[615] Jenna Schroeder, "CA Reuse Analysis.xlsx" (attached hereto as "Appendix I").

[616] U.S. Geological Survey, *Estimated Use of Water in the United States in 2000* at 41 (2004) (Exh. 128) *also available at* http://pubs.usgs.gov/circ/2004/circ1268/pdf/circular1268.pdf.

[617] USGS (1998) at 58.

d. The Use of Reclaimed Water for Closed-Cycle Cooling Addresses Any Consumption Issues.

Numerous studies address the consumptive versus withdrawal considerations of various cooling practices. EPRI estimates that "once-through consumption levels, when including downstream evaporation, are less than, but of the same magnitude as, wet recirculating cooling system consumption levels."[618]

The table below, taken from Mielke et al. (2010),[619] shows estimated once-through fossil plant water consumption levels of 300 gal/MWh versus closed-loop water consumption levels of 480 gal/MWh. For nuclear plants, the corresponding numbers are 400 gal/MWh and 720 gal/MWh.[620]

All units in gal/MWh	Steam condensing				Other use				Total			
	Withdrawal		Consumption		Withdrawal		Consumption		Withdrawal		Consumption	
	Low	High	*Low*	*High*	Low	High	*Low*	*High*	Low	High	Low	High
Steam turbine (coal, gas, biomass)												
Once-through	20,000	50,000	*300*	*300*	30	30	*0*	*30*	20,030	50,030	300	330
Closed-loop	300	600	*300*	*480*	30	30	*0*	*30*	330	630	300	510
Dry	0	0	*0*	*0*	30	30	*0*	*30*	30	30	0	30
Steam turbine (nuclear)												
Once-through	25,000	60,000	*400*	*400*	30	30	*0*	*30*	25,030	60,030	400	430
Closed-loop	500	1,100	*400*	*720*	30	30	*0*	*30*	530	1,130	400	750
Dry	0	0	*0*	*0*	30	30	*0*	*30*	30	30	0	30
Combined-cycle gas turbine												
Once-through	7,500	20,000	*100*	*100*	30	30	*0*	*30*	7,530	20,030	100	130
Closed-loop	230	230	*180*	*180*	30	30	*0*	*30*	260	260	180	210
Dry	0	0	*0*	*0*	30	30	*0*	*30*	30	30	0	30
IGCC (coal)												
Closed-loop	250	250	*200*	*260*	137	140	*137*	*140*	387	390	337	400

Most importantly, however, no matter how one calculates consumptive use of closed-cycle cooling, the consumption is relatively minor relative to available reclaimed water.

Relying on the Mielke data, the amount of water *consumed* at once-through facilities is anywhere between 0.5 percent and 1.6 percent of the water withdrawn. Therefore, because the EPA reports that approximately 200 BGD of cooling water is withdrawn for once-through

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[618] NETL 2010 at 21 (citing EPRI, *Water & Sustainability (Volume 3): U.S. Water Consumption for Power Production – The Next Half Century*, Topical Report No. 1006786 (Mar. 2002) [hereinafter "EPRI 2002"] (Exh. 129)). As EPA recognizes, most studies do not consider the consumptive impacts of once-through cooling *after* the cooling water leaves the power plant. 76 Fed. Reg. 22,199. Note: 40 CFR 125.98(e) does not expressly require consideration of the consumptive use of once-through cooling once the discharge leaves the facility, but it should.

[619] Erik Mielke, Laura Diaz Anadon, & Venkatesth Narayanamurti, "Water Consumption of Energy Resource Extraction, Processing, and Conversion: A review of the literature for estimates of water intensity of energy-resource extraction, processing to fuels, and conversion to electricity," Energy Technology Innovation Policy Discussion Paper No. 2010-15, Belfer Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University (Oct. 2010) (Exh. 130) *also available at* http://belfercenter.ksg.harvard.edu/files/ETIP-DP-2010-15-final-4.pdf.

[620] NETL notes that its original analysis (relied on by Mielke) did not account for downstream evaporative losses, which are not insignificant. NETL 2010 at 21. Interestingly, EPRI 2002 also reveals that shifting from coal and nuclear-based generation to natural gas generation would reduce water consumption *more than* the amount increased due to closed cycle cooling requirements. NETL 2002 at vii-viii.

facilities,[621] then between 1 and 3.2 BGD is generally consumed at once-through facilities. Switching from once-through to closed-cycle cooling could marginally increase the amount of water *consumed* from anywhere between 0 percent and 80 percent at any given facility. Thus, switching these facilities to closed-cycle cooling would increase consumption to 1 BGD on the low end (no change in consumption) and 5.8 BGD on the high end (assuming 80 percent increase in consumption). The amount of reclaimed water available more than meets these needs, assuming it is distributed where needed.

Similarly, in 2002, EPRI predicted that "if EPA requires cooling system retrofits at plants with once-through cooling[,] then national power plant freshwater consumption will rise [] about 10% above the base projection."[622] This would result in increased consumption of less than 1 BGD across the 48 conterminous states.[623] Moreover, in 2010, NETL calculated a 26.6 percent increase in consumption from 2010 to 2035 with a phased approach to closed-cycle cooling retrofits. Under this scenario, NETL estimated an increase in consumption from 3.6 BGD to 4.6 BGD, or additional consumption of 1.0 BGD by 2035.[624] Again, the amount of reclaimed water available far exceeds these needs, assuming it is distributed where needed.

Finally, even under more extreme scenarios, reclaimed water could offset any increases in consumption due to modernization to closed-cycle cooling. For example, given that once-through generators use approximately 200 BGD of cooling water per year, if all of these facilities were to convert to closed-cycle wet cooling, the withdrawal rate would drop by about 95.6 percent on the low end to 99.4 percent on the high end.[625] Assuming *all of the remainder* is consumed, this would result in new consumption for closed-cycle cooling between approximately 2 to 8.8 BGD. Given the approximately 41 BGD of wastewater available in the U.S. reported by USGS in 1995, there is more than adequate daily reclaimed water flow in the United States to meet this demand, again assuming it is distributed where needed.

e. At a Minimum, EPA should Emulate California's Policy on the Use of Reclaimed Water for Cooling and Establish a Preference for Reclaimed Water.

Since 1975, California has encouraged the use of reclaimed wastewater for power plant cooling and placed a priority on using wastewater for cooling purposes.[626] The use of freshwater for power plant cooling in California is only allowed "when it is demonstrated that the use of other water supply sources or other methods of cooling would be environmentally undesirable or

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[621] Personal Communication with Paul Shriner, EPA (June 8, 2011).

[622] EPRI 2002 at 6-2.

[623] *See* EPRI 2002 at Figure 6-5.

[624] NETL 2010 at 1-2.

[625] Erik Mielke, Laura Diaz Anadon, & Venkatesth Narayanamurti, "Water Consumption of Energy Resource Extraction, Processing, and Conversion: A review of the literature for estimates of water intensity of energy-resource extraction, processing to fuels, and conversion to electricity," Energy Technology Innovation Policy Discussion Paper No. 2010-15, Belfer Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University (Oct. 2010) (Exh. 130).

[626] California State Water Resources Control Board (SWRCB), Res. No. 75-058 at 4-5 (June 19, 1975) (Exh. 131) *also available at* http://www.swrcb.ca.gov/board_decisions/adopted_orders/resolutions/1975/rs75_058.pdf.

economically unsound."[627] The success of this policy has resulted in almost a dozen power plants in California using reclaimed water for closed-cycle cooling makeup water.[628]

Today, California Water Code § 13552.6 codifies the importance of using reclaimed water and declares the use of potable domestic water for closed-cycle cooling to be a waste or unreasonable use of water if safe and sufficient reclaimed water is available.

Unfortunately, EPA's Proposed Rule takes a very different approach by essentially elevating the use of inland waters over reclaimed water and by placing the burden on state agencies to evaluate the cooling water impact on water consumption. Yet the longevity and success of California's approach provides further evidence that the use of reclaimed water is the best technology available for minimizing environmental impact and consumption. Like California did more than three decades ago, EPA should at the very least establish a preference for the use of reclaimed water for power plant cooling in areas at risk of water scarcity.

6. EPA Should Not Exempt Cooling Water Withdrawals from the Rule Merely Because the Water Is Also Used for Desalination.

While we understand EPA's desire to encourage the reuse of cooling water for other processes, we have serious concerns about the blanket exemptions in Section 125.91(c) and Section 125.92. As drafted, these sections exempt water from the definition of "cooling water" if it is obtained from a desalination plant or is used in a manufacturing process either before or, more likely, after it is used for cooling purposes. This exemption promotes withdrawal – and associated aquatic mortality – and raises particular concerns with respect to the co-locating of desalination facilities with power plants.

EPA has acknowledged that: "[f]rom a biological perspective, the effect of intake structures on impingement and entrainment does not differ depending on whether an intake structure is associated with a power plant or a manufacturer."[629] This conclusion is true for seawater desalination facilities that withdrawal large amounts of water and do not employ the best technology available for minimizing entrainment and impingement and propose to co-locate with a power plant in order to utilize their existing intake structure for the desalination process feed water. The exclusion of seawater used for cooling and desalination from the definition of "cooling water," as contemplated by proposed Sections 125.91(c) and 125.92, would allow the power plant to characterize all of its intake as water that is not defined as "cooling water" because it is also used for desalination feed water – thereby effectively exempting the power plant from the Proposed Rule. Thus, if a power plant co-locates with a large enough ocean desalination facility to exempt it from the rule, the marine life mortality would go completely unregulated.

This exemption would thus allow both the first user and second user of the seawater to avoid impingement and entrainment controls, thus providing no protection for marine life.

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[627] *Id.* at 4.

[628] *See* J.A. Veil, Argonne National Laboratory, *Use of Reclaimed Water for Power Plant Cooling* at 9 (Aug. 2007) (Exh. 119).

[629] 76 Fed. Reg. at 22,192.

Significantly, new desalination plants in California have received NPDES permits under the presumption that they will cause no net impact to the marine environment by virtue of co-locating with power plants who are subject to Section 316(b) (on the theory that the power plant is already required to employ the best technology available to minimize adverse impacts under 316(b) and the desalination plant is withdraw no additional water beyond that used by the power plant).[630] Now, ironically, EPA's proposed rule would exempt a once-through-cooled power plant from Section 316(b) compliance if it gives its discharge water to a desalination plant (on the theory that the water is not cooling water if it is ultimately used for drinking). Consequently, both the first user and second user (the power plant and the desalination facility) might claim that they cause no impact because the other user is the primary consumer, while their massive water withdrawal kills sea life through entrainment and impingement at exactly the same levels as before.

EPA has provided no reasonable explanation for this broad exemption. Regardless of whether a desalination plant also uses it, if water is used for cooling it remains "cooling water" and must be regulated under Section 316(b). To ensure the objective of Section 316(b) to minimize entrainment and impingement from cooling water intakes is achieved, the proposed language in the regulations must be re-written to eliminate any and all definitions or exemptions that would potentially allow power plants to be excluded from the regulations simply because a seawater desalination facility happened to co-locate with the power plant.

7. EPA Should Require an Actual-Flow Calculation Baseline.

In the preamble to the Proposed Rule, EPA states that "[f]ollowing promulgation of the 2004 Phase II rule, … EPA became aware of certain elements of the 2004 rule that were particularly challenging or time-consuming to implement."[631] The very first of these "challenging" elements mentioned by EPA is the calculation baseline: "In practice, both permitees and regulatory agencies encountered difficulty with the calculation baseline. Specifically how a facility should determine what the baseline represented and how a particular facility's site-specific configurations or operations compared to the calculation baseline."[632]

A calculation baseline typically comes into play in either of two scenarios. First, where a performance standard is expressed in terms of a percentage reduction (as in the 2004 Phase II rule), the calculation baseline is the starting point from which the reductions are measured. Second, a calculation baseline is often used to compare two different technologies that protect fish in different ways. For example, regulatory agencies often employ a calculation baseline when comparing the performance of closed-cycle cooling to other flow reduction measures such as variable speed pumps or to screening technologies.

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[630] *See, e.g.,* Cal. Reg'l Water Quality Control Bd., San Diego Region, Order No.R9-2009-0038 Amending Order No. R9-2006-0065 (NPDES No. CA0109223) Waste Discharge Requirements for the Poseidon Resources Corporation Carlsbad Desalination Project Discharge to the Pacific Ocean via the Encina Power Station Discharge Channel 1 (2009) (Exh. 132) *also available at* http://www.waterboards.ca.gov/sandiego/board_decisions/adopted_orders/2009/R9_2009_0038_rev1.pdf

[631] 76 Fed. Reg. at 22,185 (col. 2).

[632] *Id.* at cols. 2-3.

In the commenters' experience, the most controversial aspect of the Phase II calculation baseline definition was its operational component. In relevant part, the Phase II rule provided as follows:

> *Calculation baseline* means an estimate of impingement mortality and entrainment that would occur at your site assuming that: … *baseline practices [and] procedures* ... are *those that your facility would maintain* in the absence of any … operational controls, including flow or velocity reductions, implemented in whole or in part for the purposes of reducing impingement mortality and entrainment.[633]

Where a facility has not implemented any operational controls to save fish, the operational baseline should be straightforward – it would simply reflect the actual intake flow (AIF) and the timing (seasonality) of that actual flow. But in practice, some power companies and at least one state agency has stated that the operational component of the calculation baseline should be a "full-flow" baseline, i.e., a baseline that assumes, contrary to actual practice at any power plant, that the facility runs 24 hours a day, 7 days a week, 365 days a year.

Use of a fictional full-flow baseline can allow, for example, a plant that runs 60 percent of the time (as many baseload fossil plants do) to take credit for "saving" 40 percent of the fish, when it has made no actual reductions at all. More important, using a "full-flow" calculation baseline tends to overestimate the effects of alternatives to closed-cycle cooling such as variable speed pumps. To illustrate the point from a particular permit proceeding, when issuing a draft permit for the Port Jefferson power station in 2009, New York State DEC estimated that the plant would entrain 1.1 billion organisms per year if it operated 100 percent of the time. Thus, the full-flow calculation baseline for entrainment at Port Jefferson is 1.1 billion organisms. In fact, the station was at that time entraining only 1.02 billion organisms per year under its actual operating conditions. Thus, the actual flow baseline (or, more precisely, the actual fish-kill baseline) is 1.02 billion organisms, which is about a 7 percent difference from the baseline. To illustrate the significance of this difference, closed-cycle cooling would reduce entrainment by 95 percent or more from the *actual* 1.02 billion entrainment figure, reducing entrainment to approximately 50 million organisms per year. But if the full-flow baseline is used, then a suite of technologies and operational measures that reduce entrainment to 55 million organisms per year would be deemed to be 95 percent effective (and therefore identical in effectiveness to closed-cycle cooling) and a suite of technologies and operational measures that reduce entrainment to 160 million organisms per year would be deemed to be 85.5 percent effective (and therefore "equivalent" to closed-cycle cooling using a 10 percent margin of error that DEC imitated from EPA's Phase I rule). The full-flow baseline distorts reality and provides less protection for aquatic resources because if an actual fish-kill baseline were used, then a 95 percent reduction would equate to 50 million organisms entrained regardless of which technologies were being used, and not 55 or 160 million organisms. In cases where the actual-flow baseline and full-flow baseline are further apart, such as with the Bowline Point Generating Station in New York, now operating below 10% of capacity,[634] the prejudice will be even greater. Clearly, EPA cannot intend that this gross distortion be permissible.

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[633] 69 Fed. Reg. at 41,683 (col. 3)-41,684 (col. 1) (adopting 40 C.F.R. § 125.93) (emphasis added).

[634] *See* supra note 218, p. 36.

Recognizing the problematic nature of the calculation baseline, EPA states that it "has developed a new approach to the technology-based requirements proposed today that does not use a calculation baseline."[635] What EPA presumably means is that, unlike the Phase II rule, the Proposed Rule does not include performance standards expressed in terms of a percentage reduction and does not include a definition of calculation baseline. But by proposing a site-specific, case-by-case approach to BTA determinations for entrainment, EPA is requiring regulators to compare the performance of different technologies. Because the Proposed Rule does not forbid use of a calculation baseline, many state agencies will no doubt employ one in comparing different candidate BTA technologies. Likewise, to the extent that facilities propose impingement reduction technologies that are "comparable" in performance to barrier nets for shellfish or that meet the "90 percent or greater" (i.e., Track II) standard for new units, regulators may employ calculation baselines to make those comparisons. The Proposed Rule thereby invites the use of calculation baselines but without defining the term or otherwise providing guidance on how they should be defined and applied. The result is therefore even worse than the Phase II rule in this regard because EPA is punting to the states, with less guidance and direction than before, the primary problem it had identified from its implementation experience under the 2004 Phase II rule.

Accordingly, EPA should either include a provision in the rule prohibiting states and EPA regional offices from using any calculation baseline in implementing the rule, or if EPA allows use of calculation baselines then EPA should make clear in the rule that a "full-flow" calculation baseline is impermissible, and that the operational component of a calculation baseline must reflect the plant's actual operations (for example, taking the last 3 years of actual operation), modified only in the rare instance where there have been reductions in flow actually implemented to protect fish (and only to that extent). Most importantly, because power plants never operate 100 percent of the time, a full-flow baseline should never be allowed.

8. EPA Should Remove the Special Provision for Nuclear Facilities.

EPA created an exception to the entrainment mortality requirements for nuclear facilities if compliance "would result in a conflict with a safety requirement established by the [Nuclear Regulatory] Commission [NRC]."[636] However, OMB broadened it to also cover impingement mortality requirements and deleted EPA's clarifying statement that the exception was narrow and that "[t]echnical infeasibility, and not cost, is the only consideration in evaluation of a potential conflict with Commission safety requirements."[637] If this provision is retained, EPA should revert to the version contained in the proposed rule sent to OMB. Better yet, EPA should remove the provision entirely because the exception is unnecessary and potentially confusing, given the design and operation of U.S. nuclear plants' cooling water systems and existing NRC regulations.

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[635] 76 Fed. Reg. at 22,185 (col. 3).

[636] Proposed 40 C.F.R. § 125.94(e); 76 Fed. Reg. at 22,284 (col. 1).

[637] Redlined Version of Proposed Rule at 431.

Currently operating nuclear power plants that utilize once-through cooling have two completely separate and independent cooling systems; one system to cool the steam used to generate electricity, which is the subject of this rulemaking, and a second "service water" system which provides water to cool plant buildings and equipment, and emergency cooling water to cool the reactors, spent fuel pools and other critical plant systems in the event of an accident.[638] The first system is considered "non-safety related" by the Nuclear Regulatory Commission, and the second "service water" system is considered "safety-related." The two systems are completely separate in that they rely on different pumps, piping and intakes to function. It is extremely unlikely that compliance with Section 316(b) could in any way implicate or create safety concerns related to the operation of the safety-related service water system, given this separation. Moreover, the NRC's existing regulations adequately address proposed changes to a nuclear facility, rendering this additional process unnecessary.[639]

Furthermore, by creating a unique process for the Director to make a secondary BTA determination in response to a facility operator raising safety concerns with the NRC, the provision creates confusion as to when NRC review of BTA requirements would occur. Any review by the NRC of a BTA determination should be limited to ensuring that the implementation of BTA, as determined by EPA and implemented by the Director, would not reduce safety margins at an operating nuclear plant. Such review should occur after the BTA requirements have been specified, not before.

9. EPA Should Require Interim Measures to Reduce Cooling Water Flow Until Long Term Compliance Solutions Are in Place.

The proposed rule does not set a firm deadline for entrainment compliance and gives facilities up to eight years to comply with the rule's impingement standard. In the interim, a number of technologies exist, which while not commensurate with the effectiveness of closed-cycle cooling, nevertheless offer reductions in adverse impacts, move a facility's performance closer to BTA, and can be installed relatively quickly. Accordingly, we request that EPA include a definition of interim measures in the proposed rule and require that the interim measures be implemented as NPDES permit conditions until full compliance is achieved.

The interim measures can include technologies and operational changes that reduce the flow of cooling water, particularly at peak spawning times. For example, peaking facilities can install variable speed pumps that allow them to use less water when not operating at full capacity. All facilities can alter their standard procedures to implement aggressive shutdowns of pumps when offline, rather than leaving cooling water pumps running. And facilities can typically schedule regular maintenance outages for peak spawning periods. These kinds of operational measures should be within reach of most facilities and there is no reason why they should not be required immediately while long-term BTA requirements are being studied, developed, and implemented.

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[638] For a description of the different cooling systems employed at nuclear power plants, see *Got Water? Issue Brief*, David Lochbaum, Union of Concerned Scientists, December 2007 (Exh. 41).

[639] *See* 10 C.F.R. § 50.59.

10. EPA Should Clarify that Only Offshore Seafood Processing Facilities, Not Onshore Facilities, Are Exempt from the Rule.

EPA intended to exempt seagoing vessels from the rule because of concerns about space limitations and retrofits that could compromise the seaworthiness of drilling rigs, liquefied natural gas terminals, and fishing boats. As the rule is drafted, however, it is unclear whether all seafood processing facilities are exempted, including land based facilities, or whether only vessels are exempted. The preamble discussion of seaworthiness and related concerns makes it clear that only vessels are exempted.[640] But proposed 40 C.F.R. § 125.91(d) reads "This subpart does not apply to seafood processing facilities, offshore liquefied natural gas terminals, and offshore oil and gas extraction facilities that are existing facilities as defined in § 125.92." By not prefacing "seafood processing facilities" with the word "offshore," some might read ambiguity where EPA intended none. Therefore, EPA should include the word "offshore" as a preface to "seafood processing facilities."

F. EPA's Cost-Benefit Analysis is Deeply Flawed and Illegal.

1. EPA's Extensive Monetized Cost-Benefit Analysis Far Exceeds the Restrictions Imposed by Congress.

As discussed above, while Section 316(b) permits EPA to consider costs in relation to benefits in choosing a regulatory option and establishing nationwide performance standards for the Section 316(b) existing facilities rule, the statute restricts EPA's investigation of, and reliance upon, such comparisons. Congress intended EPA to consider environmental benefits in non-monetized terms, avoid lengthy cost-benefit proceedings and futile attempts at comprehensive monetization, and take account of the Clean Water Act's technology-forcing objectives. If used at all in developing intake structure requirements, cost-benefit analysis should be used only to prevent results that are absurd in light of extreme disparities between costs and benefits, for example through EPA's traditional wholly disproportionate test. Most importantly, any cost-benefit comparison must be limited and subsidiary, not a primary or paramount factor. Congress intended to allow only a limited consideration of costs when it directed EPA to set technology-based standards. Cost-benefit comparisons must be limited in light of the difficulty of quantifying and monetizing all the benefits of minimizing the adverse impacts of cooling water intake structures, which consistently causes unreasonable regulatory delays and underestimates of benefits.

The cost-benefit analysis that EPA performed, however, went well beyond what Congress intended. Instead of leaving its consideration of the rule's costs and benefits in non-monetized terms, EPA attempted to monetize them. And instead of avoiding lengthy cost-benefit proceedings, EPA expended considerable time and energy over the course of several years on this analysis, and now intends to require state permitting authorities to oversee hundreds of these lengthy, monetized cost-benefit reviews as well. EPA's efforts to conduct a fine-grained and monetized cost-benefit analysis have spanned several years and included multiple rounds of data gathering, volumes of economic analysis, extensive literature reviews, and several economic

[640] *See, e.g.*, 76 Fed. Reg. at 22,193 (col. 2) ("EPA decided to propose requiring the Director, exercising BPJ, to establish BTA impingement and entrainment mortality standards for . . . a seafood processing vessel . . . .").

modeling runs. EPA is embroiled in a far more intense comparison of costs and benefits then Congress intended even under the BPT standard – the Clean Water Act's only technology-based standard that actually required some form of cost-benefit analysis.

But when it comes time to make a final decision, it seems that this fine-grained, time intensive, and costly approach to cost-benefit analysis provides relatively little useful information. By its own admission, the agency still cannot adequately monetize the benefits of this rule and cannot rely on the analysis it has performed to date in determining the best technology available. After years of analysis, during which existing plants have killed billions more fish, continued to degrade hundreds of aquatic ecosystems, and placed threatened and endangered species in jeopardy, EPA still has not come to a clear conclusion about the precise monetary benefits of saving one fish or one billion fish. Instead, the agency proposes to kick the problem down to the states, which is exactly what Congress did not want EPA to do.

2. EPA Vastly Underestimated the Benefits of the Rulemaking Options Such that Any Reliance on the Cost-Benefit Analysis Would Be Arbitrary and Capricious.

Despite a considerable expenditure of time and effort, EPA was unable to value the benefits of this rule in monetary terms. EPA also made several errors in those parts of its analysis that it was able to complete. This section summarizes key points from a more extensive environmental economic report prepared by two of Stockholm Environment Institute's senior economists, Frank Ackerman and Elizabeth Stanton. The full Stockholm Environment Institute (SEI) report is attached to these comments as Appendix A. As the attached report explains in more detail, the errors in EPA's analysis are significant enough that for the agency to rely on this faulty cost-benefit analysis would be arbitrary, capricious, and an abuse of the agency's discretion.

Calculating the value of the rule's benefits in monetary terms is a two stage process: EPA must first quantify the rule's physical impacts – the baseline number of fish and other organisms[641] that are now being killed by cooling water intake structures but will be saved by the rule. Then, EPA faces the challenge of attaching monetary values to those physical impacts. The agency has made significant errors at both stages.

Making only partial and conservative corrections for the errors in EPA's benefits estimates, the SEI report attached to this comment letter concludes that the monetized benefits of regulation approach or exceed EPA's cost estimates for every option that EPA explored. The corrected benefits estimates, coupled with revised cost estimates provided by Powers Engineering that address flaws in EPA's estimate of compliance costs,[642] demonstrate that the benefits of a national entrainment standard based on the use of closed cycle cooling outweigh the costs.

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[641] Significantly, EPA does not even attempt to quantify the issues of phytoplankton and the small organisms (other than fish and shellfish) despite the fact that they are important components of the food chain.

[642] *See* Section III.F.3, below.

a. EPA Has Drastically Underestimated the Number of Fish Killed by Cooling Water Intake Structures.

EPA appears to have significantly underestimated the baseline number of fish killed by cooling water intake structures. Errors in this baseline calculation inevitably propagate through the rest of EPA's cost-benefit analysis, thereby casting serious doubts on the whole effort.

For example, EPA's estimate of the number of walleye entrained and impinged annually in the entire Great Lakes region is orders of magnitude less than the number of walleye reported to have been entrained in one year at a single facility. EPA estimates that all of the power plants and manufacturing facilities in the Great Lakes combined impinge and entrain less than 10,000 individual walleye: eggs, larvae, juveniles, and adults.[643] In 2005 and 2006, the operator of the Bay Shore Power Plant, located on the shore of Lake Erie in Ohio, hired the independent consulting firm Kinectrics to analyze and report impingement and entrainment sampling data from Bay Shore and provided this data of the Ohio Environmental Protection Agency.[644] By its own estimate, Bay Shore killed over 7,000,000 walleye larvae and 499,000 juveniles in a single year.[645] There is no way to square EPA's estimate of less than 10,000 individual walleye deaths in all of the Great Lakes with the plant's evidence-based conclusion that it killed 7.5 million.

Nor are EPA's walleye numbers the only dubious statistics in its Great Lakes analysis. EPA estimates that 221 million individual freshwater drums are impinged and entrained every year in all of the Great Lakes.[646] In 2005/06, Bay Shore estimated that it killed 940 million individual freshwater drums by itself.[647] Similarly, EPA estimated Great Lakes logperch deaths at 10.5 million annually.[648] Bay Shore reports killing over 30 million.[649] And EPA estimates white perch deaths at less than 10,000 for the entire Great Lakes, while Bay Shore reports killing nearly 490,000 individuals by itself.

EPA has thus grossly underestimated the number of fish killed by power plants and manufacturing facilities in the Great Lakes region. The agency should investigate, document and correct any similar gross errors in its estimates for that and other regions. These errors are

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[643] *See* EEBA Table C-12, p. C-16 (reporting number of "individuals" impinged and entrained); *see also id.* at 3-2 (explaining that EPA employs a model to convert organisms of any particular age into an equivalent number of "individuals" of any other age), 76 Fed. Reg. at 22,238 (col. 3) (defining age-one equivalent losses as "the number of individuals of different ages impinged and entrained by facility intakes, standardized to equivalent numbers of 1-year old fish").

[644] *See* Kinetrics, *Bay Shore Power Plant Cooling Water Intake Structure Information and I&E Sampling Data*, 16 (Table 5.4), 22 (Table 5.7) (Jan. 2008) (Exh. 11), *also available at* http://www.epa.state.oh.us/portals/35/permits/bayshore_IE_data_collection.pdf.

[645] *Id.* at. 16 (Table 5.4), 22 (Table 5.7).

[646] *See* EEBA Table C-12, p. C-15.

[647] *See* Kinetrics, *Bay Shore Power Plant Cooling Water Intake Structure Information and I&E Sampling Data*, 16 (Table 5.4), 22 (Table 5.7). (Jan. 2008) (Exh. 11) *also available at* http://www.epa.state.oh.us/portals/35/permits/bayshore_IE_data_collection.pdf.

[648] *See* EEBA Table C-12, p. C-15.

[649] *See* Kinetrics, *Bay Shore Power Plant Cooling Water Intake Structure Information and I&E Sampling Data*, 16 (Table 5.4), 22 (Table 5.7) (Jan. 2008) (Exh. 11) *also available at* http://www.epa.state.oh.us/portals/35/permits/bayshore_IE_data_collection.pdf.

deeply problematic because the number of fish killed by cooling water intake structures is the fundamental basis of all of EPA's benefit calculations. EPA's underestimate of mortality – a thousand-fold undercounting of some species – undermines the validity of its entire cost-benefit analysis.

b. EPA Cannot Accurately Monetize the Benefits of Saving Non-Market Fish, Other Aquatic Organisms, and Ecosystems.

The problems with EPA's cost-benefit analysis do not end with its gross underestimates of the number of fish that would be saved by a more stringent rule. Even if the agency's physical estimates were corrected, EPA would still need to address significant errors and gaps in its efforts to put a dollar figure on the true value to society of fish, other aquatic organisms, and entire ecosystems that are not bought and sold in commercial markets. Several of the most significant problems with EPA's analysis identified in the SEI report are summarized below.

Even the most straightforward of the non-market calculations – estimating the direct use values of fish as objects of sport – has proved quite challenging. EPA seems to have severely underestimated recreational fishing benefits. The value that EPA concludes that the average angler derives from catching a walleye in the Great Lakes – approximately four dollars – is based on EPA's own meta-analysis. It does not appear to match other estimates in the economic literature, which are over twenty dollars per fish, nor does it accord with the perception of companies in the sportfishing industry.[650]

Beyond direct use values, the problems escalate dramatically. To begin with, EPA admits that entire and substantial categories of benefits, including many non-use values, are beyond its capacity to estimate.[651] EPA has not yet estimated the non-use value of any of the billions of aquatic organisms and thousands of ecosystems that are affected by cooling water intake structures outside of the North and Mid-Atlantic Regions. And EPA has failed to capture the indirect use benefits of fish and healthier aquatic ecosystems, such as scuba diving, or hunting and watching birds that eat fish. Currently, EPA places a zero value on these activities.[652]

Even in the North and Mid-Atlantic regions, where EPA was able to conduct a partial non-use value calculation, the agency made the problematic and unjustified assumption that people place no value whatsoever on the welfare of fish and ecosystems outside of their home region.[653] Thus, EPA assumes that Alaskans would place no value on saving endangered sea turtles in Florida, and that Floridians, in turn, do not care about the health of such iconic American rivers as the Hudson, Colorado, Columbia, Delaware, and Mississippi. In making this assumption, EPA is ignoring empirical evidence from leading environmental economists that people place substantial value on the health of ecosystems and animals even if they are hundreds

[650] *See* SEI Report, attached as Appendix A; *see also* Gentner Consulting Group, Economic Damages of Impingement and Entrainment of Fish, Fish Eggs, and Fish Larvae at the Bay Shore Power Plant (Sept. 2009) at Table 8 (Exh. 133).

[651] *See* SEI Report.

[652] *See id.*

[653] *See id.*

or thousands of miles away.[654] John Loomis, a leading economist in the field who EPA relies on and cites for other purposes, concluded that "on average, measuring only the benefits at the state level would result in just 13 percent of the national total public good benefits."[655]

EPA also failed to take into account the particular value that people attach to protecting threatened and endangered species. EPA notes that cooling water intakes have significant impacts on threatened and endangered species, but claims an inability to come up with any reasonable estimates for the value of these impacts. Yet model calculations that EPA included in the EEBA demonstrate that EPA is well aware of the research literature on methods for estimating the non-use value of threatened and endangered species.[656]

EPA's model calculations, however, are problematic and would need to be refined before further use. EPA's model calculations of the non-use value of threatened and endangered species – which are not included in the final cost-benefit analysis – depend crucially on the assumed percentage of the affected population that is lost under baseline conditions. This is doubly problematic. First, EPA used different assumed percentage losses for different species without providing any basis for its chosen percentages (all of which were very low). Second, EPA's analysis simply will not be credible until the agency corrects the drastic quantitative impact assessment errors discussed above. For example, even if EPA could justify its assumption that requiring closed-cycle cooling would save only one percent of endangered sea turtles, one percent of a severely underestimated baseline number of turtles remains a severe underestimate.

Until and unless EPA corrects its estimates of fish kills and recreational fishing benefits, completes its planned willingness to pay study, accounts for the substantial value that people place on environmental preservation (even from a distance), and corrects the serious deficiencies in its approach to valuing threatened and endangered species, the agency will continue to dramatically undervalue the benefits of a uniform national standard based on closed-cycle cooling. The flaws in EPA's present analysis, both in its quantification and monetization of the rule's benefits, are sufficiently large that to rely upon it would be arbitrary, capricious and an abuse of discretion.

3. EPA Overestimated the Costs of Closed-Cycle Cooling.

In the proposed rule, EPA significantly overestimates the costs of installing closed-cycle cooling at existing facilities. The greatest flaw in EPA's approach to estimating the cost of retrofits was EPA's irrational decision, in 2007, to abandon its own thoroughly documented cost estimation model and instead use unverified figures provided by the Electric Power Research Institute (EPRI), which is an arm of the electric power industry being regulated by the rule.

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[654] *See id.*

[655] *See id.* (quoting John B. Loomis, "Vertically Summing Public Good Demand Curves: An Empirical Comparison of Economic versus Political Jurisdictions," 76(2) *Land Economics* 312, 319–20 (2000)).

[656] *See id.*

This section summarizes key points from a more extensive engineering and cost report prepared by Powers Engineering. The full report is attached to this comment letter as Appendix D. As the attached report explains in more detail:

a. EPA Has Significantly Over-Estimated the Costs of Retrofitting Existing Power Plants to Closed-Cycle Cooling.

EPA developed a model for estimating the costs of closed-cycle cooling retrofits. The inputs for EPA's model are thoroughly explained and corroborated with actual fossil and nuclear plant retrofit cost data. EPA concluded that its model generates accurate and conservative estimates for closed-cycle cooling retrofits at both conventional and nuclear power plants.[657]

But EPA abandoned its model in 2007, when the Electric Power Research Institute (EPRI), a power industry body, provided EPA with cost estimates based on the results of a self-administered industry survey. EPA stated that it would use EPRI's capital cost estimates and energy penalty estimates instead of its own model results because the two sets of estimated costs were similar.[658]

The estimates produced by EPRI and EPA are not similar at all: EPRI's capital cost estimates are between 50% and 100% higher than EPA's.[659] EPRI has also estimated energy penalties several times larger than EPA. And EPRI's cost estimates are also higher than those of SPX, the largest manufacturer of power plant cooling towers in the United States.[660]

EPA should not have used EPRI's estimates. EPRI cannot be considered a neutral party in assessing the cost or difficulty of closed-cycle cooling retrofits because EPRI member companies have consistently opposed such retrofits. And in contrast to EPA's well documented and well understood model, there is no record evidence to corroborate EPRI's extremely high cost estimates. Thus, EPA should have continued to use its own model.

There are only two areas in which EPA's model requires substantial changes: nuclear plant retrofit costs, and nuclear plant outage (downtime) estimates. With these notable exceptions aside, the cost estimation model that EPA used until 2007 is conservative and fairly accurate.

EPA's new cost estimates – based on EPRI's model – are not remotely similar to EPA's original estimates, nor are they realistic, for several reasons.

First, at conventional plants, EPA's final cost estimate is greatly inflated because EPA replaced its own well-grounded and conservative[661] cost estimate of $27 million with EPRI's $53

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[657] *See* Powers Engineering comments on EPA 316(b) March 28, 2011 TDD, William Powers, P.E., Powers Engineering, hereinafter ("Powers Report") (attached as Appendix D).

[658] *See* Technical Development Document at 8-15.

[659] See Powers Report (section II).

[660] *See* Powers Report.

[661] In this context conservative means that actual costs are likely to be lower.

million estimate. EPA is wrong to claim that these are "similar results." EPA's model generates two different estimates of the capital cost of a retrofit, depending on whether a plant uses conventional (fossil fuel burning) or nuclear technology. EPRI's model generates three different capital cost estimates, and these differ not by the plant's technology, but by whether site conditions make a retrofit "easy", "average," or "difficult." The table below, drawn from EPA's technical development document, displays the different estimates generated by EPA and EPRI.[662]

Exhibit 12-3. Cost Comparison for a 350 MW Plant with Cooling Flow of 200,000 gpm (288 MGD)

	Tower Type	Capital Costs - Tower and Piping	Condenser Upgrade[1]	O&M	Tower Electricity Usage (Pumps & Fans)	O&M Total[2]	Annualized Capital Not Including Condenser Upgrade[3]	Annualized Condenser Upgrade	Total Annualized Cost Not Including Condenser Upgrade	Annual Heat Rate Penalty[4]
EPA Phase II	Redwood Tower	$27,000,000	$5,200,000	Included in O&M Total	Included in O&M Total	$2,900,000	$2,200,000	$400,000	$5,100,000	?
	Redwood Tower - Nuclear	$49,000,000	$9,400,000	Included in O&M Total	Included in O&M Total	$4,200,000	$3,900,000	$800,000	$8,100,000	?
EPRI Costs	Easy	$32,000,000	-	$260,000	$2,600,000	$2,860,000	$2,600,000	-	$5,460,000	$1,040,000
	Average	$53,000,000	-	$260,000	$2,600,000	$2,860,000	$4,200,000	-	$7,060,000	$1,040,000
	Difficult	$83,000,000	-	$260,000	$2,600,000	$2,860,000	$6,600,000	-	$9,460,000	$1,040,000

In this chart, EPA took the example of a cooling system with a flow rate of 200,000 gpm. EPA wrongly concluded that its cost estimates and EPRI's estimates are similar because it compared its conventional plant capital cost estimate of $27 million to EPRI's lower bound "easy" estimate of $32 million, and its nuclear plant capital cost estimate of $49 million with EPRI's "average" estimate of $53 million.[663] But EPA did not use EPRI's lower bound estimate to determine capital costs at conventional plants, it used EPRI's higher value – $53 million – as the basis for estimating costs at *all* power plants.[664]

At conventional plants, EPRI's estimate of $53 million is nearly double EPA's $27 million estimate. And EPA's original estimate was already generous because it assumed a low approach temperature, deliberately over-estimated pump and fan sizes, used a cost estimate for surface condenser upgrades that is considerably higher than a manufacturer's estimate, and did not take into account the 0.5 percent efficiency improvement that typically results from a condenser upgrade (which would considerably offset efficiency losses associated with installation of closed-cycle cooling).[665] By replacing a well documented and conservative cost estimate of $27 million with an unsupported industry estimate of $53 million, EPA has significantly overestimated retrofit costs at conventional plants.[666]

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[662] *See* Powers Report.

[663] *See* Powers Report.

[664] *See* TDD 8-17.

[665] See Powers Report. (Sections II.B & II.C)

[666] Some adjustment to the EPA model cost would be necessary to account for the rise in costs between 1999 and 2009. However, the rise in costs is on the order of 37 percent between 1999 and 2009, not a factor of two. At best, EPRI's cost estimates are 50% higher than EPA's. See Powers Report (providing industry standard cost inflation references and performing calculation).

Second, at nuclear plants, EPA's estimates are erroneously inflated because of unspecified safety concerns. EPA's underlying model, developed in 2002, generates estimates of retrofit costs at nuclear power plants far lower than the $49 million value that EPA provides in the present rulemaking. EPA stated that its 2002 model was both conservative and very accurate at nuclear plants. And EPA presented the data behind its cost model in extensive detail, including the costs of actual closed-cycle cooling retrofits, to support its position. But, as the attached Powers report explains, the agency then arbitrarily applied a cost multiplier to its estimates in order to account for unspecified and undocumented concerns about the added expense of safely retrofitting a nuclear power plant.[667]

Using these cost multipliers, EPA estimates that the same retrofit that costs $27 million at a conventional power plant will cost $22 million more at a nuclear plant. And it is on the basis of this inflated $49 million estimate that EPA claims it is acceptable to adopt EPRI's even higher estimate of $53 million. But there is no support in the current record for EPA's decision to double many retrofit costs at nuclear plants, just as there was no record evidence to support this practice when EPA began it in 2002. Indeed, as the attached report shows, the record contains evidence that partially contradicts EPA's stance: statements by nuclear plant operators and regulators indicating that construction in close proximity to an operating nuclear plant is a familiar practice (it takes place, for example, when new generating units are built alongside an existing one) and does not raise significant safety concerns.[668]

Third, EPA's estimates of the turbine efficiency penalty and closed-cycle cooling parasitic fan and pump loads for nuclear and fossil plants are unreasonably high. The attached report shows that these overestimates again result from EPA's adoption of EPRI's unsupported figures. EPRI's figures contradict both EPA's own model and record evidence from existing retrofits. EPRI's estimated turbine efficiency penalty is approximately five times the average efficiency penalty found in EPA's own cost model, and about ten times the average efficiency penalty observed at some sites that have been retrofitted to a closed-cycle system.[669] And compared to EPA's original model, the EPRI cost spreadsheet overestimates fan and pump energy requirements by 30%. Overall, as the attached report makes clear, EPA's closed-cycle cooling cost model provided reasonably accurate estimates of annual average turbine efficiency penalties, fan energy demand, and pump energy demand.[670] EPA should reinstate its retrofit closed-cycle cooling cost model's estimates of energy demand and efficiency penalties and not rely on the EPRI figures.

b. EPA Overestimated the Downtime (and Attendant Costs) Required for Closed-Cycle Cooling Retrofits at Nuclear Plants.

In 2002, EPA estimated that if facilities are given a period of several years to come into compliance, as they are under the Proposed Rule, then closed-cycle conversions at both fossil

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[667] *See* Powers Report.

[668] *See* Powers Report. (Section II.D)

[669] With respect to the turbine efficiency penalty, part of the overestimate arises from EPA's erroneous decision to model the long-run energy penalty on the peak energy penalties observed at the height of summer, rather than adopting the average energy penalty observed over time. *See* Powers Report. (Section III.A)

[670] *See* Powers Report.

and nuclear plants would require no more than two months of additional downtime beyond that which is ordinarily scheduled. EPA provided considerable support for this position on the record based on its experience at several power plants.[671]

EPA later increased its estimate from two months to seven months at nuclear plants. Nothing in the record developed by EPA between 2002 and 2011 can support this drastic revision. EPA's 350 percent increase in the outage time estimate was based on a single weak data point: a letter from a planner at the Palisades II nuclear plant, written in 2002, describing a retrofit at the plant that was conducted in the early 1970's.[672] Thirty years later, plant staff could not state definitively how long the retrofit had taken and could only infer an estimate of the plant's outage time from whatever records remained from the 1970s.[673]

As the attached Powers report explains, information from better-documented retrofits and other complicated construction projects at nuclear plants completed within the past ten years strongly supports EPA's original view that two months of additional downtime is a reasonable and conservative estimate (i.e., actual costs are likely to be lower). EPA pointed out in the April 2002 TDD that four surface condensers at an Arkansas nuclear plant were upgraded during two days of downtime. More complicated construction projects at nuclear power plants, such as plant replacements, have been completed in much less than seven months. For example, the 2008 replacement of four steam generators at the Diablo Canyon nuclear facility, Units 1 and 2, which involved cutting an opening in the nuclear reactor containment dome, required an outage of only ten weeks. The attached engineering report points out that:

> it is not credible that the outage time for a highly invasive nuclear reactor steam generator replacement that occurs inside the nuclear containment dome averages 2 to 2-and-a-half months, and yet the hook-up of circulating water piping to an existing nuclear reactor surface condenser, an action the NRC predecessor agency stated would create no nuclear safety concerns, would require a 7-month outage.[674]

EPA should assume that, at most, a closed-cycle cooling hook-up requires no more than two months outage time.

4. If EPA Relies on, or Authorizes Use of, a Cost-Benefit Analysis, that Analysis Must Be Significantly Improved.

If EPA uses cost-benefit comparisons at all, the agency may use them only as Congress intended: as secondary "reality checks" intended only to avert extreme disparities between the costs and benefits of technologies that deliver the greatest reductions in entrainment, impingement, and thermal pollution. This kind of practical cost-benefit analysis would lead EPA to set a uniform national standard based on the performance of closed-cycle cooling systems.

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[671] *See* Powers Report.

[672] *See* Letter from John A. Gulvas, Consumers Energy to Timothy Connor/Ashley Allen, U.S. EPA dated Feb. 28, 2002 (EPA-HQ-2002-0049-2341).

[673] *See id.* at 7.

[674] Powers Report.

But even if EPA completes this rulemaking under the unlawful approach to cost-benefit analysis that it has applied to date, the result should be the same. The economic analysis performed by SEI that is attached to this comment shows that, after correcting significant errors in EPA's cost-benefit analysis, the benefits of a closed-cycle cooling standard actually exceed its costs.[675] Thus, the benefits of protecting fish and aquatic ecosystems clearly "justify" the costs of a uniform, national closed-cycle cooling standard.

a. EPA's Approach to Cost-Benefit Analysis Should Be Reformed.

Had EPA followed the cost-benefit approach that Congress envisioned, it would have proposed a uniform national entrainment standard based on the use of the best technology available: closed-cycle cooling. The Clean Water Act allows EPA to consider whether the costs of a closed-cycle cooling standard can be reasonably borne by an industry; they can. And EPA's data show that the costs of a closed-cycle cooling standard are not wholly disproportionate to its benefits.

But EPA decided to compare costs and benefits more extensively and probingly than Congress deemed appropriate in setting technology-based standards. Despite a determined and good faith effort, EPA produced a cost-benefit analysis that overlooks many benefit categories entirely and underestimates others, both physically and monetarily. This is not surprising. Through 40 years of failed environmental regulation, Congress learned that elaborate efforts to precisely assess environmental harms and benefits would be futile and, what is worse, would leave the agency unable to enact effective environmental regulations at all. That is why Congress prohibited EPA from making cost-benefit comparisons a primary consideration in setting the best technology available standard.

Further, there is a severe imbalance in any cost-benefit analysis when, as here, the costs of the proposed action can be valued commercially but the benefits cannot be monetized with any meaningful degree of accuracy. Faced with such uni-directional uncertainty, EPA should set a rule that errs on the side of environmental protection.

If EPA were to apply its longstanding "wholly disproportionate" test to the information that it has already analyzed, the agency could quickly set a uniform national standard based on the performance of closed-cycle cooling systems. The non-use values of the fish and other organisms saved by this rule are substantial. EPA's initial effort to monetize them through a habitat valuation analysis generated a value of several billion dollars.[676] Thus, EPA has firm grounds to conclude that the costs of this rule are reasonable and proportionate to its benefits and, indeed, that the rule's benefits exceed its costs. At the very least, however, there is no extreme disparity between the benefits and costs of a uniform national standard based on closed-cycle cooling.

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[675] *See* SEI Report.

[676] EEBA chapter 9; see also Stockholm Environment Institute report (discussing EPA's habitat valuation analysis).

b. EPA's National Benefits Assessment Requires Certain Adjustments.

The most significant errors in EPA's benefits analysis are described above in Section III.F.2 of these comments and in the report of the Stockholm Environmental Institute, attached as Appendix A. Briefly, EPA has underestimated the number of fish and other organisms affected by this rule and the recreational and non-use benefits that people derive from healthier aquatic ecosystems. The Stockholm Environment Institute has provided a general estimate of benefits that addresses many of the deficiencies in EPA's analysis. Specifically, the Stockholm Environment Institute:

- applied EPA's habitat area restoration method (discussed in the EEBA) for non-use values, but extrapolates the method's results nationally;
- used a benefits transfer method to infer national threatened and endangered species benefits; and
- modified EPA's estimated recreational benefits to account for the significant discrepancies between EPA's estimates and others.

Together, these basic modifications result in benefits estimates that are greater than or approach EPA's cost estimates for all of the options that EPA considered, including for a uniform national standard based on closed-cycle cooling. And, as noted above, EPA's cost estimates are themselves inflated.[677] Correcting the errors in both the costs and the benefits estimates leads to the conclusion that the benefits of regulation are greater than the costs for every option that EPA considered. EPA should correct its national estimate to account for the deficiencies identified in the Stockholm Environment Institute's report, which is attached as Appendix A.

c. EPA's National Costs Assessment Requires Certain Adjustments.

As explained above (and more extensively in the attached report of Powers Engineering), there are multiple flaws in EPA's estimate of the costs of closed-cycle cooling retrofits. Many of the problems with EPA's figures stem from the agency's decision to abandon its own well-grounded cost estimates and rely instead on significantly higher estimates provided by EPRI. To correct these errors, EPA should re-estimate the costs of retrofits at plants around the country using the following default values for unit costs, recommended by Powers Engineering.[678] These unit costs are based on EPA's original estimates and some recent data from a leading cooling tower manufacturer:

Installed cost, wet tower (in-line or back-to-back), $/gpm:	182 – 223
Installed cost, plume-abated tower (in-line or back-to-back), $/gpm:	316 – 411
Average turbine efficiency penalty (fossil or nuclear), %:	0.30 – 0.40
Average fan parasitic energy penalty (fossil or nuclear), %:	0.40 – 0.60
Average pump parasitic energy penalty (fossil or nuclear), %:	0.40 – 0.60

[677] *See* Section III.F.3, supra.

[678] The ranges provided represent the variation from 12° F to 8° F design approach temperatures at different power plants.

Total retrofit downtime, months: fossil – 1, nuclear – 2

Based on these more realistic unit cost estimates, and assuming some variation in design approach temperatures and a mix of wet and plume-abated towers, Powers Engineering concludes that the annualized national pre-tax compliance costs for power plants under Option 2 and Option 3 would be $3,029 million and $3,104 million annually (compared to $4,933 million and $5,079 million in EPA's estimates, as shown in *EBA*, Table 3-8). Assuming no change in EPA's estimates of costs to manufacturers, this implies that the total cost of Option 2 is 62.8 percent of EPA's estimate and the total cost of Option 3 is 62.9 percent of EPA's estimate.

Moreover, both EPA's and Powers Engineering's calculations are very conservative (i.e., actual costs are likely to be lower) because they both use total current nationwide design intake flow (DIF) to calculate the capital cost of cooling tower retrofits under Options 2 and 3. Given the ongoing coal plant retirement trends unrelated to projected 316(b) compliance costs, the actual number of existing plants needing to be retrofit will likely be smaller. For example, a December 2010 compilation of various studies by The Brattle Group evaluating the amount of coal plant retirements found estimates ranging from 10 GW to 75 GW of coal capacity will be retired between now and 2020.[679] In fact, more than 27.5 GW of coal plant retirements have already been announced by utilities throughout the country.[680] EPA should factor these retirements into its cost analysis because plants that are to be retired in the near future will not need to be retrofitted with cooling towers and, therefore, will avoid a significant cost.

d. Any Site-Specific Benefits Assessment Should Adhere to Precise Regulatory Requirements Established by EPA.

As explained previously, requiring states to conduct site-specific cost-benefit assessments violates the Clean Water Act, offends the Congressional intent behind the Act, and is arbitrary, capricious, and an abuse of EPA's limited discretion to consider the costs and benefits of setting a uniform, *national* standard. State agencies should not be authorized to conduct any cost-benefit analysis in the process of issuing NPDES permits, because they simply cannot perform or meaningfully review such analysis in a manner that provides any useful information. However, to the extent that EPA persists in allowing states to undertake any cost-benefit assessment, the rule should require those analyses to adhere to precise requirements established by EPA. As the attached report of the Stockholm Environment Institute explains in greater detail, EPA should start by making four important changes to the site-specific cost-benefit analysis process envisioned in the Proposed Rule.

First, EPA should clarify how costs and benefits are to be compared. EPA's novel formulation in the Section 316(b) context that benefits should "justify" the costs of entrainment controls is unclear and some states may interpret it as a departure from the "wholly disproportionate" standard. A clear interpretive standard set by federal regulation would prevent states from making cost-benefit comparisons under disparate standards. It would also

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[679] The Brattle Group, Potential Coal Plant Retirements Under Emerging Environmental Regulations (December 8, 2010) (Exh. 134).

[680] *See* Electric Generating Units Planned Retirement Date Spreadsheet (developed from publicly available information), Aug. 15, 2011 (Exh. 135).

prevent states from relying on cost-benefit considerations in a manner that is inconsistent with the limits that Congress placed on the use of cost-benefit comparisons. Therefore, EPA should establish that the new "benefits justify the costs" standard is consistent with its existing Clean Water Act guidance: the costs of a protective measure are justified so long as they are not wholly disproportionate to the benefits conferred by that measure.

Second, EPA should ensure that government employees or contractors are the sole arbiters of the technical adequacy of all cost-benefit analyses. The integrity of the analytical process can only be assured if the State, not the applicant, selects the contractors and oversees the studies.

Third, applicants require additional guidance on how to conduct complex cost-benefit analyses. Therefore, EPA should restore guidance statements that OMB had deleted, including EPA's explanation of the difference between the social costs and the private costs to facilities of installation downtime and energy penalties and how these costs should be calculated to avoid overestimating the social costs, as well as EPA's guidance on discount rates, which called for facilities to use a "social discount rate . . . reflecting society's rate of time preference as opposed to a facility's cost of capital," and suggested 3%, as per existing OMB guidance.[681]

Finally, EPA should provide standardized default values and valuation methodologies for costs of control technologies, and for all major benefits categories, suitable for use in local analyses. As the attached SEI report explains in more detail, EPA should require:

- *Estimates of national, not regional, non-use values* – economic studies have repeatedly shown that people place a high value on preserving and protecting ecosystems even if they do not live close to them. A complete benefits analysis must include the value that all Americans derive from protecting wildlife, not just the benefits to those people who live close to a particular waterbody.

- *A clear explanation of how the heightened value of protecting threatened and endangered species is included in the benefits analysis* – Americans place a particularly high value on protecting and preserving threatened and endangered species. This additional value must be reflected in the benefits analysis.

- *Quantified uncertainty estimates* – EPA should require that all cost-benefit studies include a quantitative measure of the uncertainty in the estimates of the number of fish and other organisms affected by a cooling water intake structure, and in the estimates of the economic costs and benefits of protecting these organisms. Regulators should understand the error range associated with the estimates they have received.

- *A buffer or margin of safety for threatened and endangered species* – The difference between killing 1 percent and 2 percent of all the individuals in an endangered population can be hugely significant – it may be the difference between life and extinction for that species. Where threatened or endangered species, or species of concern are involved, EPA should require that applicants do their utmost to quantify the uncertainties in their

[681] *See* Redlined Version of Proposed Rule, p. 340.

benefits estimate, and then base their benefits calculations on the upper end of the error range.

- *Non-use value estimates no lower than those found by EPA* – Presently, EPA is conducting a national willingness to pay study to develop accurate and transferable estimates of the non-use benefits of wildlife. If applicants or regulators can document a substantial basis to deviate upwards from EPA's estimates, this should be permitted. But contingent valuation of environmental goods is difficult and must be done with care and transparency because an applicant can significantly alter the results of a site-specific cost-benefit analysis by manipulating estimates of non-use values. As a safeguard against inaccurate estimation studies, EPA should not allow applicants to present non-use values for fish and aquatic ecosystems that are lower than those found in EPA's forthcoming study.

G. EPA Cannot Issue a Final Rule Without First Consulting NMFS and FWS and Fully Complying with its Duties under Other Applicable Federal Environmental Laws.

Although EPA is promulgating this proposed rule under the Clean Water Act, the agency has a separate duty to comply with the Endangered Species Act. Under that Act, EPA has a mandatory duty "to use . . . all methods which are necessary to bring any endangered . . . or threatened species to the point at which the protections of the Act are no longer necessary."[682] Also, EPA must consult with the Secretaries of the Departments of Interior and Commerce to insure that any action it authorizes, funds, or carries out "is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of [critical] habitat of such species."[683]

To date, EPA has not consulted the National Marine Fisheries Service (NMFS) and the Fish and Wildlife Service (FWS), the designees of the Secretaries of the Interior and Commerce, to obtain their opinions on the biological and ecological impacts of this rule and the advisability of reasonable and prudent alternatives to EPA's Proposed Rule. Reasonable and prudent alternatives to EPA's proposed action exist, including the other regulatory options under consideration.

In promulgating this rule, EPA will be taking an action within the meaning of the Endangered Species Act.[684] Specifically, EPA is requiring states to make case-by-case entrainment control decisions and is declining to set a uniform, national, technology-based standard based on the performance of closed-cycle cooling systems. Thus, EPA is authorizing existing cooling water intake structures to continue to take endangered species, and to adversely modify habitat that is critical to multiple endangered species, on the vain hope that states may be

[682] *Nat'l Wildlife Fed'n v. Hodel*, No. S-85-0837, 1985 U.S. Dist. Lexis 16490 at *11 (Aug. 26, 1985) (E.D. Cal.) (citing 16 U.S.C §§ 1536(a)(1), 1532(3)).

[683] 16 U.S.C. § 1536(a)(2).

[684] *See* 40 C.F.R. § 402.02 ("Action means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas. Examples include, but are not limited to . . . the promulgation of regulations...").

able to take effective action to regulate these intakes. Where an EPA action directly continues a situation in which endangered species are being taken, EPA must first consult the Secretary of Interior, Commerce, or Agriculture as appropriate.[685]

EPA has evidence that cooling water intake structures take endangered and threatened species of fish. And the Proposed Rule authorizes continued operation of existing cooling water intake structures in a manner that EPA claims will at best "minimize" over an extremely extended schedule – and, significantly, will not end – the killing of fish and other aquatic organisms, as well as the wholesale degradation of aquatic ecosystems by CWISs. Under these circumstances, EPA has a mandatory duty to consult with the NMFS and FWS prior to promulgating a final rule.

In addition, EPA's has duties to protect and conserve wildlife, and to cooperate with other federal agencies in the protection and conservation of wildlife, under a number of federal laws including but not limited to: the National Environmental Protection Act,[686] the Endangered Species Act,[687] the Fish and Wildlife Coordination Act,[688] the Bald and Golden Eagle Protection Act,[689] the Migratory Bird Treaty Act,[690] the Migratory Bird Conservation Act,[691] the Marine Mammal Protection Act,[692] the Wilderness Act,[693] the Coastal Zone Management Act,[694] the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006,[695] and Federal Land Policy and Management Act,[696] and the National Forest Management Act.[697] EPA cannot promulgate a final regulation without first insuring that it has met its particular duties under these acts, and its general duty to protect and conserve wildlife – particularly endangered and threatened species.

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[685] *See Defenders of Wildlife v. EPA*, 882 F.2d 1294, 1300 (8th Cir. 1989).

[686] *See* 42 U.S.C. §§ 4321-70d.

[687] *See* 16 U.S.C. §§ 1531-44.

[688] *See* 16 U.S.C. §§ 661-67e.

[689] *See* 16 U.S.C. §§ 668a-668d.

[690] *See* 16 U.S.C. §§ 703-712.

[691] *See* 16 U.S.C. §§ 715-715s.

[692] *See* 16 U.S.C. §§ 1361-1421h.

[693] *See* 16 U.S.C. §§ 1132-1136.

[694] *See* 15 U.S.C. §§ 1451-65.

[695] *See* 16 U.S.C. §§ 1801-91d.

[696] *See* 43 U.S.C. §§ 1701-85.

[697] *See* 16 U.S.C. §§ 1600-87.

IV.

ADDITIONAL REVISIONS TO THE PHASE I RULE ARE WARRANTED IN LIGHT OF THE *RIVERKEEPER I* DECISION

In addition to removing from the Phase I new facility rule the restoration-based compliance alternative and the associated monitoring and demonstration requirements (as EPA is currently proposing), another revision is also warranted in light of the *Riverkeeper I* decision.

In its Phase I rule, EPA required new facilities to limit intake volume to a level commensurate with closed-cycle cooling (Track I),[698] while also allowing those facilities to use technologies other than closed-cycle cooling so long as they could demonstrate that "the technologies employed will reduce the level of adverse environmental impact from [the] cooling water intake structures to a comparable level" to that which would be achieved by closed-cycle cooling (Track II).[699] EPA further defined "comparable level" to mean a reduction in impingement mortality and entrainment of all life stages of fish and shellfish to 90 percent or greater of the reduction that would be achieved by closed-cycle cooling.[700]

In the *Riverkeeper I* litigation, Riverkeeper and other environmental groups challenged EPA's 90-percent threshold because it appeared to allow facilities to choose technologies that were designed to achieve only 90 percent of the reductions that EPA had selected as BTA. In defending the 90 percent threshold, EPA explained to the court that:

> given the numerous factors that must be considered to determine the required level of reduction in impingement and entrainment for Track II [*i.e.*, the 90 percent option] and the *complexity inherent in assessing the level of performance of different control technologies*, EPA believes it is appropriate for a new facility following Track II to achieve reductions in impingement and entrainment that are 90 percent or greater of the levels achieved under Track I [*i.e.*, closed-cycle cooling].[701]

In ruling on the issue, the Second Circuit stated that "impingement and entrainment … cannot always be measured directly and with mathematical precision, the use of any alternative technologies would require the EPA to make a judgment call as to whether those technologies yield results 'equivalent' to Track I's."[702] Thus, the court concluded as follows: "We think it was reasonable for the EPA to make clear … how much ambiguity it is willing to tolerate in measuring compliance and what it considers a reasonable margin of error in comparing the performance of different technologies."[703] However, the court then added a critical caveat:

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[698] 40 CFR § 125.84(b)(1).

[699] 40 CFR § 125.84(d)(1).

[700] 40 CFR § 125.86(c)(2)(i).

[701] *Riverkeeper I,* 358 F.3d at 187-88 (emphasis added), citing 66 Fed. Reg. at 65,279 .

[702] *Id.* at 188-89.

[703] *Id.* at 189.

> Based on the EPA's representation that "90 percent" compliance is permitted because of measuring error, EPA Br. at 52, it would, of course, be inappropriate for the EPA to use 90 percent as a benchmark and allow an additional margin of error in measuring compliance with that benchmark. *A facility must aim for 100 percent, and if it falls short within 10 percent, that will be acceptable. It may not, however, aim for 90 percent and achieve only an 89 percent reduction in impingement and entrainment.*[704]

In other words, where an applicant proposes a suite of technologies and operational measures as equivalent to closed-cycle cooling, it must submit data showing that the reductions are expected to be 100 percent of the level that would be achieved by closed-cycle cooling. So long as such a demonstration is made in the permitting process, actual monitoring showing that performance was within the 10 percent margin of measuring error will be deemed to be in compliance.

In the Proposed Rule, EPA makes this same point in the context of the proposed 12 percent annual impingement mortality standard for existing facilities:

> EPA recognizes that some variability in the annual average is inevitable, and thus the only way to consistently achieve the 12 percent annual standard is to *target a better level of performance as the long-term average performance.*[705]

The Phase I rule, however, does not make it clear that facilities must – as the Second Circuit held – "aim for 100 percent" of Track I, and thus applicants and permit writers may be under the mistaken impression that facilities can instead aim for 90 percent and fall short of that reduced target without violating the regulations. Accordingly, to respond to the *Riverkeeper I* decision, EPA should revise 40 CFR § 125.89(b)(1)(ii) to read as follows (additions shown in italics):

> **§ 125.89 As the Director, what must I do to comply with the requirements of this subpart?**
>
> (b)(1)(ii) For a facility that chooses Track II, you must review the information submitted with the Comprehensive Demonstration Study information required in § 125.86(c)(2), evaluate the suitability of the proposed design and construction technologies and operational measures to determine whether they will reduce both impingement mortality and entrainment of all life stages of fish and shellfish to 90 percent or greater of the reduction that could be achieved through Track I. *In seeking to comply with the requirement set forth in this subsection, a facility must aim for 100 percent, and if it falls short within 10 percent, that will be acceptable. It may not, however, aim for 90 percent and achieve only an 89 percent reduction in entrainment mortality.*

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[704] *Id.* n.16 (emphasis added).

[705] 76 Fed. Reg. at 22,203 (col. 2) (emphasis added).

V.

RESPONSES TO EPA'S SPECIFIC REQUESTS FOR COMMENT

A. Responses to Numbered Requests.

On pages 22,273-75 of the preamble, EPA provided a numbered list of 28 "Specific Solicitations of Comment and Data," which summarized and pulled together in one place many of the requests for comment that were otherwise scattered throughout the preamble. We respond to those requests here.

1. **Definition of "Design Intake Flow."** *EPA requests comment on whether the definition of DIF should be further revised to clarify that EPA intends for the design intake flow to reflect the maximum volume of water that a plant can physically withdraw from a source waterbody over a specific time period. This would mean that a facility that has permanently taken a pump out of service or has flow limited by piping or other physical limitations should be able to consider such constraints when reporting its DIF. See Section V.G.*[706]

Response:

So long as facilities are not receiving impingement and entrainment mortality reduction "credit" for fictional flow reductions (see discussion above regarding full flow baseline) DIF should reflect the maximum amount of water than can be withdrawn by the plant.

2. **National BTA Categorical Standards for Offshore Oil and Gas Extraction and Seafood Processing Facilities.** *EPA requests comment and data on the appropriateness of a single BTA categorical standards* [sic] *for offshore oil and gas extraction facilities and seafood processing facilities. Today's rule would continue to require that the BTA for existing offshore oil and gas extraction facilities and seafood processing facilities be established by NPDES permit directors on a case-by-case basis using best professional judgment. See Section V.H*[707]

Response:

Like all other facilities, existing offshore facilities should be subject to categorical standards that minimize adverse environmental impact. EPA determined that a categorical standard requiring technologies more advanced than the screens presently in use on ocean going vessels would "result in unacceptable changes in the envelope of existing platforms, drilling rigs, mobile offshore drilling units (MODUs), seafood processing vessels (SPVs), and similar facilities as the technologies would project out from the hull, potentially decrease the seaworthiness, and potentially interfere with structural components of the hull."[708] EPA should

[706] 76 Fed. Reg. at 22,273 (col. 2); *see also* 76 Fed. Reg. at 22,195 (col. 3).

[707] 76 Fed. Reg. at 22,273 (col. 2); *see also* 76 Fed. Reg. at 22,196 (col. 1).

[708] 76 Fed. Reg. at 22,195-96 (col. 3).

clarify whether, in reaching the conclusion that no better categorical standard is technically feasible, it considered (1) installation of variable speed pumps that would better match cooling water intake with process needs, and (2) operational changes, such as limiting or delaying activities that require cooling water intake while a vessel is in near-shore and other highly biologically productive waters.

Additionally, as discussed above in Section III.E.10 of these comments, EPA should clarify the text of proposed 40 C.F.R. § 125.91(d) to make it clear that only offshore seafood processing facilities – i.e., ocean going vessels – are exempt from the categorical standards proposed.

The following section of this comment letter is most relevant to this request for comment:

- III.E.10 - EPA Should Clarify that Only Offshore Seafood Processing Facilities, not Onshore Facilities, Are Exempt from the Rule.

3. **Cost-cost Alternative From Phase II Rule.** *EPA does not have technical data for all existing facilities. EPA concluded that the Phase II rule costs provided in Appendix A are not appropriate for use in a facility-level cost-cost test. See Section III. Moreover, under the national requirements EPA is proposing today, EPA concluded that a specific cost-cost variance is not necessary because the Director already has the discretion to consider such factors. EPA requests comment on these conclusions.*[709]

Response:

The cost data provided in Appendix A to the Phase II rule are highly speculative, unreliable, irrelevant to today's rulemaking, out-dated, problematic in numerous other respects and should not be considered in facility level cost-cost tests because, among other things, they reflect only EPA's estimate of the cost of installing screens at some facilities. As EPA recognizes that screens are less effective than closed-cycle cooling, the screens-only cost data is of limited utility. If EPA establishes a variance from a national standard based on closed-cycle cooling, and if that variance mechanism allows for consideration of costs (which is not required), then the appropriate comparison will be between a facility's cost of implementing closed-cycle cooling and EPA's estimate of the average cost of such conversions nationwide.

As noted above, and as explained further in the attached report of Powers Engineering, EPA's current estimates for the costs of closed-cycle cooling are significantly overestimated. Finally, the compliance costs to be considered in any cost-cost variance should include only capital expenditures, operation and maintenance, and energy penalty, not speculative, indirect add-on costs.

The following sections of this comment letter are most relevant to this request for comments:

[709] 76 Fed. Reg. at 22,273 (col. 3).

- III.B - EPA Should Establish a National Categorical Entrainment Standard Based on Closed-Cycle Cooling;

- III.F.3 - EPA Overestimated the Costs of Closed-Cycle Cooling.

4. **Entrainment Survival.** *There are circumstances where certain species of eggs have been shown to survive entrainment under certain conditions, however EPA has not received any new data for either the most common species or the species of concern most frequently identified in available studies. For purposes of today's national rulemaking, entrainment is still presumed to lead to 100 percent mortality. See Section VI. Today's proposed rule would allow facilities to demonstrate, on a site specific basis, that entrainment mortality of one or more species of concern is not 100 percent. EPA requests comment on this approach.*[710]

Response:

As explained more fully above, in any instance where entrainment monitoring is conducted, EPA should not allow permitees to attempt to demonstrate that entrainment mortality is less than 100 percent at their particular site. Assessing entrainment mortality on a site-specific and species-specific basis is administratively unworkable and will lead to significant delays in the permitting of cooling water intake structures for little gain.

The following section of this comment letter is most relevant to this request for comments:

- III.E.3 - EPA and States Should Maintain an Assumption of 100 Percent Entrainment Mortality in All Site-Specific Proceedings.

5. **Alternative Impingement Mortality Compliance Requirements.** *EPA requests comment and data on a provision that would require facilities seeking to comply with the impingement mortality standard by meeting an intake velocity requirement either to demonstrate that the species of concern is adequately protected by the maximum intake velocity requirements, or else to employ fish friendly protective measures including a fish handling and return system. EPA is considering this provision because the Agency is concerned that some facilities that comply with the impingement mortality requirements by reducing intake velocity to 0.5 fps or less, may still impact species of concern. See Section VI.D.1.a.*[711]

Response:

As discussed above, EPA should require existing facilities to reduce their intake velocity to 0.5 ft/s and should additionally require those facilities with travelling screens to employ fish

[710] 76 Fed. Reg. at 22,273 (col. 3).

[711] 76 Fed. Reg. at 22,273 (col. 3); *see also* 76 Fed. Reg. at 22,203 (col. 3).

friendly protective measures including a fish handling and return system because reducing intake velocity alone is not sufficient to protect fish.

The following section of this comment letter is most relevant to this request for comments:

- III.C - Although the Establishment of National Categorical Standards for Impingement Is Necessary and Appropriate, the Proposed Standards Are Impermissibly Weak and Problematic in Numerous Respects.

In addition, with respect to the term "species of concern" please see:

- III.E.1 - EPA Should Clarify the Meaning of the Term "Species of Concern" and Restore Additional Protections for These Species;
- III.E.2 - EPA Should Prevent Directors from Excluding Any Species from the Rule's Scope
- III.G - EPA Cannot Issue a Final Rule Without First Consulting NMFS and FWS and Fully Complying with its Duties under Other Applicable Federal Environmental Laws.

6. **Monthly and Annual Limits on Impingement Mortality.** *EPA requests comment on the need to tailor the impingement mortality requirements of today's proposal to account for site-specific circumstances and/or technologies, including location of cooling water intakes that impinge relatively few fish or other approaches that achieve impingement mortality reductions equivalent to the proposed performance standards. For example, if EPA were to consider number of fish killed as an alternative, it might statistically model the data or select the minimum observed value. Studies and information supporting these alternatives would be most helpful. EPA also requests comment on the monthly and annual limits in the proposed rule and way in which they were calculated.*[712]

Response:

In general, EPA should not set (or ask Directors to set) impingement mortality limits on a site-specific basis. Nor should EPA's national uniform standard for impingement mortality be set on a percentage basis, as the agency now proposes. Instead, EPA should set a nationally uniform technology standard that minimizes both impingement and entrainment based on the performance of closed-cycle cooling systems and a velocity limit of 0.5 ft/s. As discussed above, the percentage mortality approach that EPA has adopted at present is flawed, and the 12 percent annual and 31 percent monthly limits are based on very limited data. Moreover, EPA and states are not permitted to weaken technology-based standards on the basis that the source waters are already "degraded."

The following sections of this comment letter are most relevant to EPA's request for comments:

[712] 76 Fed. Reg. at 22,273 (col. 3); *see also* 76 Fed. Reg. at 22,187 (col. 3), 22,203 (col. 1).

- III.C - Although the Establishment of National Categorical Standards for Impingement Is Necessary and Appropriate, the Proposed Standards Are Impermissibly Weak and Problematic in Numerous Respects.

  In particular:

  - III.C.1 - EPA Should Establish A National Categorical Impingement Standard Based on Closed-Cycle Cooling.

  - III.C.3 - The 12 Percent/31 Percent Impingement Mortality Reduction Requirement Is Problematic In Numerous Respects.

- Appendix B - Comments of Dr. Peter Henderson and Richard Seaby, PISCES Conservation, Ltd.

7. **Flow Basis for Option.** *EPA requests comment on both the threshold and the flow basis for a variation of option 2 that would use 125 MGD Actual Intake Flow (AIF) rather than a 125 MGD Design Intake Flow (DIF) as the threshold. See Section VI.D.2.*[713]

Response:

EPA should maintain the use of a DIF threshold rather than an AIF threshold. A DIF threshold is simpler to establish and the administrative burden on states of vetting claims from applicants is already considerable; EPA should not increase that burden.

Also, demand for energy has declined somewhat during the current economic downturn. A facility may currently have a historically low AIF, but without an enforceable commitment to maintain the current rate of operations in the future, the facility may not stay below the AIF threshold for long as the economy recovers. Once the NPDES permit is issued it will not be revised, and with many states facing a NPDES permitting backlog that sees facilities operate on administratively continued permits for years – or, in some cases, decades – an erroneous determination that a facility falls below the threshold may go uncorrected for ten years or longer.

If EPA is concerned about the costs or feasibility of a national categorical standard for entrainment, it must undertake a thorough effort to craft a national standard by looking at various thresholds and options for subcategorizing the more than 1,200 facilities with cooling water intake structures affected by this rule. But those thresholds should be set on a clear and easily determined basis. DIF provides such a basis; AIF does not.

8. **Waterbody Type as a Basis for Different Standards.** *EPA's reanalysis of impingement and entrainment data does not support the premise that the difference in the density of organisms between marine and fresh waters justifies different standards. More specifically, the average density of organisms in fresh waters may be less than that found*

[713] 76 Fed. Reg. at 22,274 (col. 1); *see also* 76 Fed. Reg. at 22,206 (col. 1).

on average in marine waters, but the actual density of aquatic organisms in some specific fresh water systems exceeds that found in some marine waters. EPA also believes the different reproduction strategies of freshwater versus marine species make broad characterizations regarding the density less valid a rationale for establishing different standards for minimizing adverse environmental impact. EPA requests comment on its proposal not to differentiate requirements by water body type.[714]

Response:

EPA has provided a firm environmental basis for not distinguishing between facilities situated on different waters of the United States: the variation in organism densities and reproduction strategies within marine and freshwater ecosystems is sufficiently high that no category of waterbodies can be singled out for different treatment. EPA should therefore maintain its intention to set uniform national impingement standards across all water bodies (though these should be improved, as noted above), and EPA should also set a uniform national entrainment standard (based on the use of closed-cycle cooling) across all water bodies.

There is also a legal requirement for uniform national standards across all waters of the United States. Congress intended "that the 'design' of intake structures be regulated directly, based on the best technology available, and without resort in the first instance to water quality measurements."[715] Closed-cycle cooling and a velocity limit of 0.5 ft/s are the best technologies available to minimize adverse environmental impacts in all waters of the United States. Congress intended that the best technologies available be used, and that technology-based standards not be relaxed based on assessments of local water quality, which in this context means considerations of the density or reproductive strategies of the aquatic populations in a particular water body.

Establishing different standards for different water bodies based on their existing ability to support certain densities and populations would allow facilities to impact the remaining and badly stressed aquatic populations in water bodies that have already been severely harmed by prior use as industrial dumping grounds. This runs directly contrary to the Clean Water Act's goals of *restoring* and maintaining aquatic ecosystems, and courts forbade this outcome in the earlier *Riverkeeper* litigation.[716]

The following section of this comment letter is most relevant this request for comment:

- I.B.2 – The 1972 CWA Amendments Fundamentally Restructured U.S. Water Pollution Regulation by Replacing Ineffectual Site-Specific Assessments of Water Quality with National Technology-Based Standards;

9. **Capacity Utilization Rating as a Basis for Different Standards.** *Electric generating facilities may still continue to withdraw significant volumes of water when not generating*

[714] 76 Fed. Reg. at 22,274 (col. 1).

[715] *Riverkeeper I*, 358 F.3d at 190; *see also Riverkeeper II*, 475 F.3d at 108-09.

[716] *See Riverkeeper II*, 475 F.3d at 108-09.

electricity. Further, EPA found that load-following and peaking plants operate at or near 100 percent capacity (and therefore 100 percent design intake flow) when they are operating. Peaking facilities (those with a CUR of less than 15 percent, as defined in the 2004 Phase II rule) may withdraw relatively small volumes on an annual basis, but if they operate during biologically important periods such as spawning seasons or migrations, then they may have nearly the same adverse impact as a facility that operates year round. EPA requests comment on its decision not to exclude facilities with a low capacity utilization rate. Comments who believe that EPA should include a CUR threshold in the final rule should provide a suggested threshold and explain the basis for it.[717]

Response:

EPA is correct to avoid setting any kind of capacity utilization rate threshold for the reasons that the agency has already articulated.

10. **Flow Commensurate With Closed-Cycle Cooling.** *EPA requests comment on whether the demonstration that a facility's flow reduction will be commensurate with closed-cycle cooling should be based on a defined metric, or determined by the permitting authority on a site-specific basis for each facility. EPA is proposing that a facility seeking to demonstrate flow reduction commensurate with closed-cycle cooling using flow reduction technologies and controls other than through closed-cycle cooling (e.g., through seasonal flow reductions, unit retirements, and other flow reductions) would have to demonstrate total flow reductions approximating 97.5% for freshwater withdrawals and 94.9% for saltwater withdrawals. See Section IX.D.*[718]

Response:

The 97.5 percent freshwater/94.9 percent saltwater flow reduction metrics that EPA has proposed for determining when a facility has reduced its intake flow commensurate with closed-cycle cooling are clear and workable, and supported by EPA's record. They should be maintained in the final rule. But in that final rule, these metrics should apply to all facilities, not merely to new units at existing facilities. As explained above, EPA is required to set a uniform national standard under this rule based on the performance of closed-cycle cooling systems. There is no need, or legal basis, for EPA to require permitting authorities to define "commensurate" anew at every facility.

11. **Credits for Unit Closures.** *EPA requests comments on the proposed approach to allow credits for unit closures to be valid for 10 years from the date of the closure. In EPA's current thinking this approach reasonably allows facilities to get credit for flow reductions attributable to unit closures, but also requires such facilities to make future progress to ensure its operations reflect best available entrainment controls. See Section IX.D.*

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[717] 76 Fed. Reg. at 22,274 (col. 1).

[718] 76 Fed. Reg. at 22,274 (col. 2); *see also* 76 Fed. Reg. at 22,253 (col. 3).

Response:

EPA should not allow any "credit" whatsoever for flow reductions attributable to unit closures. Plant operators may choose to close a unit, but the remaining units must still use BTA to minimize the adverse environmental impacts of their cooling water intake structures.

12. **Land Constraints.** *EPA requests comment on the use of a ratio for determining the land constraint threshold for retrofit construction of cooling tower, as well as data for determining alternative thresholds. EPA has not identified any facilities with more than 160 acres/1000MWs that EPA believes would be unable to construct retrofit cooling towers. EPA is exploring the use of such a ratio to support determinations regarding adequate land area to construct retrofit cooling towers. See Section IX.D (footnote 1).*[719]

Response:

As explained in the attached engineering report prepared by Powers Engineering, EPA's estimate that as many as 25 percent of facilities might have space constraints that would limit retrofit of cooling towers for the entire facility or increase compliance costs is vastly overblown because EPA's assessment is based on the use of land-intensive in-line cooling towers, not the much more space efficient back-to-back cooling tower configuration. A back-to-back cooling tower configuration requires about 17 percent of the space needed for two in-line towers for the same cooling capacity, assuming the spacing recommended for parallel banks of in-line towers. Because cooling towers can be installed in a back-to-back configuration at virtually any site, EPA should not set a "limited acreage" exemption (such as the 160 acres per gigawatt threshold the agency is exploring) and should acknowledge that cooling towers are an available technology for the industry as a whole.

The following sections of this comment letter are most relevant this request for comment:

- III.B.2.b.1 – There Is Adequate Space for Cooling Towers at Virtually Any Plant Site;
- Appendix D – Comments of William Powers, P.E., Powers Engineering

13. **Proposed Implementation Schedule.** *EPA requests comment on its proposed schedule for implementing the proposed rule. The proposed schedule uses a phased approach for information submittal, requiring some facilities to submit application materials as soon as six months after rule promulgation. The longest timeframe for information submittal would not exceed seven years and six months. EPA solicits comment on the proposed schedule, and specifically seeks comment and data on the appropriate amount of time to collect data, conduct reviews, obtain comment, provide for public participation, and issue final permit conditions. See Section IX.E.*[720]

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[719] 76 Fed. Reg. at 22,274 (col. 2); *see also* 76 Fed. Reg. at 22,252 (col. 3).

[720] 76 Fed. Reg. at 22,274 (col. 2); see also 76 Fed. Reg. at 22,254 (col. 3).

Response:

EPA's proposed schedule for information submittal is entirely too long and should be cut in half. As EPA noted in the Proposed Rule, facilities with a DIF greater than 50 MGD were previously subject to the withdrawn Phase II rule and therefore should have already compiled much of the proposed application data which can be used to meet many of the information submittal requirements.[721] The maximum time frame for impingement compliance should be shortened to three years or less. Further, completion of cooling tower retrofits should be required no later than 36 months after approval of the application at fossil plants, and no more than 48 months after approval at nuclear plants (nuclear plants may need additional time to synchronize the retrofit outage with a refueling outage).[722]

The following sections of this comment letter are most relevant to EPA's request for comments:

- III.B.4 - EPA Should Shorten the Entrainment Compliance Timelines.

- III.C - Although the Establishment of National Categorical Standards for Impingement Is Necessary and Appropriate, the Proposed Standards Are Impermissibly Weak and Problematic in Numerous Respects.

  In particular:

  - III.C.4 - EPA Should Select the 0.5-Feet-per-Second Velocity Limit as the Impingement Standard for the Final Rule.

14. Methods for Evaluating Latent Mortality Effects Resulting From Impingement. *EPA requests comment on methods for evaluating latent mortality effects resulting from impingement. EPA requests comment on whether it should specifically establish 24 or 48 hours after initial impingement as the time at which to monitor impingement mortality. EPA's record demonstrates that a holding time of no more than 48 hours is optimal for evaluating the latent mortality associated with impingement while at the same time minimizing mortality associated with holding the organisms. See Section IX.F.1.*[723]

Response:

EPA should not measure latent mortality from impingement at all. Instead, EPA should eliminate the 12/31 percent impingement mortality standard as a compliance option and set a 0.5 ft/s velocity limit to control impingement as the national standard.

Measuring latent mortality is deeply problematic. As EPA acknowledges, "there are no standard methods for conducting impingement and entrainment studies and that there can be

[721] *See* 76 Fed. Reg. at 22,254 (col. 2).

[722] *See* Powers Report.

[723] 76 Fed. Reg. at 22,274 (col. 3); see also 76 Fed. Reg. at 22,257 (col. 3).

variability in designing a sampling plan between sites."[724] That variability, along with the complexity of the biological issues involved, will inevitably lead to disputes, delays and uncertainty. Also, latent mortality may occur after more than 48 hours. While EPA is not proposing a longer latency period because of the potential for greater mortality as a result of the holding, the fact remains that mortality which occurs 72 or 96 hours after the impingement event would not be measured at all under the Proposed Rule. As the attached biological report from PISCES Conservation explains, latent impingement mortality has been demonstrated to occur 96 hours after the impingement event. Thus, if latent mortality evaluations are conducted, they must include a holding time of at least 96 hours.

It is both more straightforward and more effective to reduce impingement altogether by lowering intake velocities, rather than allowing unlimited impingement but attempting to reduce the mortality rate. EPA has already concluded that "a design through-screen velocity of 0.5 feet per second would be protective of 96% of motile organisms" and is better than attempting to reduce impingement mortality through the use of technologies such as modified travelling screens.[725] The evidence shows not only that 18 percent of intake structures presently meet the 0.5 ft/s velocity limit but also that many existing facilities can meet it.[726]

The following sections of this comment letter are most relevant to this request for comment:

- III.C - Although the Establishment of National Categorical Standards for Impingement Is Necessary and Appropriate, the Proposed Standards Are Impermissibly Weak and Problematic in Numerous Respects.

In particular:

  - III.C.2 – EPA's Rejection of the 0.5 Ft/S Velocity Limitation as the Primary National Standard Is Illegal.
  - III.C.3 - The 12 Percent/31 Percent Impingement Mortality Reduction Requirement Is Problematic In Numerous Respects.

- Appendix B - Comments of Dr. Peter Henderson and Richard Seaby, PISCES Conservation, Ltd.

15. Counting Impinged Organisms With the ''Hypothetical Net.'' *EPA requests comment on the ''hypothetical net'' approach to measuring impingement mortality. Facilities could apply a ''hypothetical net'' in that they could elect to only count organisms that would not have passed through a net with 3/8'' mesh. For example, a facility that uses a finemesh screen or diverts the flow directly to a sampling bay would only need to count organisms that could be collected if the flow passed through a net,*

[724] *Id.* at n.103.

[725] *See* 76 Fed. Reg. at 22,204 (col. 3).

[726] *See* TDD, Ch. 6.

screen, or debris basket fitted with 3/8'' mesh spacing. See Section IX.F.1. EPA further solicits comment on alternative approaches that would not penalize facilities for employing fine mesh screens.[727]

Response:

The response to this request is similar to the previous response: EPA should not measure impingement mortality at all. Instead, EPA should eliminate the 12/31 percent impingement mortality standard as a compliance option and set a 0.5 ft/s velocity limit to control impingement as the national standard. Furthermore, as the PISCES report explains, there is not a distinct cut-off for the size of animal that will pass through a 3/8"inch mesh. It depends on many factors, such as body shape of a particular species (long thin forms can pass through the mesh when many times longer than 3/8"), the angle at which a fish approaches the mesh (head on, most fish are smaller than side on), the amount of debris already on the mesh, among other factors.

16. **Incentives for Reducing I&E by Reducing Water Withdrawals.** *EPA requests comment on incentives or alternative requirements for exceptionally energy efficient or water efficient facilities. See Section III. EPA also solicits comment on the regulatory provisions that encourage the use of recycled water as cooling water, including reclaimed water from wastewater treatment plants and process water from manufacturing facilities, EPA solicits comment on other incentives to encourage use of recycled water to supplement or replace marine, estuarine, or freshwater intakes.*[728]

Response:

In principle, the commenters support efforts to encourage the conservation, use and reuse of water and believe that EPA should incentivize the use of reclaimed water wherever possible. As discussed more thoroughly above, reclaimed water is widely available for use as cooling water and EPA has underestimated the availability of this resource. EPA should incentivize the use of reclaimed water by following the State of California in requiring that all facilities demonstrate that they have made use of all reasonably available reclaimed water for cooling before any withdrawal of water from a water of the United States is allowed.

However, we are concerned that EPA is not effectively encouraging reuse, and is instead providing a huge and unwarranted loophole from BTA requirements, when it exempts cooling water withdrawals where the water is also used for desalination. In particular, we have serious concerns about the blanket exemptions in Section 125.91(c) and Section 125.92. As drafted, these sections exempt water from the definition of "cooling water" if it is obtained from a desalination plant or is used in a manufacturing process either before or, more likely, after it is used for cooling purposes.

The problem arises because new desalination plants in California have received NPDES permits under the presumption that they will cause no net impact to the marine environment by

[727] 76 Fed. Reg. at 22,274 (col. 3).

[728] 76 Fed. Reg. at 22,274 (col. 3).

virtue of co-locating with power plants that will be required to employ the best technology available to minimize adverse impacts under 316(b).[729] But EPA's proposed rule would exempt a once-through-cooled power plant from Section 316(b) compliance if it gives its discharge water to a desalination plant. Consequently, in California (and soon in other states), both the power plant and the desalination facility will be able to claim that they cause no impact because the other user is the primary consumer, while their massive water withdrawal kills sea life through entrainment and impingement at exactly the same levels as before. To ensure the objective of Section 316(b) to minimize entrainment and impingement from cooling water intakes is achieved, the proposed language in the regulations must be re-written to eliminate any and all definitions or exemptions that would potentially allow power plants to be excluded from the regulations simply because a seawater desalination facility happened to co-locate with the power plant.

The following sections of this comment letter are most relevant to this request for comment:

- I.A.13 - Water Availability and Related Energy Impact
- III.E.5 - EPA Must Prohibit the Use of Freshwater for Once-Through Cooling in Arid Regions or Those at Risk of Drought.
- III.E.6 - EPA Should Not Exempt Cooling Water Withdrawals from the Rule Merely Because the Water Is Also Used for Desalination.

17. Options Which Provide Closed-Cycle Cooling as BTA. *EPA solicits comment on regulatory options that establish closed-cycle cooling as BTA. EPA specifically requests comment on the regulatory options 2 and 3 included in today's proposal, which would establish closed-cycle cooling as BTA for EM at a DIF of 2 MGD and 125 MGD, respectively. See Section VI and VII. EPA further solicits comment and supporting data on alternative thresholds, including whether such alternative thresholds should be based on DIF or AIF. EPA also solicits comment and supporting data for alternative criteria that would establish closed-cycle cooling as BTA for some facilities.*[730]

Response:

EPA should establish an entrainment standard based on closed-cycle cooling as envisioned in the agency's Option 3. Option 3 would set a national categorical standard based on closed-cycle cooling and include a narrow safety-valve variance for those plants with factors fundamentally different than the majority of plants that can meet such a standard. Option 3 would minimize adverse environmental impacts with feasible and readily affordable technology.

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[729] *See, e.g.,* Cal. Reg'l Water Quality Control Bd., San Diego Region, Order No.R9-2009-0038 Amending Order No. R9-2006-0065 (NPDES No. CA0109223) Waste Discharge Requirements for the Poseidon Resources Corporation Carlsbad Desalination Project Discharge to the Pacific Ocean via the Encina Power Station Discharge Channel (May 13, 2009) (Exh. 136) *also available at* www.swrcb.ca.gov/rwqcb9/board_decisions/adopted_orders/2009/R9_2009_0038_rev1.pdf.

[730] 76 Fed. Reg. at 22,275 (col. 1); see also 76 Fed. Reg. 22,205 (col. 1).

Contrary to industry's hyperbolic claims (many of which EPA uncritically accepted), Option 3 would not cause electric reliability problems, would not increase electricity prices, and would not cause any significant adverse environmental effects. Further, EPA's economic findings are unambiguous: the stronger the regulation, the greater the boost to the economy and job creation. At either discount rate EPA used in its analysis, Option 3 creates jobs and stimulates the economy to a greater degree than any of the other options. At a 7 percent discount rate, it produces 10,102 new jobs under EPA's analysis, but the actual benefits to the economy of Option 3 are likely much greater. Option 3 is therefore a job-creating rule that will improve the economy.

In its cost-benefit analysis, EPA was unable to quantify whole categories of benefits, and even where EPA was able to quantify benefits, it was unable to monetize the overwhelming majority of them. A complete cost-benefit analysis, if that were even possible using existing economic tools, would show that the benefits of Option 3 clearly exceed the costs and thus the benefits obviously justify the costs, and the costs are not wholly disproportionate to the benefits.

The following sections of this comment letter are most relevant to this request for comment:

- I.B.3 – As Part of the CWA's Technology-Based Regime, Section 316(b) Requires EPA to Adopt Uniform, National, Categorical, Technology-Based and Technology-Forcing BTA Standards for Cooling Water Intake Structures;

- I.C – Regulatory Background: For Forty Years, Regulation on a Case-by-Case Site-Specific Basis Has Caused Bureaucratic Paralysis and Perpetuated the Unacceptable Status Quo, Contrary to Congress's Intent;

- II.D – The Rulemaking Process: Changes Made at the Suggestion or Recommendations of OMB;

- III.A – EPA's Interpretation of Section 316(b) and its "Approach to BTA" Contradicts the Plain Meaning of the Act and Congress's Clearly Expressed Intent;

- III.B – EPA Should Establish a National Categorical Entrainment Standard Based on Closed-Cycle Cooling; and

- III.F – EPA's Cost-Benefit Analysis is Deeply Flawed and Illegal.

18. Costs of Controls to Eliminate Entrapment. *EPA assumes facilities with modified traveling screens including a fish handling and return system would meet the proposed requirements to eliminate entrapment of fish and shellfish. EPA believes those facilities with an offshore velocity cap leading to a forebay but without a fish return system would incur costs to meet the proposed requirements for entrapment. For facilities with closed-cycle cooling systems, EPA does not have data on the number of facilities that also have a fish handling and return system. Further, EPA does not have data on the number of facilities that have less than 0.5 feet per second intake velocity but have a cooling water*

intake system that may cause entrapment. EPA solicits comment and data on the types and numbers of facilities with a cooling water intake system that may cause entrapment, and the costs to eliminate entrapment.[731]

Response: No comment.

19. **Analysis of New Capacity.** *EPA requests comment on the number of new units and the amount of new capacity construction projected. See Section VII.*[732]

Response:

As discussed above, even the most expensive of EPA's options will cause so few power plant retirements that the number of new units and amount of new capacity is irrelevant. Any retirements would be replaced many times over under even the most modest new capacity projections.

20. **Monitoring Reports.** *EPA solicits comment on how frequently I&E mortality monitoring reports should be submitted. EPA further solicits comment on incorporating the monitoring reports into monthly DMRs, or whether less frequent reporting is appropriate. EPA also requests comment on whether minimum monitoring frequencies should be established in this rule or left to the discretion of the Director. See Section IX.*[733]

Response:

To the extent biological monitoring is conducted pursuant to the rule, EPA should specify minimum monitoring requirements that meet the expectations it laid out in the preamble, rather than leaving monitoring terms to be determined by the Director. It is inefficient for each state to reinvent monitoring requirements (as EPA would have it) dozens of times – once for each facility.

The following sections of this comment letter are most relevant to this request for comment:

- III.E.4 - EPA Should Specify Minimum Monitoring Requirements.
- Appendix B - Comments of Dr. Peter Henderson and Richard Seaby, PISCES Conservation, Ltd.

21. **Seasonal Operation of Cooling Towers.** *EPA solicits comment on an option that would require cooling towers on some or all facilities but recognize the site-specific nature of EM by allowing seasonal operation of cooling towers during peak entrainment season.*

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[731] 76 Fed. Reg. at 22,275 (col. 1); *see also* 76 Fed. Reg. at 22,251 (col. 2) and 76 Fed. Reg. at 22,204 (col. 3)

[732] 76 Fed. Reg. at 22,275 (col. 1).

[733] 76 Fed. Reg. at 22,275 (col. 1); *see also* 76 Fed. Reg. at 22,262 (col. 2).

EPA also requests comment on including a similar provision for new units at existing facilities, which are required to achieve I&E reductions commensurate with closed-cycle cooling in the proposed rule.[734]

Response:

Closed-cycle cooling should operated year-round because of the potential to entrain and impinge aquatic organisms well beyond "peak entrainment season." To the extent that a facility operating closed-cycle cooling nevertheless entrains large numbers of organisms during peak entrainment season, additional fish protective measures should be required, such as seasonal outages.

22. New Unit Provision. *EPA solicits comment on the new unit provision. Specifically, EPA solicits comment on the clarity of the definition of new unit, and whether it should be expanded to include other units such as those that are repowered or rebuilt. EPA also solicits comment on whether the new unit provision should be deleted, therefore subjecting these units to the same site-specific entrainment BTA determination required of existing units.*[735]

Response:

EPA should revert to the new units definition and standards that it proposed to OMB with minor revisions noted above. The version of the proposed rule that EPA sent to OMB would have required all replacements, repowerings, and rebuilt power plants to meet standards based on closed-cycle cooling because those plants have the ability to include closed-cycle cooing systems as part of the initial design of the rebuilt, repowered or replacement plant. But OMB modified those provisions such that only "new units at existing facilities," a very narrowly-defined class of entities, now have to meet the closed-cycle cooling standards.

Neither the rule, nor the preamble, provide any justification for not treating replaced, repowered, or rebuilt facilities as new units. The reasons that EPA gave for strictly regulating additional units apply equally to total replacements and repowerings[736] – this is evident from the version of the preamble that EPA sent to OMB. The current rule irrationally distinguishes between two total replacements of a facility. If an owner replaces every inch of the site, it is a new facility. But if the owner completely demolishes and replaces everything at the existing facility except for the cooling water intake structure itself, it is an existing facility. Yet all the equipment necessary to meet a closed-cycle cooling standard is built behind the cooling water intake structure.

EPA's technical experts agreed that the reasons for considering an additional unit to be a new unit apply equally to replacements and repowerings, but they were overruled by OMB.

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[734] 76 Fed. Reg. at 22,275 (col. 2).

[735] 76 Fed. Reg. at 22,275 (col. 2).

[736] As do the reasons EPA gave for strictly regulating new facilities back in 2001, in the Phase I rule.

OMB has not justified its proposed change, and in any case the office does not have technical expertise. For EPA to accept OMB's unjustifiable modification to the rule is arbitrary and unreasonable; it is also inconsistent with Congress's intent to control mortality at cooling water intakes.

The following sections of this comment letter are most relevant to EPA's request for comments:

- II.D.3 - OMB Determined that Replacements/Repowerings Are Not New Units and Deleted EPA's Contrary Statements and Rationale.

- III.D - All Repowered, Replaced, or Rebuilt Facilities Must Be Subject to the Same Closed-Cycle-Cooling-Based Requirements as New Units at Existing Facilities.

23. Review Criteria to Guide Evaluation of Entrainment Feasibility Factors. EPA solicits comment on the criteria specified in the regulation for guiding the evaluation of closed-cycle cooling as BTA for EM. EPA further solicits comment on additional criteria that EPA should address, and whether such criteria should be developed in the regulation or provided in guidance.[737]

Response:

State permitting directors should not be required to evaluate whether closed-cycle cooling is the best technology available to minimize entrainment on a site-specific basis because EPA's record evidence supports – and the Clean Water Act requires – establishing a national categorical standard based on the performance of closed-cycle cooling systems. Further, the evidence shows that states are incapable of making these determinations in a timely manner, if at all, and certainly not in the manner that EPA envisions in the proposed rule. But in cases where a facility seeks a variance from national standards, Directors will be required to determine whether a variance is warranted. As discussed above, EPA should carefully tailor any variance provision and set rules for the Director to follow in apply that variance.

The following section of this comment letter is most relevant to this request for comments:

- III.B.5 – Any Variance EPA Includes as Part of a Categorical Entrainment Standard Must Clearly Delineate What Issues May Be Considered by the Director and How They Are to Be Considered.

24. Alternative Procedures for Visual or Remote Inspections. *EPA requests comment on its proposal to permit the Director to establish alternative procedures for conducting visual or remote inspections during periods of inclement weather. EPA also requests comment on whether the rule should specific minimum frequencies for visual or remote*

[737] 76 Fed. Reg. at 22,275 (col. 2).

inspections, or leave this to the determination of the permitting authority. See Section IX.F.[738]

Response:

EPA should maintain the requirement that cooling water intake structures be inspected at least weekly to ensure that any technologies installed to comply with § 125.94 are maintained and operated to ensure that they will continue to function as designed.

25. **Threshold for In-Scope Facilities.** EPA requests comment on the threshold of DIF greater than 2 MGD for identifying facilities in-scope of this rule.[739]

Response:

The 2 MGD DIF threshold is appropriate for defining the universe of facilities within the scope of the Clean Water Act. Facilities above this level have an impact on water bodies that is more than *de minimis* and the 2 MGD threshold matches the threshold set in the Phase I rule. If EPA is concerned about costs and impacts on small business of meeting a national standard that is also suitable for the nation's largest power plants, EPA must undertake a thorough effort to craft a national standard by looking at various thresholds and options for subcategorizing the more than 1,200 facilities with cooling water intake structures affected by this rule. But EPA should not and cannot set a higher threshold and leave all below-threshold facilities to have their BTA determination made on a BPJ basis.

26. **Application Requirements.** *EPA requests comment on the burden and practical utility of all of the proposed application requirements. EPA is particularly interested in the burden of application requirements to facilities with DIF < 50 MGD. EPA also requests comment on its proposal to limit application requirements for facilities that have already installed closed-cycle cooling, or opt to do so without a site-specific assessment of BTA, and whether there are additional requirements that could be relaxed for this group.*[740]

Response:

The application burdens imposed by the open-ended case-by-case process in the Proposed Rule can be dramatically lessened by selecting Option 3. This would avoid the need for 1,200 site-specific applications, with multiple studies included in each application. Such studies would only be required in the context of a variance from a uniform national closed-cycle cooling standard. To the extent that EPA leaves any significant aspect of cooling water intake regulation to site-specific determination, the studies that EPA is requiring as part of the proposed application requirements are necessary and unavoidable. EPA, the states, and the public lack reliable information as to specific power plants' technologies, operations and fish kills and the

[738] 76 Fed. Reg. at 22,275 (col. 2); *see also* 76 Fed. Reg. 22,259 (col. 2).

[739] 76 Fed. Reg. at 22,275 (col. 2).

[740] 76 Fed. Reg. at 22,275 (col. 2); *see also* 76 Fed. Reg. at 22,249 (col. 2).

required studies should fill this data gap. Application requirements can be lessened for facilities with closed-cycle cooling or those that opt to install closed-cycle cooling.

27. Comment from State and Local Officials. EPA specifically requests comment on this proposed rule from State and local officials. See Section X.E.[741]

Response:

As discussed above, many states have previously commented to EPA that they lack the resources and expertise to make BTA determinations or conduct cost-benefit analyses on a site-specific, case-by-case basis in the absence national categorical standards.

The following sections of this comment letter are most relevant to this request for comments:

- I.C. Regulatory Background: For Forty Years, Regulation on a Case-by-Case Site-Specific Basis Has Caused Bureaucratic Paralysis, Litigation Quagmires, and the Perpetuation of the Unacceptable Status Quo, Contrary to Congress's Intent.
- III.B.1.c(1) – States Cannot Complete Case-By-Case BTA Determinations.
- III.B.1.c(2) – States Cannot Conduct, or Meaningfully Review, Site-Specific Cost-Benefit Analyses.

28. Comment From Tribal Officials. EPA specifically requests additional comment on this proposed action from Tribal officials. See Section X.F.

Response: No comment.

B. Responses to Additional Requests.

In addition, the preamble also contains other specific requests for comments that were not included in the list of 28 responded to above. We respond to these, which appear at various places in the preamble, here.

From Preamble Section VI.C.

EPA also considered applying a confidence or tolerance limit to the long-term average in deriving the annual average standard. EPA rejected this approach because EPA believes that facilities can achieve better long-term performance than documented in the data by maintaining tight control on their technology and operations and adaptively managing the technology to achieve the best possible performance. While EPA has not included any additional costs for this adaptive management, EPA believes that such adaptive management should be part of the routine maintenance an operation of the technology

[741] 76 Fed. Reg. at 22,275 (col. 3).

and additional costs should not be necessary. EPA has occasionally used annual limits in the effluent guidelines program (most recently for the pulp and paper industry category (40 CFR 430, promulgated in 1998) and has previously not included a variability factor for annual limits. Thus, EPA's proposed approach to calculating the annual standard for mortality impingement is consistent with past practice. ***EPA requests comment*** *on its proposed approach for calculating and implementing the annual standard. This technology does not minimize adverse environmental impacts associated with entrainment, and does not specifically address impingement mortality of shellfish.*[742]

Response:

As noted above, EPA should not measure impingement mortality as a percentage of impingement at all. Instead, EPA should eliminate the 12/31 percent impingement mortality standard as a compliance option and set a 0.5 ft/s velocity limit to control impingement as the national standard. Please see the responses above to EPA's fourteenth and fifteenth requests for comments.

But it is conceivable that, in the context of a variance from a national impingement standard that requires facilities to meet a 0.5 ft/s velocity limit, measuring impingement mortality may be necessary. In that situation, EPA should not apply a variability factor for the reasons EPA presents in the preamble.

From Preamble Section VI.D.1.b.

Entrainment Controls

The proposal would require consideration of site-specific entrainment controls for each facility above 2 MGD DIF. EPA considered proposing no further controls to address entrainment mortality, and to rely instead only on the BTA impingement mortality controls, which would achieve up to a 31 percent reduction in total AEI. EPA has not selected this option as the basis for national BTA because EPA believes that some facilities may be able to do more to control entrainment and that requiring a structured site-specific analysis of candidate BTA technologies for entrainment control will allow the Director to determine where it is appropriate to require such controls. However, one outcome of the site specific analysis may be that the Director would determine that no other technologies beyond impingement control meet the criteria for election as BTA, because no other technologies are feasible and/or their benefits do not justify their costs. ***EPA requests comment*** *on the option of basing national BTA on impingement controls only and dropping the specific requirement for a structured site specific analysis of entrainment BTA options, as discussed below.*[743]

Response:

The evidence that EPA has gathered compels EPA to establish an entrainment standard based on closed-cycle cooling as envisioned in the agency's Option 3 because closed-cycle cooling is the best technology available. Anything less –particularly a decision to set no

[742] 76 Fed. Reg. at 22,203 (col. 2-3).
[743] 76 Fed. Reg. at 22,205 (col. 1).

entrainment standard at all – is a wholesale abdication of EPA's statutory duty. Congress specifically enacted Section 316(b) to address the massive fish kills caused by closed-cycle cooling. EPA has consistently found that the primary adverse environmental impacts of cooling water intake structures are impingement and entrainment. EPA has no authority to require BTA for minimizing impingement only and not entrainment.

The following sections of this comment letter are most relevant to this request for comment:

- I.A – Factual Background: Once-Through Cooling Causes Adverse Environmental Impacts of Staggering Proportions;
- I.B. – Congress Enacted Section 316(b) as Part of the 1972 Clean Water Act Amendments to Standardize Permitting and Minimize Once-Through Cooling's Massive Water Withdrawals and Fish Kills;
- III.A – EPA's Interpretation of Section 316(b) and its "Approach to BTA" Contradicts the Plain Meaning of the Act and Congress's Clearly Expressed Intent;
- III.B – EPA Should Establish a National Categorical Entrainment Standard Based on Closed-Cycle Cooling; and
- III.F – EPA's Cost-Benefit Analysis is Deeply Flawed and Illegal.

From Preamble Section VI.E. Option Selection

> ***EPA solicits comment*** *on Option 4 and the impacts, including the cumulative impacts of today's proposal on small entities generally.*[744]

Response:

Option 4 is the least protective and most legally inadequate of all the options that EPA considered and should be given no further consideration.

> ***EPA also requests comment*** *on whether, if Option 4 were adopted for the final rule, it should include uniform national requirements for new units at existing facilities with DIF less than 50 MGD based on closed-cycle cooling.*[745]

Response:

Option 4 is the least protective and most legally inadequate of all the options that EPA considered and should be given no further consideration. New units (as properly defined) with a DIF of 2 MGD or above should be subject to uniform national requirements based on closed-cycle cooling.

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[744] 76 Fed. Reg. at 22,208 (col. 2).

[745] 76 Fed. Reg. at 22,208 (col. 2).

From Preamble Section VI.I. EPA's Costing of the Preferred Option

These hypothetical scenarios illustrate the site-specific costs if a significant number of facilities install and operate a closed-cycle cooling system. These scenarios assume facilities would install only closed-cycle cooling and operate it year-round. This may represent an upper-bound cost for those facilities. EPA also assumed that cooling towers will be installed at fossil fuel plants within 10 years. EPA is aware that there are other possible scenarios for projecting which facilities might be required to install closed-cycle cooling or other entrainment mortality technologies as a result of individual BTA determinations. Some of these would show lower or higher costs than those presented here. ***EPA requests comment*** *on other scenarios that might better capture the range of costs that result from the structured analysis of entrainment mortality BTA required by today's proposed rule.*[746]

Response:

As explained above, and in more depth in the attached report of Powers Engineering, EPA overestimated the costs of closed-cycle cooling. The greatest flaw in EPA's approach to estimating the cost of retrofits was EPA's irrational decision, in 2007, to abandon its own thoroughly documented cost estimation model and instead use unverified figures provided by the Electric Power Research Institute (EPRI), which is an arm of the electric power industry being regulated by the rule. Consequently, EPA has overestimated the costs of closed-cycle cooling by approximately 60 percent.

The following sections of this comment letter are most relevant to this request for comment:

- III.F.3 - EPA Overestimated the Costs of Closed-Cycle Cooling.
- Appendix D – Comments of William Powers, P.E., Powers Engineering

From Preamble Section IX.B. ***When would affected facilities be required to comply?***

...if a facility plans to retrofit to wet cooling towers to both reduce entrainment mortality and to use the resulting lower intake velocity to comply with requirements for impingement mortality, the Director may be able to allow for compliance with the IM requirements to extend to the same schedule as the entrainment mortality requirements. However, where the Director determines a facility would need longer than 8 years to comply with the EM requirements established by the Director, the proposed rule would not allow the compliance schedule for IM to extend beyond 8 years. EPA recognizes that this limitation may penalize facilities that might install cooling towers to meet both IM and EM requirements but are unable to complete installation within 8 years. ***EPA requests comment*** *on this limitation.*[747]

[746] 76 Fed. Reg. at 22,211 (col. 2).

[747] 76 Fed. Reg. at 22,248 (col. 2).

Response:

In the draft of this proposed rule that EPA originally sent to OMB, the agency explained the firm eight year deadline for impingement compliance by saying that it "does not intend for the facility to do nothing to reduce [impingement] until the technologies for [entrainment] have been implemented." All facilities should be able to install closed-cycle cooling in less than eight years, and impingement controls should be required in three years or less. To the extent that a facility installs closed-cycle cooling to meet impingement and entrainment standards, and the retrofit is expected to take longer than usual, the facility should be required to install interim measures to reduce impingement.

From Preamble Section IX.D. ***What information must I submit in my permit application?***

Section 122.21(r)(12) Non-Water Quality Impacts Assessment

EPA recognizes that in some cases it may be efficient for permit applicants to combine several of the required studies into a single document and have them reviewed holistically by a single set of peer reviewers. Such an approach is not precluded by the proposed rule as long as the peer review panel has the background appropriate to conduct the combined review and the permitting authority approves. ***EPA requests comment*** *on the peer review requirements and the level of specificity regarding peer review in the draft rule text.*[748]

Response:

The current study process is deeply flawed because consultants and peer reviewers will be hired and paid by the applicant. In many cases, they will become advocates for the applicant's position rather than impartial adjudicators. This risk is multiplied because most applicants are repeat players: the parent company owns or operates multiple facilities and can provide pliant consultants and reviewers with a steady stream of work. Even if applicants pay for the cost of conducting studies and peer reviews, the integrity of the analytical process can only be assured if the State, not the applicant, selects the contractors and oversees the studies.

Under 125.94(d)(2), EPA would allow facilities to implement technologies other than closed-cycle cooling systems that reduce entrainment mortality by at least 90 percent of what would have been obtained via flow reduction commensurate with closed-cycle cooling under 125.94(d)(1). This compliance provision mirrors the Track II provision of the Phase I rule, and is intended to provide opportunities for facilities to consider technologies such intake relocation or fine mesh screens, or operational measures such as the recycle and reuse of cooling water for other purposes… ***EPA seeks comment*** *on this provision.*[749]

[748] 76 Fed. Reg. at 22,253 (cols. 1-2).

[749] 76 Fed. Reg. at 22,254 (col. 2).

Response:

EPA should clarify that, in seeking to comply with the entrainment mortality requirement by demonstrating reductions in mortality that are commensurate with use of a closed-cycle system, a facility must aim for 100 percent, and if it falls short within 10 percent, that will be acceptable. It may not, however, aim for 90 percent and achieve only an 89 percent reduction in entrainment mortality.

The following sections of this comment letter are most relevant to this request for comment:

- III.D.2 – All Repowered, Replaced, or Rebuilt Facilities Must Be Subject to the Same Closed-Cycle-Cooling-Based Requirements as "New Units at Existing Facilities."
- IV – Additional Revisions to the Phase I Rule Are Warranted in Light of the *Riverkeeper I* Decision.

From Preamble Section IX.J. What is the Director's role under today's proposal?

(4) The Director would review and approve the site-specific impingement mortality plan including the duration and frequency of any monitoring beyond the minimum specified by the rule, the monitoring location, the organisms to be monitored, and the method in which naturally moribund organisms would be identified and taken into account. ***EPA solicits comment*** *on whether the Director should review, but not approve, the identified plans.*[750]

Response:

EPA should not measure impingement mortality at all. Instead, EPA should eliminate the 12/31 percent impingement mortality standard as a compliance option and set a 0.5 ft/s velocity limit to control impingement as the national standard. Please see the responses above to EPA's fourteenth and fifteenth requests for comments.

However, if a facility should face technical constraints that prevent it from complying with a 0.5 ft/s velocity limit and impingement mortality monitoring is required, monitoring plans should depend on approval by the Director. Facilities should not be able to design their own monitoring plans without oversight because sampling is an expense that plant operators will want to minimize, they have every incentive to propose minimal sampling frequencies and to scale down the extent of monitoring in every other way.

At the same time, however, the Director's ability to approve monitoring studies, as set forth in proposed 40 CFR § 125.98(c)(6), should be revised to prevent state permit directors from excluding "other specific species," which are neither invasive nor naturally moribund, from monitoring, sampling, and study requirements. Since BTA determinations and compliance with

[750] 76 Fed. Reg. at 22,260 (col. 3).

BTA standards will be in large part determined through monitoring, sampling and studies, this "species of [no] concern" provision would allow states to simply ignore, rather than minimize, mortality to certain species.

The following sections of this comment letter are most relevant to this request for comment:

- III.E.2. – EPA Should Prevent Directors from Excluding Any Species from the Rule's Scope.

> *(6) The Director would review and approve the site-specific entrainment mortality sampling plan for new units at existing facilities (other than those employing closed-cycle cooling) including the duration and frequency of monitoring, the monitoring location, the organisms to be monitored, and the method in which latent mortality would be identified.* ***EPA solicits comment*** *on whether the Director should review, but not formally approve, the identified plans.*[751]

Response:

As with impingement monitoring, entrainment monitoring plans should also depend on approval by the Director. Facilities should not be able to design their own monitoring plans without oversight because sampling is an expense that plant operators will want to minimize, they have every incentive to propose minimal sampling frequencies and to scale down the extent of monitoring in every other way.

At the same time, however, the Director's ability to approve monitoring studies, as set forth in proposed 40 CFR § 125.98(c)(6), should be revised to prevent state permit directors from excluding "other specific species," which are neither invasive nor naturally moribund, from monitoring, sampling, and study requirements. Since BTA determinations and compliance with BTA standards will be in large part determined through monitoring, sampling and studies, this "species of [no] concern" provision would allow states to simply ignore, rather than minimize, mortality to certain species.

The following section of this comment letter is most relevant to this request for comment:

- III.E.2 – EPA Should Prevent Directors from Excluding Any Species from the Rule's Scope.

[751] 76 Fed. Reg. at 22,260 (col. 3) - 22,621 (col. 1).

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Exhibit 4: Versar, *Technical Review and Evaluation of Thermal Effects Studies and Cooling Water Intake Structure Demonstration of Impact for the Salem Nuclear Generating Station*, Revised Final Report (1989)

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Massachusetts, NPDES Permit No. MA0003654, Docket No. 08-007, Findings and Order for Compliance (Exh. 116).

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Exhibit 123: U.S. Department of Energy, Office of Fossil Energy, "*Project Fact Sheet*"

Exhibit 124: U.S. Department of Energy, Office of Fossil Energy, "*Internet-Based GIS Catalog of Non-Traditional Sources for Cooling Water for use at America's Coal-Fired Power Plants*" (2009)

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Exhibit 126: National Energy Technology Laboratory, *Use of Treated Municipal Wastewater as Power Plant Cooling System Makeup Water: Tertiary Treatment Versus Expanded Chemical Regimen for Recirculating Water Quality Management*

Exhibit 127: U.S. Geological Survey, *Estimated Water Use in the United States in 1995* (1998)

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Exhibit 129: EPRI, *Water & Sustainability (Volume 3): U.S. Water Consumption for Power Production – The Next Half Century*, Topical Report No. 1006786 (Mar. 2002)

Exhibit 130: Erik Mielke, Laura Diaz Anadon, & Venkatesth Narayanamurti, "Water Consumption of Energy Resource Extraction, Processing, and Conversion: A review of the literature for estimates of water intensity of energy-resource extraction, processing to fuels, and conversion to electricity," Energy Technology Innovation Policy Discussion Paper No. 2010-15, Belfer Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University (Oct. 2010)

Exhibit 131: California State Water Resources Control Board (SWRCB), Res. No. 75-058 (June 19, 1975)

Exhibit 132: Cal. Reg'l Water Quality Control Bd., San Diego Region, *Order No.R9-2009-0038 Amending Order No. R9-2006-0065 (NPDES No. CA0109223) Waste Discharge Requirements for the Poseidon Resources Corporation Carlsbad Desalination Project Discharge to the Pacific Ocean via the Encina Power Station Discharge Channel* (2009)

Exhibit 133:	Gentner Consulting Group, Economic Damages of Impingement and Entrainment of Fish, Fish Eggs, and Fish Larvae at the Bay Shore Power Plant (Sept. 2009)
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Exhibit 135:	Electric Generating Units Planned Retirement Date Spreadsheet (developed from publicly available information), Aug. 15, 2011
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To: CN=Robert Wood/OU=DC/O=USEPA/C=US@EPA[]
Cc: []
From: CN=Julie Hewitt/OU=DC/O=USEPA/C=US
Sent: Fri 12/23/2011 9:36:43 PM
Subject: 316(b) proposal mat'ls
76 FR 22174 Proposed Rule.pdf
Permit Application and Studies Timeline 2.pptx
316(b) Rule Presentation_04-05-11.ppt

Here's the full FR notice, but it's pages 33-37 where you'll find the rationale for the Ex. 5 - Deliberative (what I printed and handed to you):

This is the presentation that summarizes the proposal:

And this is the one-pager that has the whole timeline for compliance:

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 122 and 125

[EPA–HQ–OW–2008–0667, FRL–9289–2]

RIN 2040–AE95

National Pollutant Discharge Elimination System—Cooling Water Intake Structures at Existing Facilities and Phase I Facilities

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: This proposed rule would establish requirements under section 316(b) of the Clean Water Act (CWA) for all existing power generating facilities and existing manufacturing and industrial facilities that withdraw more than 2 million gallons per day (MGD) of water from waters of the U.S. and use at least twenty-five (25) percent of the water they withdraw exclusively for cooling purposes. The proposed national requirements, which would be implemented through National Pollutant Discharge Elimination System (NPDES) permits, would establish national requirements applicable to the location, design, construction, and capacity of cooling water intake structures at these facilities by setting requirements that reflect the best technology available (BTA) for minimizing adverse environmental impact. The proposed rule constitutes EPA's response to the remand of the Phase II existing facility rule and the remand of the existing facilities portion of the Phase III rule. In addition, EPA is also responding to the decision in *Riverkeeper* I and proposing to remove from the Phase I new facility rule the restoration-based compliance alternative and the associated monitoring and demonstration requirements. EPA expects this proposed regulation would minimize adverse environmental impacts, including substantially reducing the harmful effects of impingement and entrainment. As a result, the Agency anticipates this proposed rule would help protect ecosystems affected by cooling water intake structures and preserve aquatic organisms and the ecosystems they inhabit in waters used by cooling water intake structures at existing facilities.

DATES: Comments must be received on or before July 19, 2011.

ADDRESSES: Submit your comments, identified by Docket No. EPA–HQ–OW–2008–0667 by one of the following methods:

- *http:www.regulations.gov:* Follow the on-line instructions for submitting comments.
- *E-mail: OW-Docket@epa.gov,* Attention Docket ID No. EPA–HQ–OW–2008–0667.
- *Mail:* Water Docket, U.S. Environmental Protection Agency, Mail Code: 4203M, 1200 Pennsylvania Ave., NW., Washington, DC 20460. Attention Docket ID No. EPA–HQ–OW–2008–0667. Please include a total of 3 copies. In addition, please mail a copy of your comments on information collection provisions to the Office of Information and Regulatory Affairs, Office of Management and Budget (OMB), *Attn:* Desk Officer for EPA, 725 17th St., NW., Washington, DC 20503.
- *Hand Delivery:* Water Docket, EPA Docket Center, EPA West Building Room 3334, 1301 Constitution Ave., NW., Washington, DC, Attention Docket ID No. EPA–HQ–OW–2008–0667. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information by calling 202–566–2426.

Instructions: Direct your comments to Docket No. EPA–HQ–OW–2008–0667. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at *http://www.regulations.gov,* including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through *http://www.regulations.gov* or e-mail. The *http://www.regulations.gov* Web site is an "anonymous access" system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an e-mail comment directly to EPA without going through *http://www.regulations.gov* your e-mail address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD–ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses.

Docket: All documents in the docket are listed in the *http://www.regulations.gov* index. Although listed in the index, some information is not publicly available, *e.g.,* CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in *http://www.regulations.gov* or in hard copy at the Water Docket in the EPA Docket Center, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave., NW., Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is 202–566–1744, and the telephone number for the Water Docket is 202–566–2426.

FOR FURTHER INFORMATION CONTACT: For additional technical information, contact Paul Shriner at 202–566–1076; e-mail: *shriner.paul@epa.gov.* For additional economic information, contact Erik Helm at 202–566–1049; e-mail: *helm.erik@epa.gov.* For additional biological information, contact Tom Born at 202–566–1001; e-mail: *born.tom@epa.gov.*

SUPPLEMENTARY INFORMATION:

What Entities Are Regulated By This Action? This proposed rule would apply to existing facilities that use cooling water intake structures to withdraw water from waters of the U.S. and have or require a National Pollutant Discharge Elimination System (NPDES) permit issued under Section 402 of the CWA. Existing facilities subject to this regulation would include those with a design intake flow greater than 2 MGD. If a facility meets these conditions, it is subject to today's proposed regulations. If a facility has or requires a NPDES permit but does not meet the 2 MGD intake flow threshold, it would be subject to permit conditions implementing section 316(b), developed by the NPDES permit director, on a case-by-case basis, using best professional judgment. This proposal defines the term "cooling water intake structure" to mean the total physical structure and any associated waterways used to withdraw water from waters of the U.S., provided that at least twenty-five percent of the water withdrawn is used for cooling purposes. The cooling water intake structure extends from the point at which water is withdrawn from the surface water source up to, and including, the intake pumps. Generally,

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facilities that meet these criteria fall into two major groups: steam electric generating facilities and manufacturing facilities.

The following table lists the types of entities that are potentially subject to this proposed rule. This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be regulated by this action. Other types of entities not listed in the table could also be regulated.

Category	Examples of regulated entities	Standard Industrial Classification Codes	North American Industry Codes (NAIC)
Federal, State and Local Government.	Operators of steam electric generating point source dischargers that employ cooling water intake structures..	4911 and 493	221111, 221112, 221113, 221119, 221121, 221122, 221111, 221112, 221113, 221119, 221121, 221122.
Industry	Operators of industrial point source dischargers that employ cooling water intake structures..	See below	See below.
	Steam electric generating	4911 and 493	221111, 221112, 221113, 221119, 221121, 221122, 221111, 221112, 221113, 221119, 221121, 221122.
	Agricultural production	0133	111991, 11193.
	Metal mining	1011	21221.
	Oil and gas extraction (Excluding offshore and coastal subcategories).	1311, 1321	211111, 211112.
	Mining and quarrying of nonmetallic minerals	1474	212391.
	Food and kindred products	2046, 2061, 2062, 2063, 2075, 2085.	311221, 311311, 311312, 311313, 311222, 311225, 31214.
	Tobacco products	2141	312229, 31221.
	Textile mill products	2211	31321.
	Lumber and wood products, except furniture	2415, 2421, 2436, 2493.	321912, 321113, 321918, 321999, 321212, 321219.
	Paper and allied products	2611, 2621, 2631, 2676.	3221, 322121, 32213, 322121, 322122, 32213, 322291.
	Chemical and allied products	28 (except 2895, 2893, 2851, and 2879).	325 (except 325182, 32591, 32551, 32532).
	Petroleum refining and related industries	2911, 2999	32411, 324199.
	Rubber and miscellaneous plastics products	3011, 3069	326211, 31332, 326192, 326299.
	Stone, clay, glass, and concrete products	3241	32731.
	Primary metal industries	3312, 3313, 3315, 3316, 3317, 3334, 3339, 3353, 3363, 3365, 3366.	324199, 331111, 331112, 331492, 331222, 332618, 331221, 22121, 331312, 331419, 331315, 331521, 331524, 331525.
	Fabricated metal products, except machinery and transportation equipment.	3421, 3499	332211, 337215, 332117, 332439, 33251, 332919, 339914, 332999.
	Industrial and commercial machinery and computer equipment	3523, 3531	333111, 332323, 332212, 333922, 22651, 333923, 33312.
	Transportation equipment	3724, 3743, 3764	336412, 333911, 33651, 336416.
	Measuring, analyzing, and controlling instruments; photographic, medical, and optical goods; watches and clocks.	3861	333315, 325992.
	Electric, gas, and sanitary services	4911, 4931, 4939, 4961.	221111, 221112, 221113, 221119, 221121, 221122, 22121, 22133.
	Educational services	8221	61131.
	Engineering, accounting, research, management and related services.	8731	54171.

To determine whether your facility could be regulated by this action, you should carefully examine the applicability criteria in §125.91 of the proposed rule. If you have questions regarding the applicability of this action to a particular entity, consult the person listed for technical information in the preceding **FOR FURTHER INFORMATION CONTACT** section.

Supporting Documentation

1. Docket

EPA has established an official public docket for this action under Docket ID No. EPA–HQ–OW–2008–0667. The official public docket consists of the documents specifically referenced in this action, any public comments received, and other information related to this action. Although a part of the official docket, the public docket does not include information claimed as Confidential Business Information (CBI) or other information the disclosure of which is restricted by statute. For information on how to access materials in the docket, refer to the preceding **ADDRESSES** section. To view docket materials, please call ahead to schedule

an appointment. Every user is entitled to copy 266 pages per day before incurring a charge. The Docket may charge 15 cents for each page over the 266-page limit plus an administrative fee of $25.00.

2. Electronic Access

You may access this **Federal Register** document and the docket electronically, as well as submit public comments, through the Web site *http://www.regulations.gov* by searching for Docket ID No. EPA–HQ–OW–2008–0667. For additional information about the public docket, visit the EPA Docket Center homepage at *http://www.epa.gov/epahome/dockets.htm.*

3. Technical Support Documents

The proposed regulation is supported by three major documents:

1. Economic and Benefits Analysis for the Proposed Section 316(b) Existing Facilities Rule (EPA–821–R–11–003), hereafter referred to as the Economic and Benefits Analysis (EBA or more simply EA). This document presents the analysis of compliance costs, closures, energy supply effects, and a summary of benefits associated with the proposed rule.

2. Environmental and Economic Benefits Analysis for the Proposed Section 316(b) Existing Facilities Rule (EPA–821–R–11–002), hereafter referred to as the Environmental and Economic Benefits Analysis (EEBA). This document examines cooling water intake structure impacts and regulatory benefits at the regional level.

3. Technical Development Document for the Proposed Section 316(b) Existing Facilities Rule (EPA–821–R–11–001), hereafter referred to as the Technical Development Document (TDD). This document presents detailed information on the methods used to develop unit costs and describes the set of technologies that may be used to meet the proposed rule requirements.

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I. Legal Authority, Purpose, and Background of Today's Proposed Regulation

A. Legal Authority

Today's proposal is issued under the authority of sections 101, 301, 304, 308, 316, 401, 402, 501, and 510 of the Clean Water Act (CWA), 33 U.S.C. 1251, 1311, 1314, 1318, 1326, 1341, 1342, 1361, and 1370.

B. Purpose of Today's Proposed Regulation

The purpose of today's proposed rule is to propose national requirements for cooling water intake structures at existing facilities that implement section 316(b) of the CWA. Section 316(b) of the CWA provides that any standard established pursuant to section 301 or 306 of the CWA and applicable to a point source must require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available (BTA) for minimizing adverse environmental impact.

EPA first promulgated regulations to implement section 316(b) in 1976. The U.S. Court of Appeals for the Fourth Circuit remanded these regulations to EPA which withdrew them, leaving in place a provision not remanded that directed permitting authorities to determine BTA for each facility on a case-by-case basis. In 1995, EPA entered into a consent decree establishing a schedule for taking final action on regulations to implement section 316(b).

Pursuant to a schedule in the amended decree providing for final action on regulations in three phases, in 2001, EPA published a Phase I rule governing new facilities. The U.S. Court of Appeals for the Second Circuit, while generally upholding the rule, rejected the provisions allowing restoration to be used to meet the requirements of the rule. *Riverkeeper, Inc.* v. *U.S. EPA,* 358 F. 3d 174, 181 (2d Cir.2004) ("*Riverkeeper* I"). Today's proposed rule proposes to delete these restoration provisions.

In 2004, EPA published the Phase II rule applicable to existing power plants with a design intake flow greater than or equal to 50 MGD. Following challenge, the Second Circuit remanded numerous aspects of the rule to the Agency, including the Agency's decision to reject closed-cycle cooling as BTA. The Agency made this determination, in part, based on a consideration of costs and benefits. The Second Circuit concluded that a comparison of the costs and benefits of closed-cycle cooling was not a proper factor to consider in determining BTA. *Riverkeeper, Inc.* v. *U.S.EPA,* 475 F. 3d 83 (2d Cir. 2007) ("*Riverkeeper* II"). In 2008, the U.S, Supreme Court agreed to review the *Riverkeeper* II decision limited to a single issue: whether section 316(b) authorizes EPA to balance costs and benefits in 316(b) rulemaking. In April 2009, in *Entergy Corp.* v. *Riverkeeper Inc.,* 129 S. Ct. 1498, 68 ERC 1001 (2009) (40 ER 770, 4/3/09), the Supreme Court ruled that it is permissible under section 316(b) to consider costs and benefits in determining the best technology available to minimize adverse environmental impacts. The court left it to EPA's discretion to decide whether and how to consider costs and benefits in 316(b) actions, including rulemaking and BPJ determinations. The Supreme Court remanded the rule to the Second Circuit. Subsequently, EPA asked the Second Circuit to return the rule to the Agency for further review of the rule.

In 2006, EPA published the Phase III rule. The Phase III rule establishes 316(b) requirements for certain new offshore oil and gas extraction facilities. In addition, EPA determined that, in the case of electric generators with a design intake flow of less than 50 MGD and existing manufacturing facilities, 316(b) requirements should be established by NPDES permit directors on a case-by-case basis using their best professional judgment. In July 2010, the U. S. Court of Appeals for the Fifth Circuit issued a decision upholding EPA's rule for new offshore oil and gas extraction facilities. Further, the court granted the request of EPA and environmental petitioners in the case to remand the existing facility portion of the rule back to the Agency for further rulemaking. See section C.2 below for a more detailed discussion of the history of EPA's actions to address standards for cooling water intake structures.

In response to the remand in Phase II, the remand of the existing facility portion of the Phase III rule, and the associated Supreme Court decision, EPA is today proposing a number of requirements. Most significantly, EPA is proposing requirements reflecting the best technology available for minimizing adverse environmental impact, applicable to the location, design, construction, and capacity of cooling water intake structures for existing facilities. EPA is treating existing power generating facilities and existing manufacturing and industrial facilities in one proceeding. Today's proposal applies to all existing power generating facilities and existing manufacturing and industrial facilities that have a design intake flow of at least two million gallons from waters of the United States and use at least twenty-five (25) percent of the water they withdraw exclusively for cooling purposes. In addition, EPA is today also responding to the decision in *Riverkeeper* I and proposing minor changes to the Phase I rule for new facilities. Specifically, EPA proposes to remove from the Phase I rule the restoration-based compliance alternative and the associated monitoring and demonstration requirements.

C. Background

1. The Clean Water Act

The Federal Water Pollution Control Act, also known as the Clean Water Act (CWA), 33 U.S.C. 1251 *et seq.,* seeks to restore and maintain the chemical, physical, and biological integrity of the nation's waters. 33 U.S.C. 1251(a). Among the goals of the Act is that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water. 33 U.S.C. 1251(a)(2).

In furtherance of these objectives, the CWA establishes a comprehensive regulatory program, key elements of which are (1) a prohibition on the discharge of pollutants from point sources to waters of the United States, except in compliance with the statute; (2) authority for EPA or authorized States or Tribes to issue National Pollutant Discharge Elimination System (NPDES) permits that authorize and regulate the discharge of pollutants; and (3) requirements for effluent limitations and other conditions in NPDES permits to implement applicable technology-based effluent limitations guidelines and standards and applicable State water quality standards.

Section 402 of the CWA authorizes EPA (or an authorized State or Tribe) to issue an NPDES permit to any person discharging any pollutant or combination of pollutants from a point source into waters of the United States. Forty-seven States and one U.S. territory are authorized under section 402(b) to administer the NPDES permitting program. NPDES permits restrict the types and amounts of pollutants, including heat, that may be discharged from various industrial, commercial, and other sources of wastewater. These permits control the discharge of pollutants by requiring dischargers to meet technology-based effluent limitations guidelines (ELGs) or new source performance standards (NSPS) established pursuant to section 301 or section 306. Where such nationally applicable ELGs or NSPS exist, permit authorities must incorporate them into permit requirements. Where they do not exist, permit authorities establish effluent limitations and conditions, reflecting the appropriate level of control (depending on the type of pollutant) based on the best professional judgment (BPJ) of the permit writer. Limitations based on these guidelines, standards, or on best professional judgment are known as technology-based effluent limits. Where technology-based effluent limits are inadequate to meet applicable State water quality standards, section 301(b)(1)(C) of the Clean Water Act requires permits to include more stringent limits to meet applicable water quality standards. NPDES permits also routinely include standard conditions applicable to all permits, special conditions, and monitoring and reporting requirements. In addition to these requirements, NPDES permits must contain conditions to implement the requirements of section 316(b).

Section 510 of the Clean Water Act provides that, except as provided in the Clean Water Act, nothing shall preclude or deny the right of any State (or political subdivision thereof) to adopt or enforce any requirement respecting control or abatement of pollution; except that if a limitation, prohibition or standard of performance is in effect under the Clean Water Act, such State may not adopt any other limitation, prohibition, or standard of performance which is less stringent than the limitation, prohibition, or standard of

performance under the Act. EPA interprets this to reserve for the States authority to implement requirements that are more stringent than the Federal requirements under state law. *PUD No. 1 of Jefferson County* v. *Washington Dep't of Ecology,* 511 U.S. 700, 705 (1994).

Sections 301, 304, and 306 of the CWA require that EPA develop technology-based effluent limitations guidelines and new source performance standards that are used as the basis for discharge requirements in wastewater discharge permits. EPA develops these effluent limitations guidelines and standards for categories of industrial dischargers based on the pollutants of concern discharged by the industry, the degree of control that can be attained using various levels of pollution control technology, consideration of various economic tests appropriate to each level of control, and other factors identified in sections 304 and 306 of the CWA (such as non-water quality environmental impacts including energy impacts). EPA has promulgated regulations setting effluent limitations guidelines and standards under sections 301, 304, and 306 of the CWA for more than 56 industries. See 40 CFR parts 405 through 471. EPA has established effluent limitations guidelines and standards that apply to most of the industry categories that use cooling water intake structures (*e.g.,* steam electric power generation, paper and allied products, petroleum refining, iron and steel manufacturing, and chemicals and allied products).

Section 316(b) states that any standard established pursuant to section 301 or section 306 of [the Clean Water] Act and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.

Section 316(b) addresses the adverse environmental impact caused specifically by the intake of cooling water, rather than discharges of pollutants, including thermal discharges, into waters of the United States. Despite this special focus, the requirements of section 316(b) remain closely linked to several of the core elements of the NPDES permit program established under section 402 of the CWA to control discharges of pollutants into navigable waters. Thus, while effluent limitations apply to the discharge of pollutants by NPDES-permitted point sources to waters of the United States, section 316(b) applies to facilities subject to NPDES requirements that also withdraw water from a water of the United States for cooling and that use a cooling water intake structure to do so.

The CWA does not describe the factors to be considered in establishing section 316(b) substantive performance requirements that reflect the "best technology available for minimizing adverse environmental impact" nor does it require that EPA develop nationally applicable performance requirements through rule making. The most recent guidance in interpreting 316(b) comes from the U.S. Supreme Court's decision in *Entergy Corp.* v. *Riverkeeper, Inc.* As noted, the decision was limited to the single question of whether Section 316(b) of the Clean Water Act authorizes EPA to compare costs and benefits of various technologies when setting national performance standards for cooling water intake structures under Section 316(b) of the Clean Water Act. In *Riverkeeper* II, the Second Circuit rejected EPA's determination that closed-cycle cooling was not BTA because it could not determine whether EPA had improperly considered costs and benefits in its 316(b) rulemaking. The Supreme Court reversed and remanded the Second Circuit ruling in a 6–3 opinion authored by Justice Scalia. The Court held that it is reasonable for EPA to conduct a cost-benefit analysis in setting national performance standards for cooling water intake structures under Section 316(b). The Court held that EPA has the discretion to consider costs and benefits under Section 316(b) but is not required to consider costs and benefits. The Court's discussion of the language of section 316(b)—section 316(b) is "unencumbered by specified statutory factors"—and its critique of the Second Circuit's decision affirms EPA's broad discretion to consider a number of factors in standard setting under section 316(b). While the Supreme Court's decision is limited to whether or not EPA may consider one factor (cost/benefit analysis) under section 316(b), the language also suggests that EPA has wide discretion in considering other factors that it deems relevant to 316(b) standard setting. ("It is eminently reasonable to conclude that §1326b's silence is meant to convey nothing more than a refusal to tie the agency's hands as to whether cost-benefit analysis should be used, and if so to what degree." 129 S.Ct. 1498, 1508 (2009).

Regarding the other factors EPA may consider, section 316(b) cross references sections 301 and 306 of the CWA by requiring that any standards established pursuant to those sections also must require that the location, design, construction and capacity of intake structures reflect BTA. EPA has interpreted the cross reference as authorizing consideration of the same factors considered under those provisions Thus, for example, section 306 directs EPA to establish performance standards for *new* sources based on the "best available demonstrated control technology" (BADT). 33 U.S.C. 1316(a)(1). In establishing BADT, EPA "shall take into consideration the cost of achieving such effluent reduction, and any non-water quality environmental impact and energy requirements." 33 U.S.C. 1316(b)(2)(B). The specific cross-reference in CWA section 316(b) to CWA section 306 "is an invitation to look to section 306 for guidance in discerning what factors Congress intended the EPA to consider in determining the 'best technology available' " for new sources. See *Riverkeeper* v. *EPA,* 358 F. 2d 174, 186 (2nd Cir. 2004).

Similarly, Section 301 of the CWA requires EPA to establish standards known as "effluent limitations" for existing point source discharges in two phases. In the first phase, applicable to all pollutants, EPA must establish effluent limitations based on the "best practicable control technology currently available" (BPT). 33 U.S.C. 1311(b)(1)(A). In establishing BPT, the CWA directs EPA to consider the total cost of application of technology in relation to the effluent reduction benefits to be achieved from such application, and to also take into account the age of the equipment and facilities involved, the process employed, the engineering aspects of the application of various types of control techniques, process changes, non-water quality environmental impact (including energy requirements), and such other factors as [EPA] deems appropriate. 33 U.S.C. 1314(b)(1)(b).

In the second phase, EPA must establish effluent limitations for conventional pollutants based on the "best conventional pollution control technology" (BCT), and for toxic pollutants based on the "best available technology economically achievable" (BAT). 33 U.S.C. 1311(b)(2)(A), (E).

In determining BCT, EPA must consider, among other factors, the relationship between the costs of attaining a reduction in effluents and the effluent reduction benefits derived, and the comparison of the cost and level of reduction of such pollutants from the discharge from publicly owned treatment works to the cost and level of reduction of such pollutants from a class or category of industry source * * * and the age of equipment and

facilities involved, the process employed, the engineering aspects * * * of various types of control techniques, process changes, the cost of achieving such effluent reduction, non-water quality environmental impacts (including energy requirements), and such other factors as [EPA] deems appropriate. 33 U.S.C. 1314(b)(4)(B).

In determining BAT, the CWA directs EPA to consider "the age of equipment and facilities involved, the process employed, the engineering aspects * * * of various types of control techniques, process changes, the cost of achieving such effluent reduction, non-water quality environmental impacts (including energy requirements), and such other factors as [EPA] deems appropriate." 33 U.S.C. 1314(b)(2)(B).

Section 316(b) expressly refers to section 301, and the phrase "best technology available" is very similar to the phrases "best available technology economically achievable" and "best practicable control technology currently available" in that section. Thus, section 316(b), section 301(b)(1)(A)—the BPT provision—and section 301(b)(1)(B)—the BAT provision—all include the terms "best," "technology," and "available," but neither BPT nor BAT goes on to consider minimizing adverse environmental impacts, as BTA does. See 33 U.S.C. 1311(b)(1)(A) and (2)(A). These facts, coupled with the brevity of section 316(b) itself, prompt EPA to look to section 301 and, ultimately, section 304 for further guidance in determining the "best technology available to minimize adverse environmental impact" of cooling water intake structures for existing facilities.

By the same token, however, there are significant differences between section 316(b) and sections 301 and 304. See *Riverkeeper, Inc.* v. *United States Environmental Protection Agency* (2nd Cir. Feb. 3, 2004) ("not every statutory directive contained [in sections 301 and 306] is applicable" to a section 316(b) rulemaking). Moreover, as the Supreme Court recognized, while the provisions governing the discharge of toxic pollutants must require the elimination of discharges if technically and economically achievable, section 316(b) has the less ambitious goal of "minimizing adverse environmental impact." 129 S.Ct. 1498, 1506. In contrast to the effluent limitations provisions, the object of the "best technology available" is explicitly articulated by reference to the receiving water: to minimize adverse environmental impact in the waters from which cooling water is withdrawn. This difference is reflected in EPA's past practices in implementing sections 301, 304, and 316(b). EPA has established BAT effluent limitations guidelines and NSPS based on the efficacy of one or more technologies to reduce pollutants in wastewater in relation to their costs without necessarily considering the impact on the receiving waters. This contrasts to 316(b) requirements, where EPA has previously considered the costs of technologies in relation to the benefits of minimizing adverse environmental impact in establishing 316(b) limits, which historically has been done on a case-by case basis. In *Re Public Service Co. of New Hampshire,* 10 ERC 1257 (June 17, 1977); *In Re Public Service Co. of New Hampshire,* 1 EBAD 455 (Aug. 4, 1978); *Seacoast Anti-Pollution League* v. *Costle,* 597 F. 2d 306 (1st Cir. 1979). EPA concluded that, because both section 301 and 306 are expressly cross-referenced in section 316(b), EPA reasonably interpreted section 316(b) as authorizing consideration of the same factors, including costs, as in those sections. EPA interpreted "best technology available" to mean the best technology available at an "economically practicable" cost. This approach squared with the limited legislative history of section 316(b) which suggested the BTA was to be based on technology whose costs were "economically practicable." In debate on section 316(b), one legislator explained that "[t]he reference here to 'best technology available' is intended to be interpreted to mean the best technology available commercially *at an economically practicable cost.*" 118 Cong. Rec. 33,762 (1972) (statement of Rep. Clausen) (emphasis added).

For EPA's initial Phase II rulemaking, as it had during 30 years of BPJ section 316(b) permitting, EPA therefore interpreted CWA section 316(b) as authorizing EPA to consider not only the costs of technologies but also their effects on the water from which the cooling water is withdrawn.

2. History of Actions To Address Cooling Water Intake Structures Under the NPDES Program

a. 1976 Rulemaking

In April 1976, EPA promulgated regulations under section 316(b) that addressed cooling water intake structures. 41 FR 17387 (April 26, 1976), see also the proposed rule at 38 FR 34410 (December 13, 1973). The rule added a new § 401.14 to 40 CFR Chapter I that reiterated the requirements of Clean Water Act section 316(b). It also added a new part 402, which included three sections: (1) Section 402.10 (Applicability), (2) § 402.11 (Specialized definitions), and (3) §402.12 (Best technology available for cooling water intake structures). Section 402.10 stated that the provisions of part 402 applied to "cooling water intake structures for point sources for which effluent limitations are established pursuant to section 301 or standards of performance are established pursuant to section 306 of the Act." Section 402.11 defined the terms "cooling water intake structure," "location," "design," "construction," "capacity," and "Development Document." Section 402.12 included the following language: The information contained in the Development Document shall be considered in determining whether the location, design, construction, and capacity of a cooling water intake structure of a point source subject to standards established under section 301 or 306 reflect the best technology available for minimizing adverse environmental impact.

In 1977, fifty-eight electric utility companies challenged those regulations, arguing that EPA had failed to comply with the requirements of the Administrative Procedure Act (APA) in promulgating the rule. Specifically, the utilities argued that EPA had neither published the Development Document in the **Federal Register** nor properly incorporated the document into the rule by reference. The U.S. Court of Appeals for the Fourth Circuit agreed and, without reaching the merits of the regulations themselves, remanded the rule. *Appalachian Power Co.* v. *Train,* 566 F.2d 451 (4th Cir. 1977). EPA later withdrew part 402. 44 FR 32956 (June 7, 1979). The regulation at §401.14, which reiterates the statutory requirement, remains in effect.

Since the Fourth Circuit remanded EPA's section 316(b) regulations in 1977, NPDES permit authorities have made decisions implementing section 316(b) on a case-by-case, site-specific basis. EPA published draft guidance addressing section 316(b) implementation in 1977. *See Draft Guidance for Evaluating the Adverse Impact of Cooling Water Intake Structures on the Aquatic Environment: Section 316(b) Pub. L. 92–500* (U.S. EPA, 1977). This draft guidance described the studies recommended for evaluating the impact of cooling water intake structures on the aquatic environment and recommended a basis for determining the best technology available for minimizing adverse environmental impact. The 1977 section 316(b) draft guidance states, "[t]he environmental-intake interactions in question are highly site-specific and the decision as to best technology available for intake design, location, construction, and capacity must be made on a case-

by-case basis." (Section 316(b) Draft Guidance, U.S. EPA, 1977, p. 4). This case-by-case approach was also consistent with the approach described in the 1976 Development Document referenced in the remanded regulation. The 1977 section 316(b) draft guidance suggested a general process for developing information needed to support section 316(b) decisions and presenting that information to the permitting authority. The process involved the development of a site specific study of the environmental effects associated with each facility that uses one or more cooling water intake structures, as well as consideration of that study by the permitting authority in determining whether the facility must make any changes for minimizing adverse environmental impact. Under this framework, the Director determined whether appropriate studies have been performed, whether a given facility has minimized adverse environmental impact, and what, if any, technologies may be required.

b. Phase I—New Facility Rule

On November 9, 2001, EPA took final action on regulations governing cooling water intake structures at new facilities. See 66 FR 65255 (December 18, 2001). On December 26, 2002, EPA made minor changes to the Phase I regulations. 67 FR 78947. The final Phase I new facility rule (40 CFR part 125, subpart I) establishes requirements applicable to the location, design, construction, and capacity of cooling water intake structures at new facilities that have a design capacity to withdraw at least two million gallons per day (MGD) and use at least twenty-five percent of the water they withdraw solely for cooling purposes.

In the new facility rule, EPA adopted a two-track approach. Under Track I, for facilities that withdraw equal to or greater than 10 MGD, the intake flow of the cooling water intake structure is restricted, at a minimum, to a level commensurate with that which could be attained by use of a closed-cycle, recirculating cooling system. For facilities that withdraw greater than 2 MGD, the design through-screen intake velocity is restricted to 0.5 feet per second and the total quantity of intake is restricted to a proportion of the mean annual flow of a freshwater river or stream, or to a level necessary to maintain the natural thermal stratification or turnover patterns (where present) of a lake or reservoir except in cases where the disruption is beneficial, or to a percentage of the tidal excursions of a tidal river or estuary. If certain environmental conditions exist, an applicant that withdraws equal to or greater than 10 MGD must select and implement appropriate design and construction technologies for further minimizing impingement mortality and entrainment. Applicants with greater than 2 MGD but less than 10 MGD flows are not required to reduce intake flow to a level commensurate with a closed-cycle, recirculating cooling system, but must still meet specific operational criteria.

Under Track II, the applicant has the opportunity to demonstrate to the Director that the technologies he employs will reduce the level of adverse environmental impact to a comparable level to what would be achieved by meeting the Track I requirements for restricting intake flow and velocity. In making this demonstration, the regulations allow an applicant to rely on a combination of measures in additional to technology controls for reducing impingement and entrainment to achieve results equivalent to the Track I intake flow and velocity requirements. These include measures to restore the affected water body such as restocking fish and improvement of the surrounding habitat to offset the adverse effects that would otherwise be caused by the operation of the intake structures. These restoration measures would result in increases in fish and shellfish which, in combination with any technologies employed, would result in a level of fish and shellfish in the water body comparable to that which would result from the reductions in impingement mortality and entrainment that would be achieved under Track I. Note that restoration provisions are no longer authorized (and EPA is proposing to delete them from the CFR in this rule making), but they are included in this description of the Phase I rule for completeness. See Chapter II of this preamble for more information.

In addition, under the Phase I rule, the Director (*i.e.,* the permitting authority) may establish less stringent alternative requirements for a facility if compliance with the Phase I standards would result in compliance costs wholly out of proportion to those EPA considered in establishing the Phase I requirements or would result in significant adverse impacts on local air quality, water resources, or local energy markets.

EPA specifically excluded new offshore oil and gas extraction facilities from the Phase I new facility rule, but committed to consider establishing requirements for such facilities in the Phase III rulemaking. 66 FR 65338 (December 18, 2001).

c. Phase II—Large Flow Existing Power Plants

On February 16, 2004, EPA took final action on regulations governing cooling water intake structures at certain existing power producing facilities. 69 FR 41576 (July 9, 2004). The final Phase II rule applied to existing facilities that are point sources; that, as their primary activity, both generate and transmit electric power or generate electric power for sale or transmission; that use or propose to use a cooling water intake structure with a total design intake flow of 50 MGD or more to withdraw water from waters of the United States; and that use at least 25 percent of the withdrawn water exclusively for cooling purposes. In addition, power producers fitting the description above were also subject to the final Phase II rule even if they obtain their cooling water from one or more independent suppliers of cooling water. Such facilities were subject to the rule if their supplier withdraws water from waters of the U.S. even if the supplier was not itself a Phase II existing facility. EPA included this provision to prevent circumvention of the Phase II rule requirements by a facility purchasing cooling water from entities not otherwise subject to Section 316(b).

The final Phase II rule and preamble also clarified the definition of an "existing" power producing facility. The Phase II rule defined an "existing facility" as "any facility that commenced construction as described in §122.29(b)(4) on or before January 17, 2002; and any modification of, or addition of a unit at such a facility that does not meet the definition of a new facility at §125.83." Given that the definition of the term "existing facility" was based in part on the Phase I definition of the term "new facility," the preamble to the final Phase II rule also clarified and provided some examples of how the definition of "existing facility" might apply to certain changes at power producing facilities.

Under the Phase II rule, EPA established BTA performance standards for the reduction of impingement mortality and, under certain circumstances, entrainment (see 69 FR 41590–41593). The performance standards consisted of ranges of reductions in impingement mortality and/or entrainment (*e.g.*, reduce impingement mortality by 80 to 95 percent and/or entrainment by 60 to 90 percent) relative to a "calculation baseline" that reflected the level of impingement mortality and entrainment that would occur absent specific controls. These performance standards

were not based on a single technology but, rather, on consideration of a combination of technologies that EPA determined were commercially available and economically achievable for the industries affected as a whole. (69 FR 41598–41610). EPA based the impingement mortality and entrainment (I&E) performance standards on a combination of technologies because it found no single technology to be most effective at all affected facilities. For impingement standards, these technologies included: (1) Fine and wide-mesh wedgewire screens, (2) barrier nets, (3) modified screens and fish return systems, (4) fish diversion systems, and (5) fine mesh traveling screens and fish return systems. With regard to entrainment reduction, these technologies include: (1) Aquatic filter barrier systems, (2) fine mesh wedgewire screens, and (3) fine mesh traveling screens with fish return systems. Because EPA based the performance standards on a combination of technologies and because of the uncertainty inherent in predicting the efficacy of one or more of these technologies as applied to different Phase II facilities, EPA promulgated these standards as ranges. Furthermore, because the site-specific performance was based on a comparison to a once-through system without any specific controls on the shoreline near the source waterbody (*i.e.*, calculation baseline, see section III.A.2 for more details), the rule also allowed facilities to receive credit towards meeting the performance standards for I&E reduction associated with alternate locations of their intakes (eg, deep water where fish and shellfish were less abundant).

The types of performance standard applicable to a particular facility (*i.e.*, reductions in impingement mortality only or impingement mortality and entrainment) were based on several factors, including the facility's location (*i.e.*, source waterbody), rate of use (capacity utilization rate), and the proportion of the waterbody withdrawn.

The Phase II rule identified five compliance alternatives to meet the performance standards. A facility could demonstrate to the Director one of the following: (1) That it has already reduced its flow commensurate with a closed-cycle recirculating system (to meet both impingement mortality and entrainment), or that it has already reduced its maximum through-screen velocity to 0.5 feet per second or less (to meet the impingement performance standard only); (2) that its current cooling water intake structure configuration meets the applicable performance standards; (3) that it has selected design and construction technologies, operational measures, and/or restoration measures that, in combination with any existing design and construction technologies, operational measures, and/or restoration measures, meet the applicable performance standards; (4) that it meets the applicability criteria and has installed and is properly operating and maintaining a rule-specified and/or approved State-specified design and construction technology (*i.e.,* submerged cylindrical wedgewire screens) in accordance with §125.99(a) or an alternative technology that meets the appropriate performance standards and is approved by the Director in accordance with §125.99(b); or (5) that its costs of compliance would be significantly greater either than the costs considered by the Administrator for a like facility to meet the applicable performance standards, or than the benefits of meeting the applicable performance standards at the facility. Under the cost-cost comparison alternative, a Director could determine that the cost of compliance for a particular facility would be significantly greater than the costs considered by EPA in establishing the applicable impingement mortality and entrainment reduction performance standards. Similarly, under the cost-benefit comparison alternative, a Director could determine that the cost of compliance for a particular facility would be significantly greater than the benefits of complying with the applicable performance standards. In the event of either of these determinations, the Director would have to make a site-specific determination of BTA for minimizing adverse environmental impact that came as close as possible to meeting the applicable performance standards at a cost that did not significantly exceed either the costs EPA considered in establishing these standards or the site-specific benefits of meeting these standards.

The final Phase II rule also provided that a facility that chooses specified compliance alternatives might request that compliance with the requirements of the rule be determined based on the implementation of a Technology Installation and Operation Plan (TIOP) that would indicate how the facility would install and ensure the efficacy, to the extent practicable, of design and construction technologies, and/or operational measures, and/or a Restoration Plan. The rule also established requirements for the development and submittal of a TIOP (§125.95(b)(4)(ii)) as well as provisions that specified how compliance could be determined based on implementation of a TIOP (§125.94(d)). Under these provisions, a TIOP could be requested in the first permit term and continued use of a TIOP could be requested where a facility was in compliance with such plan and/or its Restoration Plan.

d. Phase III Rulemaking—Low Flow Existing Power Plants, Existing Manufacturing Facilities, and New Offshore Oil and Gas Facilities

On June 16, 2006, EPA published a final Phase III rule that established categorical regulations for new offshore oil and gas extraction facilities that have a design intake flow threshold of greater than 2 MGD and that withdraw at least 25 percent of the water exclusively for cooling purposes. For most such facilities, the rule establishes requirements virtually identical to the requirements applicable to new facilities in the Phase I rule. In the Phase III rule, EPA declined to establish national standards for Phase III existing facilities. Instead it concluded that CWA section 316(b) requirements for electric generators with a design intake flow of less than 50 MGD and all existing manufacturing facilities would continue to be established on a case-by-case basis under the NPDES permit program using best professional judgment. (71 FR 35006).

3. Rulings by the U.S. Court of Appeals for the Second Circuit

Both the Phase I and Phase II 316(b) rules were challenged in the U.S. Court of Appeals for the Second Circuit. Key aspects of each of these decisions are discussed below.

a. Phase I Rule

Various environmental and industry groups challenged the Phase I 316(b) rule. In February 2004, the Second Circuit sustained the entire rule except for the restoration provision, ruling that restoration was not a technology as provided for in 316(b). With respect to the other provisions of the rule, the Court concluded the Phase I rule was based on a reasonable interpretation of the applicable statute and sufficiently supported by the record. Restoration provisions of the rule were remanded to EPA for further rulemaking consistent with the Court's decision. *Riverkeeper, Inc.* v. *EPA,* 358 F.3d 174, 191 (2nd Cir., 2004). Today's proposal rule would remove the restoration provisions from the Phase I rule. *See* Chapter II of this preamble for more details.

b. Phase II Rule

Industry, environmental stakeholders, and some States [1] challenged many aspects of the Phase II regulations. On January 25, 2007, the Second Circuit (*Riverkeeper, Inc.* v. *EPA,* 475 F.3d 83, (2d Cir., 2007)) upheld several provisions of the Phase II rule and decision and remanded others to EPA for further rulemaking.

As noted above, for the final rule EPA rejected closed-cycle cooling as BTA. Instead, EPA selected a suite of technologies to reflect BTA, including *e.g.,* screens, aquatic filter barriers, and barrier nets. Based on the chosen technologies, EPA established national performance standards for reducing impingement mortality and entrainment of fish and fish organisms but did not require the use of any specific technology. Among the aspects of the rule the Second Circuit remanded for further clarification was EPA's decision to reject closed-cycle cooling as BTA and EPA's determination of performance ranges as BTA. In addition, the Second Circuit found that, consistent with its Phase I decision, restoration was not a technology for BTA, and that EPA's cost-benefit site-specific compliance alternative was not in accord with the Clean Water Act. There are also several issues for which the court requested additional clarification, and some instances where the court determined that EPA had failed to provide adequate notice and opportunity to comment on certain provisions of the rule.

4. EPA Suspension of the Phase II Rule

As a result of the decision of the Second Circuit Court of Appeals in *Riverkeeper, Inc.* v. *EPA,* 475 F.3d 83, (2d Cir., 2007), EPA, on July 9, 2007 (72 FR 37107) suspended the requirements for cooling water intake structures at Phase II existing facilities, pending further rulemaking. Specifically, EPA suspended the provisions in §122.21(r)(1)(ii) and (5), and part 125 Subpart J, with the exception of Sec. 125.90(b). EPA explained that suspending the Phase II requirements was an appropriate response to the Second Circuit's decision, and that such action would allow it to consider how to respond to the remand. In addition, suspending the Phase II rule was responsive to the concerns of the regulated community and permitting agencies, both of whom sought guidance regarding how to proceed in light of the approaching deadline of the remanded rule. EPA's suspension clarified that pending further rulemaking, permit requirements for cooling water intake structures at Phase II facilities should be established on a case-by-case, best professional judgment (BPJ) basis (*see* 125.90(b)).

5. Ruling by the U.S. Supreme Court

Following the Phase II decision in the Second Circuit, several industry group litigants petitioned the U.S. Supreme Court to hear an appeal regarding several issues in the case. *Entergy Corp. et al.* v. *EPA, S. Ct. No. 07–588, et al.* On April 14, 2008, the Supreme Court granted the petitions for writs of certiorari submitted by these Phase II litigants, but limited its review to the issue of whether section 316(b) authorizes EPA to compare costs with benefits in determining BTA for cooling water intake structures. The Supreme Court held oral arguments in this case on December 2, 2008, and issued a decision on April 1, 2009. The Supreme Court held that it is permissible for EPA to rely on cost-benefit analysis in decision making for setting the Phase II national performance standards, and in providing for cost-benefit variances from those standards as part of the Phase II regulations. The Court indicated that the phrase "best technology available for minimizing adverse environmental impact" does not unambiguously preclude use of cost-benefit analysis in decision making. The ruling supports EPA's discretion to consider costs and benefits, but imposes no obligation on the agency to do so.

6. Ruling by the U.S. Court of Appeals for the Fifth Circuit

In 2009, EPA petitioned the Fifth Circuit to remand the existing facility portion of the Phase III rule. Specifically, EPA requested remand of those provisions in the Phase III rule that establish 316(b) requirements at electric generators with a design intake flow of less than 50 MGD, and at existing manufacturing facilities, on a case-by-case basis using best professional judgment. This request did not affect the Phase III rule requirements that establish categorical regulations for new offshore oil and gas extraction facilities that have a design intake flow threshold of greater than 2 MGD and that withdraw at least 25 percent of the water exclusively for cooling purposes.

On July 23, 2010, the U. S. Court of Appeals for the Fifth Circuit issued a decision regarding the Phase III rule. The Court granted EPA's motion to remand the rule with respect to existing facilities. In addition, the Fifth Circuit affirmed the portion of the rule that regulated cooling water intake structures for new offshore oil and gas facilities. In sustaining these requirements, the Fifth Circuit upheld EPA's decision not to use cost benefit balancing in determining the requirements for these new facilities. This was in accord with the discretion afforded by 316(b) and affirmed by the Supreme Court, namely that EPA properly interpreted section 316(b) as authorizing, but not requiring, the Agency to consider costs and benefits in its decision making.

7. Settlement of Litigation in U.S. District Courts

On January 19, 1993, a group of individuals and environmental organizations [2] filed, under section 505(a)(2) of the CWA, 33 U.S.C. 1365(a)(2), a complaint in *Cronin, et. al.* v. *Reilly,* 93 Civ. 314 (LTS)(S.D.N.Y.). The plaintiffs alleged that EPA had failed to perform a non-discretionary duty to issue regulations implementing section 316(b) of the CWA, 33 U.S.C. 1326(b). In 1995, EPA and the plaintiffs executed a consent decree in the case that provided for EPA to implement section 316(b) of the CWA by prescribed dates in the three separate rulemaking proceedings described above. In late 2002, the district court entered an amended consent decree that modified the schedule for the Phase II and Phase III rulemakings for existing facilities.

On November 17, 2006, some of the same environmental organizations in the *Cronin* case filed a second complaint, amended on January 19, 2007, in *Riverkeeper, et al.* v. *EPA,* 06 Civ. 12987 (S.D.N.Y.). Here, the plaintiffs alleged that EPA failed to perform a non-discretionary duty under section 316(b) of the CWA in its final regulation covering the Phase III facilities, and also had violated sections 706(2)(A) and 706(2)(C) of the Administrative Procedure Act (APA) in the manner in which it had made that decision.

Earlier, the same plaintiffs had also petitioned for review of the Phase III rule in the U.S. Court of Appeals for the Second Circuit. This and other petitions for review were consolidated for hearing

[1] Rhode Island, Connecticut, Delaware, Massachusetts, New Jersey, and New York.

[2] There are the following plaintiffs currently: Riverkeeper, Inc.; Alex Matthiessen, a/k/a The Hudson Riverkeeper; Maya K. Van Rossum, a/k/a The Delaware Riverkeeper; Terrance E. Backer, a/k/a The Soundkeeper; John Torgan, a/k/a The Narragansett BayKeeper; Joseph E. Payne, a/k/a The Casco BayKeeper; Leo O'Brien, a/k/a the San Francisco BayKeeper; Sue Joerger, a/k/a The Puget Soundkeeper; Steven E. Fleischli, a/k/a The Santa Monica BayKeeper; Andrew Willner, a/k/a The New York/New Jersey Baykeeper; The Long Island Soundkeeper Fund, Inc.; The New York Coastal Fishermen's Association, Inc.; and The American Littoral Society, Inc.

in the U.S. Court of Appeals for the Fifth Circuit. *Conoco Phillips* v. *EPA* (5th Cir. No. 06–60662). Following the Supreme Court decision in *Entergy,* EPA, Riverkeeper and others requested remand of the regulation to allow EPA to reconsider its decisions regarding Phase III facilities in light of more recent technical information and recent court decisions. As noted above, on July 23, 2010, the Fifth Circuit granted the joint motion of EPA and environmental petitioners for a voluntary remand. On September 3, 2010, one of the industry petitioners filed a petition asking the Fifth Circuit panel to rehear its grant of the motion to remand.

On August 14, 2008, EPA filed a motion to terminate the *Cronin* proceeding because it had discharged its obligations ("to take final action") under the decree with respect to the Phase II and III rulemakings. The plaintiffs in *Cronin* asserted that EPA had not discharged its obligations under the second amended decree because the Second Circuit remanded core provisions of the 316(b) rule for existing power plants to EPA, and EPA had suspended the Phase II rule. In the *Riverkeeper* proceeding, on February 7, 2007, EPA moved to dismiss arguing that the district court lacked jurisdiction to hear the challenge to the Phase III rule.

EPA entered into a settlement with the plaintiffs in both lawsuits. Under the settlement agreement, EPA agreed to sign a notice of a proposed rulemaking implementing section 316(b) of the CWA at existing facilities no later than March 14, 2011 and to sign a notice taking final action on the proposed rule no later than July 27, 2012. Plaintiffs agreed to seek dismissal of both their suits, subject to a request to reopen the *Cronin* proceeding in the event EPA failed to meet the agreed deadlines. The district courts have now entered orders of dismissal. On March 11, 2011, the parties agreed to an amendment to the settlement agreement to extend the date for proposal to March 28, 2011.

II. Proposed Amendments Related to the Phase I Rule

EPA is proposing several limited changes to the Phase I rule at 40 CFR subpart I. The changes fall into two categories. The first is deletion of the provision in the rule that would allow a facility to demonstrate compliance with the Phase I BTA requirements in whole or in part through restoration measures. The proposed change responds to the decision of the U.S. Court of Appeals for the Second Circuit which remanded these provisions to EPA because it concluded the statute did not authorize restoration measures to comply with section 316(b) requirements. The second category of changes reflects technical corrections or errors that do not change the substance of the current Phase I rule. EPA is not reopening any other aspects of the Phase I rule other than the provisions specifically noted here.

A. Restoration Provisions Not Authorized

As discussed above in Section I.C.2, the Phase I final rule established two compliance tracks. Track I requires facilities to restrict intake flow and velocity. Track II gives a facility the option of demonstrating to the Director that the control measures it employs will reduce the level of adverse environmental impact to a comparable level to what would be achieved by meeting the Track I requirements. As part of this demonstration, Track II allows a facility to make use of restoration measures. The Comprehensive Demonstration Study allowed a quantitative or qualitative demonstration that restoration measures would meet, in whole or in part, the performance levels of Track I. Similarly, the Verification Monitoring Plan could be tailored to verify that the restoration measures would maintain the fish and shellfish in the waterbody at a substantially similar level to that which would be achieved under Track I. *See* 65 FR 65280–65281.

As discussed in Section I.C.3, the Second Circuit concluded that EPA exceeded its authority by allowing new facilities to comply with section 316(b) through restoration measures, and remanded that aspect of the rule to EPA. The Supreme Court did not grant the petitions for writs of certiorari concerning restoration provisions. Thus in EPA's view the Agency is bound by the Second Circuit decision. Today's proposed rule proposes to amend Phase I to remove those provisions in §125.84(d) and 125.89(b)(1)(ii) authorizing restoration measures. This proposed rule also specifically proposes deletion of application requirements contained in the Comprehensive Demonstration Study at §125.86(c)(2)(ii); evaluation of proposed restoration measures at 125.86(c)(2)(iv)(C); and verification monitoring requirements at 125.86(c)(2)(iv)(D)(2)) that are specific to restoration. EPA acknowledges these changes may reduce the alternatives available to some Phase I facilities. However, EPA notes that the deletion of restoration measures does not otherwise alter the availability of Track II. In any event, EPA's determination of BTA for Phase I did not presume reliance on the restoration provisions, and the deletion of restoration measures in no way alters the Agency's BTA determination for Phase I facilities.

B. Corrections to Subpart I

Today's proposed rule proposes to change the applicability statement at 125.81(a)(3) to match the applicability of the technical requirements at 125.84 and application requirements at 125.86. The applicability in all three instances should specify design intake flow or withdrawals "greater" than the specified value of 2 MGD. See Basis for the Final Regulation at 66 FR 65270.

Today's proposed rule also proposes a correction to the source waterbody flow information submission requirements. Track I requirements at 125.84(b)(3) apply to new facilities that withdraw equal to or greater than 10 MGD. Track I requirements at 125.84(c)(2) apply to facilities that withdraw less than 10 MGD. The source waterbody flow information under 125.86(b)(3) requires a facility to demonstrate it has met the flow requirements of both 125.84(b)(3) "and" 125.84(c)(2). However, a facility cannot be subject to both 125.84(b)(3) and 125.84(c)(2) at the same time. Accordingly, the word "and" should read as "or" in 125.86(b)(3).

In addition, today's proposed rule proposes corrections to the application requirement for the Source Water Biological Characterization at 122.21(r)(4). Accordingly, references to the Source Water Biological Characterization should read as (r)(4). However, the references to the Source Water Biological Characterization at 125.86(b)(4)(iii), at 125.87(a), and at 125.87(a)(2) incorrectly refer to 122.21(r)(3) and are thus being corrected.

III. What New Information Has EPA Obtained or Developed in Support of This Proposed Rule?

In developing the Phase I, Phase II, and Phase III rules, EPA collected and analyzed a substantial amount of information regarding cooling water intake structures, their biological impacts, available technologies to reduce those impacts, and other relevant subjects. EPA considered a sizable volume of material submitted during previous public comment periods, as well as additional data from stakeholders, industry groups, technology vendors, and environmental organizations since those comment periods. Many of the materials are summarized or discussed in the preambles to these regulations or in the administrative record for these rules

(see, *e.g.,* docket numbers W–00–03, OW–2002–0049, and EPA–OW–2004–0002). Today's proposal is based on data and information contained in the records supporting the Phase I, Phase II, and Phase III rulemakings, as well as new information. This section summarizes new data collected since the promulgation of the Phase III rule in June 2006; it will not review or summarize previous data collection efforts except to frame discussions about the new data. For information on EPA's historic data collection efforts, refer to the preambles and records for the three rules (see, *e.g.,* 65 FR 49070, 66 FR 28854, 68 FR 17131, 68 FR 13524, 69 FR 41593, 69 FR 68457, and 70 FR 71059).

A. Additional Data

EPA has supplemented the existing documents with additional information as summarized below.

1. Site Visits

As documented in the suspended 2004 Phase II rule, EPA conducted site visits to 22 power plants in developing the 2004 rule. See 67 FR 17134. Since 2007, EPA has conducted over 50 site visits to power plants and manufacturing sites. The purpose of these additional visits was to: Gather information on the intake technologies and cooling water systems in place at a wide variety of existing facilities; better understand how the site-specific characteristics of each facility affect the selection and performance of these systems; gather performance data for technologies and affected biological resources; and solicit perspectives from industry representatives. EPA used a number of criteria in selecting the sites to visit, including those sites representing a variety of geographical locations and different types of intakes, and sites that already had an impingement or entrainment technology in place for which the facility had collected performance data. EPA also asked trade associations to recommend sites facing unique circumstances that may affect the adoption of certain control technologies. EPA also collected information on 7 additional facilities that staff did not physically visit; usually, these were other facilities owned by the parent company of a site visited by EPA. EPA also held conference calls or met with representatives of other sites at EPA's Washington, DC location.

Copies of the site visit reports (which provide an overall facility description as well as detailed information such as electricity generation, the facility's cooling water intake structure and associated fish protection and/or flow reduction technologies, impingement and/or entrainment sampling and associated data, and a discussion of the possible application of cooling towers) for each site are provided in the docket for the proposed rule. In addition, in response to stakeholder inquiries, EPA made these site reports publicly available well before publication of the proposed rule. A list of the facilities visited by EPA is provided in the TDD.

2. Data Provided to EPA by Industrial, Trade, Consulting, Scientific or Environmental Organizations or by the General Public

EPA has continued to exchange information with various stakeholders in the development of today's proposal. EPA met several times with Electric Power Research Institute (EPRI), Edison Electric Institute, Nuclear Energy Institute, and Utility Water Act Group, along with other representatives from facilities and affected industries on topics including the latest advancements in fish protection technologies, permit experience, and the feasibility and cost of installing technologies at certain types of facilities.

In 2010, the North American Electric Reliability Corporation (NERC) issued a reliability study and found potentially substantial reliability effects under a 316(b) rule scenario that would require closed-cycle cooling of all large power plants. See *Potential Resource Adequacy Impacts of U.S. Environmental Regulations. October 2010.* The scenario assumes all existing steam units with a capacity utilization factor of less than 35% would close,[3] and assumes all in-scope electric generators would be required to install cooling towers within a 5-year window. While the report's focus was on energy reliability and reflects a regulatory scenario that is not directly comparable to any of the options explored for today's proposed rule, the report nevertheless serves as a useful upper bound estimate of (1) the potential for premature generating unit retirements to avoid the costs of retrofitting existing cooling water intake systems and (2) increased power needs as a result of a capacity derating (*i.e.,* the energy penalty[4]).

[3] IPM analyses do not predict all units with capacity utilization rates of less than 35% would close as a result of a closed-cycle cooling retrofit. Thus the total loss in capacity under EPA's Option 2 would be 14,418 MW or 1.3% of existing capacity.

[4] The report assumes the total energy penalty of 4 percent is a constant; EPA believes the energy penalty is reduced over time as units replace, repower, or make other modifications such as condenser replacement that would eliminate the turbine backpressure.

The Edison Electric Institute published a study of the combined impact of EPA's upcoming air, water (316(b)), and solid waste rulemakings on the coal fired fleet of power plants. See *Potential Impacts of Environmental Regulation on the U.S. Generation Fleet Final Report. January 2011.* As with the NERC study, conservative assumptions were made about EPA rules yet to be proposed or promulgated. The report summarizes reductions in capacity, but does not distinguish how much of that capacity was unused in the baseline scenario. Conservative costing assumptions such as 21 percent higher average costs,[5] and application of full retrofit costs to new capacity (instead of incremental costs for installing required technology at new construction) gives results that are not comparable to any of the options explored for today's proposed rule. While this study analyzed multiple scenarios, each scenario combines the effects of multiple rules so that the impact of the section 316(b) rule alone could not be determined. Even so, the report provides useful insight on the potential impact of multiple rulemakings if each EPA rule was promulgated at the level of stringency assumed in the study.

EPA met with Riverkeeper and other environmental groups to discuss the progress of the revisions to the rule, advances in fish protection technologies, state programs, environmental issues associated with cooling water withdrawals, and the feasibility of closed-cycle cooling. Through these interactions, EPA has received additional data and information including, but not limited to: Efficacy data, operating information, cost information, feasibility studies, environmental impacts, and non-water quality related impact information for various candidate BTA technologies.

3. Other Resources

EPA also collected information on cooling water intake structure-related topics from a variety of other sources, such as state and international policies. For example, the California Office of Administrative Law approved the "Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling" on September 27, 2010, which requires that all coastal power plants reduce their intake flow to a level commensurate with closed-cycle cooling. The Delaware state legislature passed a resolution that urges the Delaware Department of Natural

[5] EPRI's site-specific evaluation of 82 facilities provides an average capital cost of $275 per GPM, but the EEI report uses $319 per GPM.

Resources and Environmental Control (DNREC) to consider closed-cycle cooling as BTA and to require closed-cycle cooling at all facilities. The New York Department of Environmental Conservation (DEC) released a draft policy in March 2010 that would require flow reduction equivalent to closed-cycle cooling at all existing facilities that withdraw more than 20 MGD as part of the state's plan to restore the Hudson River. Additional examples of state programs are discussed further in the TDD.

In addition to state-wide cooling water policies, some recent individual NPDES permits have incorporated requirements for significant reductions in cooling water flow. For example, EPA Region I (which develops NPDES permits for several non-delegated New England states) issued a final NPDES permit in October 2003 that required Brayton Point in Somerset, Massachusetts to reduce cooling water intake flow and thermal discharges approximately 95 percent.[6] Brayton is currently constructing two natural draft cooling towers at the facility. New Jersey, as part of its policy for protecting marine life from the adverse impacts created by power plants, issued a draft permit for Oyster Creek that would require closed-cycle cooling, and is studying closed-cycle cooling for two units at Salem Generating Station. Other examples are documented in site visit reports found in the record for today's proposed action.

Electric generators are the subject of several rulemaking efforts that either are or will soon be underway. In addition to this rulemaking proposal, this includes regulation under section 110(a)(2)(D) of the Clean Air Act (CAA) addressing the interstate transport of emissions contributing to ozone and PM air quality problems, coal combustion wastes, hazardous air pollutants under CAA section 112, and criteria pollutant NSPS standards under CAA section 111. They will also soon be the subject of a rulemaking under CAA section 111 concerning emissions of greenhouse gases. EPA recognizes that it is important that each and all of these efforts achieve their intended environmental objectives in a common-sense manner that allows the industry to comply with its obligations under these rules as efficiently as possible and to do so by making coordinated investment decisions and, to the greatest extent possible, by adopting integrated compliance strategies. In addition, EO 13563 states that "[i]n developing regulatory actions and identifying appropriate approaches, each agency shall attempt to promote such coordination, simplification, and harmonization. Each agency shall also seek to identify, as appropriate, means to achieve regulatory goals that are designed to promote innovation." Thus, EPA recognizes that it needs to approach these rulemakings, to the extent that its legal obligations permit, in ways that allow the industry to make practical investment decisions that minimize costs in complying with all of the final rules, while still achieving the fundamentally important environmental and public health benefits that the rulemakings must achieve. The Agency expects to have ample latitude to set requirements and guidelines in ways that can support the states' and industry's efforts in pursuing practical, cost-effective and coordinated compliance strategies encompassing a broad suite of its pollution-control obligations.

B. Implementation Experience

Following promulgation of the 2004 Phase II rule, states and EPA Regions began to implement the rule. During that time, EPA worked to assist states in understanding the rule requirements, develop guidance materials, and support review of the documentation of the new requirements. As a result, EPA became aware of certain elements of the 2004 rule that were particularly challenging or time-consuming to implement. In developing today's proposed rule, EPA has considered these challenges and crafted a revised regulatory framework that the Agency believes is easier for all stakeholders to understand and implement. Some of the key changes are described below.

1. Calculation Baseline

The 2004 Phase II rule required that facilities reduce impingement mortality and entrainment from the calculation baseline. The calculation baseline was intended to represent a "typical" Phase II facility and outlined a configuration for a typical CWIS. (See 69 FR 41590.) EPA defined the calculation baseline as follows:

> an estimate of impingement mortality and entrainment that would occur at your site assuming that: the cooling water system has been designed as a once-through system; the opening of the cooling water intake structure is located at, and the face of the standard 3/8 inch mesh traveling screen is oriented parallel to, the shoreline near the surface of the source waterbody; and the baseline practices, procedures, and structural configuration are those that [a] facility would maintain in the absence of any structural or operational controls, including flow or velocity reductions, implemented in whole or in part for the purposes or reducing impingement mortality and entrainment.

Under this approach, a facility that had undertaken efforts to reduce impingement and entrainment impacts (*e.g.,* by installing a fine mesh screen or reducing intake flow) would be able to "take credit" for its past efforts and only be required to incrementally reduce impingement mortality or entrainment to meet the performance standards.

In practice, both permittees and regulatory agencies encountered difficulty with the calculation baseline, specifically how a facility should determine what the baseline represented and how a particular facility's site-specific configuration or operations compared to the calculation baseline. For facilities whose site configuration conforms to the calculation baseline, it was relatively easy to determine impingement mortality and entrainment at the conditions representing the calculation baseline. However, for facilities that have a different configuration, estimating a hypothetical calculation baseline could be difficult. For example, facilities with intake configuration that differed significantly from the calculation baseline (*e.g.,* a submerged offshore intake) were unsure as to how to translate their biological and technological data to represent the calculation baseline (a shoreline CWIS). Oftentimes facilities encountered difficulty in determining the appropriate location for monitoring to take place. Other facilities were unsure as to how to take credit for retired generating units and other flow reductions practices. In site visits, EPA learned that facilities with little or no historical biological data encountered a particularly difficult and time-intensive task of collecting appropriate data and developing the calculation baseline. For example, EPA found that for some sites impingement was very difficult to convert into a baseline, as facilities needed to predict which fish would be impinged and then further estimate which of those impinged organisms survived. As a result, EPA has developed a new approach to the technology-based requirements proposed today that does not use a calculation baseline.

2. Entrainment Exclusion Versus Entrainment Survival

As EPA worked towards revising the existing facility rules, EPA discovered a nuance to the performance based requirements of the 2004 Phase II rule: Entrainment exclusion versus entrainment survival. As discussed in section III.C below, EPA re-reviewed the

[6] See *http://www.epa.gov/ne/braytonpoint/index.html.*

data on the performance of intake technologies and conducted statistical analysis of the data. From this analysis, it became apparent that the 2004 Phase II rule did not fully consider the true performance of intake technologies in affecting "entrainable" organisms.

By definition, entrainment is the incorporation of aquatic organisms into the intake flow, which passes through the facility and is then discharged. In order to pass through the technologies located at the CWIS (*e.g.,* intake screens, nets, etc.), the organisms must be smaller than the smallest mesh size.[7] For coarse mesh screens (3/8″ mesh size), most "entrainables" simply pass through the mesh (and through the facility) with only some contact with the screen.[8] In this situation the mortality of organisms passing through the facility was assumed to be 100 percent. However, as mesh sizes are reduced,[9] more and more entrainables will actually become impinged on the screens (*i.e.,* "converted" from entrainable to impingeable) and would then be subjected to spray washes and returned along with larger impinged organisms as well as debris from the screens. Under the 2004 Phase II rule, these "converts" would be classified as a reduction in entrainment, since the entrainment performance standard simply required a reduction in the number (or mass) of entrained organisms entering the cooling system. However, for some facilities the low survival rate of converts resulted in the facility having difficulty complying with the impingement mortality limitations. By comparison, the performance standard for impingement was measured as impingement mortality. Organisms that were impinged (*i.e.,* excluded) from the CWIS were typically washed into a return system and sent back to the source water. In this case, impingement mortality is an appropriate measure of the biological performance of the technology.

Through EPA's review of control technologies, the Agency found that the survival of "converts" on fine mesh screens was very poor, and in some extreme cases comparable to the extremely low survival of entrained organisms that are allowed to pass entirely through the facility.[10] More specifically, EPA found that nearly 100 percent of eggs were entrained unless the mesh slot size was less than 2 mm, and mortality of eggs "converted" to impingement ranged from 20 to 30 percent. Further, the mortality of larvae collected from a fine mesh screen was usually greater than 80 percent. As a result, a facility with entrainment exclusion technologies such as fine mesh screens could approach 90 percent performance, but the subsequent survival of eggs and larvae combined ranged from 0 to 52 percent (mean value of 12 percent survival) depending on life stage and species, and the facility's impingement mortality rates increased. In other words, a facility that simply excluded entrainable organisms (with no attention being paid to whether they survive or not) could be deemed to have met its entrainment requirements under the 2004 Phase II rule, when in fact it may be causing the same level of mortality as a facility with no entrainment controls at all. EPA's current review of entrainment and entrainment mortality shows the same trends identified in the research reviews by EPRI (2003), namely that entrainment decreases with increasing larval length, increased sweeping flow, decreasing slot (intake) velocity, and decreasing slot width. In other words, by using screens with finer mesh, entrainment mortality can be converted to impingement mortality without necessarily protecting any more aquatic organisms.

3. Cost-Cost Test

In the 2004 Phase II rule, EPA developed facility-specific cost estimates, and published those costs in Appendix A (69 FR 41669). The 2004 Phase II rule also included a cost-cost test (see 69 FR 41644) where a facility could demonstrate that its costs to comply with the 2004 rule were significantly greater than those that EPA had considered. Since initial implementation of the July 9, 2004 316(b) Phase II rule, EPA has identified several concerns with the facility-specific costs listed in Appendix A and their use in the cost-cost test. First, EPA has identified numerous inconsistencies between facility permit applications, responses in the facility's 316(b) survey, and overall plant capacity as reported in the most recent EIA database. These inconsistencies resulted in Appendix A costs that were different from the facility's own compliance cost estimates due to inconsistencies in the underlying parameters used to estimate these costs. In addition, as described more fully in Chapter 2 of this proposal's Technical Development Document, EPA does not have available technical data for all existing facilities. EPA obtained the technical data for facilities through industry questionnaires. In order to decrease burden associated with these questionnaires, EPA requested detailed information from a sample, rather than a census, of facilities. EPA has thus concluded that the costs provided in Appendix A are not appropriate for use in a facility-level cost-cost test. Moreover, for most of the national requirements EPA is proposing here, a cost-cost variance is not necessary for the reasons described below. As a result, EPA is not providing a framework similar to Appendix A in today's proposed rule.[11] (See section III.C below and VII for more information about how EPA developed compliance costs.)

First, the impingement mortality requirements of today's proposed rule are economically achievable,[12] and the low variability in the costs of impingement mortality controls at a facility makes such a provision unnecessary. Second, a cost-cost variance is not necessary for entrainment mortality requirements because the costs of various requirements are a factor considered in each site-specific determination. Under the national rule, entrainment requirements would be established on a facility specific basis, except in the case of new units at an existing facility, which are subject to standards based on closed-cycle cooling or its equivalent. In the facility-specific process proposed today for entrainment mortality, a facility would be required to submit facility-specific compliance cost estimates. The determination of whether the cost of specific entrainment mortality technologies is too high is made by the Director on a case-by-case basis and accordingly a cost-cost provision is unnecessary for these facilities. However, consistent with the Phase I rule, EPA has included a

[7] In the case of many soft-bodied organisms such as eggs and larvae, the force of the intake flow can be sufficient to bend organisms that are actually larger than the screen mesh and pull them into the cooling system.

[8] Eggs are generally smaller than 2 millimeters in diameter, while larvae head capsids are much more variable in size, increasing as they mature to the juvenile stage.

[9] Fine mesh screens were considered to be one technology that could be used to meet the entrainment performance standards under the 2004 Phase II rule. EPA also reviewed performance data for screens with mesh sizes as small as 0.5 mm, as described in section III.C.

[10] Through-plant entrainment survival has been studied extensively, with EPRI's Review of Entrainment Survival Studies being amongst the most comprehensive. See DCN 2–017A–R7 from the Phase I docket.

[11] There is a form of "cost-cost variance" for new units at existing facilities, comparable to the provision in Phase I for new facilities. See further discussion below.

[12] The Phase II rule found impingement mortality (plus entrainment exclusion on certain waterbodies) was economically achievable; EPA has not identified any reason for revising this conclusion. See 69 FR 41603.

provision for new units at existing facilities that the Director may establish less stringent alternative requirements for a facility if compliance with the Phase I standards would result in compliance costs wholly out of proportion to those EPA considered in establishing the Phase I requirements or would result in significant adverse impacts on local air quality, water resources other than impingement or entrainment, or local energy markets.

C. New or Revised Analyses

In addition to collecting new information, EPA has re-evaluated some existing data and analyses that underlay its earlier decisions. The standards of the 2004 Phase II regulation required impingement mortality reduction for all life stages of fish and shellfish of 80 to 95 percent from the calculation baseline (for all Phase II facilities) and entrainment reduction requirements of 60 to 90 percent (for certain Phase II facilities). EPA based these performance requirements on a suite of technologies and compliance alternatives. For today's proposal, EPA has reanalyzed various candidate technologies as the basis for EPA's BTA decision. This reanalysis includes, but is not limited to, a reanalysis of candidate BTA technologies, their effectiveness, their costs, and their application. This section highlights some of the results from this reanalysis. See Section VI for a thorough discussion of EPA's updated BTA analysis and determination. Based on this reanalysis, EPA has reached several conclusions. The first is that closed-cycle cooling reduces impingement and entrainment mortality to the greatest extent. The second is that screen technologies are significantly less effective, particularly in comparison with closed-cycle cooling, in reducing entrainment mortality than EPA had concluded in 2004. Finally, EPA determined that while none of the reviewed technologies cause unacceptable energy reliability concerns, particulate emission increases, or adverse economic impacts at the national level, the performance and availability of some technologies varies widely depending on local factors, and these issues could be a significant concern at individual sites.

1. Revised Performance Database

In its Section 316(b) rule development efforts to date, EPA has gathered industry documents and research publications with information from studies which evaluated the performance of a range of technologies for minimizing impingement or entrainment. As explained in 68 FR 13538–13539, EPA previously developed a Technology Efficacy Database in an effort to document and assess the performance of various technologies and operational measures designed to minimize the impacts of cooling water withdrawals (*see* DCN 6–5000 in the docket for the 2004 Phase II rule). In support of today's proposal, EPA has updated that performance database. In updating the database, EPA's objective was to review the methods used to generate data in these studies and to combine relevant data across studies in order to produce statistical estimates of the overall performance of each of the technologies.

In developing the updated database, EPA considered data from over 150 documents. This includes documents previously contained in all three phases of EPA's 316(b) rulemaking records as well as new documents obtained during development of today's proposal. These documents contain information on the operation and/or performance of various forms and applications of these technologies, typically at a specific facility or in a controlled setting such as a research laboratory. The studies presented in these documents were performed by owners of facilities with cooling water intake structures, organizations that represent utilities and the electric power industry, and other research organizations. EPA established two general criteria for using data from the documents: (1) The data must be associated with technologies for minimizing impingement mortality or entrainment [13] that are currently viable (as recognized by EPA) for use by industries with cooling water intake structures that are (or will be) subject to Section 316(b) regulation; and (2) the data must represent a quantitative measure (*e.g.,* counts, densities, or percentages) that is related to the impingement mortality or entrainment of some life form of aquatic organisms within cooling water intake structures under the given technology.

For studies meeting the above criteria, EPA populated a new database. This performance study database consisted of two primary data tables. The first table contains specific information on a particular study, such as the document and study IDs, facility name, water body, data classification (*e.g.,* impingement mortality, entrainment), technology category, and other test conditions when specified (*e.g.,* mesh size, intake velocity, flow rate, water temperature, conditions when the technology is in place, control conditions). The second table contains the reported performance data for a given study. Each row of this table contains one or more performance measures for a particular species along with other factors when they were specified (*e.g.,* age category, dates or seasons of data collection, water temperature, velocity, elapsed time to mortality). For one option considered for today's proposed rule, EPA used this database in an attempt to revise the impingement mortality and entrainment limits developed for the Phase II rule. However, as described in section VI, the performance data for screens and other intake technologies indicates that those technologies were not very effective at minimizing entrainment mortality in comparison to closed-cycle cooling. As a result, EPA has not included this option in today's proposed rule package.

2. Impingement Mortality and Entrainment Technology Performance Estimates

To evaluate the effectiveness of different control technologies and the extent to which the various regulatory options considered for today's proposal minimize adverse environmental impacts associated with cooling water intake structures, EPA used the data collected in the revised performance database to develop impingement mortality and entrainment reduction estimates associated with each technology. For some technologies, this proposal reflects updated information or a different methodology for estimating effectiveness. For impingement mortality, EPA focused on 14 studies of 31 species for traveling screens with post-Fletcher modifications and with a 48 hour [14] or less holding time, and found the monthly impingement mortality corresponding to the 95th percentile was 31 percent mortality. EPA's full analysis of impingement mortality limitations may be found in Chapter XI of the TDD. EPA found the best performance of entrainment exclusion for fine mesh screens was 73 to 82 percent for eggs and 46 to 52 percent for larvae at 0.5 mm slot sizes. The best performance of fine mesh screens for entrainment survival (and not just exclusion) was 29 to 34 percent, with zero survival of eggs and larvae under certain conditions. The next section further discusses the distinction

[13] There were insufficient numbers of studies specifically looking at entrainment mortality or entrainment survival, therefore EPA broadened the review to include any measure of entrainment.

[14] Holding times beyond 48 hours often result in mortality due to holding conditions rather than mortality due to impingement.

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between entrainment exclusion and entrainment survival.

3. Exclusion Technologies

As discussed in section III.B above, screens and other technologies operate using a principle of excluding organisms from entering the cooling system. For technologies other than cooling towers, EPA generally calculated their efficacy as the mean percent efficacy of the available data. Because EPA has sufficient data to evaluate impingement mortality, its impingement mortality technology efficacy calculation accounts for mortality. However, because EPA has data on entrainment exclusion but lacks sufficient entrainment mortality data to calculate exclusion technology entrainment mortality efficacy, EPA's calculated mean entrainment percent efficacy does not account for mortality. Available data on today's proposed technology basis demonstrate that entrainment reductions associated with fine mesh technologies vary depending on life stage and mesh size. See Section VIII and the TDD for additional information on EPA's estimate of entrainment reductions for today's proposal.

In reality, excluding an organism from the cooling water intake does not minimize entrainment-related adverse environmental impacts unless the excluded organisms survive and ultimately return back to the waterbody. In the 2004 Phase II rule, EPA made the assumption that any entrainable organism which was entrained died (*i.e.,* 100 percent mortality for organisms passing through the facility) and any organism not entrained survived. In other words, if a technology reduced entrainment by 60 percent, then EPA estimated 40 percent of the organisms present in the intake water would die in comparison to 100 percent in the absence of any entrainment reduction. As explained in Section VI, while it has been conjectured that certain species of eggs have been shown to survive entrainment under certain conditions, EPA has not received any new data for either the most common species or the most frequently identified species of concern described in available studies and, as such, has not altered its decision that for purposes of national rulemaking, entrainment should be presumed to lead to 100 percent mortality. Today's proposed rule would allow facilities to demonstrate, on a site-specific basis, that entrainment mortality of one or more species of concern is not 100 percent.

For today's proposal, EPA analyzed the limited data on the survivability of organisms that are "converted" from entrained to impinged on fine mesh screens. These data show that under most operational conditions, many larvae die as a result of the impact and impingement on fine mesh screens. In the case of eggs, the data indicate that some species may die, but some do survive. The data also demonstrate that if the organisms can withstand the initial impingement on the fine mesh screen, the majority of entrainable organisms survive after passing through a fish return and returning to the source water. Finally, the data indicate that survival increases as the body length and age of the larvae increases.[15] EPA seeks additional data on the survivability (or mortality) of organisms that are converted from entrained to impinged on fine mesh screens.

4. Application of Requirements Based on Capacity Utilization Rate (CUR) and Waterbody Type

In the 2004 Phase II rule, the type of performance standard applicable to a particular facility (*i.e.,* reductions in impingement mortality only or impingement mortality and entrainment) depended on several factors, including the facility's location (*i.e.,* source waterbody), capacity utilization rate (CUR) (as an indicator of the rate of use), and the proportion of the source waterbody withdrawn. EPA's reanalysis of impingement and entrainment data does not support the premise that the difference in the density of organisms between marine and fresh waters justifies different standards. More specifically, the average density of organisms in fresh waters may be less than that found in marine waters, but the actual density of aquatic organisms in some specific fresh water systems exceeds that found in some marine waters. In other words, there is considerable overlap in the range of densities found in marine waters and in fresh waters. EPA also believes the different reproduction strategies of freshwater versus marine species makes broad characterizations regarding the density less valid a rationale for establishing different standards for minimizing adverse environmental impact.

In re-considering the applicability of requirements based on CUR, EPA found that even infrequently used facilities may still withdraw significant volumes of water when not generating electricity. EPA also found that load-following and peaking plants operate at or near 100 percent capacity (and therefore 100 percent design intake flow) when they are operating, and these operations occur frequently during peak summer electricity demand, coinciding with some of the most biologically sensitive portions of the year.[16] Accordingly, today's proposed requirements are not based on waterbody type or CUR. See further discussion in Section VI.

IV. Revised Industry Description

Today's proposed rule applies to all existing electric generating and manufacturing facilities, except for certain water going vessels as described in section V. EPA has earlier fully described the electricity industry in the 2002 Phase II proposed rule (*see,* for example, 67 FR 17135) and the manufacturing industries in the 2004 Phase III proposed rule (*see,* for example, 69 FR 68459).[17] While these general descriptions continue to broadly reflect the current state of these industries, EPA has revised some of its estimates of numbers of facilities, intakes, flows, and other pertinent information. In particular, this section describes those facilities with a cooling water intake structure having a DIF of greater than 2 MGD, related cooling water use in power production and manufacturing activities, and an overview of the industry sectors in scope for today's proposed rule. See the TDD and EA for today's proposed rule for more detailed information including industry profiles.

A. Water Use in Power Production and Manufacturing

Water is used for a wide variety of application in the United States. The U.S. Geologic Survey (USGS) publishes a comprehensive review of water use across industry sectors every 5 years. The 2005 report indicated that 410 billion gallons per day (BGD) of water are withdrawn for various uses. (See

[15] EPA found this is a very important distinction when reviewing technology efficacy, as some studies do not include the smaller, more fragile, and often non-motile stages of larvae. Older stages of larvae have started to develop avoidance responses, and generally have already started developing scales and skeletal structures.

[16] Some facilities continue to withdraw cooling water even when not generating for a variety of reasons: to discourage biofouling or mechanical seizures, to promote continued water flow, or to maintain a state of readiness. Peaking facilities (those with a CUR of less than 15percent, as defined in the 2004 Phase II rule) may withdraw relatively small volumes on an annual basis, but if they operate during biologically important periods such as spawning seasons or migrations, then they may have nearly the same adverse impact as a facility that operates year round.

[17] EPA also addressed both electric generators and manufacturers in the 2000 Phase I proposed rule (see, for example, 65 FR 49070). The support documents for all three rule phases also provide information characterizing the affected industry sectors.

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DCN 10–6872.) Of that amount, approximately 201 BGD is withdrawn by electric generators, primarily for non-contact cooling,[18] plus water withdrawals by other industrial sites of 18.2 BGD for a total of 219 BGD. This total flow represents the universe of flow potentially subject to regulation under 316(b), therefore today's proposed rule may address over half of the water withdrawals in the entire nation.[19]

Industrial water use (broadly defined as water used by power plants and manufacturers) falls generally into one of four categories: non-contact cooling water, contact cooling water, process water, and other water uses. A more detailed description of each category and how it relates to 316(b) is provided below.

1. Non-Contact Cooling Water

Power plants and manufacturers frequently generate large amounts of heat in their industrial processes. Non-contact cooling systems are one of the most common techniques used to dissipate this heat. In a non-contact cooling system, water is pumped through a heat exchanger or other equipment where it comes into indirect contact with heated materials in the industrial process. The water absorbs heat and is subsequently discharged (in a once-through cooling system) or recirculated (in a closed-cycle system). In these systems, the cooling water does not come into contact with any industrial materials, equipment or processes; the cooling water is contained within the cooling system for heat absorption and generally requires very little treatment (except heat removal) before discharge.

At power generators, non-contact cooling is by far the largest water use. Approximately three quarters of the total annual electricity output in the United States results from steam powered turbines. Power plants heat water inside a boiler. The water is turned to steam, at which point the temperature of the steam can be increased with further heating, allowing additional energy to be stored in the steam. The steam is then used to spin a turbine, producing electricity. The steam must then be condensed and returned to the boiler.[20] Non-contact cooling water is used to extract heat and return the steam to water in a condenser. The water can then be pumped back to the boiler for heating to repeat the cycle. Consistent with engineering theory, there are limits to the maximum efficiency of a thermal plant. Thermal power plants are actually not very efficient at converting fuel to electricity; only 30 to 60 percent of the fuel is captured as electricity, with the higher efficiency units relying on further use of the steam for further heating (usually referred to as cogeneration) or energy purposes (such as combined cycle power generators or other process warming). Depending on the type of generating unit, roughly one-third to two-thirds of the total energy generated is lost in the form of heat that must be subsequently dissipated.

At manufacturers, non-contact cooling is also a significant component of water use. Some manufacturers have electric generating units which generally operate in the same manner as summarized above. In some cases, virtually all of the manufacturing facility's cooling water withdraws are for power production. In contrast to power generators, some manufacturing facilities also need a reliable source of high pressure steam for manufacturing processes. Other manufacturers may need to condense steam generated from other processes, or may need to extract heat from a raw or processed material (*e.g.,* to reduce the temperature of an intermediate petroleum or chemical product before it enters a subsequent processing stream). Some facilities engage in testing or research, and have cooling needs for these activities.

2. Contact Cooling Water

Contact cooling water differs from non-contact cooling in that contact cooling systems use cooling water in direct contact with the hot equipment or heated materials. As a result, contact cooling water may intermingle with industrial products or equipment and often will take up pollutants other than heat, such as oil and grease or metals. Contact cooling water often requires treatment for these pollutants before it may be discharged.

In power plants, cooling water may be used for contact cooling of pumping equipment, such as the cooling water pump bearings. Contact cooling water is more frequently needed by manufacturing processes, such as quench water (*e.g.,* water into which bars of hot metal are dipped for rapid cooling or control of the formed metal temperature), mechanical pulping, forming and molding processes, food and agricultural products, and petrochemical gas quenching.

3. Process Water

Process water is water that is used directly in an industrial process. While steam electric plants do have some process water, process water is more typically associated with manufacturers, as the primary industrial process at power plants (electricity generation) is usually cooled with non-contact cooling water. Examples of process water include water used to break down wood pulp in a paper mill, water that is used in creating consumer products such as beverages or personal care products, water added to facilitate transportation of materials within a manufacturing process, water needed as a raw material, and water used in numerous chemical separations processes. Process water may be used as an ingredient in the intermediate products, consumed by the products, lost to evaporation, extracted later in the process line for treatment and discharge, or further reused.

EPA has found through site visits, extensive experience with manufacturing water use in the development of previous effluent guidelines, and a general review of water uses by manufacturing processes that a significant amount of reduction, reuse, and recycling has already occurred in most manufacturing processes, in part due to pretreatment standards and NPDES permit conditions. Beyond these reductions, today's proposed rule recognizes that many industrial facilities have worked to reduce the volume of process water usage at their sites and to increase the reuse of process water for other purposes within the facility. A leading facility or an entire industry may have evolved to use less process water in its industrial process. For example, EPA has found some facilities have undergone plant wide energy audits to reduce their energy needs by up to 25 percent, providing a roughly 25 percent reduction in cooling water needs. One analysis of paper mills estimates that over 39 billion gallons daily of water is recycled and not used solely for cooling purposes by a typical mill. Further, there has been a 69 percent reduction in

[18] Irrigation was the next highest user of water at 31% of the total withdrawn.

[19] In the Phase I rule, EPA also presented data indicating that the combined 316(b) rules for electric generators and the largest manufacturing sectors would address approximately 99% of all cooling water withdrawals in the U.S. See 65 FR 49071 and the Phase I Economic and Engineering Analyses of the Proposed §316(b) New Facility Rule.

[20] The thermodynamic laws governing the Rankine cycle in power plants requires a heat source and a heat sink. The difference in temperature and pressure is a major factor in maintaining efficiency of the thermal engine. Additional reasons for condensing the steam include: handling pressure drops in the system, the need to remove non-condensable gases before they damage equipment, to allow make-up water to be added to the system, and to safely allow pumping of the water back to the boiler.

the average volume of treated effluent at pulp and paper mills (see DCN 10–6902). In response to effluent guidelines discharge limitations, some facilities have reduced their compliance costs by reducing the volume of wastewater they must treat. Some effluent limitation guidelines have also established explicit requirements for flow reduction. In the case of iron and steel facilities, effluent limitations require no discharge of process wastewater pollutants (for example, see 40 CFR part 420 subpart D Steelmaking). As another observed example of the recycling of process water, a facility might use non-contact cooling water for condensing steam, but then reuse the heated water for washing raw materials instead of discharging the water.

See section V for more information on how water reuse and conservation efforts are considered in compliance alternatives for today's proposed rule.

4. Other Uses

Given the diversity of industrial processes across the U.S., there are many other industrial uses of water not intended to be addressed by today's proposed rule. Emergency water withdrawals, such as fire control systems and nuclear safety systems, are not considered as part of a facility's design intake flow. Warming water at liquefied natural gas terminals, and hydro-electric plant withdrawals for electricity generation are not cooling water uses and are not addressed by today's proposal. Other water uses might include service water and dilution water. Service water is a generic term that often refers to uses other than non-contact cooling (*i.e.,* it may include contact cooling), but can also include specialty water uses such as makeup water for radiation waste systems at nuclear power plants. Examples of dilution water are using water to reduce the concentration of a pollutant for biological treatment purposes, or to reduce the temperature of an effluent.

B. Overview of Electric Generators

In the Phase I proposal, EPA described its rationale for setting the threshold for section 316(b) national requirements at 2 MGD. As described in that proposed rule, EPA selected 2 MGD to ensure that almost all cooling water withdrawn from waters of the U.S. is covered by a national regulation. The Agency recognized that there was relatively little information currently available regarding the lower bound of withdrawals at which significant levels of impingement and entrainment and, therefore, adverse environmental impact, was likely to occur. At the time, most case studies available to the agency documenting impingement and entrainment from cooling water withdrawals focused on facilities withdrawing very large amounts of water (in most cases greater than 100 MGD). After soliciting comment and data on several different thresholds, the Agency adopted 2 MGD in the final rule. 66 FR 65288.

While the overview of the electric generating facilities in the previous Phase II and III proposed and final rules has not changed substantially, this section combines those multiple industry profiles into one overview. The information below is generally based on data from the U.S. Department of Energy's (DOE) "Annual Electric Generator Report" (Form EIA–860) and "Annual Electric Power Industry Report" (Form EIA–861), and EPA's Section 316(b) Industry Surveys. According to the 2007 EIA database, 38 of the 671 facilities have ceased operation since the Survey and 15 facilities will likely do so by the time today's proposed rule is promulgated (*i.e.,* 2012). EPA also excluded 20 electric generators that are already required by state policy to comply with standards based on closed-cycle cooling, and thus for regulatory analysis purposes are not expected to be affected by the proposed rule. In addition, 39 facilities are projected to be baseline closures according to Integrated Planning Model analyses (see Section VII of this preamble and Chapter 6 of the EA for discussion of IPM analysis).[21] Based on (1) data collected from these Surveys; (2) the compliance requirements in today's proposed rule, and (3) the in-scope threshold of 2 MGD DIF (see section V for further explanation of the 2 MGD threshold), EPA has therefore identified 559 Electric Generators that are in scope of today's 316(b) Existing Facilities Proposed Rule.[22] [23]

EPA estimates that the 559 steam electric generators represent 3 percent of all parent-entities, approximately 11 percent of all facilities, and over 45 percent of the electric power sector capacity. Based on the 2007 EIA database, EPA estimates that 388 of these in-scope facilities are owned by utilities and 171 in-scope facilities are owned by non-utilities.[24] The majority of electric generating facilities expected to be subject to today's proposed Existing Facilities rule, or 285 facilities, are investor-owned utilities, while nonutilities make up the second largest category. For a detailed discussion of parent-entities, see Chapter 5 and 7 of the EA (DCN 10–0002).

As reported in Exhibit IV–1, approximately half of the in-scope electric generators draw water from a freshwater river (306 facilities or 55 percent), followed by lakes or reservoirs (117 facilities or 21 percent) and estuaries or tidal rivers (83 facilities or 15 percent). The exhibit also shows that most of the in-scope facilities (355 facilities or 63 percent) employ a once-through cooling system.

EXHIBIT IV–1—NUMBER OF IN-SCOPE ELECTRIC GENERATORS BY WATERBODY AND COOLING-SYSTEM TYPE [a]

Waterbody type	Recirculating Number	Once-through Number	Combination Number	Other Number	Total [b] Number
Estuary/Tidal River	5	69	8	1	83
Ocean	0	9	0	0	9
Lake/Reservoir	36	73	7	1	117
Freshwater Stream/River	102	166	32	5	306

[21] For the purpose of this analysis, a facility is considered no longer in operation and retired if it no longer has any steam operations.

[22] EPA developed the estimates of the number and characteristics of facilities expected to be within the scope of today's proposed rule, based on the facility sample weights that were developed for the suspended 2004 Phase II Final Regulation analysis. These weights provide comprehensive estimates for the total of expected in-scope facilities based on the full set of facilities sampled in the Section 316(b) Industry Surveys. See Appendix 3.A: Weighting Concepts of the Economic and Benefits Analysis report for further discussion of the sample weights used in this analysis.

[23] EPA estimates of the characteristics of facilities expected to be within the scope of today's proposed rule are also based on the facility sample weights that were developed for the suspended 2004 Phase II Final Regulation analysis.

[24] Electric utilities engage in the generation, transmission, and the distribution of electricity for sale generally in a regulated market. Utilities include investor-owned, publicly-owned, and cooperative entities.

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EXHIBIT IV–1—NUMBER OF IN-SCOPE ELECTRIC GENERATORS BY WATERBODY AND COOLING-SYSTEM TYPE [a]—Continued

Waterbody type	Recirculating Number	Once-through Number	Combination Number	Other Number	Total [b] Number
Great Lake	4	37	2	0	43
Total	148	355	49	7	559

[a] The numbers of facilities are calculated on a sample-weighted basis.
[b] Individual values may not sum to totals due to independent rounding.

C. Overview of Manufacturers

EPA obtained information on in-scope Manufacturers presented in the tables below from the EPA's Section 316(b) Industry Surveys (the Industry Screener Questionnaire (SQ) and the Industry Detailed Questionnaire (DQ)). Based on the Survey data and the compliance requirements in today's proposed rule, EPA estimates 592 industry facilities with greater than 2 MGD DIF would be subject to today's proposal; 575 of these facilities are in the 6 primary manufacturing industries.[25]

Exhibit IV–2 below presents in-scope and industry-wide facility and parent entity counts by industry. The largest share of manufacturers, or 225 facilities, is in the Pulp and Paper industry, while facilities in the Chemicals and Allied Products make up the second largest category at 179 facilities.

EXHIBIT IV–2—EXISTING MANUFACTURERS BY INDUSTRY

Sector	Number of facilities	
	Sector total	Number in-scope [b c]
Aluminum	333	26
Chemicals	4,433	179
Food	28,938	37
Paper	597	225
Petroleum	352	39
Steel	1,525	68
Total	36,178	[a] 575

[a] In-scope facility counts include baseline closures and exclude an estimated additional 17 facilities with NAICS codes that do not fall into any of these six primary manufacturing industries.
[b] Number of in-scope facilities are weighted estimates; see Appendix 3.A of the EA for information on weights development. Individual values may not sum to totals due to independent rounding of sample-weighted (non integer) estimates.
[c] These facility count estimates are based on sample weights that are applicable for estimating the number of facilities that would be within the scope of today's proposed rule. However, because of missing financial data on certain facilities, these weights were not used in assessing the economic impact of the rule. Alternative weights, which yield modestly different total in-scope facility estimates (*e.g.*, 569 in-scope facilities in the Primary Manufacturing Industries instead of the 575 reported in this table), were used for developing facility count estimates in the economic impact analysis.

Exhibit IV–3 provides the distribution of manufacturing intakes by source water body and cooling system type. In total, EPA estimates that 593 intakes will be within the scope of today's rule. The vast majority (453 facilities or 77 percent) withdraw cooling water from freshwater streams or rivers, followed by Great Lakes (47 facilities). Two hundred eighty-seven (48 percent) manufacturers employ once-through cooling systems, 119 (20 percent) use closed-cycle cooling systems, and 124 (21 percent) use "combination" systems. An estimated 192 (32 percent) manufacturers have installed one or more cooling towers. In the total of 593 facility/intake combinations, EPA does not have information on the cooling water system type for 4 facilities/intakes. Note that not all manufacturers that have installed a cooling tower are classified as using closed-cycle cooling systems, as facilities with multiple cooling water systems may be "combination" systems that employ both closed-cycle and once-through cooling. Manufacturers may also list "helper" cooling towers in their survey responses, which are generally used to mitigate discharge temperatures and do not necessarily affect intake flows.

EXHIBIT IV–3—NUMBER OF IN-SCOPE MANUFACTURERS BY WATERBODY AND COOLING-SYSTEM TYPE

Waterbody type	Recirculating [b] Number	Once-through Number	Combination Number	Other Number	Type unknown Number	Total [a] Number
Estuary/Tidal River	1	23	16	0	0	40
Ocean	0	11	0	0	0	11
Lake/Reservoir	7	13	12	11	0	42
Freshwater Stream/River	111	215	82	41	4	453
Great Lake	0	25	14	7	0	47
Total	119	287	124	59	4	593

[a] Facility counts include baseline closures and exclude 17 facilities with NAICS codes that do not fall into the six primary manufacturing industries (see Chapter 3 of EA for more detail). Individual facilities may be reported more than once in this table if they have multiple intakes while a single intake that serves both recirculating and once-through systems is counted once as a combination. Individual values may not sum to totals due to independent rounding of sample-weighted (non integer) estimates.
[b] Four facilities have an unknown CWS type.

[25] The remaining 17 facilities have NAICS codes that do not fall into any of these six primary manufacturing industries.

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D. Other Existing Facilities

EPA's data collection efforts largely focused on five industrial sectors: Chemicals and allied products (SIC Major Group 28); primary metals industries (SIC Major Group 33); paper and allied products (SIC Major Group 26); petroleum and coal products (SIC Major Group 29); and food and kindred products (SIC Major Group 20).[26] The first four sectors use a significant portion of the cooling water withdrawn among all manufacturing industries and were more heavily targeted in EPA's industry questionnaire effort, but data were also collected from the following industries: Food processing; aircraft engines and engine parts; cutlery; sawmills and planing mills; finishers of broad woven fabrics of cotton; potash, soda and borate minerals; iron ores; and sugarcane and sugar beets. These data from other industries, while not a statistically derived sample, confirm that the primary industry sectors discussed above account for the vast majority of non-power plant cooling water use. The data collected for these other industries suggests that the intake structure design and construction at these industries were substantially similar to the industries for which EPA did collect data, and EPA did not receive any data during the Phase III proposed rule comment period that suggests otherwise. EPA's analysis of costs and impacts includes these additional existing facilities.

V. Scope and Applicability of the Proposed Section 316(b) Existing Facility Rule

The proposed rule includes all existing facilities with a design intake flow of more than 2 MGD. The proposed rule also clarifies the definition and requirements for new units at existing facilities. The applicable requirements are summarized in Exhibits V–1 and V–2.

EXHIBIT V–1—APPLICABILITY BY PHASE OF THE 316(b) RULES

Facility characteristic	Applicable rule
New power generating or manufacturing facility	Phase I rule.
New offshore oil and gas facility	Phase III rule.
New unit at an existing power generating or manufacturing facility	This proposed rule.
Existing power generating or manufacturing facility	This proposed rule.
Existing offshore oil and gas facility and seafood processing facilities	This proposed rule (Case-by-case, best professional judgment).

EXHIBIT V–2—APPLICABLE REQUIREMENTS OF TODAY'S PROPOSED RULE FOR EXISTING FACILITIES

Facility characteristic	Applicable requirements
Existing facility with a AIF >125 MGD	Impingement mortality requirements at 125.94(b) and Entrainment Characterization Study requirements at 125.94(c) (categorical rule).
Existing facility with a DIF >2 MGD but AIF not greater than 125 MGD	Impingement mortality requirements at 125.94(b) (categorical rule).
New unit with a DIF >2 MGD at an existing facility	Impingement and entrainment mortality requirements at 125.94(d) (categorical standard).
Other existing facility with a DIF of 2 MGD or smaller or that has an intake structure that withdraws less than 25 percent of the water for cooling purposes.	Case-by-case, best professional judgment.

Initially, EPA divided the 316(b) rulemaking into three phases in response to litigation and to make the best use of its resources (see Section I). However, as EPA's analysis progressed, it became clear that cooling water intake structures are operated similarly at most industrial facilities (*i.e.,* both power producing and manufacturing facilities). From a biological perspective, the effect of intake structures on impingement and entrainment does not differ depending on whether an intake structure is associated with a power plant or a manufacturer. Instead the impingement and entrainment impacts associated with intakes of the same type are generally comparable, and today's proposed rule addresses these impacts without discriminating which facilities are behind the intake structure. Thus, EPA is consolidating the universe of potentially regulated facilities from the 2004 Phase II rule with the existing facilities in the 2006 Phase III rule for purposes of today's proposed rule. This consolidation also provides a "one-stop shop" for information related to today's proposed rulemaking, as all existing facilities would be addressed in an equitable manner by the same set of technology-based requirements.

A. General Applicability

This rule would apply to owners and operators of existing facilities that meet all of the following criteria:

- The facility is a point source that uses or proposes to use cooling water from one or more cooling water intake structures, including a cooling water intake structure operated by an independent supplier not otherwise subject to 316(b) requirements that withdraws water from waters of the United States and provides cooling water to the facility by any sort of contract or other arrangement;
- The total design intake flow of the cooling water intake structure(s) is greater than 2 MGD; and
- The cooling water intake structure(s) withdraw(s) cooling water from waters of the United States and at least twenty-five (25) percent of the water withdrawn is used exclusively for cooling purposes measured on an average annual basis for each calendar year.

EPA is proposing to continue to adopt provisions to ensure that the rule does not discourage the reuse of cooling water for other uses such as process water. The definition of cooling water at 125.93 provides that cooling water used in a manufacturing process either before or after it is used for cooling is considered process water for the purposes of calculating the percentage of a facility's intake flow that is used for cooling purposes. Therefore, water used for both cooling and non-cooling purposes does not count towards the 25

[26] EPA also identified many other industry sectors that use cooling water; a more comprehensive list of industries that use cooling water and their NAICS and SIC Codes can be found in section A of the Supplementary Information.

percent threshold. EPA notes this definition is the same definition used for new facilities in the Phase I rule at 125.83. Examples of water withdrawn for non-cooling purposes includes water withdrawn for warming by liquefied natural gas facilities and water withdrawn for public water systems by desalinization facilities. Further, the proposed rule at 125.91(c) specifies that obtaining cooling water from a public water system or using treated effluent (such as wastewater treatment plant "gray" water) as cooling water does not constitute use of a cooling water intake structure for purposes of this rule.

Today's proposed rule focuses on those facilities that are significant users of cooling water; only those facilities that use more than 25% of the water withdrawn for cooling purposes are subject to the proposed rule. EPA previously considered a number of approaches for clarifying applicability of the rule (66 FR 28854 and 66 FR 65288). EPA adopted the 25% threshold in each of the Phase I, II, and III rules, and EPA has not received any new data or identified new approaches that would provide further clarity to the applicability of the rule. EPA is proposing to continue to adopt 25% as the threshold for the percent of flow used for cooling purposes to ensure that a large majority of cooling water withdrawn from waters of the U.S. is addressed by requirements for minimizing adverse environmental impact. Because power generating facilities typically use far more than 25 percent of the water they withdraw exclusively for cooling purposes, the 25 percent threshold will ensure that intake structures accounting for nearly all cooling water used by the power sector are addressed by today's proposed requirements. While manufacturing facilities often withdraw water for more than cooling purposes, the majority of the water is withdrawn from a single intake structure.[27] Once water passes through the intake, water can be apportioned to any desired use, including uses that are not related to cooling. However, as long as at least 25% of the water is used exclusively for cooling purposes, the intake will be subject to the requirements of today's rule. EPA estimates that approximately 68% of manufacturers and 93% of power-generating facilities that meet the other proposed thresholds for the rule use more than 25% of intake water for cooling and thus will be addressed by today's rule.

EPA decided to propose requiring the Director, exercising BPJ, to establish BTA impingement and entrainment mortality standards for an existing offshore oil and gas facility, a seafood processing vessel, or an offshore liquefied natural gas import terminal. Such a facility would be subject to permit conditions implementing CWA section 316(b) where the facility is a point source that uses a cooling water intake structure and has, or is required to have, an NPDES permit. At their discretion, permit writers may further determine that an intake structure that withdraws less than 25% of the intake flow for cooling purposes should be subject to section 316(b) requirements, and set appropriate requirements on a case-by-case basis, using best professional judgment. Today's proposed rule is not intended to constrain permit writers at the Federal, State, or Tribal level, from addressing such cooling water intake structures.

B. What is an "existing facility" for purposes of the Section 316(b) Phase II rule?

In today's proposed rule, EPA is defining the term "existing facility" to include any facility that commenced construction before January 18, 2002, as provided for in §122.29(b)(4).[28] EPA is proposing to establish January 17, 2002 as the date for distinguishing existing facilities from new facilities because that is the effective date of the Phase I new facility rule. Thus, existing facilities include all facilities the construction of which commenced on or before this date. In addition, EPA is defining the term "existing facility" in this proposed rule to include modifications and additions to such facilities, the construction of which commences after January 17, 2002, that do not meet the definition of a new facility at §125.83, which is the definition used to define the scope of the Phase I rule.[29]

The preamble to the final Phase I rule discusses this definition at 66 FR 65256; 65258–65259; 65285–65287, December 18, 2001. EPA's definition of an "existing facility" in today's proposed regulation is intended to ensure that all sources excluded from the definition of new facility in the Phase I rule are captured by the definition of existing facility in this proposed rule.

A point source would be subject to Phase I or today's proposed rule even if the cooling water intake structure it uses is not located at the facility.[30] In addition, modifications or additions to the cooling water intake structure (or even the total replacement of an existing cooling water intake structure with a new one) does not convert an otherwise unchanged existing facility into a new facility, regardless of the purpose of such changes (*e.g.,* to comply with today's proposed rule or to increase capacity). Rather, the determination as to whether a facility is new or existing focuses on whether it is a green field or stand-alone facility and whether there are changes to the cooling water intake to accommodate it.

C. What is "cooling water" and what is a "cooling water intake structure?"

EPA has not revised the definition of cooling water intake structure for today's proposed rule. A cooling water intake structure is defined as the total physical structure and any associated constructed waterways used to withdraw cooling water from waters of the United States. Under the definition in today's proposed rule, the cooling water intake structure extends from the point at which water is withdrawn from the surface water source up to, and including, the intake pumps. Today's proposed rule proposes for existing facilities the same definition of a "cooling water intake structure" that applies to new facilities under Phase I. Today's proposal also adopts the new facility rule's definition of "cooling water" as water used for contact or noncontact cooling, including water used for equipment cooling, evaporative cooling tower makeup, and dilution of effluent heat content. The definition specifies that the intended use of cooling water is to absorb waste heat rejected from the processes used or auxiliary operations on the facility's premises. The definition also indicates that water used in a manufacturing process either before or after it is used for cooling is process water and would not be considered cooling water for purposes of determining whether 25 percent or more of the flow is cooling water. This clarification is necessary because cooling water intake structures typically bring water into a facility for numerous purposes, including industrial processes; use as circulating

[27] Facilities may also use groundwater wells or municipal water for various uses, but the volume of these withdrawals is usually much smaller than the volume withdrawn from surface waters.

[28] Construction is commenced if the owner or operator has undertaken certain installation and site preparation activities that are part of a continuous on-site construction program, and it includes entering into certain specified binding contractual obligations as one criterion (§122.29(b)(4)).

[29] The Phase I rule also listed examples of facilities that would be "new" facilities and facilities that would "not be considered a 'new facility' " in two numbered paragraphs.

[30] For example, a facility might purchase its cooling water from a nearby facility that owns and operates a cooling water intake structure.

water, service water, or evaporative cooling tower makeup water; dilution of effluent heat content; equipment cooling; and air conditioning. Note however, that all intake water (including cooling and process) is included in the determination as to whether the 2 MGD DIF threshold for covered intake structures is met.

D. Would my facility be covered only if it is a Point Source Discharger?

Today's proposed rule would apply only to facilities that are point sources (*i.e.,* have an NPDES permit or are required to obtain one). This is the same requirement EPA included in the Phase I new facility rule at §125.81(a)(1). Requirements for complying with section 316(b) will continue to be applied through NPDES permits.

Based on the Agency's review of potential existing facilities that employ cooling water intake structures, the Agency anticipates that most existing facilities subject to this proposed rule will control the intake structure that supplies them with cooling water, and discharge some combination of their cooling water, wastewater, or storm water to a water of the United States through a point source regulated by an NPDES permit. Under these circumstances, the facility's NPDES permit will include the requirements for the cooling water intake structure. In the event that an existing facility's only NPDES permit is a general permit for storm water discharges, the Agency anticipates that the Director would write an individual NPDES permit containing requirements for the facility's cooling water intake structure. Alternatively, requirements applicable to cooling water intake structures could be incorporated into general permits. If requirements are placed into a general permit, they must meet the requirements set out at 40 CFR 122.28.

As EPA stated in the preamble to the final Phase I rule (66 FR 65256 (December 18, 2001)), the Agency encourages the Director to closely examine scenarios in which a facility withdraws significant amounts of cooling water from waters of the United States but is not required to obtain an NPDES permit. As appropriate, the Director will necessarily apply other legal requirements, where applicable, such as section 404 or 401 of the Clean Water Act, the Coastal Zone Management Act, the National Environmental Policy Act, the Endangered Species Act, or similar State or Tribal authorities to address adverse environmental impact caused by cooling water intake structures at those facilities.

E. Would my facility be covered if it withdraws water from waters of the U.S.? What if my facility obtains cooling water from an independent supplier?

The requirements in today's proposed rule apply to cooling water intake structures that have the design capacity to withdraw amounts of water equal to or greater than 2 MGD from "waters of the United States." Waters of the United States include the broad range of surface waters that meet the regulatory definition at 40 CFR 122.2, which includes lakes, ponds, reservoirs, nontidal rivers or streams, tidal rivers, estuaries, fjords, oceans, bays, and coves. These potential sources of cooling water may be adversely affected by impingement and entrainment.

Some facilities discharge heated water to manmade cooling ponds, and then withdraw water from the ponds for cooling purposes. EPA recognizes that cooling ponds may, in certain circumstances, constitute a closed-cycle cooling system and therefore may already comply with some or all of the technology-based requirements in today's proposed rule. However, facilities that withdraw cooling water from cooling ponds that are waters of the United States and that meet the other criteria for coverage (including the requirement that the facility has or will be required to obtain an NPDES permit) would be subject to today's proposed rule. In some cases water is withdrawn from a water of the United States to provide make-up water for a cooling pond. In many cases, EPA expects such make-up water withdrawals are commensurate with the flows of a closed-cycle cooling tower, and again the facility may already comply with requirements to reduce its intake flow under the proposed rule. In those cases where the withdrawals of make-up water come from a water of the United States, and the facility otherwise meets today's criteria for coverage (including a design intake flow of 2 million gallons per day), the facility would be subject to today's proposed rule requirements.

EPA does not intend this rule to change the regulatory status of cooling ponds. Cooling ponds are neither categorically included nor categorically excluded from the definition of "waters of the United States" at 40 CFR 122.2. The determination whether a particular cooling pond is, or is not, a water of the United States is to be made by the permitting authority on a case-by-case basis. The EPA and the U.S. Army Corps of Engineers have jointly issued jurisdictional guidance concerning the term "waters of the United States" in light of the Supreme Court's decision in *Solid Waste Agency of Northern Cook County* v. *U.S. Army Corps of Engineers,* 531 U.S. 159 (2001) (SWANCC). A copy of that guidance was published as an Appendix to an Advanced Notice of Proposed Rulemaking on the definition of the phrase "waters of the U.S.," see 68 FR 1991 (January 15, 2003), and may be obtained at (*http://www.epa.gov/owow/wetlands/pdf/ANPRM–FR.pdf*). The agencies additionally published guidance in 2008 regarding the term "waters of the United States" in light of both the *SWANCC* and subsequent *Rapanos* case (*Rapanos* v. *United States,* 547 U.S. 715 (2006)).

The Agency recognizes that some facilities that have or are required to have an NPDES permit might not own and operate the intake structure that supplies their facility with cooling water. In addressing facilities that have or are required to have an NPDES permit that do not directly control the intake structure that supplies their facility with cooling water, revised §125.91 provides (similar to the new facility rule) that facilities that obtain cooling water from a public water system or use treated effluent are not deemed to be using a cooling water intake structure for purposes of this proposed rule. However, obtaining water from another entity that is withdrawing water from a water of the US would be counted as using a cooling water intake structure for purposes of determining whether an entity meets the threshold requirements of the rule. For example, facilities operated by separate entities might be located on the same, adjacent, or nearby property(ies); one of these facilities might take in cooling water and then transfer it to other facilities prior to discharge of the cooling water to a water of the United States. Section 125.91(b) specifies that use of a cooling water intake structure includes obtaining cooling water by any sort of contract or arrangement with one or more independent suppliers of cooling water if the supplier or suppliers withdraw water from waters of the United States but that is not itself a new or existing facility subject to section 316(b), except if it is a public water system.

As a practical matter, existing facilities are the largest users of cooling water, and typically require enough cooling water to warrant owning the cooling water intake structures. In some cases, such as at nuclear power plants or critical baseload facilities, the need for cooling water includes safety and reliability reasons that would likely preclude any independent supplier arrangements. Therefore, EPA does not expect much application of this

provision. EPA is nevertheless retaining the provision in order to prevent facilities from circumventing the requirements of today's proposed rule by creating arrangements to receive cooling water from an entity that is not itself subject to today's proposed rule, and is not explicitly exempt from today's rule (such as drinking water or treatment plant discharges reused as cooling water).

F. What intake flow thresholds result in an existing facility being subject to this proposed rule?

There are two ways in which EPA determines the cooling water flow at a facility. The first way is based on the design intake flow (DIF), which reflects the maximum intake flow the facility is capable of withdrawing. While this normally is limited by the capacity of the cooling water intake pumps, other parts of the cooling water intake system could impose physical limitations on the maximum intake flow the facility is capable of withdrawing. The second way is based on the actual intake flow (AIF), which reflects the actual volume of water withdrawn by the facility. EPA has defined AIF to be the average water withdrawn each year over the preceding 3 years. Both of these definitions are used in today's proposed rule.

In this proposed rule EPA considered requirements based on the intake flow at the existing facility. EPA is proposing the rule to apply to facilities that have a total design intake capacity of at least 2 MGD (see §125.91).[31] Above 2 MGD, 99.7% of the total water withdrawals by utilities and other industrial sources would potentially be covered (if the other criteria for coverage are met) while 58% of the manufacturers, 70% of the non-utilities, and 100% of the utilities would be covered. EPA also chose the greater than 2 MGD threshold to be consistent with the applicability criteria in the Phase I rule.[32] EPA continues to believe that this threshold ensures that the largest users of cooling water will be subject to the proposed rule.

EPA proposes to continue to use a threshold based on design intake flow as opposed to actual intake flow for several reasons. In contrast to actual intake flow, design intake flow is a fixed value based on the design of the facility's operating system and the capacity of the circulating and other water intake pumps. This provides clarity, as the design intake flow does not change, except in limited circumstances, such as when a facility undergoes major modifications. On the other hand, actual flows can vary significantly over sometimes short periods of time. For example, a peaking power plant may have an actual intake flow close to the design intake flow during times of full energy production, but an AIF of zero during periods of standby. Use of design intake flow provides clarity as to regulatory status, is indicative of the possible magnitude of environmental impact, and would avoid the need for monitoring to confirm a facility's status. Also see 69 FR 41611 for more information about these thresholds.

Under current NPDES permitting regulations at §122.21, all existing facilities greater than 2 MGD DIF must submit basic information describing the facility, source water physical data, source water biological characterization data, and cooling water intake system data. Under this proposed rule, all facilities greater than 2 MGD DIF must submit additional facility-specific information including the proposed impingement mortality reduction plan, relevant biological survival studies, and operational status of each of the facility's units.[33] Certain facilities withdrawing the largest volumes of water for cooling purposes have additional information and study requirements such as the Entrainment Characterization Study as described below.

EPA is proposing to use actual intake flow (AIF) rather than design intake flow (DIF) for purposes of determining which facilities must conduct an Entrainment Characterization Study. Environmental impacts, particularly entrainment and entrainment mortality, result from actual water withdrawals, and not the maximum designed withdrawals. Further, using actual flow may encourage some facilities to reduce their flows in order to avoid collecting supplemental data and submitting the additional entrainment characterization study. Furthermore, any facility that has DIF greater than 2 MGD is required to submit basic information that will allow the permitting authority to verify its determination of whether or not it meets the 125 MGD AIF threshold.

EPA has selected a threshold of 125 MGD AIF because a threshold of 125 MGD would capture 90 percent of the actual flows but would only establish the Entrainment Characterization Study requirements for 30 percent of existing facilities. This would significantly reduce facility burden by more than two-thirds of the potentially in-scope facilities, and would focus permit authorities on the majority of cooling water withdrawals by addressing approximately 200 billion gallons of daily cooling water withdrawals.

In today's proposal, EPA seeks to clarify that for some facilities, the design intake flow is not necessarily the maximum flow associated with the intake pumps. For example, a power plant may have redundant circulating pumps, or may have pumps with a name plate rating that exceeds the maximum water throughput of the associated piping. EPA intends for the design intake flow to reflect the maximum volume of water that a plant can physically withdraw from a source waterbody over a specific time period. This also means that a plant that has permanently taken a pump out of service or has flow limited by piping or other physical limitations should be able to consider such constraints when reporting its DIF. EPA solicits comment on whether the definition of DIF should be revised to make this clarification more apparent.

G. Offshore Oil and Gas Facilities, Seafood Processing Vessels or LNG Import Terminals BTA Requirements Under This Proposed Rule

Under today's proposal, existing offshore oil and gas facilities, seafood processing facilities and LNG import terminals would be subject to 316(b) requirements on a best professional judgment basis. In the Phase III rule, EPA studied offshore oil and gas facilities and seafood processing facilities[34] and could not identify any technologies (beyond the protective screens already in use) that are technically feasible for reducing impingement or entrainment in such existing facilities.[35] As discussed in the Phase III rule, known technologies that could further reduce impingement or entrainment would result in unacceptable changes in the envelope of existing platforms, drilling rigs, mobile offshore drilling units (MODUs), seafood processing vessels (SPVs), and similar facilities as the technologies would project out from the hull, potentially decrease the seaworthiness, and potentially interfere with structural

[31] The 2004 Phase II rule applied to existing power-generating facilities with a design intake flow of 50 mgd or greater. Facilities potentially in scope of the Phase III rule had a DIF of greater than 2 MGD.

[32] See 65 FR 49067/3 for more information.

[33] The proposed rule contains streamlined information submission requirements for facilities that already employ closed cycle cooling.

[34] EPA studied naval vessels and cruise ships as part of its development of a general NPDES permit for discharges from ocean-going vessels. (See *http://cfpub.epa.gov/npdes/home.cfm?program_id=350* for more information.) EPA studied seafood processing vessels and oil and gas exploration facilities in the 316(b) Phase III rule.

[35] As discussed in today's preamble, requirements for new offshore facilities set forth in the Phase III rule remain in effect.

components of the hull. EPA also believes that for many of these facilities, the cooling water withdrawals are most substantial when the facilities are operating far out at sea—and therefore not withdrawing from a water of the U.S. The EPA is aware that LNG facilities may withdraw hundreds of MGD of seawater for warming (re-gasification). However, some existing LNG facilities may still withdraw water where 25 percent or more of the water is used for cooling purposes. As discussed in section V, EPA has not identified a uniformly applicable and available technology for minimizing impingement and entrainment (I&E) mortality at these facilities. However, technologies may be available for some existing LNG facilities. LNG facilities that withdraw any volume of water for cooling purposes would be subject to case-by-case, best professional judgment BTA determinations.

EPA has not identified any new data or approaches that would result in a different determination. Therefore, today's rule would continue to require that the BTA for existing offshore oil and gas extraction facilities and seafood processing facilities is established by NPDES permit directors on a case-by-case basis using best professional judgment. EPA solicits comment and data on the appropriateness of national categorical standards for these facilities.

H. What is a "new unit" and how are new units addressed under this proposed rule?

The Phase I rule did not distinguish between new stand-alone facilities and new units where the units are built on a site where a source is already located and does not totally replace the existing source. Because EPA is not changing the new facility rule definitions, and is only proposing clarifying revisions to the existing facility rule, this proposed provision is not intended to otherwise reopen the Phase I rule. Today's proposed rule establishes requirements for new units added to an existing facility that are not a "new facility" as defined at §125.83. Today's proposal seeks to clarify the definitions of "new" versus "existing" by first noting that, for purposes of section 316(b), a facility cannot be defined as a new facility and an existing facility at the same time. In this rule, while EPA will continue to treat replacement and new units for the same industrial purpose as existing facilities, EPA intends to have different requirements for the addition of new units. A replacement unit or repowered unit, as distinct from constructing an additional unit, would not be treated as a new unit. The requirements for new units are modeled after the requirements for a new facility in the Phase I rule.

EPA has adopted this approach for the following reasons. As new units are built at existing facilities to provide additional capacity, facilities have the ideal opportunity to design and construct the new units without many of the additional expenses associated with retrofitting an existing unit to closed-cycle. The incremental downtime that can be associated with retrofitting to closed-cycle cooling is avoided altogether at a new unit. In addition, when new units are added, the condensers can be configured for closed-cycle, reducing energy requirements, and high efficiency cooling towers can be designed as part of the new unit, allowing for installation of smaller cooling towers. Thus, the capital costs for closed cycle cooling at new units are lower than the capital costs for once-through cooling. These advantages may not always be available when retrofitting cooling towers at an existing unit.

In consideration of the fact that additional unit construction decisions rest largely within the control of the individual facility, EPA decided that subjecting new units to the same national BTA requirements as those applicable to new facilities is warranted.

VI. BTA Consideration

In response to the Supreme Court's decision in *Entergy Corp. et al.* v. *EPA* in April 2009, and the Second Circuit decision in *Riverkeeper II,* EPA has reevaluated the requirements for existing facilities under section 316(b). As discussed in Section III, for the BTA determinations proposed below, EPA collected additional data and information and updated the technology efficacy and costs analyses prepared for the earlier rulemaking efforts. These data and analyses serve to update the rulemaking record and allow EPA to apply greater technical rigor to EPA's analysis of BTA. As a result, EPA has decided not to re-propose requirements similar to those of the final Phase II rule, but would adopt, for the reasons explained in this preamble, a new framework. In addition, as previously noted, EPA decided to address all existing facilities subject to 316(b) in one rule (*i.e.,* Phase II and Phase III).

A. EPA's Approach to BTA

Section 316(b) of the CWA requires EPA to establish standards for cooling water intake structures that reflect the "best technology available for minimizing adverse environmental impact." The statute is silent with respect to the factors that EPA should consider in determining BTA but courts have held that, given section 316(b)'s reference to sections 301 and 306 of the Act, EPA may look to the factors considered in those sections in establishing those standards for section 316(b) standard setting. The Supreme Court noted that, given the absence of any factors language in Section 316(b), EPA has more discretion in its standard setting under section 316(b) than under the effluent guidelines provisions. EPA has broad discretion in determining what is the "best" available technology for minimizing adverse environmental impact. EPA is not bound to evaluate the factors it considers in standard setting in precisely the same way it considers them in establishing effluent limitations guidelines under section 304 of the Clean Water Act. Thus, the U.S. Supreme Court has explained that, under section 316(b), "best" technology may reflect a consideration of a number of factors and that "best" does not necessarily mean the technology that achieves the greatest reduction in environmental harm that the regulated universe can afford. Rather, the "best" (or "most advantageous" technology in the court's words) may represent a technology that most efficiently produces the reductions in harm.

EPA has interpreted section 316(b) to require the Agency to establish a standard based on the best technology available that will minimize impingement and entrainment—the two main adverse effects of cooling water intake structures. In EPA's view, there are several important considerations underpinning its decision. First, its BTA determination should be consistent with,and reflective of, the goals of Section 101 of the CWA: "to restore and maintain the physical, chemical, and biological integrity of the Nation's waters," with an interim goal of protecting water quality so as to provide for the protection and propagation of fish, shellfish, and wildlife and provide for recreation in and on the water.

Second, because the Supreme Court has concluded that EPA may permissibly consider costs and benefits in its BTA determination and E.O. 13563 directs EPA only to propose regulations based on a reasoned determination that the benefits justify the costs, EPA has taken costs and benefits into account in this proposal. EPA has concluded that the benefits of the proposed option justify its costs. See section VI. E below.

Both *Riverkeeper* decisions recognize that EPA may consider a number of factors in establishing section 316(b) standards. In the Phase I *Riverkeeper* case, the court explained that the cross

reference in section 316(b) to sections 301 and 306 is an "invitation" to look to those statutory provisions for guidance concerning the factors EPA should consider in determining BTA. In the Phase II decision, the court stated that the interpretation of section 316(b) should be "informed" by these other two provisions. EPA may consider the factors involved in establishing effluent discharge limitations when regulating intake structures. The factors specifically delineated in CWA sections 301 and 306 that EPA may consider include: cost of the technology, taking into account the age of the equipment and facilities, process employed, engineering aspects associated with a particular technology, process changes and non-water quality environmental impact (including energy requirements).

In selecting the "best" technology, EPA looked at a number of factors. Thus, EPA first considered the availability and feasibility of various technologies, their costs including potential costs to facilities as well as households, and economic impacts of different technologies. EPA reviewed the efficacy of these technologies in reducing impingement and entrainment mortality, including cost-effectiveness relationships. EPA also considered additional factors set out in 304(b) of the Clean Water Act, including location, age, size, and type of facility. EPA next considered the non-water quality effects of different technologies on energy production and availability, electricity reliability, and potential adverse environmental effects that may arise from the use of the different controls evaluated.

EPA has also considered the costs and the benefits of the different technologies it evaluated for BTA. Consideration of benefits in particular is complicated by the absence of well-developed tools or data to fully express the ecological benefits in monetized terms. EPA has, however, used the best currently available science to monetize the benefits of the various options in four major categories: Recreational fishing, commercial fishing, nonuse benefits, and benefits to threatened and endangered species (see Exhibit VIII–10). EPA believes that the benefits estimated for the first two categories are fairly complete, while the benefits estimated for the latter two categories are incomplete for a number of reasons. For example, the non-use benefits consider only the northeast and middle Atlantic states. EPA will continue to refine its tools in order to develop a more complete analysis concerning benefits during the rulemaking proceeding.

As a result of this thorough evaluation, EPA is proposing the use of modified traveling screens with a fish handling and return system or reduced intake velocity as BTA for impingement mortality. EPA's record shows modified traveling screens are available for all facilities, whereas reduced intake velocity may not be available at all locations. For entrainment, on the other hand, EPA could identify no single technology that represented BTA for all facilities for the reasons explained in detail below. Instead, as the national BTA entrainment requirement for existing facilities, EPA is proposing to adopt regulations that establish a process for the permitting authority to determine entrainment BTA controls on a site-specific basis following the consideration of several factors. In addition to the general considerations discussed above, EPA has identified the following specific factors as the key elements in its decision not to prescribe a single technology as the basis for a national BTA determination. These factors are local energy reliability, air emissions permits, land availability, and remaining useful plant life. The rest of this chapter describes each of these considerations in detail.

B. Technologies Considered to Minimize Impingement and Entrainment

As described in Section IV, power plants and manufacturers withdraw large volumes of cooling water on a daily basis. The majority of environmental impacts associated with intake structures are caused by water withdrawals that ultimately result in the loss of aquatic organisms. These losses may be due to impingement, entrainment, or both. Impingement occurs when organisms are trapped against the outer part of a screening device of an intake structure.[36] The force of the intake water traps the organisms against the screen and they are unable to escape. Not all organisms contained in the incoming water are impinged, however. Some may pass through the screening system and the intake structure and travel through the entire cooling system including the pumps, condenser tubes, and discharge pipes. This is referred to as entrainment. Various factors lead to the susceptibility of an organism to impingement or entrainment. For more detailed discussion of impingement and entrainment and their resulting impact, see 67 FR 17136–17140 and the EEBA.

As described in Section III.D, reductions in impingement or entrainment do not necessarily mean reductions in mortality. For purposes of this proposal, EPA has developed the following definitions for impingement and entrainment and mortality:

- Impingement: The entrapment of all life stages of fish and shellfish on the outer part of an intake structure or against a screening device during periods of intake water withdrawal.
- Impingement Mortality: The death of fish or shellfish due to impingement (as defined above). Note impingement mortality need not occur immediately; impingement may cause harm to the organism, which results in mortality several hours after the impingement event. For purposes of this proposed rule, impingement mortality is limited to those organisms collected or retained by ⅜ inch sieve.
- Entrainment: The incorporation of all life stages of fish and shellfish with intake water flow entering and passing through a cooling water intake structure and into a cooling system.
- Entrainment Mortality: The death of fish or shellfish due to entrainment. This also includes the death of those fish and shellfish due to fine mesh screens or other technologies used to exclude the organisms from entrainment. For purposes of this proposed rule, entrainment mortality is limited to those organisms passing through a ⅜-inch sieve.

Based on available information, as described in section III.D, EPA is assuming for purposes of this rule that all entrained organisms are a loss, *i.e.*, no entrained organisms survive. Therefore, in the absence of entrainment control, entrainment is assumed to lead to entrainment mortality. Also see Chapter A7 of the Phase II Regional Studies Document (DCN 6–0003; EPA–HQ–OW–2002–0049–1490). Entrainable organisms generally consist of eggs and early life stage larvae. Early larvae generally do not have skeletal structures, have not yet developed scales, and in many cases are incapable of swimming for several days post hatching. However, for impingement, mortality occurs less than 100% of the time. Impingeable organisms are generally larger juvenile or adult fish, with fully formed scales and skeletal structures, and well developed survival traits such as avoidance responses. EPA's data demonstrate that, under the proper conditions, many impinged organisms survive.

In addition to these definitions it is helpful to further characterize

[36] Typically, cooling water intake structures use various screening devices to prevent large objects (e.g., trash, logs) from being drawn in with the cooling water and ultimately clogging or damaging the cooling water system.

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impingement and entrainment as those terms are used in the literature and in studies conducted by power plants. Historically, traveling screens deployed by power plants utilized a ⅜-inch mesh size. For this reason, most studies and reports referring to impingement are in fact referring to those organisms impinged on a ⅜-inch mesh screen. Impingement can also refer to any organism incapable of swimming away from the intake structure due to the water velocity at the intake. Similarly, entrainable organisms are those organisms fitting through a mesh of less than or equal to ⅜ of an inch. This also means the majority of entrainable organisms are comprised of eggs, larvae, and juveniles. More recent studies, particularly those that evaluate mesh sizes smaller than ⅜ of an inch, continue to refer to impingement as any organism caught on the screen. This can cause some confusion, as many organisms that would have been entrained with a ⅜-inch mesh instead become impinged by the finer mesh. These are referred to as "impinged entrainables" or "converts." EPA has also found that most studies of entrainment are biased towards the larger (older) larvae with higher survival rates and do not analyze survival of smaller larvae. This corresponds to larvae body lengths sufficient to have begun scale and bone development, and generally reflects the more motile early life stages. EPA found these study findings cannot be applied to non-motile life stages, which are incapable of avoidance responses. As discussed in Section III.C, it is also important to note that the prevention of entrainment by some exclusion technologies may result in very high entrainment reductions, but these organisms do not necessarily survive interactions with the exclusion technology. Therefore, while entrainment refers specifically to passage through the cooling water intake system, entrainment mortality also includes those smaller organisms killed by exclusion from the cooling water intake system. Today's rule proposes to use the ⅜-inch mesh size as part of the definition of impingement and entrainment mortality as a means of clearly differentiating those organisms that may be susceptible to impingement or entrainment, and thereby avoiding any confusion over the status of "impinged entrainables" or "converts."

Generally, there are two basic approaches to reduce impingement and entrainment (I&E) mortality. The first approach is flow reduction, where the facility installs technology or operates in a manner to reduce or eliminate the quantity of water being withdrawn. Reduced volumes of cooling water produce a corresponding reduction in I&E, and therefore reduced I&E mortality. The second way to reduce I&E is to install technologies or operate in a manner that either (a) gently excludes organisms or (b) collects and returns organisms. Under the first approach, technologies or practices are used to divert those organisms that would have been subject to I&E. The second approach is to install collection and return technologies; organisms not diverted are collected and returned back to the source water.

Though not available to all facilities, a third approach to reducing impingement and entrainment is relocating the facility's intake to a less biologically rich area in a water body, usually further from shore and/or at greater depths, or varying the timing of withdrawals by time of day, season, etc., to target withdrawals to times when organism densities are lower. This approach can be effective at entrainment reduction, but is not generally available to inland facilities.

The section below further describes flow reduction and exclusion technologies.

1. Flow Reduction

Flow reduction is commonly used to reduce impingement and entrainment. For purposes of rulemaking, EPA assumes that entrainment and impingement (and associated mortality) at a particular site are proportional to source water intake volume.[37] Thus, if a facility reduces its intake flow, it similarly reduces the amount of organisms subject to impingement and entrainment. Some common flow reduction technologies include: Variable frequency drives, variable speed pumps, seasonal operation or seasonal flow reductions, unit retirements, use of alternate cooling water sources, water reuse, and closed-cycle cooling systems. For additional detailed information on these technologies as well as others, see the TDD, "California's Coastal Power Plants: Alternative Cooling System Analysis" (DCN 10–6964), and EPRI's "Fish Protection at Cooling Water Intake Structures: A Technical Reference Manual" (DCN 10–6813).

a. Variable Frequency Drives and Variable Speed Pumps

A facility with variable speed drives or pumps operating at their design maximum can withdraw the same volume of water as a conventional circulating water pump. However, unlike a conventional circulating water pump, variable speed drives and pumps allow a facility to reduce the volume of water being withdrawn for certain time periods. The pump speed can be adjusted to reduce water withdrawals when cooling water needs are lower, such as when ambient water temperatures are colder (and therefore capable of dissipating more heat) or when fewer generating units are operating. In site visits, EPA found that variable speed drives and pumps were typically used at units operating below capacity, such as load following units. For this reason most base load generating units and continuously operated manufacturing processes would obtain minimal reductions in flow as a result of these technologies. EPA estimates that facilities with intermittent water withdrawals could achieve a 5 to 10 percent reduction in flow.[38] EPA is further aware that some facilities need to withdraw water for cooling even while the facility is not in production, such as facilities on standby status, or nuclear facilities where the heat energy generated by fission must still be dissipated while the facility is out of service.

b. Seasonal Flow Reductions

Seasonal flow reduction refers to the reduction or elimination of a quantity of water being withdrawn during certain biologically important time periods. Most facilities that practice seasonal flow reductions do so in order to reduce entrainment because peak entrainment events are often seasonal, typically occurring during local spawning season, while impingement is more sporadic. For example, clupeids species experience impingement episodes sporadically all throughout the winter and spring. Largemouth bass, on the other hand, may spawn in the late-spring, which would thus be a season of

[37] Impingement rates are related to intake flow, intake velocity, and the swimming ability of the fish subject to impingement. Entrainment is generally considered to be proportional to flow and therefore reduced on a 1-to-1 basis via flow reductions, as EPA assumes for purposes of national rulemaking that entrainable organisms are uniformly distributed throughout the source water. EPA has consistently applied this assumption throughout the 316(b) rulemaking process (see, *e.g.*, 66 FR 65276 for a discussion of proportional flow requirements in the Phase I rule or 69 FR 41599) and continues to believe that it is broadly applicable on a national scale and is an appropriate assumption for a national rulemaking. EPA recognizes that this assumption is not necessarily true on a site specific basis and that relocating or varying the time pattern of withdrawals may be effective strategies to reduce I&E in some cases.

[38] Withdrawals of colder water could allow facilities to reduce their intake using variable speed drives and pumps, but EPA does not have data on the efficacy or availability of this approach.

potentially high entrainment for this species. During this specific peak entrainment time period, a facility could operate less (or perhaps not at all) thereby reducing or eliminating the volume of cooling water withdrawn. This may be accomplished through a combination of variable speed pumps or shutting down some portion of the pumping system. Seasonal flow reduction may also consist of operating a once-through cooling system during part of the year and switching to closed-cycle during peak entrainment season. Facilities may also choose to schedule periodic maintenance to occur during these time periods; these maintenance activities often require the facility to reduce or cease operations and can be timed to coincide with the most biologically productive periods. By identifying species of concern at facilities visited by EPA, the Agency has identified some sites where entrainment is significant all year long, and other sites where peak entrainment occurs in as few as three to four months of the year. In addition, not all power generating facilities in a local area could stop operating at the same time without interrupting local electricity reliability. Therefore, not all facilities can utilize seasonal flow reduction technologies.

c. Unit Retirements

Some power plants have retired units completely or have essentially ceased all operations but have yet to be formally retired or decommissioned. Reasons for their inactivity vary,[39] but the end result is the facility eliminates the need for cooling water withdrawals for these units. Similarly, manufacturers may retire processing units as market demand changes, process lines are moved to other sites, or production technologies change. Unit closures provide clear reductions in flow, but the demand for electricity (or other products) may dictate that production be increased at the facility in question or another facility altogether; there is usually no guarantee that the intake flow will be permanently retired. EPA expects flow reductions due to unit closures could be reasonably included as part of a facility's I&E mortality reductions for a period of up to 10 years.

d. Alternate Sources of Cooling Water

While not reducing the overall usage of water at a facility, using an alternate source of cooling water may have the same effect in reducing impingement and entrainment, as new or additional withdrawals from surface waters may be reduced. An example is using "gray" water as a source of cooling water; a facility reaches an agreement with a nearby wastewater treatment plant to accept the WWTP's effluent as a source of cooling water.[40] Such alternative sources are limited by available capacity, consistency of flow, and increasing competition for these sources of water, and may be more challenging to find for existing facilities than for new facilities that are not yet fixed in location.

e. Water Reuse

Typically associated with manufacturing facilities, water reuse (defined as using water for multiple processes) can reduce the volume of water needed for cooling, process, or other uses. For example, a facility might withdraw water for non-contact cooling water and then re-use the heated effluent as part of an industrial process. In effect, the facility has eliminated the need to withdraw additional water for the latter process. EPA has observed significant water reuse at manufacturing facilities, but has not developed national level data for such reuse due to the range of different manufacturing sectors and the significant variability in manufacturing processes (during site visits, it was observed that complex facilities have found it difficult to assess their specific water reuse). See Section IV for further discussion on water usage in specific industrial sectors.

f. Closed-cycle Cooling Towers

Closed-cycle cooling systems allow a facility to transfer its waste heat to the environment using significantly smaller quantities of (or in some cases no) water. There are two main types of closed-cycle cooling systems: Wet cooling and dry cooling. Each of these is described below.

Wet Cooling Tower Systems

In a wet cooling system, cooling water that has absorbed waste heat, transfers that heat through evaporation of some of the heated water into the surrounding air and recirculates the cooling water to continue the cooling process.[41] This process enables a facility to re-use the remaining water, thereby reducing the quantity of water that must be withdrawn from a water body. Because the heat is transferred through evaporation, while the amount of water withdrawn from the water source is greatly reduced, it is not eliminated completely because make-up water is required to replace that lost through evaporation and blowdown. There are two main types of wet cooling systems: Natural draft and mechanical. While wet cooling towers reduce withdrawals relative to once-through systems, they may increase the consumptive use of water since they tend to rely on evaporation (which is not returned to the water body) for heat dissipation. When once-through cooling is used and withdrawals are a significant portion of the waterbody, the return of heated water may contribute to greater evaporation from the water body. However, EPA does not have data on the relative magnitude of these effects. The relative loss of water through evaporation for closed cycle and once-through systems is site specific, depending on the exact design of the systems.

A natural draft cooling tower is tall[42] and has a hyperbolic shape. The height of these towers creates a temperature differential between the top and bottom of the tower, creating a natural chimney effect that facilitates heat transfer as heated water contacts rising air. In contrast, mechanical cooling towers rely on motorized fans to draw air through the tower and into contact with the heated water. These towers are likely to be much shorter units than natural draft cooling towers,[43] and due to their modular construction can be built in multiples, but they may require more land area for the same amount of cooling. Both types of towers require electricity for pumps, while mechanical draft towers also require electricity to operate the fans; both electricity needs serve to reduce a facility's net generating output. Thus the monetary and environmental costs of making up this reduction in energy efficiency need to be considered. These environmental costs include human health and welfare effects from increased air emissions, including the global climate change effects of increased greenhouse gas output at fossil-fueled plants. Both natural draft and mechanical cooling towers can operate in freshwater or saltwater environments. Saltwater applications typically require more make-up water than freshwater

[39] Note that some generating units are retired for market-driven reasons (*i.e.,* the unit is no longer considered sufficiently profitable to operate). They may also be mothballed, placed on cold storage, or maintained in various other states of operational readiness.

[40] See, for example, EPA's site visit report for PSEG's Linden Generating Station (DCN 10–6557), which has a capacity of 1230 MW, 35% CUR, and uses 7–8 mgd of gray water as makeup water for its cooling towers.

[41] In addition, a smaller portion of the heat is also removed through direct contact between the warm water and the cooler surroundings.

[42] Natural draft towers can be as high as 500 feet or more.

[43] Mechanical draft towers typically range from 30 to 75 feet in height.

applications, making them less efficient in reducing water withdrawals.[44] Optimized cooling towers may achieve flow reductions of 97.5 percent or better and 94.9 percent or better for freshwater and saltwater sources, respectively.

Dry Cooling Tower Systems

Dry cooling systems virtually eliminate the need for cooling water withdrawals.[45] Unlike wet cooling systems, in dry cooling systems, waste heat is transferred completely through convection and radiation, rather than evaporation. Direct dry cooling is much like a car radiator; turbine exhaust steam passes through tubes or fins and the condensate is returned for reuse in the turbine. The system is completely closed to the atmosphere and there is no contact between the outside air and the steam or the resulting condensate. Due to the heavy reliance of dry cooling on ambient air temperatures and the lower efficiency of heat transfer through convection and radiation, dry cooling towers are much larger and therefore more expensive[46] than wet cooling towers for a given cooling load. Dry cooling towers have been built in areas where limited water supplies exist for either once-through cooling or wet cooling make-up water, such as the arid southwestern U.S. Dry cooling is not demonstrated and available for nuclear facilities, due to the backup cooling systems and related safety needs required at a nuclear facility.

Hybrid Cooling Tower Systems

In certain applications, a facility may choose a hybrid cooling tower design that incorporates elements of both wet and dry cooling. Typically, the base of the tower functions as a wet cooling tower and the upper portion as a dry tower; the most common reason for this design is to reduce the visible plume emitted from the tower, which is accomplished by recapturing some of the water vapor evaporated in the wet portion of the tower. This design is also usually much shorter than natural draft wet towers, which can also offer plume abatement controls.

2. Exclusion Technologies To Minimize Impingement and/or Entrainment

Over the last several decades, in addition to flow reduction and closed-cycle cooling, numerous technologies have been developed in an effort to minimize impingement and entrainment mortality associated with cooling water intake systems. The following summarizes the most widely used technologies as well as the most effective and best performing technologies. For additional detailed information on these technologies as well as others, see the TDD, CA Report, and EPRI report.

a. Screens

i. Traveling Screens

Traveling screens are a technology in place at virtually all cooling water intake structures. These screens were originally designed to prevent debris from entering the cooling water system, but also prevent some fish and shellfish from entering the cooling water system. Traveling screens have been installed in numerous environmental conditions: Salt water, brackish water, fresh water, and icy water. Based on the technical survey, EPA found 93 percent of electric generators and 73 percent of manufacturers employ traveling screens or other intake screens. There are many types of traveling screens (*e.g.,* through flow, dual flow, center flow). The most common design in the U.S. is the through flow system. The screens are installed behind bar racks (trash racks) but in front of the water circulation pumps. The screens rotate up and out of the water where debris (including impinged organisms) is removed from the screen surface by a high pressure spray wash. Screen wash cycles are triggered manually or by a certain level of head loss across the screen (indicating clogging). By definition, this technology works by collecting or "impinging" fish and shellfish on the screen. Traveling screens are ideally used with a fish handling and return system, discussed further in Section VI.B.3 below.

ii. Cylindrical Wedgewire Screens

Cylindrical wedgewire screens, also called "V" screens or profile screens, unlike traveling screens, are a passive intake system. Wedgewire screens consist of a v-shaped, cross section wire on a framing system. Slot sizes for conventional traveling screens typically refer to a square opening (3/8" × 3/8") that is punched or woven into the screen face. Wedgewire screens are constructed differently, however, with the slot size referring to the maximum distance between longitudinally adjacent wires. These screens are designed to have a low through-slot velocity (less than 0.5 ft/sec or 0.15 m/sec) and typically have smaller slot sizes than a coarse mesh traveling screen. The entire wedgewire structure is submerged in the source waterbody.

When appropriate conditions are met, these screens exploit physical and hydraulic exclusion mechanisms to achieve consistently high impingement reductions (and as a result, impingement mortality reductions). Wedgewire screens require an ambient current crossflow to maximize the sweeping velocity provided by the waterbody. The screen orientation and cross current flow carries organisms away from the screen allowing them to avoid or escape the intake current. Lower intake velocities also allow fish to escape from the screen face. Entrainment reductions can potentially be observed when the screen slot size is small enough and intake velocity is low enough to exclude egg and larval life stages.[47] There is also limited evidence suggesting that extremely low intake velocities can allow some egg and larval life stages to avoid the intake due to hydrodynamic influences of the cross current. Therefore performance is largely dictated by local conditions that are further dependent on the source waterbody's biological composition. Costs of wedgewire screens also increases significantly as slot size and design intake velocity decrease. Wedgewire screens may also employ cleaning and de-icing systems such as air-burst sparging to aid in maintaining open intake structures and low intake velocities.

According to data from the industry questionnaire, EPA's site visits, and industry documents, dozens of facilities across the U.S. employ cylindrical wedgewire screens. However, wedgewire screens are not feasible for facilities with limited access to source water, such as shallow water or limited shoreline frontage. Wedgewire screens may also not be feasible where the size and number of wedgewire screens would interfere with navigational traffic. As described above, locations also need to have an adequate source water sweeping velocity. Most of the performance data for wedgewire screens is based on coarse mesh slot sizes with an intake velocity of 0.5 feet per second. As it is extremely difficult to measure

[44] Modular cooling tower units provide an additional cooling tower alternative. Modular cooling towers resemble mechanical cooling towers, but are portable, typically rented for short-term periods and quickly assembled.

[45] Dry cooling systems do blow down some of the circulating water within the cooling system to prevent the buildup of materials within the condenser. However, the volume of makeup water is extremely low—a dry cooling system typically reduces intake flows by 98–99 percent over a comparable once-through cooling system.

[46] The construction and capital costs for dry cooling towers have been reported as five to 10 times as expensive as wet cooling towers, and the parasitic load for dry cooling is higher than for wet cooling. See DCN 10–6679.

[47] Note that this is entrainment exclusion and not necessarily related to the survival of entrainable organisms. See Section III.B.2 for more detail.

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impingement and entrainment reductions in the field, most performance data is based on barge studies and lab studies. EPA does not have data on the performance of fine mesh wedgewire screens on entrainment survival; therefore EPA has only considered wedgewire screens for impingement mortality. For additional discussion of the specific design and operation of cylindrical wedgewire screens, see the TDD. The following section discusses the importance of mesh size to impingement and entrainment mortality reductions.

iii. Screen Mesh Size Considerations

Coarse Mesh

Coarse mesh traveling screens are the typical traveling screen fitted on the majority of cooling water intakes. A large number of facilities have intake screens with ⅜-inch (9.5 mm) mesh panels. This size mesh is common because, as a general rule of thumb, the maximum screen slot size is never larger than one half of the condenser tube diameter (the condenser tubing is the narrowest point in the cooling water system and, as such, is most susceptible to clogging from debris), and this tubing is typically ¾ or ⅞ inches in diameter. Mesh of ⅜-inch (roughly 9.5 mm) does not prevent entrainment and in the absence of any other precautions can lead to high mortality of impinged fish. Coarse mesh traveling screens have been in use by both power plants and manufacturers for more than 75 years and represent the baseline technology. Similarly, the majority of successful wedgewire installations are coarse mesh.

Fine Mesh

Fine mesh traveling and wedgewire screens are similar to coarse mesh screens, with the only difference being the size of the screen mesh. The mesh size of fine mesh screens varies, depending on the organisms to be protected, but typically range from 0.5 to 5 mm. Typically, facilities have incorporated fine mesh in an effort to reduce entrainment. Data in the record demonstrate that entrainment typically decreases as mesh size decreases. However, slot sizes larger than 2 mm do not prevent eggs from passing through the screen. Fine mesh traveling screens have been in use in this industry since the 1980s. EPA estimates as many as 17 percent of existing intakes could not be expanded in size to accommodate a 2 mm mesh, and as many as 55 percent of existing intakes could not accommodate a 0.5 mm slot size under conditions of low intake velocities. For these reasons, fine mesh screens are demonstrated for some locations, but are not the best performing technologies, and are not available technologies for the industry as a whole. See Chapter 6 of the TDD for more details.

b. Barrier Nets

Barrier nets are nets that fully encircle the intake area of water withdrawal, from the bottom of the water column to the surface and that prevent fish and shellfish from coming in contact with the intake structure and screens. According to data from the industry questionnaire (as of the year 2000), at least a half dozen facilities employ a barrier net. Typically, barrier nets have large mesh sizes (*e.g.,* ½-inch or 12.7 mm)[48] and are designed to prevent impingement. Due to the large mesh size, they offer no reduction in entrainment. They are often deployed seasonally, wherever seasonal migrations create high impingement events or to avoid harsh winter conditions which jeopardize integrity of the net. Barrier nets also prevent impingement of shellfish on the intake traveling screen. Shellfish such as crustaceans may pose a unique issue for traveling screens because the shellfish are not impinged, but rather they may grab hold of the traveling screen surface and are not removed from the traveling screen by pressure wash sprays. Barrier nets have been shown to be particularly helpful in this regard. For this reason, the costs of options considered today include the costs of barrier nets to minimize impingement mortality of shellfish.

c. Aquatic Filter Barriers

Aquatic Filter Barriers (AFBs), such as the Gunderboom Marine Life Exclusion System (MLES) or simply "Gunderboom," are similar to barrier nets in that they extend throughout the area of water withdrawal from the bottom of the water column to the surface. However, AFBs consist of water permeable fabric panels with small pores (< 20 microns). AFBs reduce both impingement mortality and entrainment because they present a physical barrier to all life stages. The surface area of an AFB is quite large compared to a traveling screen, allowing for extremely low water velocities. The low velocity allows non-motile organisms to drift away. EPA is aware of one power plant that used an AFB, but notes that this facility recently ceased operations.[49] EPA has updated performance data for AFB for small flow intakes, but does not have enough data to evaluate the technology at large intakes and in all waterbodies.

3. Collection and Return

Conventional traveling screens were not designed with the intention of protecting fish and aquatic organisms that become entrapped against them. Marine life may become impinged against the screens from high intake velocities that prevent their escape. Prolonged contact with the screens may suffocate insufficiently strong species or certain susceptible life stages of fish. Exposure to high pressure sprays and other screening debris may cause significant injuries that result in latent mortality, or increase the susceptibility to predation or re-impingement. Organisms that do survive initial impingement and removal are not typically provided with a specifically-designed mechanism to return them to the water body and are handled in the same fashion as other screening debris. Other objects collected on the screen are typically removed with a high-pressure spray and deposited in a dumpster or debris return trough for disposal. Screens are rotated periodically based on a set time interval or when the pressure differential between the upstream and downstream faces exceeds a set value. Conventional traveling screen systems have been modified to reduce impingement-related mortalities with collection and return systems. In simplest form, this is comprised of a return flume or trough with sufficient water volume and flow to enable impinged organisms to return to the source water. Return systems should be designed to avoid predation and latent mortality while organisms are in the flume, positioned at an appropriate water depth for high survival of the organisms, located at an appropriate elevation to avoid large drops of the organisms back to the surface water, and sited to avoid repeated impingement of the organisms by the intake structure.

Following the 1972 Clean Water Act's requirement to require technology-based solutions to minimize adverse environmental impacts, some conventional coarse mesh traveling screen systems were modified to reduce impingement mortality by removing fish trapped against the screen and returning them to the receiving water with as few injuries as possible. The first modified

[48] Barrier net mesh sizes vary, depending on the configuration, level of debris loading, species to be protected, and other factors.

[49] This facility ceased operations for reasons other than impingement and entrainment related to cooling water intake.

screens, also known as "Ristroph" screens, feature capture and release modifications. In the simplest sense, these screens are fitted with troughs (also referred to as buckets) containing water that catch the organisms as they rise out of the water and are sprayed off of the screen. The return component consists of a gentle mechanism to remove impinged fish from the collection buckets, such as a low-pressure spray. The buckets empty into a collection trough that returns fish to a suitable area in the source water body. These modified screens have shown significant improvements in reducing impingement mortality compared with unmodified screen systems.

Data from early applications of the "Ristroph" screen design showed that while initial survival rates might be high at some installations, latent mortality rates were higher than anticipated, indicating significant injuries could be sustained during the impingement and return process that were not immediately fatal. Based on a study conducted by Ian Fletcher in the 1990s (see DCN 5–4387), industry identified several additional critical screen modifications to address latent mortality. These include redesign of the collection buckets to minimize turbulence, addition of a fish guard rail/barrier to prevent fish from escaping the collection bucket, replacement of screen panel materials with "fish friendly" smooth woven mesh, and a low pressure wash to remove fish prior to any high pressure spray to remove debris on the ascending side. The Fletcher analysis also identified that longer impingement duration, insufficient water retention in the buckets, and exposure to the air and temperature extremes could negatively impact fish survival. Finally, these findings indicate that modified Ristroph screens must be continually rotated instead of the periodic rotation schedule common with conventional screen systems. Performance data for modified traveling screens with fish return systems show low levels of impingement mortality across a wide variety of water body types and fish species. Therefore, EPA has concluded modified traveling screens with a fish return system is a candidate best performing technology for impingement mortality.

For additional and more detailed discussion of the specific design and operation of these screen modifications, see the TDD.

4. Intake Location and Velocity Caps

Currently, the most common intake location for a cooling water intake structure is along a shoreline. In some types of waterbodies, shoreline locations are thought to have the potential for greater environmental impact because the water is withdrawn from the most biologically productive areas especially with regards to earlier life stages. Some facilities employ an offshore intake to withdraw water from less biologically productive areas to reduce entrainment relative to intakes located in more productive shoreline areas, though impingement (and therefore impingement mortality) reductions have also been observed. Obviously, reduction in impingement mortality and entrainment depend on intake location at a particular site, but the greatest potential for reductions is found with far offshore locations at distances of several hundred feet, something not possible on many rivers and streams. Both depth and the offshore location must be evaluated to determine if fish densities and species distribution at the offshore location are substantially different than those near the shoreline. Two areas where far offshore locations are commonly used today include the oceans and Great Lakes.

EPA found most offshore intakes are fitted with a velocity cap. Velocity caps are a physical structure rising vertically from the sea bottom and placed over top of the intake pipe. Intake water is withdrawn through openings in the velocity cap in a manner which converts the direction of flow from vertical to horizontal. The horizontal flow provides a physiological trigger in fish to induce an avoidance response thereby reducing impingement mortality. The velocity cap further serves to limit the zone of influence of the intake to the depth level at which the velocity cap is situated, thus affecting only the life stages that live at that depth. Furthermore, the velocity at an offshore intake is lower than the velocity of an equivalent sized intake at the shoreline due to differences in pressure, resulting in a lower intake velocity at the velocity cap than at a shoreline intake. Velocity caps are also usually equipped with supports and bar spacing selected to prevent larger aquatic organisms (*e.g.,* turtles or marine mammals) from entering the intake pipe. Because velocity caps operate under the principle that the organisms can escape the current, velocity caps do not offer entrainment reductions over and above those achieved by being located offshore. Reductions in entrainment observed with velocity caps occur due to the difference in organism densities in far offshore deep water compared to a surface intake at the shoreline.

For additional and more detailed discussion of the specific design and operation of offshore intake locations and velocity caps, see the TDD.

5. Reduced Intake Velocity

Impingement mortality can be greatly reduced by reducing the through-screen velocity in any screen. Reducing the rate of flow of cooling water through the screen (through-screen velocity) to 0.5 ft/sec or less reduces impingement of most fish because it allows them to escape the intake current. (See 66 FR 65274 and DCN 2–028A, EPRI's "Technical Evaluation of the Utility of Intake Approach Velocity as an Indicator of Potential Adverse Environmental Impact Under Clean Water Act 316(b).") Limited lab studies indicate that entrainment also may decrease as through-screen velocity decreases and that through-screen velocity may have an effect on entrainment survival rates, although such data is extremely variable by species (see DCN 10–6802 and DCN10–6803). As a result, some Phase II facilities have designed and operate their modified traveling screens or wedgewire screens so as not to exceed a through-screen velocity of 0.5 ft/sec. In addition, for the reasons described in Section VI.B.2, aquatic filter barriers and velocity caps [50] are likely to have velocities of 0.5 ft/sec or less. Swim speed studies demonstrate that for most facilities, an intake velocity of 0.5 feet per second or less results in 90 percent or better reductions in impingement mortality for most species. (EPA notes that preliminary results from recent studies of fine mesh screens suggest that at even lower intake velocities such as 0.25 feet per second, there may be some hydrodynamic influences that reduce entrainment mortality even more, because flow dynamics are nonlinear. It is unclear whether such observations hold true when cooling water withdrawals (water volumes) are large.) Therefore, EPA has concluded reduced intake velocity is a candidate best performing technology for impingement mortality.

C. Technology Basis for Today's Proposed Regulation

As described in the previous section, EPA examined the full range of technologies that reduce impingement and/or entrainment, and evaluated these technologies based on their efficacy in reducing impingement and entrainment, availability, and cost. Based on an assessment of these factors, EPA has

[50] Velocity as measured at the velocity cap opening.

identified three best performing technologies for further analysis as the basis for today's proposed rule: Modified traveling screens with a fish return (for fish impingement), barrier nets (for shellfish impingement on tidal waters), and mechanical draft wet cooling towers (for impingement and entrainment at new units). Although EPA has identified velocity reduction to 0.5 feet per second or less as a candidate best performing technology for impingement mortality, EPA is not proposing reduced intake velocity as BTA because it is not available at all facilities, but is allowing facilities to comply with intake velocity of 0.5 feet per second or less where available.

EPA has concluded that modified traveling screens, such as Ristroph screens and equivalent modified traveling screens are a best performing technology for impingement mortality. These screens use coarse size mesh with collection buckets designed to minimize turbulence, a fish guard rail/barrier to prevent fish from escaping the collection bucket, "fish friendly" smooth woven mesh, and a low pressure wash to remove fish prior to any high pressure spray to remove debris on the ascending side. The fish removal spray must be of lower pressure and the fish return must be fish friendly and provide sufficient water and minimize turbulence. Modified traveling screens must generally be continually rotated to obtain the highest reductions in impingement mortality. As discussed in Section III, traveling screens with post-Fletcher modifications achieve a monthly impingement mortality of 31 percent mortality (performance corresponding to the 95th percentile of the beta distribution) under conditions of 48 hour or less holding times. The use of the 95th percentile is consistent with the convention EPA has used for monthly average limitations in the effluent guidelines program (*i.e.,* for pollutant discharges). In developing the monthly average standard proposed for this rule, EPA has taken into account the reasonable anticipated variability in impingement mortality that may occur at a well-operated facility. Variability occurs due to changes in seasons, differing intake locations, higher mortality of certain species, and speciation found in different water bodies.

In contrast to the monthly average, which is adjusted to reflect month-to-month variability in performance of the technology, EPA has not included an upward adjustment of the annual average[51] standard to account for year-to-year variability. The annual average standard requires that impingement mortality not exceed 12 percent, calculated as the average of monthly impingement mortality for 12 consecutive months as determined by the Director. The 12 percent value corresponds to the long-term average performance of the technology that EPA has identified as BTA, based on available data from eight episodes of sampling collected on three different waterbody types over all seasons (see Chapter 11 of the TDD for more information). EPA expects facilities to track their compliance with the annual average standard on an ongoing basis, and to proactively modify their technology or operations when any individual monthly average suggests that they may be in danger of exceeding the annual average standard in the future. EPA recognizes that some variability in the annual average is inevitable, and thus the only way to consistently achieve the 12 percent annual standard is to target a better level of performance as the long-term average performance. While EPA's data show a long-term average performance of 12 percent impingement mortality for the BTA technology, EPA believes that by continuously monitoring and adaptively adjusting the operation of the technology, facilities can achieve a better long-term performance than is documented in the data, and thus consistently meet the annual average.

EPA also considered applying a confidence or tolerance limit to the long-term average in deriving the annual average standard. EPA rejected this approach because EPA believes that facilities can achieve better long-term performance than documented in the data by maintaining tight control on their technology and operations and adaptively managing the technology to achieve the best possible performance. While EPA has not included any additional costs for this adaptive management, EPA believes that such adaptive management should be part of the routine maintenance and operation of the technology and additional costs should not be necessary.

EPA has occasionally used annual limits in the effluent guidelines program (most recently for the pulp and paper industry category (40 CFR 430, promulgated in 1998) and has previously not included a variability factor for annual limits. Thus, EPA's proposed approach to calculating the annual standard for mortality impingement is consistent with past practice. EPA requests comment on its proposed approach for calculating and implementing the annual standard.

This technology does not minimize adverse environmental impacts associated with entrainment, and does not specifically address impingement mortality of shellfish.

EPA selected the seasonal deployment of barrier nets on estuaries and oceans as the best performing technology for minimizing the impingement mortality of shellfish (crustaceans) because no other technology has been identified that is available, demonstrated, and feasible. EPA did not select wedgewire screens as a candidate technology for impingement mortality because wedgewire screens are not available and feasible for all existing facilities. Wedgewire screen performance requires an adequate crossflow of the source water that is not present in all waterbodies. Wedgewire screens also require a minimum water depth in order to fully submerge the screens; the requisite depth and space to submerge the screens is not available at all locations, and further may pose an obstacle to navigation. However, where passive screens such as cylindrical wedgewire screens are feasible, data in the record shows they would perform equally as well or better than seasonal deployment of barrier nets. EPA has included a provision in the proposed regulation that specifies that passive screens meet the IM requirement for shellfish.

One technology for reducing impingement mortality as well as reducing entrainment mortality is wet cooling towers. Mechanical cooling towers achieve flow reductions of 97.5 percent for freshwater and 94.9 percent for saltwater sources by operating the towers at a minimum of 3.0 and 1.5 cycles of concentration, respectively. Based on the high levels (greater than 95 percent on average) of flow reduction obtained by optimized cooling tower operation, EPA has identified wet cooling towers as a candidate best performing technology for both impingement mortality and entrainment mortality for new units at existing facilities. As discussed further below, EPA is not proposing cooling towers as BTA for existing facilities (other than new units) because it is not available on a national basis. As described in Section VI.B, other technologies are demonstrated, but are not the best performing technologies and/or are not

[51] The annual average should not be confused with a rolling average of the preceding 12 months; EPA has specified in the rule language at §125.96 that the annual average means 12 consecutive months as specified by the Director. EPA expects that compliance with the annual average standard would be determined once each calendar year.

available technologies for the industry as a whole.

Although, EPA's record shows numerous instances of existing facility retrofits to closed-cycle, EPA has not identified it as BTA for the reasons discussed below. EPA has also not identified any other available and demonstrated candidate technology for entrainment mortality that is available on a national basis; see Section VI.B and the TDD for other entrainment technologies that may be available on a site-specific basis. EPA did not select the other flow reduction technologies such as variable speed drives and seasonal flow reductions as the technology basis for entrainment mortality because these technologies are not feasible for all facilities. Further, EPA has not identified a basis for subcategorizing existing facilities for where these flow reduction technologies are feasible, because their seasonal operation depends on the site-specific biology of the facility. EPA did not select relocation of a shoreline intake to far offshore as a technology basis because this technology is not feasible for all facilities. Even if EPA subcategorized by water body type (*i.e.,* intake location), the performance of wet cooling towers for entrainment mortality is at least three times that of a far offshore intake. Therefore relocation of the intake is not the best performing technology for minimizing entrainment mortality.

D. Options Considered for Today's Proposed Regulation

After careful consideration of the technologies available as described in Section VI.C, EPA developed four primary options based on these technologies for today's proposed rule. Three of the options would require the same impingement mortality standards, but would vary the approach to entrainment mortality controls. The fourth option would allow both impingement and entrainment mortality controls to be established on a site-specific BPJ basis for facilities with a DIF less than 50 MGD. The options are described briefly below, followed by a discussion of EPA's evaluation of each option as BTA.

1. Option 1—Uniform Impingement Mortality Controls at All Existing Facilities; Site-Specific Entrainment Controls for Existing Facilities (Other Than New Units) That Withdraw Over 2 MGD DIF; Uniform Entrainment Controls for All New Units at Existing Facilities

Under this option, all existing facilities withdrawing more than 2 MGD would be required to meet either the design or the performance standard for impingement mortality. Entrainment controls would be established by the permitting authority on a case-by-case basis taking into account those factors at a particular facility that are specified in today's proposal and the information required by the existing permit regulations at §122.21(r)(1)–(8) for all facilities with at least 2 MGD DIF. In addition, under EPA's CWA sections 301, 308, 316(b), and 402 authority, in the case of facilities withdrawing greater than 125 MDG AIF (actual intake flow), the site-specific determination of BTA would be based on a submission of certain other required information. The proposal would amend the permit application requirements at §122.21(r)(9)–(11) to require the facility to prepare an Entrainment Characterization Study that would fully characterize the amount of entrainment at the facility. (See below for more details about the study). In addition, under the proposal, the facility would provide detailed information on the other factors relevant to the Director's site-specific BTA determination. These would include information concerning the technologies available for control of such entrainment, the costs of controls, the non-water quality impacts of such controls, and both the monetized and non-monetized benefits of such controls. The CWA requires, and EPA encourages, the public to have a role in the permitting process; therefore EPA has also included meaningful public opportunity for participation in the site-specific decision making to help ensure the soundness of both the information and subsequent determinations.

a. Impingement Mortality Controls

As described earlier in this section, traveling screens have undergone a number of technological improvements over the years and modern screens have proven to be highly effective in promoting the survival of impinged organisms. The proposed rule requires the use of state-of-the-art screens with fish buckets, a low pressure spray wash, a dedicated fish return line, etc., but is not specifying any particular screen configuration, mesh size or screen operations, so long as facilities can consistently meet the numeric impingement mortality limits (impingement mortality also includes a design standard for shellfish). EPA is also not specifying additional design or operational criteria to promote development of improved technologies, and to allow facilities to use variations such as dual flow traveling screens and drum screens.

EPA did not select intake velocity as the sole technology basis for impingement mortality controls because, although the performance of 0.5 feet per second intake velocity is slightly better than the selected technology, the intake velocity is not available or feasible for all existing facilities (see Chapter 6 of the TDD). However, EPA has long recognized the relationship between impingement and intake velocity. EPA conducted an analysis of fish swim speeds in the Phase I rule (see 66 FR 65274) and concluded that a design through-screen velocity of 0.5 feet per second would be protective of 96% of motile organisms. As a result, a facility may chose to comply with the impingement mortality standards in today's proposed rule by instead demonstrating that the through-screen design velocity does not exceed 0.5 feet per second, or by demonstrating that the actual average intake velocity does not exceed 0.5 feet per second.

While the data shows the majority of healthy motile organisms would be protected by a maximum intake velocity of 0.5 feet per second, some species would not be adequately protected. Some facilities employ traveling screens, but do not have fish friendly modifications such as a fish handling and return system. EPA is concerned that some facilities would comply with the impingement mortality requirements by the intake velocity compliance alternative, and would continue to operate unmodified traveling screens. This is particularly a concern where the traveling screens are located in a forebay, potentially resulting in entrapment of any impinged organisms. Therefore, EPA is considering a provision that would require facilities to either demonstrate that the species of concern are adequately protected by the maximum intake velocity requirements, or to employ specific fish friendly protective measures including, at a minimum, a fish handling and return system. EPA solicits comment and data on such a provision.

EPA did not select wedgewire screens as the technology basis for impingement mortality controls because wedgewire screens are not available and feasible for all existing facilities. EPA also did not need to include wedgewire screens as a compliance alternative because wedgewire screens designed with an intake velocity of 0.5 feet per second can demonstrate compliance with the impingement mortality limits based on the intake velocity as just described. EPA did not select flow reduction by retrofit to closed-cycle cooling as the technology basis for impingement mortality because closed-cycle cooling

costs more than 10 times that of modified traveling screens with a fish return system. In other words, modified traveling screens with a fish return system and closed-cycle cooling are comparable in impingement mortality performance, but modified traveling screens with a fish return system is more cost-effective than flow reduction at preventing impingement mortality. EPA is not including wet cooling towers as a compliance alternative (*e.g.,* a pre-approved technology) because EPA's data shows existing facilities that retrofit to a closed-cycle cooling system have an intake velocity of less than 0.5 feet per second. As a practical matter, make-up water withdrawals are made at such low velocities that facilities with closed-cycle can demonstrate compliance with the alternative reduced intake velocity to meet the impingement mortality limits. For estuaries and oceans, EPA is proposing seasonal deployment of barrier nets on estuaries as the technology basis for minimizing the impingement mortality of shellfish (crustaceans) because no other technology has been identified that is available, demonstrated, and feasible. As noted previously, use of wedgewire screens (along with the limitations on intake velocity) obviates the need for barrier nets.

b. Entrainment Controls

The proposal would require consideration of site-specific entrainment controls for each facility above 2 MGD DIF. EPA considered proposing no further controls to address entrainment mortality, and to rely instead only on the BTA impingement mortality controls, which would achieve up to a 31 percent reduction in total AEI. EPA has not selected this option as the basis for national BTA because EPA believes that some facilities may be able to do more to control entrainment and that requiring a structured site-specific analysis of candidate BTA technologies for entrainment control will allow the Director to determine where it is appropriate to require such controls. However, one outcome of the site specific analysis may be that the Director would determine that no other technologies beyond impingement control meet the criteria for selection as BTA, because no other technologies are feasible and/or their benefits do not justify their costs. EPA requests comment on the option of basing national BTA on impingement controls only and dropping the specific requirement for a structured site-specific analysis of entrainment BTA options, as discussed below.

In the case of site-specific entrainment controls for facilities withdrawing greater than 125 MGD AIF, EPA's proposal would, in addition, require these facilities to develop and submit an entrainment characterization study for use by the Director in establishing site-specific BTA. See Section V.F for more on development of the 125 MGD threshold. (Facilities under the 125 MGD AIF threshold must still provide certain water body and water population information under the current permit applications requirements at §122.21(r)). An early step in conducting the entrainment characterization study is the preparation of an entrainment mortality data collection plan, which must be submitted to the Director for review and comment before implementation. The entrainment mortality data collection plan would include, at a minimum, the specific entrainment monitoring methods, taxonomic identification, latent mortality identification, documentation of all methods, and quality assurance/quality control procedures for sampling and data analysis appropriate for a quantitative survey. EPA would also require peer review of the entrainment mortality data collection plan. Peer reviewers would be selected in consultation with the Director who may consult with EPA and federal, State, and Tribal fish and wildlife management agencies with responsibility for fish and wildlife potentially affected by the cooling water intake structure(s).

The Entrainment Characterization Study would include information already collected to meet current §122.21(r)(4) requirements. In addition, under the new permit application requirements proposed for §122.21(r)(5)–(12), the facility would submit certain additional site-specific information. This would include an engineering study of the technical feasibility and incremental costs of candidate entrainment mortality control technologies. The facility would also study, evaluate, and document: the technical feasibility of technologies at a minimum including closed-cycle cooling and fine mesh screens with a mesh size of 2 mm or smaller; engineering cost estimates of all technologies considered; any outages, downtime, or other impacts to revenue along with a discussion of all reasonable attempts to mitigate these cost factors; and a discussion of the magnitude of water quality and other benefits, both monetized and non-monetized, of the candidate entrainment mortality reduction technologies evaluated. Finally, the information must include a discussion of the changes in non-water quality factors attributed to technologies and/or operational measures considered, including but not limited to increases and decreases in the following: energy consumption; thermal discharges; air pollutant emissions including particulates and associated human health and global climate change impacts; water consumption; noise; safety (*e.g.,* visibility of cooling tower plumes, icing); grid reliability, and facility reliability. See Section IX for a thorough discussion of these study requirements.

Under this option, it is EPA's expectation that the Director would review the candidate technologies for entrainment mortality control that at a minimum includes closed-cycle cooling and fine mesh screens. In the decision about what additional entrainment controls (if any) to require, the Director would consider all of the facility-specific factors described above. At a minimum, the Director must provide a discussion explaining how issues concerning local energy reliability, air emissions or land availability insofar as they relate to the feasibility of adoption of a particular entrainment technology, remaining useful plant life, and the relationship of social benefits to social costs were addressed in the site-specific determination. Under the proposal, the Director must issue a written explanation for the basis of the BTA determination for each facility. EPA also expects the written explanation would provide a review of the social costs (and not just the facility costs (see chapter 11 of the EA) of the various technologies; a review of the potential reductions in entrainment and entrainment mortality; and a review and analysis of monetized and non-monetized benefits).

Under Option 1, new units at an existing facility that withdraws more than 2 MGD would have requirements similar to the requirements of a new facility in Phase I. Under this option, new units would be required to reduce flow commensurate with closed-cycle cooling for the new unit. Under the proposal, as with Track II of the Phase I rule, a facility could demonstrate compliance with entrainment control requirements by establishing reductions in entrainment mortality for the new unit that are 90 percent of the reductions that would be achieved by closed-cycle cooling.

2. Option 2—Impingement Mortality Controls at All Existing Facilities That Withdraw Over 2 MGD DIF; Require Flow Reduction Commensurate With Closed-Cycle Cooling by Facilities Greater Than 125 MGD DIF and at New Units at Existing Facilities

Under Option 2, all in-scope existing facilities would be required to achieve the numeric impingement mortality limits described in Option 1 above. In addition, this option would require flow reduction commensurate with closed-cycle cooling by facilities greater than 125 MGD DIF and at new units. Option 2 explores using the facility size, in terms of design intake flow (DIF), as a factor for establishing different BTA for different subcategories. EPA's analysis shows that a DIF of 125 MGD would be an appropriate threshold for this purpose; see Section V. For all facilities that withdraw over 2 MGD but less than or equal to 125 MGD DIF, entrainment controls would be determined by the permitting authority on a case-by-case basis taking into account the factors at a particular facility. Facilities greater than 125 MGD DIF would not submit Entrainment Characterization Studies (because under this option this rule would have already determined that closed cycle is BTA for that facility), but all facilities would still submit §122(r)(2)–(r)(7) to the Director to inform the BTA determination as described in Option 1. Requirements for new units at an existing facility would be the same as described in Option 1.

EPA also considered a variation of this option that uses 125 MGD Actual Intake Flow (AIF) rather than 125 MGD Design Intake Flow (DIF) as the threshold. Setting the threshold at 125 MGD AIF would allow a Permit Director to treat differently those facilities that are above 125 MGD on a DIF basis but below 125 MGD on an AIF basis relative to today's Option 2. EPA traded off introducing more flexibility at those facilities for simplicity of implementation (DIF is static), but solicits comment on both the threshold and the flow basis for this option.

The technology basis for entrainment mortality controls for facilities greater than 125 MGD DIF under this option would be wet cooling towers as described in Section VI.B. The record shows optimized wet cooling towers achieve flow reductions of 97.5 percent and 94.9 percent for freshwater and saltwater sources, respectively. Optimized operation of wet cooling towers would be demonstrated through flow monitoring and conductivity measurements. Alternatively, this option would allow facilities to demonstrate flow reductions commensurate with closed-cycle cooling based on optimized wet cooling towers.

As part of this option, EPA would provide flexibility to the Director to establish compliance timelines for each existing facility to mitigate grid reliability and local electricity reliability. Under this option, most existing facilities would have no more than 10 years to complete the retrofit to closed-cycle cooling. Under this option the Director would determine when and if any such schedule for compliance is necessary, and if the facility is implementing closed-cycle as soon as possible. This provision would give the Director the discretion to provide nuclear facilities with no more than 15 years to complete the retrofit, because all nuclear facilities are baseload generating units and the additional flexibility in timelines would further mitigate energy reliability, and because the retrofits at these types of facilities in particular involve additional complexities and safety issues. The Director would have the discretion to provide manufacturing facilities with no more than 15 years to complete the retrofit due to the complexity of manufacturing facilities, multiple process units and product lines, and to allow consideration of production schedules in setting such a timeline.

3. Option 3—Establish Impingement Mortality Controls at All Existing Facilities That Withdraw Over 2 MGD DIF; Require Flow Reduction Commensurate With Closed-Cycle Cooling at All Existing Facilities Over 2 MGD DIF

Under this option, all in-scope existing facilities would be required to achieve numeric impingement mortality limits as described in Option 1 above. In addition, this option would require flow reduction commensurate with closed-cycle cooling by all facilities (including new units at existing facilities) as described in Option 2. This option would similarly authorize the Director to establish compliance timelines for each existing facility to mitigate grid reliability and local electricity reliability as described in Option 2 above. Requirements for new units at an existing facility would be the same as described in Option 1.

4. Option 4—Uniform Impingement Mortality Controls at Existing Facilities With Design Intake Flow of 50 MGD or More; BPJ Permits for Existing Facilities With Design Intake Flow Between 2 MGD and 50 MGD DIF; Uniform Entrainment Controls for All New Units at Existing Facilities

Under Option 4, only in-scope existing facilities with a design intake flow of 50 MGD or more would be required to comply with uniform national impingement regulatory requirements as described in Option 1 above. In-scope facilities with a design intake flow less than 50 MGD would not be subject to the national impingement requirements in today's proposed rule but would continue to have their 316(b) permit requirements established on a case-by-case, best professional judgment basis. In the case of an existing facility below 50 MGD that adds a new unit, the flow associated with the new unit would be subject to the uniform entrainment requirements based on closed cycle cooling. Finally, all existing facilities withdrawing in excess of 2 MGD of design intake flow would be subject to entrainment controls established on a site-specific basis.

EPA considered additional thresholds, subcategories, and other factors to explore other options; see Chapter 7 of the TDD for more information. In particular, EPA considered an approach that required impingement mortality controls only, but is not proposing such an approach because it would only address one-third of the mortality due to impingement and entrainment on a nationwide basis and EPA believes there is value in the structured site-specific entrainment BTA determination required in Option 1. As discussed in Section VI.E, EPA is aware of technologies that can further reduce entrainment mortality for some facilities. EPA also considered an approach that would establish both impingement and entrainment mortality requirements on a case-by-case basis taking into account the factors at a particular facility, but is not proposing such an approach because there are low-cost technologies for impingement mortality that are available, feasible, and demonstrated for facilities on a national basis. EPA requests comment on these and the other approaches discussed in Chapter 7.

E. Option Selection

EPA is proposing Option 1 as best technology available for minimizing adverse environmental impact under section 316(b) of the CWA. As previously explained, in evaluating

technologies that reduce impingement or entrainment mortality as the possible basis for section 316(b) requirements, EPA assessed a number of different technologies. Based on this technology assessment, EPA concluded that closed-cycle cooling reduces impingement and entrainment mortality to the greatest extent.

But EPA has determined that closed cycle cooling is not the "best technology available" for this proposal. After considering all of the relevant factors, EPA proposes that it should not establish a uniform BTA entrainment standard based on closed-cycle cooling for existing facilities other than for new units. Instead, for existing facilities other than new units, EPA is proposing that the permitting authority should establish BTA entrainment mortality controls on a site-specific basis. Site-specific proceedings are the appropriate forum for weighing all relevant considerations in establishing BTA entrainment mortality controls as discussed in section F below.

EPA proposes to reject closed-cycle cooling as the basis for national entrainment controls and choose an option under which the permitting authority would establish entrainment controls on a site-specific basis after considering specified factors. EPA concluded that closed-cycle is not the best technology available for minimizing adverse environmental impact on a national basis. The record shows that closed-cycle cooling is not practically feasible in a number of circumstances. While EPA cannot identify with precision the extent of these limitations on installation on closed-cycle on a nation-wide basis, EPA knows that the circumstances are not isolated or insignificant. In light of this, EPA decided that it should not establish closed-cycle cooling as the presumptive BTA entrainment control. Instead, entrainment controls should be determined in a site-specific setting where the opportunity for local community input in decision-making process will be maximized.

Four factors, in particular, led EPA, for this proposal, to reject a uniform standard based on closed-cycle cooling and illustrate why site-specific standard setting is the proper approach here. These factors are energy reliability, air emissions permits, land availability, and remaining useful plant life. Further explanation is provided below as to why these factors support establishing BTA entrainment mortality control on a site-specific basis as discussed in section F below.

As noted, the Supreme Court in its *Entergy* decision determined that EPA may permissibly consider the benefits, both quantitative and qualitative, derived from reductions in the adverse environmental impacts associated with cooling water intake structures and the costs of achieving them and determine the extent of reductions warranted under the circumstances. Further, E.O. 13563 directs agencies, to the extent permitted by law, to propose or adopt a regulation only upon a reasoned determination that its benefits justify its costs (recognizing that some benefits and costs are difficult to quantify). E.O. 13563, Sec. 1(b)(1).

Pursuant to the principles spelled out in the Executive Order, EPA has assessed costs and benefits for its proposed regulatory option and has reasonably determined that the benefits of its proposed rule justify the costs. EPA has analyzed the social cost of this rule to be $384 million annually. New unit requirements would cost $15 million per year. As will be described in more detail below, there are significant benefits associated with the proposed rule. These benefits include the annual reduction in impingement of 615 million age-one equivalents. In addition, there are important other benefits that EPA was not able to fully quantify such as reductions in impingement and entrainment at new units, impacts to many shellfish species, and non-use values associated with the vast majority of fish and shellfish. The rule would also require establishing site-specific entrainment control through a process in which specific environmental conditions and the localized benefits of entrainment reductions will be assessed along with the costs of controls. The information generated in the required studies would enhance the transparency of decision-making, and the opportunity for meaningful public participation and ensure decision-making based on the best available data. Overall, these requirements will foster protection and restoration of healthy aquatic ecosystems that have important commercial, recreational, aesthetic and cultural values to their surrounding communities. Many of the benefits that would result from the rule are not quantified, and as a result the Agency's quantitative benefits analysis underestimates the totality of the rule's benefits. Based on the record, EPA has determined that the proposed impingement and entrainment mortality controls will result in benefits that justify the costs of the rule.

EPA would also note that its valuation of the benefits is not yet complete. For example, EPA's analysis does not fully quantify or monetize certain potentially important categories of benefits, such as existence values for threatened and endangered species, secondary and tertiary ecosystem impacts, benthic community impacts, shellfish impacts and the impacts arising from reductions in thermal discharges that would be associated with closed cycle. Changes in fish assemblages due to impingement, entrainment and thermal effects are also not fully valued. These categories of benefits that are not fully valued are often referred to as non-use benefits: those benefits people derive absent a use or activity, such as fishing; the value one places on knowing that an aquatic ecosystem is healthy is a non-use value. Non-use benefits could be more completely evaluated than they have been to date. EPA intends to characterize these benefits more fully through the use of a stated preference survey of the general population and will consider the results of this survey analysis in development of the final rule. Although not discussed in this preamble, EPA also conducted an alternative benefits analysis that is suggestive of the potential for a more complete analysis to result in monetary benefits that are much more in line with social costs (see chapter 9 of the EEBA). These factors all lend further support to EPA's conclusion that benefits associated with the proposal justify its costs.

EPA is proposing that the permitting authority would consider social costs and benefits on a site specific basis in establishing entrainment mortality controls. This approach is consistent with the direction of E.O. 13563 and supported by several considerations.

On the basis of currently available information, a national evaluation of benefits no matter how accurate would necessarily fail to account for the variations in benefits from location to location. A national assessment would tend to mask variations in benefits and costs from different geographical locations for different water bodies. Thus for example, some fish species at coastal facilities have biological spawning attributes that differ from those at other locations. The proportion of the receiving water withdrawn for cooling may also vary among sites. The values that communities place on their resources may vary from site to site. As a consequence, for example, one ecological environment may experience large masses of hardier eggs subject to potential entrainment while another will have fewer but less hardy eggs susceptible to entrainment. The resulting differences in the value of reduced entrainment—which may be dramatic for some sites—necessarily disappear in a national aggregation of

results. The Agency has decided this masking of variation in benefits supports a requirement to consider the localized benefits of entrainment control technologies in the site-specific process to establish entrainment mortality controls.

Today's proposed rule establishes requirements based on closed-cycle cooling for new units added to an existing facility that are not a "new facility" as defined at §125.83. The requirements for new units are essentially the same as the requirements for a new facility in the Phase I rule.

EPA also considered a variation of Option 1 that would exclude existing facilities (except existing facilities that add a new unit) with a design intake flow under 50 MGD from the national impingement mortality requirements of today's proposal (Option 4). These smaller facilities would continue to be permitted on a case-by-case, best professional judgment basis for both impingement and entrainment controls. Under this option, 98.9 percent of the monetized benefits of Option 1 are realized. In addition, almost all small businesses would be excluded from the impingement requirement of the national rule, thereby reducing impacts of the national rule to small businesses. The cost of Option 4 would result in savings of $57 million over Option 1.

EPA rejected Option 4 for the proposal as BTA because EPA found that Option 1 is available, feasible, and demonstrated for all in-scope facilities on a national basis. Moreover, EPA analysis showed that economically Option 1 does not have a significant impact on a substantial number of small entities, including those that would be exempted from the national impingement mortality controls under Option 4. Of the 13 full-facility closures discussed below in Section VII, none are predicted to be small businesses. Additionally, the analysis performed under the Regulatory Flexibility Analysis showed that under Option 1, five to six small entities would incur costs exceeding 1 percent of revenue and 3 small entities would incur costs exceeding 3 percent of revenue. As percentages of the estimated total of small in-scope entities (56–96 small in-scope entities, see above), these small entities represent 5–13 percent of small in-scope entities at the 1 percent of revenue threshold, and 3–5 percent of small in-scope entities at the 3 percent of revenue threshold.

Option 4 is similar to the final determination with respect to the Phase III rule, which relied on BPJ to determine impingement and entrainment BTA for all facilities with DIF less than 50 MGD. Unlike the Phase III determination, Option 4 would not rely on BPJ for new units at existing facilities or manufacturing facilities with DIF greater than 50 MGD. This is consistent with the recommendations of the Small Business Advocacy Review Panel for the Phase III rule, which noted that an applicability threshold in the range of 20 to 50 MGD would remove a significant number of Phase III facilities, but only a small percent of flow, from coverage under national requirements, and recommended that EPA analyze a range of potential thresholds, particularly those between 20 and 50 MGD. EPA is also aware of concerns that even though Option 1 by itself does not have a significant adverse impact on a substantial number of small entities, many of the small entities affected by the rule, particularly those in the electric power sector, are subject to cumulative impacts from a number of other major regulations that will likely have to be implemented in the same time frame as this rule. For the final rule, EPA will also evaluate the relative costs and benefits of Option 4, once it has more complete benefits information, including results from its WTP Survey on impacts to fish populations. EPA solicits comment on Option 4 and the impacts, including the cumulative impacts of today's proposal on small entities generally. EPA also requests comment on whether, if Option 4 were adopted for the final rule, it should include uniform national requirements for new units at existing facilities with DIF less than 50 MGD based on closed-cycle cooling.

F. Four Factors Support EPA's Decision To Establish Site-Specific BTA Entrainment Controls for Existing Facilities

The four key factors that support determining entrainment mortality controls on a site-specific basis (except with respect to new units) and rejecting Options 2 and 3 are energy reliability, increased air emissions, land availability, and remaining useful life. First, EPA recognized that there may be potential adverse consequences to the reliability of energy delivery on the local level from the installation of cooling towers. Second, EPA also is aware that increased air emissions may be associated with increased combustion of fossil fuel as the result of installation of closed cycle cooling, and additional PM formulation associated with plume drift (even with plume abatement technology). These increased air emissions have human health, welfare, and global climate change impacts which must be considered. Furthermore, it may be difficult or impossible to obtain air permits for cooling towers at existing facilities located in nonattainment areas or attainment areas with maintenance plans. Third, EPA has identified land availability concerns that might limit the feasibility of the installation of cooling towers on a site-specific basis. Finally, EPA concluded that there are circumstances in which construction and installation of cooling towers might not be warranted given the remaining useful life of a particular facility. How all of these factors support the Agency's conclusion that site-specific, not national, entrainment controls for most existing facilities except those installing new units is discussed in detail below.

1. Energy Reliability Should Be Considered on a Localized Basis

During EPA's site visits, several urban areas were identified where the existing transmission system would not be able to transfer sufficient electricity during periods of extended downtime. This limitation to reliability occurs even when a surplus of electricity can be generated within the same NERC region. For example, EPA identified localized circumstances in Los Angeles and Chicago where an extended outage of one or more generating units could not be readily replaced by excess capacity in nearby areas. Currently available models are not able to predict localized impacts, and instead are limited to measures of reserve capacity in broader geographic regions. This uncertainty about the extent and likelihood of local reliability impacts is an important consideration in the decision to propose requiring site-specific development of section 316(b) entrainment requirements.

One approach EPA could have adopted in today's proposed rule would have been to establish a uniform entrainment requirement and then to address these local reliability concerns by providing permitting authorities the flexibility to establish extended compliance timelines (*i.e.,* 10 to 15 years) (see Option 2). This would have allowed facilities to develop more workable construction schedules with their permit writers and coordinate with NERC to schedule installation down times accounting for generating supply reliability needs. This approach would have been consistent with EPA's assessment that, at the national level (rather than local level), closed-cycle cooling would not pose material energy reliability consequences; see EA for more information. EPA was concerned that such a flexible approach, however, would not resolve all local reliability

concerns, because currently available information is not adequate to establish either the extent or significance of possible electric reliability concerns.

These same concerns would not apply in the case of the installation of new units because of the smaller nature of such projects and the availability of options like seasonal operation and portable cooling towers to address the flow reduction requirements. Since the unit is not yet online, the potential for local energy reliability to be compromised is minimal; also, local energy reliability is likely improved with the addition of the new unit, even if older units are later retired.

2. Increased Air Emissions Could Be a Factor on a Local Basis

As previously discussed, closed-cycle cooling would result in increased air emissions of various pollutants, including particulates, sulfur dioxide, nitrogen oxides, mercury, and greenhouse gases, among others.[52] As a result of the installation of closed-cycle cooling structures, fossil-fueled facilities would need to burn additional fuel (thereby emitting additional PM, CO_2, SO_2, NO_X, and Hg). There are two reasons for this: (1) To compensate for energy required to operate cooling towers, and (2) slightly lower generating efficiency attributed to higher turbine backpressure. In contrast to retrofits, new units can have their cooling water intake systems optimized for cooling towers, reducing the size of the cooling towers, increasing their efficiency, and reducing energy requirements (see Section VI.E).

The impact of the increased emissions varies based on the local circumstances. The increased emissions may consist of cooling tower emissions, stack emissions from increased fuel usage, and plumes of water vapor. EPA's analysis suggests that the most significant impacts will be specifically for $PM_{2.5}$, which, in addition to increased mortality and morbidity, may result in a facility having difficulty in obtaining air permits in those localities in non-attainment for $PM_{2.5}$ because of the need to identify offsets to its emissions. EPA notes that while there is the potential for increases in PM (*e.g.,* salt drift) in the vicinity of any wet cooling tower, there are plume abatement and drift eliminator technologies that may address this concern (and EPA has included costs for such technologies in its analysis of Options 2 and 3). However, emissions may not be eliminated entirely. EPA expects most effects of PM from cooling tower emissions would be so localized as to be wholly on the facility's property. (See DCN 10–6954.) EPA recognizes this is separate from PM emissions from the stack as a result of increased fuel usage. In addition, plumes of water vapor from the cooling tower may cause safety issues due to icing of nearby roadways, and visibility constraints for facilities located near an airport. EPA's review of emissions data from E–GRID (year 2005) suggests that impacts from other pollutants will be less significant, but on a localized basis these could still be significant. They include human health, welfare, and global climate change impacts associated with a variety of pollutant that are emitted from fossil fuel combustion generally. EPA is not able to quantify the frequency with which facilities may experience these local impacts, and therefore EPA believes a site-specific assessment must be conducted to fully address such local impacts.

EPA believes that emissions are less of a concern at new units. The condensers can be optimized for closed-cycle, reducing energy requirements, and high efficiency cooling towers can be incorporated into the design of the new unit, potentially allowing for installation of smaller cooling towers. Turbine backpressure and the associated energy penalty can be eliminated in a new unit. However, new units will still have a parasitic energy penalty. Therefore energy penalties and air emissions for tower operations can be minimized but not eliminated. The effects of requiring closed cycle cooling at new units of existing facilities is similar to the effects of this requirement at new facilities and would not pose an unacceptable impact. See the TDD for more information.

3. Land Availability Could Be A Factor on a Localized Basis

While EPA's record indicated that the majority of facilities have adequate available land for placement of cooling towers,[53] some facilities do have feasibility constraints. Based on site visits, EPA has found that several facilities have been able to engineer solutions when faced with limited available land. EPA attempted to determine a threshold of land (for example, one option explored a threshold of approximately 160 acres per GW) below which a facility could not feasibly install cooling towers. While EPA originally estimated as many as 23 percent of facilities would not have enough space,[54] EPA found some facilities with a small parcel of land were still able to install closed-cycle cooling by engineering creative solutions. On the other hand, EPA found that some facilities with large acreage still could not feasibly install cooling towers due to local zoning or other local concerns. In conjunction with setback distances to mitigate noise and plume abatement (based on GPS mapping of residential areas), EPA estimates as many as 25 percent of facilities may have one or more constraints on available space that would limit retrofit of cooling towers for the entire facility or would result in increased compliance costs. At this time, EPA lacks adequate data to better analyze how land constraints can be accommodated at existing facilities.

In contrast, for new units, because the amount of space dedicated to closed-cycle would be limited to the new unit rather than the entire facility, space constraints would be much less of an issue. New units also pose the opportunity to properly design an optimized closed-cycle cooling system for the new unit. Retrofitting an existing facility would require a facility to identify (or possibly obtain) enough acres to accommodate the cooling towers and their tie-in. By not uniformly requiring facilities to retrofit to closed-cycle, EPA has determined that more land is available for new unit construction, especially in light of compact design and more efficient use of limited resources. Furthermore, new units and their corresponding cooling system can be built in stages rather than as a facility-wide retrofit.

While EPA has concluded that space constraints would not foreclose the installation of closed cycle cooling for new units at existing facilities, EPA has concerns about whether, on a national basis, physical geography would constrain the full retrofit of closed-cycle cooling to existing facilities. Under the

[52] EPA recognizes that retrofitting closed cycle cooling could be combined with other energy efficiency or pollution control technologies with the net effect of reducing air emissions; however, facilities could (and may well have to under other rules) install such technologies anyway, without converting to closed cycle cooling as well. Comparing closed-cycle cooling to once-through cooling with all other technologies held constant, there is an energy penalty that would lead to greater air emissions.

[53] In the case of fossil fuel plants, scrubber controls may also be newly required to comply with air rules and standards.

[54] EPRI reported at least 6 percent of sites evaluated were deemed "infeasible" on the basis that no space was available on which to locate a cooling tower. (DCN 10–6951) While EPA does not have access to the facility level data, and is therefore unable to confirm the infeasibility analysis, EPRI's report supports EPA's assertion that there is significant uncertainty around space constraints for facilities to install closed-cycle cooling.

circumstances, EPA decided not to propose uniform entrainment standards for all existing facilities based on closed-cycle cooling. Instead, EPA has determined that it should establish a process for site-specific determination of entrainment controls. Site-specific proceedings would provide the opportunity to address these issues, along with the other factors discussed in this preamble in determining which additional entrainment mortality controls, if any, are appropriate.

4. Remaining Useful Plant Life Could Be a Factor on a Facility Basis

Many facilities are nearing the end of their useful life. Considering the long lead time to plan, design, and construct closed-cycle cooling systems such as wet cooling towers, EPA proposes that the permit authority should be given the latitude to consider the remaining useful plant life in establishing entrainment mortality standards for that facility. The remaining useful plant life along with other site-specific information, would affect the evaluation of the benefits (non-monetized and monetized) of closed-cycle at a particular facility. For example, closed-cycle at a facility that is going to shut down in 3 years would not result in the benefits that a facility that would continue to operate for 20 years. Because of this factor, EPA proposes that requiring closed-cycle cooling should be evaluated on a facility-specific basis, arguing against a uniform national entrainment mortality standard.

This is obviously not an issue for new units. A new unit has its full useful life before it and thus would experience the maximum possible entrainment mortality reductions throughout that useful life. Considering this factor, EPA is proposing that new units be treated the same as new facilities. EPA believes this factor, along with the other factors discussed above, indicates that it is reasonable to require new units to meet entrainment mortality requirements based on closed-cycle cooling.

G. The Process for Establishing Site-Specific BTA Entrainment Controls

EPA believes that the factors discussed above support establishment of BTA entrainment requirements on a site-specific basis and counsels against establishing a national rule based on a single BTA technology for entrainment controls. In addition, there are other factors that also support site-specific decision-making. Thus, as noted, for example, a national weighing of cost and benefits tends to mask important local differences and argues for site-specific evaluations.

As a result, EPA proposes that closed-cycle cooling for all existing units is not BTA on a national basis, except for new units at existing facilities.

EPA has decided to propose Option 1 as the basis for national performance standards that represent the "best technology available" for cooling water intake structures at existing facilities. EPA proposes that a uniform national impingement standard coupled with entrainment controls determined on a site-specific basis represents the best technology available for minimizing the adverse environmental impacts associated with intake structures. EPA's proposed decision to reject a single uniform national entrainment standard is based on closed-cycle cooling not being the "best technology available" on a national basis and not warranted under the circumstances. This proposed decision flowed from EPA's consideration of the factors described above and its conclusion that determination of BTA for entrainment through a process that allowed full and site-specific assessment of these factors with respect to candidate entrainment controls including closed-cycle cooling represented the most appropriate course here.

H. Implementation

EPA's proposal would require a site-specific determination of BTA. In that process, the permit writer would have access to all the information necessary for an informed decision about which additional technology to reduce entrainment mortality, if any, is BTA, including a full consideration of whether the benefits justify the costs.

The adoption of the proposed Option 1 approach of site-specific BTA entrainment decisions will result in one of two outcomes at any facility: BTA is an entrainment mortality technology beyond what the facility has already installed (this may include closed cycle cooling or other technologies, see Section VI.B and C), or BTA requires no additional controls for entrainment mortality. Thus, EPA expects that, under the proposed approach, there will be additional entrainment controls for some facilities and none for others.

EPA notes that in a number of areas of the country (California, Delaware, New York and New England; see, *e.g.,* DCNs 10–6963 and 10–6841, as well as EPA Region I's Brayton Point), permitting authorities have already required or are considering requiring existing facilities to install closed-cycle cooling operations. EPA supports those state efforts and determinations and thinks that similar decisions would be able to be made under this proposed rule.

The proposal would require that the facility's permit application must include the following information: The facility would submit an engineering study of the technical feasibility and incremental costs of candidate entrainment mortality control technologies. The facility would also study, evaluate, and document: the technical feasibility of technologies at a minimum including closed-cycle cooling and fine mesh screens with a mesh size of 2 mm or smaller; engineering cost estimates of all technologies considered; any outages, downtime, or other impacts to revenue along with a discussion of all reasonable attempts to mitigate these cost factors; and a detailed discussion of the magnitude of water quality benefits, both monetized and non-monetized, of the candidate entrainment mortality reduction technologies evaluated. Finally, the study must include a detailed discussion of the changes in non-water quality factors attributed to technologies and/or operational measures considered, including but not limited to increases and decreases in the following: energy consumption; thermal discharges; air pollutant emissions including particulates and their health and environmental impacts; noise; safety (*e.g.,* visibility of cooling tower plumes, icing); grid reliability, and facility reliability. See Section IX for a thorough discussion of these study requirements.

Certain facilities would submit an Entrainment Characterization Study including an entrainment mortality data collection plan that would indicate, at a minimum, the specific entrainment monitoring methods, taxonomic identification, latent mortality identification, documentation of all methods, and quality assurance/quality control procedures for sampling and data analysis appropriate for a quantitative survey. EPA would also require peer review of the entrainment mortality data collection plan. Peer reviewers would be selected in consultation with the Director who may consult with EPA and Federal, State, and Tribal fish and wildlife management agencies with responsibility for fish and wildlife potentially affected by the cooling water intake structure(s). Further, facilities with greater than 125 MGD AIF must complete an Entrainment Characterization Study (ECS). The ECS could include information already collected to meet current §122.21(r)(2)–(r)(4) requirements. With the

information in this study, the permit writer will know more about potential entrainment mortality reductions. Data from the ECS would also corroborate any through-plant entrainment survival study results from Performance Studies conducted in 122.21(r)(7). Data collected as part of the ECS would support the Benefits Valuation Study in 122.21(r)(11) by parsing entrainment mortality, for example, by recreational/commercial species and those species that are strictly forage species,[55] by species most susceptible to thermal effects (including thermal barriers), and by species of particular local or regional concern and threatened and endangered species. EPA's benefits estimate were based on an extrapolation of available I&E mortality studies; the specific entrainment characterization study conducted by a facility may lead to a different estimate of I&E mortality for that facility than its portion of EPA's regional estimate in the analysis in Section VIII.

The purpose of the ECS is to better understand, and thus help minimize, the impact of entrainment on species of concern. More specifically, the ECS should identify species of concern that may be entrained, and estimate their baseline mortality rates given current entrainment controls. Moreover, the ECS should include as much information as practical about the aquatic ecosystem effects of entrainment mortality of species of concern. An understanding of the potential ecosystem consequences of entrainment mortality for species of concern will help inform decisions about permit requirements for additional technologies and management practices. EPA will endeavor to identify high quality examples of ECSs as they are completed, and post them to the web site for this rule as a resource for ECS preparation.

Following the permit writer's review of this information, the permit writer must determine what BTA entrainment standard to propose and explain in writing the basis for the proposal. The written explanation and the draft permit would then be available for comment from the interested public under the Permitting Authority's normal permitting process. Therefore, EPA's proposed BTA standard would establish uniform requirements for impingement mortality and a process in which BTA entrainment controls would be determined on a site-specific basis.

[55] Distinctions between predator and prey cannot be made on the basis of species alone; the young of some recreational and commercial species function as forage fish.

I. EPA's Costing of the Preferred Option

For the purposes of this proposal, EPA has prepared an economic analysis according to Executive Order 12866. For the preferred option, this analysis incorporates the full costs and partially monetized benefits of impingement controls, including the costs of conducting the entrainment characterization studies. There may be additional costs and benefits associated with reductions in entrainment mortality that result from the Director's BTA entrainment determinations. Because this process will play out over the next 10 to 15 years as Directors consider waterbody-specific data, local impacts, and public comment, and weigh costs and benefits of further entrainment reductions, air quality impacts, grid reliability, and land availability, estimates of the costs of these site-specific determinations would be highly speculative.

For illustrative purposes, EPA analyzed two hypothetical outcomes for site-specific BTA determinations under Option 1. EPA analyzed the cost of closed-cycle at the 76 largest fossil fuel plants withdrawing from tidal waters and arrived at an annual compliance cost for these facilities of $762 million. EPA also analyzed a variant on the above scenario. EPA estimates this second scenario would involve 46 facilities at an annual compliance cost of $480 million, assuming only baseload and load following facilities would retrofit to closed-cycle cooling.

These hypothetical scenarios illustrate the site-specific costs if a significant number of facilities install and operate a closed-cycle cooling system. These scenarios assume facilities would install only closed-cycle cooling and operate it year-round. This may represent an upper-bound cost for those facilities. EPA also assumed that cooling towers will be installed at fossil fuel plants within 10 years. EPA is aware that there are other possible scenarios for projecting which facilities might be required to install closed-cycle cooling or other entrainment mortality technologies as a result of individual BTA determinations. Some of these would show lower or higher costs than those presented here. EPA requests comment on other scenarios that might better capture the range of costs that result from the structured analysis of entrainment mortality BTA required by today's proposed rule.

J. Consideration of Cost/Benefit on a Site-Specific Basis

In establishing performance standards for entrainment controls, as the Supreme Court in *Entergy* made clear, one factor that EPA may consider is the costs and benefits associated with various control options. That is, in setting standards, EPA may consider the benefits derived from reductions in the adverse environmental impacts associated with cooling water intake structures and the costs of achieving the reductions. As previously explained, EPA has determined that the benefits of the proposed rule justify its costs. In addition, EPA has explained why consideration of costs and benefits is also appropriate in the site-specific permit setting when establishing entrainment controls.

In the site-specific proceeding, the permit writer would be required to consider, among other factors, quantified and qualitative social benefits and social costs of available entrainment controls, including ecological benefits and benefits to any threatened or endangered species. The permit writer would be able to reject otherwise available entrainment controls if the costs of the controls are not justified by their associated benefits (taking into account both quantified and non-quantified benefits) as well as the other factors discussed in the proposed rule.

In making the site-specific entrainment BTA determination, the proposal would require that the Director consider the information required under §122.21(r) to be submitted with the section 316(b) permit application. Further, in the case of the larger cooling water intake structures (125 MGD AIF or greater), the proposed rule would require submission of additional information including, among other things, studies on entrainment at the facility, the costs and feasibility of control options, and information on the monetized and non-monetized benefits of entrainment controls. In evaluating benefits, the Director should not ignore benefits that cannot be monetized and consider only the I&E reductions that can be counted. The assessment of benefits must take into account all benefits, including categories such as recreational, commercial and other use benefits, benefits associated with reduced thermal discharges, reduced losses to threatened and endangered species, altered food webs, nutrient cycling effects, and other nonuse benefits. Merely because there is no price tag on those benefits does not mean that they are not valuable.

Under the proposal, the Director must explain the basis for rejecting an available technology not selected for entrainment control in light of the submissions, with a consideration of the

same four factors that argued against a uniform requirement for closed-cycle cooling. EPA expects that the Director's decision about BTA controls will also reflect consideration of the costs and benefits (monetized and non-monetized) of the various control technologies considered for the facilities.

As noted, the permit writer may reject an otherwise available entrainment technology as BTA (or not require any BTA controls) if the costs of the controls are not justified by the benefits. EPA decided to adopt this approach in determining site-specific entrainment controls because it is permissible under *Entergy* and consistent with the more than 30-year history of section 316(b) permitting decisions as well as E.O. 13563.

This history illustrates the role that cost/benefit considerations have played. As early as 1977, EPA issued a permitting decision and a General Counsel opinion that explained that, while Section 316(b) does not require a formal cost-benefit analysis, the relationship of costs and benefits may be considered in 316(b) decision-making. *In re Pub. Serv. Co. of N.H. (Seabrook Station, Units 1 and 2),* No. 76–7, 1977 WL 22370 (June 10, 1977), remanded on other grounds, 572 F.2d 872 (1st Cir. 1978); accord *In re Central Hudson Gas & Elec. Corp., Op. EPA Gen. Counsel,* NPDES No. 63, 1977 WL 28250, at *8 (July 29, 1977). In the more than 30 years since then, EPA and state permitting authorities have considered the relationship between costs and benefits to some extent in making individual permitting decisions. *See, e.g., In re Pub. Serv. Co. of N.H. (Seabrook Station, Units 1 and 2),* No. 76–7, 1978 WL 21140 (E.P.A. Aug. 4, 1978), aff'd, *Seacoast Anti-Pollution League* v. *Costle,* 597 F.3d 306, 311 (1st Cir. 1979).

Because E.O. 13563 directs agencies to propose and adopt rules only upon a reasoned determination that the benefits justify the costs, EPA is proposing to apply this same standard in BTA entrainment determinations. This approach is consistent with the framework EPA has traditionally followed and would allow for a full assessment in permit decisions of both qualitative and quantitative benefits and costs. As designed, EPA's proposed requirement for the establishment of site-specific BTA entrainment requirements strikes an appropriate balance between environmental improvements and costs, allowing the permitting authority to consider all of the relevant factors on a site-specific basis and determine BTA on the basis of those factors.

After considering all of the factors relevant to a particular site, the Director must establish appropriate entrainment controls at those facilities. The Director must review available control technology and may reject otherwise available entrainment controls as BTA if the social costs of the controls are not justified by their social benefits (taking into account both quantified and non-quantified benefits) or if there are other adverse factors that cannot be mitigated that the Director deems unacceptable. As designed, EPA's proposed requirement for the establishment of site-specific BTA entrainment requirements strikes an appropriate balance between environmental improvements and costs by electively requiring closed-cycle cooling or other entrainment technologies at some facilities, without requiring the same technologies at all facilities.

VII. Economic Impact of the Proposed Rule

This section summarizes EPA's analysis of the social cost and economic impact for the following regulatory options: Option 1: Impingement mortality (IM) limitations based on modified traveling screens for all facilities with flow greater than 2 million gallons per day (MGD), closed cycle cooling or its equivalent for new units, and a site-specific determination of entrainment BTA for all other facilities: Option 2: Intake flow commensurate with closed-cycle cooling for facilities that have a design intake flow of greater than 125 MGD and IM limitations based on modified traveling screens for all facilities with flow greater than 2 MGD; Option 3: Intake flow commensurate with closed-cycle cooling for all facilities and IM limitations based on modified traveling screens, for all facilities with flow greater than 2 MGD; and Option 4: Impingement mortality (IM) limitations based on modified traveling screens for all facilities with flow greater than 50 million gallons per day (MGD), closed cycle cooling or its equivalent for new units, and a site-specific determination of entrainment BTA for all other facilities and of impingements mortality controls for facilities with flow less than or equal to 50 MGD. These options are described more fully in Section VI.C.

The first part of this section provides an overall summary of the costs of the regulatory options to complying facilities and federal and state governments. This discussion is followed by a review of the method for developing compliance cost estimates. The third part provides an estimate of the total social costs of the regulatory options. The final part reviews the economic impact of the regulatory options.

A. Overview of Costs to Complying Facilities and Federal and State Governments

For estimating the total cost and economic impact of the regulatory options presented in this preamble, EPA estimated costs associated with the following cost components: Initial fixed and capital costs, annual operating and maintenance costs, downtime costs, recordkeeping, monitoring, studies, and reporting costs. The cost estimates reflect the incremental costs attributed only to today's proposal. For example, facilities with closed-cycle recirculating systems would likely already meet all of the proposed performance standards, and therefore most facilities with closed-cycle cooling would not incur costs to retrofit new technologies (though such facilities would still incur some components of permitting costs). EPA assumes, based on its technical survey data that most closed-cycle cooling systems operate with an intake velocity of less than 0.5 fps, and so would comply with the impingement BTA requirements. However, EPA recognizes a facility with closed-cycle cooling may incur additional costs to meet the proposed performance standards; some facilities with closed-cycle cooling were assumed to incur costs of modified screens with a fish handling and return system. Because EPA assumes the fish handling and return system would meet the requirements to eliminate entrapment, EPA has not included further costs for entrapment.

For the economic analyses, EPA distinguished between the two industry groups covered by the standards for existing facilities as follows:

> Manufacturing and Other Industries ("Manufacturers")—facilities in the paper, aluminum, steel, chemicals, petroleum, food and kindred products, and other industries. In addition to engaging in production activities, some of these facilities also generate electricity for their own use and occasionally for sale. Electric power producers ("Electric Generators")—facilities owned by investor-owned utilities, municipalities, States, Federal authorities, cooperatives, and nonutilities, whose primary business is electric power generation or related electric power services.

Costs to complying Electric Generators and Manufacturers include technology costs, cost of installation downtime, and costs of administrative activities; in addition, electric generating facilities are expected to incur certain energy penalty costs (*see*

Chapter 3 of the EBA report for a discussion of costs to complying facilities and of implementation costs to federal, State, and local governments). Manufacturing facilities may also need additional electricity to run certain technologies, but if they do not produce this electricity themselves, these additional energy requirements are included in operating costs, rather than accounted for separately as an energy penalty. Electric Generators incurring these costs include facilities owned by private firms, governments, and electric co-operatives. Manufacturers incurring these costs include facilities owned by private firms only. The administrative costs to federal, State, and local governments include the costs of rule implementation—*e.g.,* permits, monitoring, and working with in-scope facilities to achieve compliance. Costs are initially developed on a pre-tax, as incurred, basis. These costs underlie the analysis of the social costs of the regulatory options and are also used in assessing the impact of compliance requirements on in-scope facilities and the affected industrial categories. In the analysis of facility impacts, costs are accounted for on an after-tax basis.

B. Development of Compliance Costs

This section describes the data and methods used to estimate compliance costs of the options considered and the costs of today's proposed rule. Costs were developed for technology controls to address impingement mortality separately from controls for entrainment mortality, as the requirements of the various rule options considered would lead to different technologies being used by each facility to comply. Some of the options considered would impose different compliance timelines for impingement mortality and entrainment mortality technologies. As a result, different methodologies were used and each is briefly described below. More detailed information on these methodologies, as well as costs of other technologies and regulatory approaches, are available in the TDD.

1. Combined Facility-Specific and Model-Facility Approach

EPA develops national level costs estimates for facilities within scope of the various regulatory options. In general, facility-specific data can be used to determine what requirements apply to a given facility or whether that facility would already meet the requirements set forth in the proposed rule. This approach requires facility-specific technical data for all of the approximately 1,200 existing facilities in scope. An alternative approach is to develop a series of model facilities that exhibit the typical characteristics of the affected facilities and calculate costs for each model facility; EPA would then determine how many of each model facility would be needed to accurately represent the full universe of affected facilities.

EPA has estimated costs for potentially regulated facilities using a combination of the facility-specific and model facility approaches. The facility-specific approach used in this effort involved calculating compliance costs for 891 individual facilities for which EPA had detailed technical data from its various industry questionnaires regarding the intake design and technology. Specifically, these are the in-scope facilities that completed the detailed technical questionnaire. Where facilities reported data for separate cooling water intake structures (CWISs), compliance costs may have been derived for each intake and these intake costs were summed together to obtain total costs for each facility. These facilities became model facilities and each facility's costs were then multiplied by a weighting factor (derived from a statistical analysis of the industry questionnaire) specific to each facility to obtain industry-wide costs for the national economic impacts analyses. The weighting factors are similar to ones derived during the development of the 2004 Phase II Rule for extrapolating the impacts of DQ facilities to all in-scope facilities.

2. Updates to the Survey Data

In the 2004 Phase II rule, EPA developed facility-specific cost estimates for all facilities and published those costs in Appendix A (69 FR 41669). Since the initial implementation of the 2004 Phase II rule, EPA identified several concerns with using only the facility-specific costing approach, as well as the use of those costs in Appendix A. Since 2004, EPA has collected data from industry and other groups as described in section III. These data generally reflect changes to actual intake flow, design intake flow, intake velocity, technology in place, and operational status. EPA developed a new master database including this new data to supplement the data from the detailed technical questionnaire. Although it has been approximately 10 years since the detailed technical questionnaire was initially collected, EPA has conducted over 50 site visits, reviewed current permits, and conducted literature reviews including comparisons to data collected by EPRI, EIA, and EEI. Based on that review EPA has concluded the master database is representative and appropriate for most facilities.[56] The following section describes how EPA used this new database to estimate compliance costs.

3. Tools for Developing Compliance Costs

During the 2004 Phase II rule, EPA began developing a spreadsheet based tool that would provide facilities and permit authorities with a simple and transparent method for calculating facility-specific compliance costs. EPA refined the tool in developing the Phase III regulations. EPA has since made further refinements to the cost tool, which was used to calculate the compliance costs for impingement mortality for today's proposed rule. The cost tool employs a decision tree (*see* the TDD for a graphical presentation of the decision tree) to determine a compliance response for each model facility and assigns a technology "module" that represents a retrofit to a given technology. Cost estimates are derived through a series of computations that apply facility-specific data (such as DIF, width of intake screens, etc.) to the selected technology module. Cost tool outputs include capital costs, incremental operation and maintenance (O&M) costs, and installation downtime (in weeks).

To calculate the compliance costs of retrofitting to closed-cycle cooling for controlling entrainment mortality, EPA utilized a second tool based on a cost-estimating spreadsheet developed by the Electric Power Research Institute (EPRI). EPRI's first draft methodology presented three different levels of capital cost (Easy, Average, Difficult) based on the relative difficulty of the retrofit project. For electric generators, EPA used costs for the Average level of difficulty, as it was developed across a broad spectrum of facilities and is the most appropriate for estimating national level costs.[57] For manufacturers, EPA used the Difficult level of retrofit costs. This reflects the more complex water systems and generally more frequent technical challenges to retrofitting closed-cycle cooling at a manufacturing facility. While some manufacturers only withdraw cooling water for power or steam generation, many manufacturers have multiple units or processes that utilize cooling water. In site visits, EPA found the largest manufacturing facilities would require multiple retrofits, and accordingly believes the

[56] EPA notes that, while it has not collected updated technical information for every facility, it has updated financial data, as discussed later in this section.

[57] For purposes of energy reliability estimates, EPA used the Difficult level for electric generators.

Difficult level of retrofit costs is more representative for purposes of estimating national level costs. Additionally, EPA's tool includes additional modifications to EPRI's methodology, such as increased compliance costs for approximately 25 percent of facilities to reflect the additional expense of noise control or plume[58] abatement, and using only the cooling water flow rate for non-contact cooling water flow[59] for purposes of estimating costs for closed-cycle cooling. EPA has included the spreadsheet tools in the docket for the proposed rule to assist both facilities and permit authorities in estimating compliance costs. (*See* DCNs 10–6655 and DCN 10–6930).

4. Which technologies form the basis for compliance cost estimates?

EPA identified two broad classes of control technologies that may be used singularly or in combination to comply with the proposed rule. These classes of control technologies are: (1) Technologies that address impingement mortality (IM) and (2) technologies that address entrainment mortality (EM). *See* Section VI for further details. Under the various options considered, a facility may be subject to one or both requirements, depending on their configuration, technologies in use, or other site-specific factors.

For the impingement mortality requirements, EPA analyzed data from a wide variety of technologies and facilities and concluded that modified Ristroph (or equivalent) coarse mesh traveling screens are the most appropriate basis for determining the compliance costs.[60] As discussed in Section VI of the preamble, a facility may also comply with impingement mortality requirements by meeting a maximum intake velocity limit. Based on facility-specific data, EPA made a preliminary assessment of which model facilities would not currently meet impingement mortality requirements through either approach, and assigned technology costs based on the installation of modified traveling screens with a fish handling and return system. This assigned technology is assumed to meet the BTA standard (*see* §125.94(b)). However, some facilities might still incur costs for restructuring their intakes to avoid entrapment.[61] EPA solicits comment and data on the costs of this requirement.

For facilities subject to entrainment mortality requirements, EPA selected wet cooling towers as the technology basis for determining the compliance costs. In some cases, costs reflect installation of multiple technologies, as impingement mortality and entrainment mortality requirements were applied separately to each facility. EPA also evaluated other technologies for reducing entrainment mortality, such as seasonal operation of cooling towers, partial towers, variable speed pumps, and fine mesh screens. The performance of these technologies is further described in section VI; a detailed discussion of how the costs were developed may be found in the TDD.

5. How is facility downtime assessed?

Downtime is the amount of time that a facility may need to shut down due to the installation of a compliance technology. Downtime estimates primarily assume that the facility would need to completely shut down operations to retrofit an intake, such as relocating an intake, connecting wet cooling towers into the facility, or reinforcing condenser housings. Downtime estimates are provided as incremental outages, taking into account the periodic outages all facilities already incur as part of preventative maintenance or routinely scheduled outages. For example, nuclear facilities have refueling outages approximately every 18 months lasting approximately 40 days.[62] The entrainment control implementation periods, 10 years for fossil fuel plants and 15 years for nuclear plants, in Options 2 and 3 would provide facilities with an opportunity to schedule the retrofit when other major upgrades are being done, reducing downtime.

For most facilities subject to impingement mortality, no downtime was assigned. Facilities that are replacing or rehabilitating existing traveling screens typically do so one intake bay at a time without affecting the overall operations. EPA has also found that facilities that need to scrub screens do so during other routinely scheduled outages. For some compliance technologies such as relocating an intake, or expanding an existing intake to lower the intake velocity, several weeks of downtime are incurred, as these are more invasive tasks.

For facilities subject to entrainment mortality controls, EPA reviewed historical retrofit data and site visits conducted since 2004, and has largely retained its assumptions for downtime from the Phase II and Phase III rules. On average, EPA assumes the net construction downtime for a cooling tower retrofit for non-nuclear electric generators is 4 weeks. This total downtime allows for the tie-in of the cooling tower to the existing cooling water system. The refueling outage downtime, the safety-sensitive nature of nuclear facility retrofits, and other data in EPA's record supports 28 weeks as the net construction downtime for nuclear facilities. Downtime for manufacturing facilities that use cooling water for power and steam generation was converted into the incremental cost for purchase of those utilities during the outage. For individual process units other than power or steam generation units at a manufacturing facility (*i.e.* cooling water use for purposes other than power production), on average the downtime was assumed to be zero. In EPA's extensive experience with manufacturers while developing effluent guidelines, EPA found manufacturers are generally able to shut down individual intakes for specific process lines, use inventory approaches such as temporary increases of intermediate products, and develop other workarounds without interrupting the production of the entire facility. EPA requests comment from those manufacturing facilities that have made modifications to their cooling water systems on their experiences with facility downtime. See below for further discussion of how installation downtime in weeks is included in the estimated national costs.

6. How is the energy penalty assessed?

The term "energy penalty" in relation to a conversion to closed-cycle cooling has two components: One is the extra

[58] The EPRI tool includes drift abatement technologies in its cost assumptions, so no additional costs were included for drift eliminators.

[59] As described in the TDD, EPA only used non-contact cooling water flows in determining the proper size for wet cooling towers, the technology that forms the technical basis for entrainment mortality. Cooling towers are not widely used for contact cooling or process water, so these flows were excluded. For electric generators, the vast majority of flow is non-contact cooling, but manufacturers are more varied in their water usage.

[60] Note that this does not preclude the use of other technologies; EPA simply used the available performance data in deriving the performance requirements and excluded technologies that were either inconsistent performers or did not offer sufficient data for analysis in a national categorical regulation. EPA's research has shown that other technologies may also be capable of meeting the proposed requirements, but EPA did not opt to identify these technologies as the technology basis for today's proposal.

[61] Facilities incurring costs for impingement mortality are assumed to meet the requirement for entrapment. Because EPA does not know how many facilities that already comply with impingement mortality requirements would incur additional costs to avoid entrapment, EPA conducted a sensitivity analysis of the additional costs; see Chapter 12 of the TDD.

[62] Nuclear Energy Institute (NEI) reported average length of outage from 2003 to 2009.

power required to operate fans at a mechanical draft cooling tower, as well as additional pumping requirements (often referred to as the parasitic energy penalty), and the other is the lost power output due to the reduction in steam turbine efficiency because of an increase in cooling water temperature (often referred to as the turbine efficiency penalty or turbine backpressure penalty). Energy penalty costs only apply to facilities retrofitting a cooling tower; facilities installing a new impingement mortality technology will generally see little or no measureable change in energy usage. EPA's national level costs include the costs for both components. The parasitic energy penalty was included as a separate component in the O&M costs and was assessed for all facilities. The turbine efficiency penalty was typically expressed as a percentage of power output; EPA estimates the turbine efficiency energy penalty for nuclear and non-nuclear power generation would be 2.5% and 1.5%, respectively (see the TDD). For most manufacturers, the energy penalty for turbine efficiency loss for non-nuclear power plants (*i.e.,* 1.5%) was assumed. This may overstate costs where cooling water is used by a manufacturing facility for purposes other than power production.

7. How did EPA assess facility-level costs for the national economic impacts and energy reliability analyses?

To assess the national economic impacts, EPA conducted a modeling analysis using IPM (Integrated Planning Model). This model is widely used by EPA for analysis of rules and policies affecting electric generating facilities. This analysis is used to assess economic impacts, increases in household electricity bills, and changes in electricity reliability. In contrast to the model facility costing approach, the IPM model requires a facility-level cost for each facility. Model facility costs were converted to a per MGD DIF basis, and then averaged to derive cost equations using DIF as the independent variable. This cost equation thus provides average costs that can be applied to any facility by simply scaling to that facility's DIF. EPA also used a conservative compliance scenario in order to develop a bounding "worst case" impact analysis by assuming all facilities would be subject to Entrainment Mortality reductions based on closed-cycle cooling towers. In the worst case scenario EPA conducted the IPM analysis using the Difficult level cost for all facilities, thereby generating an upper bound of total costs and conservative predictions of the economic impacts. See the EBA for more information. In conducting its analysis, EPA found the equations used to derive the cost module estimates produced substantially higher costs per MGD rates at lower flow levels. To reflect the higher per unit costs of retrofits at lower DIF (*i.e.* smaller) facilities, EPA derived separate model facility cost equations for facilities with DIF <10 MGD and those with DIF ≥ 10 MGD. (See the TDD).

8. How did EPA assess costs for new units?

This section describes the data and methods used to estimate compliance costs for new units at existing electric generators and manufacturers. Compliance costs for new units at existing electric generators are calculated using a similar methodology to the compliance cost estimates for existing facilities. EPA is not able to predict which facilities will construct new units, however the national projections of increased capacity (*i.e.* additional megawatts capacity to be constructed each year) can be converted to a number of new units of a specified size; EPA then applied the cost equations to these projected new units. Based on site visits, EPA has found that industry trends towards water conservation and reuse in addition to the operational flexibility at existing manufacturers would result in no additional compliance costs for achieving flow commensurate with closed-cycle cooling at new units. EPA solicits comment on this assumption.

a. New Units at Existing Electric Generators

Power generation units that meet the definition of a "new unit" will be required to meet entrainment reduction based on closed-cycle cooling or an equivalent reduction in entrainment mortality for the cooling water component of the intake flow based on the average intake flow (AIF). Estimates for compliance costs for new units are based on the net difference in costs between what cooling system technologies would have been built under the current regulatory structure and what will be built given the change in requirements imposed by the proposed regulation. Compliance costs are derived using estimates of the new generating capacity that will be subject to these requirements.

Generally speaking, EPA has identified a number of differences in costs between a closed-cycle cooling retrofit at an existing facility compared to installing closed-cycle cooling at a new unit:

- New units can incorporate closed-cycle cooling in a more cost effective manner.
- The duration of new unit construction is sufficiently long enough that there would be, in nearly all circumstances, no net increase in "construction downtime."
- For power generation systems, the design of boilers, steam turbines and condensers "from scratch" allows for the optimization of the system design and cooling water flow volume to minimize the heat rate penalty. Flow is reduced over a comparable once-through cooling system, which reduces closed-cycle cooling system costs.
- Because major components of the once-through intake and cooling system must be constructed from scratch, the capital costs of closed-cycle cooling for new units are lower than the capital costs of once-through cooling.[63]
- There will be an increase in the parasitic energy requirements associated with fan operation in the closed-cycle cooling towers.
- While parasitic energy requirements for pumping head will increase as well, it may be offset, at least in part, by reductions in pumping flow associated with optimization. Any capacity losses due to parasitic energy penalty can be accounted for in the new unit design.
- New construction allows the use of an optimized cooling system design that can minimize any system efficiency losses associated with conversion to closed-cycle.

Estimation of New Capacity Subject to the Rule

New generating units will be constructed at either "greenfield" facilities subject to the Phase I regulation or at existing facilities where they may be subject to the new unit requirements for entrainment reduction.[64] New generating capacity at existing facilities can occur in three ways: (1) From new units added to an existing facility; (2) repowering, replacement and major upgrades of existing units; and (3) minor increases in system efficiency and output. Repowered, replaced, and upgraded units are not considered new units under today's proposed rule and would not be subject to requirements for entrainment reduction. While a small portion of this new capacity may result from minor increases in plant efficiency and output, this analysis assumes all

[63] See DCN 10–6650 and DCN 10–6651.

[64] This discussion will focus only on new units at existing facilities; for a discussion of the Phase I rule, see 66 FR 65256.

new capacity will occur be associated with new units.

New power generation capacity estimates by fuel/plant type were derived from IPM modeling. For the new unit costs analysis EPA focused on coal and combined cycle, since these comprised the majority of increased capacity that utilize a steam cycle and are most likely to be constructed at existing generation facilities. In the Phase I rule analysis, EPA determined that 76% of new coal and 88% of new combined cycle capacity would be constructed at new "greenfield" facilities and would be subject to Phase I requirements while the remainder (24% of coal and 12% of combined cycle) would occur at existing facilities and be subject to existing facility regulations. EPA has selected a conservative value of 30% reflecting both coal and combined cycle to serve as an estimate for the portion of new capacity that would be constructed at existing facilities.

At existing nuclear facilities, only new capacity associated the construction of new generating units would be subject to the new unit requirements. Considering their size and heat discharge as well as recent trends in industry, it is assumed that any new nuclear units will utilize closed-cycle cooling[65] and so the capacity for these nuclear facilities is not included in the costs of requirements for new units. Exhibit VII–1 presents a summary of new capacity estimates for all fuel types.

EXHIBIT VII–1—ESTIMATED NEW CAPACITY

Fuel type	New capacity (MW)[a]		New capacity incurring costs under this rule	
	Annual average	24 Year total	Annual average	24 Year total
Coal	3,573	85,744	1,072	25,723
Combined Cycle	1,491	35,795	447	10,739

[a] Includes capacity subject to both Phase I and existing facility requirements.

Baseline Compliance

Baseline compliance reflects the scenario whereby new units will use once-through cooling or closed-cycle cooling. About 32% of existing facility steam generating capacity already employs closed-cycle and another 11% employ combination cooling systems. EPA assumes that at existing plants where closed-cycle cooling is already employed for at least part of the generating capacity that closed-cycle would be used for any new capacity, regardless of the requirements of today's proposed rule. Therefore at least 43% of new capacity is projected to be compliant in the baseline (*i.e.,* they will already meet the entrainment mortality requirements of the proposed rule for new units). For example, a number of regulatory authorities have adopted or pursued closed-cycle cooling requirements for some or all existing facilities (*e.g.,* New York, California, Delaware). EPA expects this to be particularly true where the new unit would result in a substantial increase in the volume of once-through cooling water withdrawn above what is currently permitted. Thus, approximately 50% of new fossil units at existing facilities in the baseline scenario would already be compliant with the proposed rule. EPA requests comment on this assumption.

Repowering Versus New Units

The increased capacity at existing fossil fuel facilities is divided into two types of projects. The first is new unit(s) added adjacent to the existing generating units which would require a new intake or the existing intake to be substantially modified in order to supply the needed additional volume of cooling water. The second is a repowered unit which replaces an existing generating unit(s) and is assumed to be sized such that the existing once-through cooling water intake volume will provide sufficient flow to meet heat discharge requirements. Based on 2007 IPM projections (since more recent projections do not include this distinction) approximately 85% of projected total new combined cycle capacity was estimated to be repowered oil and gas units. The estimate for repowered coal capacity was very small (less than 1%). However, since there are significant economic advantages to repowering, EPA believes this to be an underestimate and selected a more conservative value of 10%. Exhibit VII–2 presents the capacity values assumed to be compliant in the baseline or that require costs associated with closed-cycle cooling for new added units versus repowering.

EXHIBIT VII–2—NEW CAPACITY SUBJECT TO NEW UNIT REQUIREMENT BY COST CATEGORY

Fuel type		Capacity subject to new unit compliance costs (MW)	
		Annual average	24 Year total
Coal	Baseline is Compliant	536	12,862
	New Added Unit	482	11,575
Combined Cycle	Baseline is Compliant	224	5,369
	New Added Unit	34	805

[65] Less than half of the current U.S. nuclear plants still use once through cooling.

Compliance Cost Estimation

Compliance costs reflect compliance with the proposed requirements for closed-cycle for the new unit; these costs do not represent costs to retrofit the entire facility to closed-cycle. Compliance costs for new units are derived from EPA's estimates for retrofitting a closed-cycle cooling system at existing facilities where the costs are expressed on a per MGD basis. For new units, the cost equations are converted to a cost per MW capacity. The cooling water flow estimates are based on plant fuel efficiency values of 42% for coal (the average of values for super-critical and ultra-critical steam), 57% for combined cycle, and 33.5% for nuclear. [DCN 10–2827]. Cost components were broken out as follows.

Capital Costs

EPA has found that for new units, the total estimated capital costs for a closed-cycle cooling system is slightly less than the capital costs of a once-through cooling system (when including costs for a new intake structure). Therefore, a conservative estimate of the incremental compliance capital costs are $0 for new units.

O&M Costs

Fixed and variable O&M costs are adjusted by deducting the O&M costs for traveling screens assumed in the baseline once-through system. Energy costs are also adjusted downward to account for reduced pumping volume passing through the intake structure and adjusted up to account for the increase in pumping head through the cooling tower.

Downtime

Each of the new units will involve extensive construction activities that would result in a prolonged construction downtime regardless of the cooling system requirements. Thus, no downtime costs are assessed for new unit compliance.

Energy Penalty

The energy penalty consists of parasitic load and heat rate penalties. Both types of installation—new and retrofit—face parasitic load associated with fans and pumps, but only retrofits would face a heat rate penalty, which is the largest portion of a retrofit energy penalty. Energy penalty costs associated with net changes in parasitic energy requirements between once-through and closed-cycle cooling are included in the O&M cost estimates.

b. New Units at Existing Manufacturers

Similar to new units at existing electric generators, manufacturing "units" that meet the definition of a "new unit" will be required to meet entrainment reduction requirements. These requirements will require closed-cycle cooling or an equivalent reduction in entrainment for the cooling water component of the intake flow based on the average intake flow (AIF). Estimates for compliance costs for new units are based on the net difference in costs between what would have been built under the current regulatory structure (baseline) and what will be built given the change in requirements imposed by the proposed regulation. Thus, baseline manufacturing unit process design and cooling water technology would be based on the response to the permitting authorities application of existing requirements including 316(b), applicable industrial water use and discharge standards (*e.g.,* categorical standards), and BPJ.

As discussed in section IV of the preamble, it has become standard practice for industries to adopt water use reduction and reuse practices wherever practical. A new unit provides the opportunity to employ such measures to the fullest extent. Thus, the baseline cooling AIF for "new units" at manufacturers should, in most cases, be much smaller than the AIF for a comparable existing unit. This is especially true for new units that perform a similar function or produce a similar product to existing units since economic factors such as the need to increase process efficiencies are often driving factors in the decision to construct a new unit. EPA recognizes that while this appears to be a general trend, it may not always be true on a site-specific basis.

For manufacturing process units that are newly constructed, many of the same cost-related factors listed above for power generators apply but additional factors may include:

- A much greater proportion of intake flow is used for process water and other non-cooling purposes which greatly increases the opportunity to design and incorporate cooling water reuse strategies within the unit.
- Where the new unit comprises only a portion of the plant, cooling water reduction may be accomplished through reuse elsewhere within the plant. The proposed rule provides credit for such flow reductions.
- The modular nature of closed-cycle cooling allows for the limited application of closed-cycle cooling only to the portion of cooling flow necessary to meet any additional reductions not accounted for by any other reuse or reduction strategies employed. Additionally, new units can utilize cooling system designs specifically tailored to process requirements. The modular nature of closed-cycle cooling and the flexibility inherent in the process system allows for more optimal placement of cooling tower units, thus minimizing piping costs.
- Flow reductions associated with the use of variable speed pumps can result in benefits associated with both reduced flow and pumping energy costs.

For power generation facilities and generating units that use once-through cooling, the majority of the intake flow is used for non-contact cooling purposes. Process water typically constitutes a few percent or less of the total. A review of the responses to the detailed technical survey showed that the median and average values for the percent of design intake flow used for cooling purposes reported for each separate cooling water intake at power generation facilities were 100% and 85% respectively. In contrast, most industrial manufacturing operations utilize a substantial portion of intake water for non-cooling purpose and the same median and average values for manufacturing facilities were 50% and 52%, respectively. In addition, this cooling flow component data includes contact cooling water, as discussed in section IV.A (*i.e.,* flow reduction is only required for non-contact cooling water flows), thus decreasing the proportion. Therefore, a "typical" manufacturing unit may use less than 50% of AIF for cooling purposes of the type that may be subject to the "new unit" requirements. In many cases, this "typical" facility may be able to reuse 100% of the cooling water in place of the process component. Thus, the "typical" manufacturing facility may be capable of designing a "new" process that could meet the "new unit" requirements through water reuse alone. EPA has observed significant innovation and water reuse during site visits to manufacturing facilities, and notes extensive industry trends towards internal water and energy audits.

Since this 50% value is the median of all reported manufacturing cooling water intake systems, at least half of manufacturing cooling water systems may have the potential to meet the "new unit" requirements simply by reusing non-contact water as process water. For the remainder, modifications to the process that reduce cooling water use such as use of variable speed pumps may provide additional reduction. For some, there may be a need to install

cooling towers for the cooling flow component that cannot be reused. EPA assumes, however, that this, however, will in most instances be a small portion of the total intake flow. Also, if the new unit comprises only a portion of the entire manufacturing facility, there may be other process units and plant operations nearby that could reuse the cooling water (or supply reusable water) in order to meet the flow reduction requirements. The proposed rule encourages facilities to incorporate flexible water use arrangements, including a provision where cooling water that is reused elsewhere in the facility is not considered cooling water; as a result, facilities will have an incentive to reuse water and avoid being subject to 316(b) requirements.

For new units that would require an increase in intake flow, EPA has found that the capital costs of the new intake and screen technology which requires deeper pump and intake wells to accommodate source water depth variations will be comparable to the capital costs for closed-cycle technology. In these cases, closed-cycle may have slightly higher O&M costs for pump and fan energy but these costs may be offset by other cost savings such as reductions in water treatment costs.

The definition of new manufacturing units limits the applicability of closed-cycle requirements to new units. As such, it is assumed that the construction activities would involve substantial downtime periods that would be of similar or more likely greater duration than required for construction and tie-in activities associated with the closed-cycle cooling technology. EPA concludes that only a small portion of new units will need to meet new unit flow reduction requirements through the use of closed-cycle cooling and the associated net costs will be minimal. EPA requests comment on these costing assumptions.

C. Social Cost of the Regulatory Options

EPA calculated the social cost of the four regulatory options for existing Manufacturers and Electric Generators using two social discount rate values: 3 percent and 7 percent. For the analysis of social costs, EPA discounted all costs to the beginning of 2012, the date at which this proposal would become effective under the regulation development schedule. EPA assumed that all facilities subject to the regulation would achieve compliance between 2013 and 2027, inclusive, depending on the compliance schedules associated with the four regulatory options considered in the proposed rule for specific categories of facilities. EPA performed the social cost analysis over a 50-year period to reflect: The last year in which individual facilities are expected to achieve compliance (2027) under any of the regulatory options considered for this analysis, the technology life of the longest-lived compliance technology installed at any facility (30 years), and a period of 5 years after the last year of compliance technology operation during which benefits continue to accrue. Under this framework, the last year for which costs were tallied in the analysis is 2056, with benefits continuing on a diminishing basis through 2061. Because the analysis period extends beyond the useful life of compliance equipment assumed to be installed at facilities that achieve compliance before 2017, the social cost analysis accounts for re-installation of IM compliance technologies after the end of their initial useful life periods; however, EPA does not expect in-scope facilities to completely re-build cooling towers (components such as piping and the concrete basin can be reused) and EPA expects other technology replacement costs (such as pumps and fill material) are accounted for as part of the ongoing O&M expenses for cooling towers. Costs incurred by governments for administering the regulation were analyzed over the same time frame. This analysis accounts for technology costs associated with new units starting in the first year after promulgation, *i.e.,* 2013 (for more information on new units see Chapter 3: Development of Costs for Regulatory Options of the EBA report).

At a 3 percent discount rate, EPA estimates annualized costs of compliance of $384 million under Option 1, $4,463 million under Option 2, $4,631 million under Option 3, and $327 million under Option 4. At a 7 percent discount rate, these costs are $459 million, $4,699 million, $4,862 million, and $383 million, respectively. The largest component of social cost is the pre-tax cost of regulatory compliance incurred by complying facilities. These costs include one-time technology costs of complying with the rule, one-time costs of installation downtime, annual fixed and variable operating and maintenance (O&M) costs, the value of electricity requirements for operating compliance technology, and permitting costs (initial permit costs, annual monitoring costs, and permit reissuance costs). In addition, all Electric Generators are expected to become subject to I&E mortality requirements at the 125 MGD threshold under Option 2. Social cost also includes implementation costs incurred by Federal and State governments. EPA's social cost estimates exclude the cost to facilities estimated to be baseline closures. As further described in the EBA document, in the case of Electric Generators, the baseline closure generating units were identified in Energy Information Administration reports or in the baseline IPM analyses, as having closed or projected to close independent of the requirements of the existing facilities rule. For Manufacturers, EPA's analyses indicated that these facilities are in sufficiently weak financial condition before outlays for this regulation, that the facilities are likely to close, again, independent of the requirements of the existing facilities rule. Because these facilities are not expected to comply with the existing facilities rule, EPA did not include the costs that would otherwise be assigned to these facilities in the analysis of social cost. Consistent with this treatment of costs, EPA also did not include benefits from these facilities in the tally of benefits to society for the analysis of social costs and benefits of the existing facilities rule.

Exhibit VII–3 presents the social cost of the proposed options, by type of cost, using 3 percent and 7 percent discount rates.

EXHIBIT VII–3—ANNUALIZED SOCIAL COST

[In millions, 2009 $] [a]

	Option 1	Option 2	Option 3	Option 4
3% Discount Rate:				
Direct Compliance Cost:				
Manufacturers	$61.31	$141.69	$172.92	$33.99
Electric Generators	318.77	4,319.59	4,457.79	289.77
Total Direct Compliance Cost	380.08	4,461.28	4,630.71	323.77

EXHIBIT VII–3—ANNUALIZED SOCIAL COST—Continued

[In millions, 2009 $] [a]

	Option 1	Option 2	Option 3	Option 4
State and Federal Administrative Cost	3.71	1.62	0.92	2.79
Total Social Cost	383.80	4,462.90	4,631.62	326.55
7% Discount Rate:				
Direct Compliance Cost:				
Manufacturers	68.90	133.60	157.49	39.04
Electric Generators	385.68	4,564.02	4,703.65	340.80
Total Direct Compliance Cost	454.58	4,697.62	4,861.14	379.84
State and Federal Administrative Cost	4.23	1.72	0.91	3.26
Total Social Cost	458.81	4,699.35	4,862.05	383.10

[a] These social cost estimates do not include costs associated with installation of cooling tower technology at new generating units subject to today's rule. They also do not include costs associated with complying with site-specific BTA determinations under Options 1, 2, and 4. Section VI.I discusses costs for complying with site-specific BTA determinations.

As shown in Exhibit VII–3, compliance cost in the Electric Generators segment accounts for the majority of total social cost and direct compliance cost under all four options. On a per regulated facility basis and at a 3 percent discount rate, annualized pre-tax costs in the Electric Generators segment amount to $0.57 million under Option 1, $7.73 million under Option 2, $7.97 million under Option 3, and $0.52 million under Option 4.[66] For Manufacturers, the average cost per regulated facility at a 3 percent discount rate is $0.12 million under Option 1, $0.27 million under Option 2, $0.33 million under Option 3, and $0.07 million under Option 4.[67] EPA's analysis found a similar profile of per facility costs by industry segment for the 7 percent discount rate case (see EBA Chapter 11 for additional detail). While all four options require some form of control technology at all facilities with design intake flows of two MGD or greater, Option 2 and Option 3 require more costly technologies, which raises the per-facility cost of compliance in these options.

EPA's estimate of federal and State government costs for administering this proposal is comparatively minor in relation to the estimated direct cost of regulatory compliance. EPA estimates government annual administrative costs under 3 and 7 percent discount rates, respectively, of approximately $3.71 million and $4.23 million (Option 1), $1.62 million and $1.72 million (Option 2), $0.92 million and $0.91 million (Option 3), and $2.79 million and $3.26 million (Option 4).

[66] Calculated using the total of 559 in-scope Electric Generators based on technical facility weights.

[67] Calculated using the total of 518 in-scope Manufacturers based on technical facility weights.

EPA also estimated the costs for installation of closed cycle cooling system technology at New Generating Units, as required by today's rule. These costs are based on the estimates of occurrence of new unit construction that would be subject to the New Units requirement, and the incurrence of costs as described above in the section titled "How Did EPA Assess Costs for New Units?"

The social costs of adding closed cycle cooling system capability at newly constructed units at existing facilities are not included in the total social cost tallies presented above. EPA did not include these costs in the tallies presented above because EPA did not estimate benefits from installation of closed cycle cooling systems at these units (their location is unknown). As a result, comparisons of social cost, which would include these costs, with benefits, which would not include the I&E mortality reductions from installing those closed cycle cooling systems, would be inconsistent. The costs for adding closed cycle cooling system capability at newly constructed units are the same across all four of the regulatory options presented in today's proposed rule, because the technology performance requirements for existing units at existing facilities, which vary by regulatory option, do not apply to these newly constructed generating units. On an annualized cost base, these amount to $14.7 million at a 3 percent discount rate, and $10.9 million at a 7 percent discount rate.

D. Economic Impact

EPA assessed the economic impact of the regulatory options in different ways depending on the affected segment, Manufacturers or Electric Generators:

For Manufacturers, EPA assessed the impact of compliance costs on business viability at the level of the affected facility (*facility-level analysis*), including assessment of the potential for facility closures and of the potential for affected facilities to incur financial stress short of closure. For manufacturers, EPA also assessed the impact of compliance requirements on the entities that own in-scope facilities (*firm-level analysis*), based on the level of compliance costs incurred by the total of in-scope facilities owned by a firm in relation to the revenue of the firm.

For Electric Generators, EPA assessed economic impact in three ways: (1) An assessment of the impact of compliance costs on first, complying facilities and second, the entities that own those facilities, based on comparison of compliance costs to facility and firm revenue, (2) an assessment of potential electricity price effects on residential and other electricity consumers, and (3) an assessment of the impact of the proposed regulatory options within the context of the electricity markets in which affected facilities operate.

These analyses are based on the facilities included in EPA's previous 316(b) surveys of electric generators and those manufacturing industries whose operations are most reliant on cooling water and that are expected to be most affected by this proposal. For each regulatory option, only those facilities that would be subject to national standards, based on their DIF, are included in the analyses.

The following sections summarize the methods and findings for manufacturers and electric power generators for these analyses.

a. Manufacturers

This section presents EPA's estimated economic impacts on Manufacturers for the three regulatory options. The

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economic impact analyses for Manufacturers assess how facilities, and the firms that own them, are expected to be affected financially by the regulatory options. The facility impact analysis starts with compliance cost estimates from the EPA engineering analysis (see section VII.B) and then calculates how these compliance costs would affect the financial performance and condition of the sample facilities and owning firms.

Measures of economic impact include facility closures and associated losses in revenue and employment, financial stress short of closure ("moderate impacts"), and firm-level impacts.[68]

In conducting the facility impact analysis, EPA first eliminated from the analysis those facilities that the Agency estimated to be at substantial risk of financial failure regardless of any additional financial burden that might result from the regulatory options under consideration (baseline closure facilities). Second, for the remaining facilities, EPA evaluated how compliance costs would likely affect facility financial performance and condition. EPA identified a facility as a regulatory closure if it would have operated under baseline conditions but would fall below an acceptable financial performance level under the new regulatory requirements.

EPA's analysis of regulatory closures is based on the estimated change in facility After-Tax Cash Flow (cash flow) as a result of the regulation and specifically examines whether the change in cash flow would be sufficient to cause the facility's going concern business value to become negative. EPA calculated business value using a discounted cash flow framework in which cash flow is discounted at an estimated cost of capital to calculate the going concern value of the facility. The specific definition of cash flow used in these analyses is after-tax free cash flow available to all capital—equity and debt—including an allowance for ongoing capital expenditures required by the business. Correspondingly, the cost of capital reflects the combined cost, after-tax, of equity and debt capital. For its analysis of economic/financial impacts on the Manufacturers industry segment, EPA used 7 percent as a real, after-tax cost of capital. Use of the 7 percent discount rate is consistent with guidance from the Office of Management and Budget on the opportunity cost of capital to society.

In these analyses, EPA first calculated the baseline going concern value of the facility using its baseline cash flow—*i.e.,* facility cash flow before compliance-related outlays—and used this value to determine whether a given facility is a baseline closure (for details see Chapter 4 of the EBA report). If EPA found the facility's estimated going concern value to be negative, then the facility was judged a baseline closure—*i.e.,* likely to fail financially, independent of incurrence of compliance costs—and removed the facility from further consideration in the impact and other economic analyses.

As the second step in the facility impact analysis, EPA adjusted the baseline cash flow to reflect the expected financial effects of compliance technology installation and operation. Based on an assessment of cost pass-through potential in the affected industries (see Chapter 5 and Appendix 4.A of the EBA), EPA assumed that *none* of the facility's compliance costs could be passed on to its customers as price and revenue increases—*i.e.,* all compliance costs must be absorbed within the facility's cash flow. EPA then recalculated the facility's business value using the adjusted post-compliance cash flow. If this analysis found that the facility's business value would become negative as a result of meeting compliance requirements, then EPA judged the facility to be a regulatory closure.

EPA also identified facilities that would likely incur moderate financial impacts, but that are not expected to close, as a result of the rule. EPA established thresholds for two measures of financial performance and condition—interest coverage ratio and pre-tax return on assets—and compared the facilities' performance before and after compliance under each regulatory option with these thresholds. EPA attributed incremental moderate impacts to the rule if both financial ratios exceeded threshold values in the baseline (*i.e.,* there were no moderate impacts in the baseline), but at least one financial ratio fell below the threshold value in the post-compliance case.

i. Baseline Closure Analysis

Exhibit VII–4 presents projected baseline closures for the estimated facilities in the Primary Manufacturing Industries and additional known facilities in Other Industries.[69] From the analysis as outlined above, EPA determined that 73 facilities (or 13 percent) of the estimated 569 regulated facilities in the six Primary Manufacturing Industries are baseline closures. The highest percentages of baseline closures occur in the Steel industry sector (32 percent). An additional three facilities (or 30 percent) of the 10 known facilities in Other Industries are projected to be baseline closures. These facilities were excluded from the post-compliance analysis of regulatory impacts, leaving 504 facilities for the assessment of compliance impacts.

EXHIBIT VII–4—SUMMARY OF BASELINE CLOSURES FOR MANUFACTURERS

Sector	Total number of facilities [a]	Number of baseline closures	Percentage of baseline closures	Operating in baseline
Paper	230	32	14	198
Chemicals	171	4	3	167
Petroleum	36	5	15	30
Steel	68	22	32	46
Aluminum	27	3	12	24
Food and Kindred Products	37	6	17	31
Total Facilities in Primary Manufacturing Industries	*569*	*73*	*13*	*497*

[68] For the analysis of three regulatory options presented in this document, neither employment loss nor output loss were in fact relevant because none of these options resulted in regulatory closures.

[69] The estimated number of Manufacturers facilities considered in the impact analysis (579) differs from the number reported in the broader analyses (592). EPA determined that the survey responses of 14 sample facilities lacked certain financial data needed for the facility impact analysis while containing sufficient data to support estimates of facility counts and compliance costs. EPA therefore retained these sample facilities (37 sample weighted facilities) in the broader analyses but excluded them from the impact analysis. When these sample facilities were excluded from the impact analysis, the sample weights for the remaining facilities within the affected sample frames were adjusted upwards to account for their removal (the revised weights are referred to as the economic analysis weights). The difference in the reported facility totals in the impact and social cost analyses reflects the removal of these 14 facilities and the use of adjusted sample weights, which due to rounding error results in a difference of 13 between the facilities in the impact analysis and those in the other analyses.

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EXHIBIT VII–4—SUMMARY OF BASELINE CLOSURES FOR MANUFACTURERS—Continued

Sector	Total number of facilities [a]	Number of baseline closures	Percentage of baseline closures	Operating in baseline
Additional known facilities in Other Industries	10	3	30	7
Total Manufacturers Facilities	579	76	13	504

[a] Economic Analysis Weights were used to determine facility counts. See preceding footnote.

ii. Number of Facilities Subject to National Standards

EPA estimates that all of these 504 Manufacturers facilities—497 facilities in the Primary Manufacturing Industries and 7 facilities in the Other Industries—are subject to the requirements under the four regulatory options, although the technology response anticipated at individual facilities differs under each option. Under Option 1, all 504 facilities passing the baseline closure test would be required to meet IM standards and EPA estimates that 370 will need to install new technology in order to do so. Under Option 2, 57 facilities with DIF exceeding 125 MGD would be required to meet I&E mortality standards, and EPA estimates that all of these facilities would need to retrofit closed-cycle cooling. The remaining 448 facilities would be subject only to IM standards, and EPA estimates that 366 would need to install new technology to meet these requirements. Under Option 3, all 504 facilities would be required to meet I&E mortality standards, and in this case EPA estimates that 426 facilities would need to install a cooling tower to meet these requirements. In addition, EPA estimates that 181 facilities would need to install additional IM technology to meet Option 3's regulatory requirements. Under Option 4, 156 facilities would be required to meet IM standards; in this case, EPA estimates that 139 facilities would need to install new technology to meet this requirement.

iii. Post-Compliance Facility Impact Analysis; Summary of Impacts

Of the 504 Manufacturers facilities potentially subject to regulation after excluding baseline closures, EPA estimated that no facilities would close or incur employment losses as a result of the Options. EPA also found that no facilities would incur moderate impacts under Options 1, 2, and 4, but 17 facilities would incur moderate impacts under Option 3.

Exhibit VII–5 summarizes the estimated impacts of the proposed rule on Manufacturers by option, including facility impacts and total annualized compliance costs on an after-tax basis. The reported costs exclude compliance costs for baseline closures. The total annualized, after-tax compliance cost reported in Exhibit VII–5 represents the cost actually incurred by complying firms, taking into account the reductions in tax liability resulting from compliance outlays and assuming no recovery of costs from customers through increased prices. The after-tax analysis uses a combined federal/State tax rate, and accounts for facilities' baseline tax circumstances. Specifically, tax offsets to compliance costs are limited not to exceed facility-level tax payments as reported in facility questionnaire responses. The total annualized, after-tax compliance cost reported here is the sum of annualized, after-tax costs by facility at the year of compliance, using a 7 percent after-tax cost of capital. This cost calculation differs from the calculation of compliance costs as included in the calculation of the total social costs of the regulation (see Section VII.C) where costs are accounted for on a pre-tax basis.

EXHIBIT VII–5—FACILITY IMPACTS AND COMPLIANCE COSTS FOR MANUFACTURERS

	Option 1	Option 2	Option 3	Option 4
Primary Manufacturing Industries				
Number of Facilities Operating in Baseline	497	497	497	497
Number of Closures (Severe Impacts)	0	0	0	0
Percentage of Facilities Closing	0%	0%	0%	0%
Number of Facilities with Moderate Impacts	0	0	17	0
Percentage of Facilities with Moderate Impacts	0%	0%	3.40%	0.00%
Annualized Compliance Costs (after tax, million 2009 $)	$40.78	$108.71	$147.87	$23.38
Additional Known Facilities in Other Industries				
Number of Facilities Operating in Baseline	7	7	7	7
Number of Closures (Severe Impacts)	0	0	0	0
Percentage of Facilities Closing	0%	0%	0%	0%
Number of Facilities with Moderate Impacts	0	0	0	0
Percentage of Facilities with Moderate Impacts	0%	0%	0%	0%
Annualized Compliance Costs (after tax, million 2009 $)	$1.13	$1.52	$1.99	$0.60

iv. Firm-Level Impact

In addition to analyzing the impact of the regulation at the facility level, EPA also examined the impact of the proposed rule on firms that own manufacturing facilities with cooling water intake structures. A firm that owns multiple facilities could be adversely affected due to the cumulative burden of regulatory requirements over these facilities. For the assessment of firm-level effects, EPA calculated annualized after-tax compliance costs as a percentage of firm revenue and reports here the estimated number and percentage of affected firms incurring compliance costs in three cost-to-revenue ranges: Less than 1 percent; at least 1 percent but less than 3 percent; and 3 percent or higher.

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EPA's sample-based analysis of facilities in the Primary Manufacturing Industries supports specific estimates of the number of facilities expected to be affected by the regulation and the total compliance costs expected to be incurred in these facilities. However, the sample-based analysis does not support specific estimates of the number of firms that own facilities in the Primary Manufacturing Industries. In addition, and as a corollary, the sample-based analysis does not support specific estimates of the number of regulated facilities that may be owned by a single firm, or of the total of compliance costs across regulated facilities that may be owned by a single firm. For the firm-level analysis, EPA therefore considered two approximate bounding cases based on the sample weights developed from the facility survey. These cases provide a range of estimates for the number of firms incurring compliance costs and the costs incurred by any firm owning a regulated facility. The cases are as follows:

1. *Lower bound estimate of number of firms owning facilities that face requirements under the regulation; upper bound estimate of total compliance costs that a firm may incur.* For this case, EPA assumed that any firm owning a regulated sample facility(ies), owns the known sample facility(ies) and all of the sample weights associated with the sample facility(ies). This case yields an approximate lower bound estimate of the count of affected firms, and an approximate upper bound estimate of the potential cost burden to any single firm (see EBA Chapter 4 for information on the analysis of firm-level impacts).

2. *Upper bound estimate of number of firms owning facilities that face requirements under the regulation; lower bound estimate of total compliance costs that a firm may incur.* For this case, EPA inverted the prior assumption and assumed (1) that a firm owns only the regulated sample facility(ies) that it is known to own from the sample analysis and (2) that this pattern of ownership, observed for sampled facilities and their owning firms, extends over the facility population represented by the sample facilities. This case minimizes the possibility of multi-facility ownership by a single firm and thus maximizes the count of affected firms, but also minimizes the potential cost burden to any single firm.

Exhibit VII–6 summarizes the results of the firm-level analysis for these two analytic cases.

EXHIBIT VII–6—FIRM-LEVEL AFTER-TAX ANNUAL COMPLIANCE COSTS AS A PERCENTAGE OF REVENUE

Number of firms in the analysis	Pot. reg.	Not analyzed due to lack of revenue information [b]		Number and percentage with after tax annual compliance costs/annual revenue of:					
				Less than 1%		1–3%		At least 3%	
		Number	%	Number	%	Number	%	Number	%
Primary Manufacturing Industries									
Case 1: Lower bound estimate of number of firms owning facilities that face requirements under the regulation; upper bound estimate of total compliance costs that a firm may incur [a]									
Option 1	117	3	3	113	96	0	0	1	1
Option 2	117	3	3	113	96	0	0	1	1
Option 3	117	3	3	113	96	0	0	1	1
Option 4	117	0	0	117	100	0	0	0	0
Case 2: Upper bound estimate of number of firms owning facilities that face requirements under the regulation; lower bound estimate of total compliance costs that a firm may incur.									
Option 1	359	9	3	349	97	0	0	1	0
Option 2	359	9	3	349	97	0	0	1	0
Option 3	359	9	3	349	97	0	0	1	0
Option 4	359	0	0	359	100	0	0	0	0
Other Industries									
Option 1	9	0	0	9	100	0	0	0	0
Option 2	9	0	0	9	100	0	0	0	0
Option 3	9	0	0	9	100	0	0	0	0
Option 4	9	0	0	9	100	0	0	0	0

[a] The alternative analysis case concepts are not applicable to the Other Industries firms and facilities, because these facilities do not receive sample weights.

[b] For Options 1, 2, and 3, all facilities and parent firms are assigned costs; however three firms are not analyzed because no revenue data is available. In Option 4, these three firms are assigned no costs, and so by definition have cost to revenue ratios less than 1% and are categorized as such.

As presented in Exhibit VII–6, EPA estimated that the number of firms owning regulated facilities in the Primary Manufacturing Industries range from 117 (Case 1 estimate) to 359 (Case 2 estimate), depending on the assumed ownership cases outlined above. An additional 9 firms are known to own facilities in Other Industries.[70]

EPA's analyses indicate that the number of firms falling in the reported cost-to-revenue impact ranges is the

[70] The alternative analysis case approaches are not applicable to the Other Industries firms and facilities, because these facilities do not receive sample weights.

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same across Options 1, 2, and 3, by analysis case. No firms fall in the reported impact ranges under Option 4 for either analysis case. Under Case 1, Lower Bound Estimate of Number of Firms Owning Facilities/Upper Bound Estimate of Costs Incurred by these Firms, zero of the estimated 117 firms owning Manufacturers facilities incur costs between 1 and 3 percent of revenue for all Options, and one firm incurs costs exceeding 3 percent of revenue under Options 1, 2, and 3. No firms incur costs exceeding 3 percent of revenue under Option 4. The remaining 113 (Options 1, 2, and 3), and 117 (Option 4) firms incur costs below 1 percent of revenue or no costs.

Under Case 2, Upper Bound Estimate of Number of Firms Owning Facilities/ Lower Bound Estimate of Costs Incurred by these Firms, zero firms in the Primary manufacturing industries are estimated to incur costs between 1 and 3 percent of revenue under all Options. Like Case 1, one firm incurs costs exceeding 3 percent of revenue under Options 1, 2, and 3, and no firms incur costs exceeding 3 percent of revenue under Option 4. The remaining 349, and 359 firms, respectively, incur costs below 1 percent of revenue or no costs.

For the firms owning Other Industries facilities, EPA's analysis indicates that across all Options, no firms incur costs exceeding 1 percent of revenue.

Regardless of the analysis case or regulatory option, the number and percentage of firms incurring costs between one and three percent of revenue, or exceeding three percent of revenue, are small.

b. Electric Generators

For Electric Generators, EPA assessed the economic impact of the regulatory options in three major ways: (1) Entity level impacts (at both the facility and parent company levels), (2) potential electricity price effects on residential and other electricity consumers, and (3) broader electricity market impacts (taking into account the interconnectedness of regional and national electricity markets, using five metrics, for the full industry, for in-scope facilities only, and as the distribution of impacts at the facility level).

1. Assessment of the Impact on Complying Facilities and Parent Entities

EPA assessed the cost to complying facilities and parent entities based on cost-to-revenue analyses. For these two analyses, the Agency assumed that none of the compliance costs will be passed on to consumers through electricity rate increases and will instead be absorbed by complying facilities and their parent entities. In performing these and other impact analyses, EPA developed and used sample weights to extrapolate impacts assessed initially at the level of a sample of facilities to the full population of in-scope facilities. Specifically, EPA developed and used different sets of weights, with each weight set being used to derive a specific estimate and/or used with a different set of sample facilities to which the weights were applied to derive a given estimate. (See Appendix 3.A of the EBA report for a discussion on weights development and application.)

a. Cost-to-Revenue Analysis for Complying Facilities

To provide insight on the potential significance of the compliance costs to complying facilities, EPA calculated the annualized after-tax compliance costs of the regulatory options as a percentage of baseline annual revenues, for 559 in-scope facilities.[71] [72] Most of the revenue estimates used in this analysis were developed using the average of facility-specific baseline (*i.e.,* pre-promulgation) projections from the Integrated Planning Model (IPM) for 2015, 2020, 2025, and 2028.[73] In a few instances where IPM-based revenue values were not available, EPA used estimates based on Energy Information Administration (EIA) data. EPA performed this analysis for each of the 257 facilities for which compliance cost estimates were explicitly developed. As stated above, EPA used facility sample weights to estimate the total numbers of in-scope facilities that fall within various cost-to-revenue ranges as reported in Exhibit VII–7 (see Chapter 5 of the EBA report for a discussion of the facility-level cost-to-revenue analysis).

Exhibit VII–7, below, summarizes the facility-level cost-to-revenue analysis results for each option, by North American Electricity Reliability Corporation (NERC) region.[74] EPA estimates for Options 1 and 4, that the majority of facilities subject to today's proposal will incur annualized costs of less than 1 percent of revenue (481 facilities or 86 percent). Under Options 2 and 3, the majority of in-scope facilities, 333 (or approximately 60 percent) and 386 (or approximately 69 percent), respectively, will incur annualized costs exceeding 3 percent of revenue.

EXHIBIT VII–7—FACILITY-LEVEL COST-TO-REVENUE ANALYSIS RESULTS BY REGULATORY OPTION AND NERC REGION [A]

Number of in-scope facilities [a, b]	No revenue [c]	Number of facilities with cost-to-revenue ratio of			Minimum ratio %	Maximum ratio %
		< 1%	1–3%	> 3%		
Option 1: IM Everywhere						
ASCC	0	0	0	0	0.00	0.00
ERCOT	5	28	7	2	0.00	3.28
FRCC	0	18	4	4	0.00	3.49

[71] For private, tax-paying entities, after-tax costs are a more relevant measure of potential cost burden than pre-tax costs. For non tax-paying entities (e.g., State government and municipality owners of in-scope facilities), the estimated costs used in this calculation include no adjustment for taxes.

[72] For the facility cost-to-revenue analysis, EPA estimated compliance costs for all facilities as of an assumed single proxy compliance year, 2015, for comparison with 2015 revenues. EPA's choice of the year for which cost and revenue values are used in a particular part of the cost analysis was driven by the concept of a given analysis (e.g., should cost and revenue values be as of the Rule promulgation year, as of a facility's expected compliance year, or as of a post-compliance, steady state operations year?) and the availability of data for the analysis. For more information on the methodology for the facility-level cost-to-revenue analysis, *see* Chapter 5 of the EBA report.

[73] To develop the average of year-by-year revenue values over the data years, EPA set aside from the averaging calculation, revenue values for years that are substantially lower than the otherwise "steady state average"—e.g., because of a generating unit being out of service for an extended period. EPA believes the resulting cost-to-revenue comparison provides a more realistic assessment of potential impact on a "steady state" operations basis.

[74] The NERC regions used for summarizing these findings are as of 2008. Some NERC regions have been re-defined over the past few years. The NERC region definitions used in today's Proposed Existing Facilities Regulation analyses vary by analysis depending on which region definition aligns better with the data elements underlying the analysis.

EXHIBIT VII–7—FACILITY-LEVEL COST-TO-REVENUE ANALYSIS RESULTS BY REGULATORY OPTION AND NERC REGION [A]—Continued

Number of in-scope facilities [a, b]	No revenue [c]	Number of facilities with cost-to-revenue ratio of			Minimum ratio %	Maximum ratio %
		< 1%	1–3%	> 3%		
HICC	0	2	2	0	0.34	1.04
MRO	0	43	4	0	0.00	1.80
NPCC	0	49	14	0	0.00	2.64
RFC	0	148	13	3	0.00	3.58
SERC	0	146	6	5	0.00	3.61
SPP	0	28	6	0	0.00	2.38
WECC	0	19	0	4	0.00	3.38
Total	5	481	55	18	0.00	3.61
Option 2: IM Everywhere and EM for Facilities With DIF > 125 MGD						
ASCC	0	0	0	0	0.00	0.00
ERCOT	5	5	1	31	0.00	43.39
FRCC	0	5	4	16	0.00	35.37
HICC	0	0	0	3	3.87	8.48
MRO	0	20	6	20	0.00	10.96
NPCC	0	15	10	38	0.00	37.53
RFC	0	47	15	102	0.00	12.50
SERC	0	44	14	100	0.00	24.23
SPP	0	11	6	17	0.00	49.66
WECC	0	19	0	4	0.00	40.10
Total	5	166	55	333	0.00	49.66
Option 3: I&E Mortality Everywhere						
ASCC	0	0	0	0	0.00	0.00
ERCOT	5	5	1	31	0.00	43.39
FRCC	0	5	4	16	0.00	35.37
HICC	0	0	0	3	3.87	8.48
MRO	0	6	7	33	0.00	18.38
NPCC	0	0	9	55	1.22	37.53
RFC	0	38	8	119	0.00	51.38
SERC	0	29	22	106	0.00	28.47
SPP	0	11	6	17	0.00	49.66
WECC	0	17	0	6	0.00	40.10
Total	5	112	57	386	0.00	51.38
Option 4: IM for Facilities With DIF > 50 MGD						
ASCC	0	0	0	0	0.00	0.00
ERCOT	5	28	7	2	0.00	3.28
FRCC	0	18	4	4	0.00	3.49
HICC	0	2	2	0	0.34	1.04
MRO	0	43	4	0	0.00	1.80
NPCC	0	52	11	0	0.00	2.64
RFC	0	151	12	2	0.00	3.54
SERC	0	148	5	5	0.00	3.61
SPP	0	28	6	0	0.00	2.38
WECC	0	19	0	4	0.00	3.38
Total	5	488	49	17	0.00	3.61

[a] No explicitly analyzed facilities are located in the ASCC region. For more information on explicitly and implicitly analyzed in-scope facilities see Appendix 3.A of the EBA report.
[b] Facility counts exclude baseline closures.
[c] IPM and EIA report no revenue for 2 facilities (5 on the weighted basis); consequently, facility-level cost-to-revenue analysis is performed for 257 facilities (559 on the weighted basis).

b. Parent Entity-Level Cost-to-Revenue Analysis

EPA also assessed the economic impact of the options considered for today's proposed rule at the parent entity-level. The cost-to-revenue analysis at the entity level provides insight on the impact of compliance requirements on those entities that own more than one in-scope facility. For this analysis, EPA identified the domestic parent entity of each in-scope facility and obtained the entity's revenue from publicly available data sources. For 5 identified ultimate parent entities that own at least one explicitly analyzed Electric Generator (*i.e.,* Detailed Questionnaire (DQ) facilities and a

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subset of the Short Technical Questionnaire (STQ) facilities with re-circulating systems in their baseline) and that are non-U.S. firms EPA could not obtain revenue for a domestic entity but did obtain revenue at the level of the international parent entity; for these 5 entities, EPA used this international entity revenue in the cost-to-revenue analysis. EPA compared the total annualized after-tax compliance costs, as of 2015 to the identified parent entity's total sales revenue (see Chapter 5 of the EBA report).

Because compliance costs for the regulatory options were directly attributable to only a subset of the in-scope facilities (*i.e.,* the explicitly analyzed, Detailed Questionnaire (DQ) facilities and a subset of the Short Technical Questionnaire (STQ) facilities with re-circulating systems in their baseline) and were therefore able to be linked with only a subset of the parent entities that own in-scope facilities, EPA developed and used entity-level sample weights for this analysis, as outlined in the Appendix 3.A of the EBA report. EPA defined two cases combining entity-level sample weights with facility-level weights to yield approximate estimates of the numbers of parent entities incurring costs in specific cost-to-revenue ranges. Each case addresses a specific element of the understanding of entity-level effects (see Chapter 5 of the EBA report for a discussion of the entity-level cost-to-revenue analysis):

- Estimation of facility costs at the level of the parent entity, accounting for the potential ownership of implicitly analyzed, sample-represented facilities by an identified parent entity and
- Estimation of the number of parent entities, accounting for the potential presence of parent entities that own only (an) implicitly analyzed facility(ies) and thus cannot be associated with the explicitly analyzed facilities.

The two analysis cases and the findings from their analysis are as follows:

- *Using facility-level weights:* For this case, facility-level weights were applied to the estimated compliance costs for facilities identified as being owned by a given parent entity.[75] This calculation may overstate the number of facilities and compliance costs at the level of any given parent entity, but also likely underestimates the number of parent entities. This analysis indicates that 97 unique parent entities own 559 facilities subject to today's proposal. From this analysis, EPA estimates that the majority of parent entities will incur annualized costs of less than one percent of revenues under Option 1 (85 out of 97 parent entities or 89 percent), Option 2 (54 out of 97 parent entities or 56 percent), and Option 4 (86 out of 97 parent entities or 91 percent). Under the more costly Option 3, a nearly equal number of entities are expected to incur costs above and below 1 percent of revenue, *i.e.,* 46 and 45 out of 91 parent entities, respectively, not taking into account 6 parent entities with unknown revenue (see Exhibit VII–8).

EXHIBIT VII–8—ENTITY-LEVEL COST-TO-REVENUE ANALYSIS RESULTS, USING FACILITY-LEVEL WEIGHTS

Parent entity type	Total number of facilities [b]	Total number of entities	Number of entities with cost-to-revenue ratio of[a]			
			< 1%	1–3%	> 3%	Unknown
Option 1: IM Everywhere						
Cooperative	25	11	10	0	1	0
Federal	16	1	1	0	0	0
Investor-owned	306	38	38	0	0	0
Municipality	25	13	9	4	0	0
Nonutility	170	30	23	0	1	6
Other political subdivision	0	0	0	0	0	0
State	17	4	4	0	0	0
Total	559	97	85	4	2	6
Option 2: IM Everywhere and EM for Facilities With DIF > 125 MGD						
Cooperative	25	11	7	1	3	0
Federal	16	1	0	0	1	0
Investor-owned	306	38	20	14	4	0
Municipality	25	13	6	5	2	0
Nonutility	170	30	18	2	4	6
Other political subdivision	0	0	0	0	0	0
State	17	4	3	0	1	0
Total	559	97	54	22	15	6
Option 3: I&E Mortality Everywhere						
Cooperative	25	11	4	3	4	0
Federal	16	1	0	0	1	0
Investor-owned	306	38	20	14	4	0
Municipality	25	13	2	5	6	0
Nonutility	170	30	18	2	4	6
Other political subdivision	0	0	0	0	0	0
State	17	4	2	1	1	0
Total	559	97	46	25	20	6

[75] Parent entity weights were not used in this calculation because the combination of facility weights and entity weights would overstate, perhaps substantially, the estimate of in-scope facilities and compliance costs assigned to parent entities.

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EXHIBIT VII–8—ENTITY-LEVEL COST-TO-REVENUE ANALYSIS RESULTS, USING FACILITY-LEVEL WEIGHTS—Continued

Parent entity type	Total number of facilities [b]	Total number of entities	Number of entities with cost-to-revenue ratio of [a]			
			< 1%	1–3%	> 3%	Unknown
Option 4: IM for Facilities With DIF > 50 MGD						
Cooperative	25	11	10	0	1	0
Federal	16	1	1	0	0	0
Investor-owned	306	38	38	0	0	0
Municipality	25	13	10	3	0	0
Nonutility	170	30	23	0	1	6
Other political subdivision	0	0	0	0	0	0
State	17	4	4	0	0	0
Total	559	97	86	3	2	6

[a] EPA was unable to determine entity-level revenues for 6 (8 weighted) parent entities; consequently, for the purpose of this analysis, EPA used the sum of facility-level revenues for facilities owned by these parent entities.
[b] Facility counts exclude baseline closures.

• *Using entity-level weights:* For this case, entity-level weights were applied to the calculated number of parent entities estimated to incur costs in each cost-to-revenue range.[76] This calculation may understate the number of facilities and compliance costs at the level of any given parent entity, but accounts more comprehensively for the number of parent entities owning in-scope facilities. This analysis found that 140 unique domestic parent entities own 257 facilities subject to today's proposal (see Exhibit VII–9).[77] From this analysis, EPA estimates that the majority of parent entities will incur annualized costs of less than one percent of revenues regardless of the option.

EXHIBIT VII–9—ENTITY-LEVEL COST-TO-REVENUE ANALYSIS RESULTS, USING ENTITY-LEVEL WEIGHTS

Parent entity type	Total number of facilities [b]	Total number of entities [c]	Number of entities with cost-to-revenue ratio of [a]			
			< 1%	1–3%	> 3%	Unknown
Option 1: IM Everywhere						
Cooperative	13	20	18	2	0	0
Federal	7	1	1	0	0	0
Investor-owned	138	42	42	0	0	0
Municipality	13	35	35	0	0	0
Nonutility	78	38	29	0	1	8
Other political subdivision	0	0	0	0	0	0
State	8	4	4	0	0	0
Total	257	140	129	2	1	8
Option 2: IM Everywhere and EM for Facilities With DIF > 125 MGD						
Cooperative	13	20	13	5	2	0
Federal	7	1	0	0	1	0
Investor-owned	138	42	35	6	1	0
Municipality	13	35	24	8	3	0
Nonutility	78	38	25	4	1	8
Other political subdivision	0	0	0	0	0	0
State	8	4	3	0	1	0
Total	257	140	101	23	9	8
Option 3: I&E Mortality Everywhere						
Cooperative	13	20	9	9	2	0
Federal	7	1	0	0	1	0
Investor-owned	138	42	35	6	1	0
Municipality	13	35	13	11	11	0
Nonutility	78	38	25	4	1	8
Other political subdivision	0	0	0	0	0	0
State	8	4	3	0	1	0

[76] In the same way as stated above, facility weights were not used in conjunction with entity weights because the combination of facility weights and entity weights would overstate, perhaps, the estimate of in-scope facilities and compliance costs assigned to parent entities.

[77] The NERC regions used to summarize these findings are as of 2004, which is the NERC region basis used in the utility-level EIA 2007 database. Some NERC regions have been re-defined over the past few years. The NERC region definitions used in these analyses vary by analysis depending on which region definition aligns better with the data elements underlying the analysis.

EXHIBIT VII–9—ENTITY-LEVEL COST-TO-REVENUE ANALYSIS RESULTS, USING ENTITY-LEVEL WEIGHTS—Continued

Parent entity type	Total number of facilities [b]	Total number of entities [c]	Number of entities with cost-to-revenue ratio of [a]			
			< 1%	1–3%	> 3%	Unknown
Total	257	140	86	29	17	8
Option 4: IM for Facilities With DIF > 50MGD						
Cooperative	13	20	18	2	0	0
Federal	7	1	1	0	0	0
Investor-owned	138	42	42	0	0	0
Municipality	13	35	36	0	0	0
Nonutility	78	38	29	0	1	8
Other political subdivision	0	0	0	0	0	0
State	8	4	4	0	0	0
Total	257	140	130	2	1	8

[a] EPA was unable to determine entity-level revenues for 6 (8 weighted) parent entities; consequently, for the purpose of this analysis, EPA used the sum of facility-level revenues for facilities owned by these parent entities.
[b] Facility counts exclude baseline closures.
[c] There are a total of 143 parent entities on an unweighted basis, 3 of which are other political subdivision entities. These entities own only implicitly analyzed facilities; consequently, there is no explicitly analyzed other political subdivision parent entity to represent these implicitly analyzed parent entities and total weighted entity counts do not include 3 other political subdivision entities.

As discussed above, because compliance costs for the regulatory options were directly attributable to only a subset of the in-scope facilities and were therefore able to be linked with only a subset of the parent entities that own in-scope facilities, EPA conducted entity cost-to-revenue analysis using two weighting approaches. Using facility-level weights is likely to underestimate the number of parent entities and overstate the number of facilities and compliance costs at the level of any given parent entity. At the same time, using entity-level weights is likely to account more comprehensively for the number of parent entities owning in-scope facilities but understate the number of facilities and compliance costs at the level of any given parent entity.

Under these alternative approaches, at the 1–3 percent of revenue impact level, EPA estimates that 4 and 2 firms (4.1 percent and 1.4 percent of firms owning in-scope facilities, respectively) would fall in this impact range under Option 1, 22 and 23 firms (22.7 percent and 16.4 percent, respectively) under Option 2, and 25 and 29 firms (25.8 percent and 20.7 percent, respectively) under Option 3. At the 3 percent of revenue impact level, the Agency estimates that 2 and 1 firms (2.1 percent and 0.7 percent, respectively) would fall in this impact range under Option 1, 15 and 9 firms (15.5 percent and 6.4 percent, respectively) under Option 2, and 20 and 17 firms (20.6 percent and 12.1 percent, respectively) under Option 3. The results for Option 4 are virtually identical to those of Option 1, with one fewer entity incurring costs between 1 and 3 percent of revenue.

2. Assessment of Potential Electricity Price Effects

As an additional measure of economic impact, EPA assessed the potential electricity price effects from today's Proposed Existing Facilities Regulation in two ways: (1) An assessment of the potential annual increase in household electricity costs and (2) an assessment of the potential annual increase in electricity costs per MWh of total electricity sales. These analyses assume that all compliance costs will be passed through on a pre-tax basis as increased electricity prices as opposed to the treatment in the facility- and firm-level analyses discussed in Section VII.D.b.1, which assume that *none* of the compliance costs will be passed to consumers through electricity rate increases. For discussion of the reasonableness of this assumption see EBA Chapter 5.

a. Cost to Residential Households

Using the assumptions outlined above, EPA estimated the potential annual increase in electricity costs per household by NERC region. The analysis uses the total annualized pre-tax compliance cost per megawatt hour (MWh) for the year 2015, in conjunction with the reported total electricity sales quantity for each NERC region as reported by the EIA for 2007 for all NERC regions except ASCC and HICC, for which total 2015 electricity sales projections came from the Department of Energy's *Annual Energy Outlook 2009* (AEO 2009).[78] This analysis also uses the quantity of residential electricity sales per household as reported by the 2007 EIA for all NERC regions 2007.

To calculate the average cost per household, by region, EPA divided total compliance costs for each NERC region by the reported total MWh of sales within the region. The potential annual cost impact per household was then calculated by multiplying the estimated average cost per MWh by the average MWh per household, by NERC region.[79]

Exhibit VII–10 below, summarizes the annual household impact results for each option, by NERC region. These results show that for Option 1, the average annual cost per residential household is expected to range from $0.05 in WECC to $3.93 in SPP, for Option 2 from $0.09 in WECC to $27.11 in SERC, and for Option 3 from $0.11 in WECC to $27.88 in SERC. Overall, for a typical U.S. household, Option 4 is expected to result in the lowest annual cost of $1.37 per household, while Option 3 is expected to result in the highest annual cost of $17.60 per household. Option 1 and Option 2 are estimated to result in annual costs of $1.41 per household and $17.09 per household, respectively.

[78] AEO does not provide information for ASCC and HICC.

[79] The NERC regions used for summarizing these findings are as of 2004, which is the NERC region basis used in the utility-level EIA 2006 database. Some NERC regions have been re-defined over the past few years. The NERC region definitions used in today's Proposed Existing Facilities Regulation analyses vary by analysis depending on which region definition aligns better with the data elements underlying the analysis.

EXHIBIT VII–10—AVERAGE ANNUAL COST PER RESIDENTIAL HOUSEHOLD IN 2015 BY REGULATORY OPTION AND NERC REGION [A B]

NERC Region [c]	Option 1	Option 2	Option 3	Option 4
ASCC	$0.00	$0.00	$0.00	$0.00
ECAR	1.23	20.00	20.47	1.22
ERCOT	1.76	26.52	26.52	1.74
FRCC	2.37	17.89	18.21	2.37
HICC	3.16	23.82	23.82	3.16
MAAC	2.11	18.97	19.31	1.95
MAIN	1.46	19.18	20.18	1.41
MAPP	1.79	16.00	17.04	1.74
NPCC	1.38	19.89	21.13	1.37
SERC	1.64	27.11	27.88	1.61
SPP	3.93	21.56	21.56	3.86
WECC	0.05	0.09	0.11	0.01
U.S.	1.41	17.09	17.60	1.37

[a] The rate impact analysis assumes full pass-through of all compliance costs to electricity consumers.
[b] Cost estimates exclude baseline closures.
[c] No explicitly analyzed facilities are located in the ASCC region. For more information on explicitly and implicitly analyzed in-scope facilities see Appendix 3.A of the EBA report.

As stated above, this analysis assumes that all of the compliance costs will be passed onto consumers through increased electricity rates. However, at least some facilities and firms are likely to absorb some of these costs, thereby reducing the impact of today's proposed rule on electricity consumers. At the same time, EPA recognizes that Electric Generators that operate as regulated public utilities are generally permitted to pass on environmental compliance costs as rate increases to consumers.

b. Compliance Cost per Unit of Electricity Sales

EPA also calculated the per unit of electricity sales cost of the regulatory options. EPA used two data inputs in this analysis (1) total pre-tax compliance cost by NERC region, and (2) estimated total electricity sales, from the AEO 2009 for 2015, by NERC region, for all NERC regions except ASCC and HICC; for ASCC and HICC EPA used 2007 EIA. The Agency summed sample-weighted pre-tax annualized compliance costs as of 2015 over complying facilities by NERC region to calculate an approximate total estimated annual cost in each region. EPA then calculated the approximate average price impact per unit of electricity consumption by dividing total compliance costs by the reported total MWh of sales in each NERC region.

As reported in Exhibit VII–11, annualized compliance costs (in dollars per KWh sales) range from 0.001¢ in the WECC region to 0.040¢ in the HICC region for Option 1, from 0.001¢ in the WECC region to 0.303¢ in the HICC region for Options 2 and 3, and from less than 0.001¢ in the WECC region to 0.040¢ in the HICC region for Option 4. On average, across the United States, Option 4 results in the lowest cost of 0.012¢ per KWh, while Option 3 results in the highest cost of 0.157¢ per KWh. Option 1 and Option 2 result in national costs of 0.013¢ per KWh and 0.153¢ per KWh, respectively.

EXHIBIT VII–11—COMPLIANCE COST PER UNIT OF ELECTRICITY SALES IN 2015 BY REGULATORY OPTION AND NERC REGION (2009 ¢/KWH SALES) [A B]

NERC Region [c]	Annualized pre-tax compliance costs (2009 $)	Total electricity sales (KWh)	Compliance cost per unit of electricity sales (2009 ¢/KWh sales)
Option 1: IM Everywhere			
ASCC	$0	6,326,610,000	0.000
ECAR	62,390,503	569,849,487,305	0.011
ERCOT	40,029,111	313,395,965,576	0.013
FRCC	41,259,203	242,320,907,593	0.017
HICC	4,259,468	10,585,038,000	0.040
MAAC	61,468,467	294,365,234,375	0.021
MAIN	41,292,594	275,415,008,545	0.015
MAPP	27,565,966	165,189,056,396	0.017
NPCC	51,647,619	284,990,412,176	0.018
SERC	99,360,633	887,073,303,223	0.011
SPP	63,811,175	204,172,271,729	0.031
WECC	4,015,273	701,826,043,025	0.001
U.S.	497,100,012	3,960,424,804,688	0.013
Option 2: IM Everywhere and EM for Facilities with DIF > 125 MGD			
ASCC	0	6,326,610,000	0.000
ECAR	1,010,953,670	569,849,487,305	0.177
ERCOT	602,721,709	313,395,965,576	0.192
FRCC	311,699,736	242,320,907,593	0.129
HICC	32,074,166	10,585,038,000	0.303

EXHIBIT VII–11—COMPLIANCE COST PER UNIT OF ELECTRICITY SALES IN 2015 BY REGULATORY OPTION AND NERC REGION (2009 ¢/KWH SALES) [A B]—Continued

NERC Region [c]	Annualized pre-tax compliance costs (2009 $)	Total electricity sales (KWh)	Compliance cost per unit of electricity sales (2009 ¢/KWh sales)
MAAC	551,710,436	294,365,234,375	0.187
MAIN	542,786,160	275,415,008,545	0.197
MAPP	246,541,770	165,189,056,396	0.149
NPCC	744,738,535	284,990,412,176	0.261
SERC	1,643,059,866	887,073,303,223	0.185
SPP	350,239,021	204,172,271,729	0.172
WECC	6,930,361	701,826,043,025	0.001
U.S.	6,043,455,430	3,960,424,804,688	0.153
Option 3: I&E Mortality Everywhere			
ASCC	0	6,326,610,000	0.000
ECAR	1,035,075,751	569,849,487,305	0.182
ERCOT	602,721,709	313,395,965,576	0.192
FRCC	317,419,881	242,320,907,593	0.131
HICC	32,074,166	10,585,038,000	0.303
MAAC	561,627,430	294,365,234,375	0.191
MAIN	571,233,958	275,415,008,545	0.207
MAPP	262,582,596	165,189,056,396	0.159
NPCC	791,203,354	284,990,412,176	0.278
SERC	1,689,520,164	887,073,303,223	0.190
SPP	350,239,021	204,172,271,729	0.172
WECC	8,641,891	701,826,043,025	0.001
U.S.	6,222,339,919	3,960,424,804,688	0.157
Option 4: IM for Facilities with DIF > 50MGD			
ASCC	0	6,326,610,000	0.000
ECAR	61,651,375	569,849,487,305	0.011
ERCOT	39,560,948	313,395,965,576	0.013
FRCC	41,259,203	242,320,907,593	0.017
HICC	4,259,468	10,585,038,000	0.040
MAAC	56,749,132	294,365,234,375	0.019
MAIN	40,018,375	275,415,008,545	0.015
MAPP	26,744,938	165,189,056,396	0.016
NPCC	51,290,663	284,990,412,176	0.018
SERC	97,785,654	887,073,303,223	0.011
SPP	62,721,433	204,172,271,729	0.031
WECC	913,556	701,826,043,025	0.000
U.S.	482,954,744	3,960,424,804,688	0.012

[a] This analysis assumes full pass-through of all compliance costs to electricity consumers.
[b] Cost values exclude baseline closures.
[c] There are no explicitly analyzed facilities located in the ASCC region. For more information on explicitly and implicitly analyzed in-scope facilities see Appendix 3.A of the EBA report.

3. Assessment of the Impacts in the Context of Electricity Markets

In the analyses for the previous 316(b) regulations, EPA used the Integrated Planning Model (IPM), a comprehensive electricity market optimization model, to assess the economic impact of regulatory options within the context of regional and national electricity markets. For its economic impact assessment of today's proposed regulatory options, EPA used an updated version of this same analytic system, Integrated Planning Model Version 3.02 EISA (IPM V3.02), to assess facility and market-level effects of the options.

Use of a comprehensive, market analysis system is important in assessing the potential impact of the options because of the interdependence of electricity generating units in supplying power to the electric transmission grid. Increases in electricity production costs and potential reductions in electricity output at directly affected facilities—whether due to the temporary shutdown of electric generating units during technology installation and/or the energy production penalties that can result from compliance system operation—can have a range of broader market impacts that extend beyond the effect on complying facilities and their direct customers. In addition, the impact of compliance requirements on directly affected facilities may be seen differently when the analysis considers the impact on those facilities in the context of the broader electricity market instead of looking at the impact on a standalone, single-facility basis.

IPM V3.02 provides outputs for the North American Electric Reliability Corporation (NERC) regions that lie within the continental United States. IPM V3.02 does not analyze electric power operations in Alaska and Hawaii because these states' electric power operations are not connected to the continental U.S. power grid.

IPM V3.02 is based on an inventory of U.S. utility- and non-utility-owned boilers and generators that provide power to the integrated electric transmission grid, as recorded in the Department of Energy's Energy Information Administration databases as

of 2005.[80] The IPM baseline universe of facilities includes 533, or nearly all, of the 559 electric generating facilities that EPA estimates will be within the scope of today's proposed rule.[81] IPM Version 3.02 embeds a baseline energy demand forecast that is derived from the Department of Energy's *Annual Energy Outlook 2008* (AEO2008). IPM V3.02 incorporates in its analytic baseline the expected compliance response for the following air regulations affecting the power sector: Title IV of the Clean Air Act (the Acid Raid Program); the NO_X SIP Call; various New Source Review (NSR) settlements;[82] and several state rules[83] affecting emissions of SO_2 and NO_X that were finalized through February 3, 2009. IPM also includes state rules that have been finalized and/or approved by a state's legislature or environmental agency, and in certain instances, facility-level compliance technology installations that have already been undertaken because of CAIR requirements.[84] [85]

EPA recognizes that due to downtime or connection outages estimated to occur in conjunction with installation of several of the technologies, and the number of facilities that will need to come into compliance over the years after today's rule is promulgated, short-term electric reliability issues could occur unless care is taken within each region to coordinate outages with NERC and, where possible, with normal scheduled maintenance operations. Based on this concern, EPA's options were developed with flexibility provided to the permit authority to tailor compliance timelines. EPA anticipates in those instances where local electric reliability could be affected, facilities would notify the Director via provisions in the permit application. Once approved, facilities would receive workable construction schedules from permit writers to schedule installation down times without negatively impacting electric supply reliability.

In performing analyses based on IPM V3.02, EPA first developed a baseline—*i.e.,* without regulation—projection of electricity markets and facility operations over the period from the expected promulgation date, 2012, through 2028 (pre-regulation baseline case). EPA then overlaid this analysis with the estimated compliance costs and other operating effects—downtime for installation of compliance technology and energy penalty—for in-scope facilities under selected regulatory options (post-compliance cases).

For the IPM analysis, EPA analyzed three options that closely correspond to those discussed elsewhere in this document: (1) Non-Cooling Tower-Based Impingement and Entrainment requirements at all in-scope facilities (Option 1: IM Everywhere), (2) Impingement Mortality Controls at all in-scope facilities, and Cooling Towers at all in-scope facilities with DIF exceeding 125 MGD (Option 2: IM Everywhere and EM for Facilities with DIF>125MGD), and (3) Cooling Towers at all in-scope facilities (Option 3: I&E Mortality Everywhere).[86] The fourth option discussed elsewhere in this document—Option 4: Non-Cooling Tower-Based Impingement and Entrainment requirements at all in-scope facilities with DIF of 50 MGD or more—was not analyzed in IPM due to time constraints. Since this option mimics the requirements of Option 1, but only applies them to a subset of in-scope facilities, the findings for this option in the IPM analysis would be lower than those estimated for Option 1.

The IPM V3.02 runs provide analysis results for selected run-years. EPA specified these analysis years taking into account the expected promulgation date for today's Proposed Existing Facilities Regulation (2012), the years in which facilities would be expected to install compliance technology and achieve compliance (2013–2027),[87] and the years in which all complying facilities would be expected to achieve compliance (2028 and subsequent years). In the following sections, EPA reports results for the analysis year 2028, which is the first year after promulgation in which all in-scope facilities would be expected to have achieved compliance and thus represents a steady state of post-compliance operations, *i.e.*, the steady-state year.[88] In addition, EPA also analyzed potential electricity market-level effects for years during which facilities would be expected to shut down operations temporarily to complete technology installation. For the IPM-based analyses of IM-only installations, the specified compliance window is from 2013 to 2017, for cooling tower installations by fossil fuel electric power generating facilities from 2018 to 2022, and for cooling tower installations by nuclear electric power generating facilities from 2023 to 2027. Consequently, the analysis of compliance technology installation downtime used output from model run-years 2015 for IM technology installations and 2020 and 2025 for CT installations by fossil fuel and nuclear electric power generating facilities, respectively. The impacts of the analysis options are measured as the difference between key economic and operational impact metrics between the pre-regulation baseline case and the post-compliance case.

[80] In some instances, facility information has been updated to reflect known material changes in a plant's generating capacity since 2005.

[81] The exclusions of facilities from the IPM analysis include 4 facilities that are located in Alaska or Hawaii (and thus not included in IPM), 4 "lower-48" facilities that are not connected to the integrated electric transmission grid, 7 facilities excluded from the IPM baseline as the result of custom adjustments made by ICF, and 11 facilities that are not explicitly present in the 316(b) facility dataset for this analysis. See Chapter 6 of the EBA report for more details.

[82] Include agreements between EPA and Southern Indiana Gas and Electric Company (Vectren), Public Service Enterprise Group, Tampa Electric Company, We Energies (WEPCO), Virginia Electric & Power Company (Dominion), Santee Cooper, Minnkota Power Coop, American Electric Power (AEP), East Kentucky Power Cooperative (EKPC), Nevada Power Company, Illinois Power, Mirant, Ohio Edison, and Kentucky.

[83] Include current and future state programs in Connecticut, Delaware, Georgia, Illinois, Maine, Maryland, Massachusetts, Minnesota, Missouri, New Hampshire, North Carolina, New Jersey, New York, Oregon, Texas, and Wisconsin.

[84] For a detailed description of IPM Version 3.02, see Chapter 6 of the EBA report.

[85] At the time that EPA began analyzing the Proposed Existing Facilities Rule options, the Agency was still developing the regulatory standards to replace CAIR requirements. The Transport Rule, which replaces CAIR, was proposed on July 6, 2010, i.e., after EPA began to develop the baseline for the current 316(b) existing facilities rule analyses. Consequently, the IPM baseline used for the analysis of the Proposed existing facilities rule options does not reflect requirements under the newly proposed Transport Rule. However, because EPA used IPM v3.02 EISA, i.e., the same IPM version used for the market model analysis of 316(b) regulatory options, to assess the impact of the proposed Transport Rule on the U.S. electric power sector, the 316(b) baseline includes other important existing regulations currently affecting this industry sector. Consequently, on balance, EPA judges that the performance of the market model analyses against the v3.02 EISA constitutes a reasonable cost and economic impact analysis for the Proposed Existing Facilities Rule—in particular, given the uncertainties regarding the final standards promulgated, and the specific requirements that States will adopt in implementing the Transport Rule.

[86] The costs as analyzed in IPM differ slightly from those used in the non-IPM analyses. For more details on these differences see Chapter 6 of the EBA report.

[87] For the IPM-based analyses of IM-only installations, the specified compliance window is from 2013 to 2017, for cooling tower installations by fossil fuel electric power generating facilities from 2018 to 2022, and for cooling tower installations by nuclear electric power generating facilities from 2023 to 2027.

[88] The first year of full compliance is 2028 for Options 2 and 3, and 2018 for Option 1. To facilitate comparison of market-level impacts across options, this presentation focuses on 2028 as the steady state comparison year.

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a. Analysis Results for the Year 2028—To Reflect Steady State, Post-Compliance Operations

For the steady-state analysis (year 2028), EPA considered impact metrics of interest at three levels of aggregation: (1) Impact on national and regional electricity markets, (2) impact on the group of in-scope power generating facilities (*i.e.,* facilities that are expected to be within the scope of today's proposed regulation but do not necessarily incur technology cost), and (3) impact on individual in-scope facilities.

(1) Impact on National and Regional Electricity Markets

For the assessment of market level impacts, EPA considered five output metrics from IPM V3.02: (1) Incremental capacity closures, calculated as the difference between capacity under the regulatory options and capacity under the base case, which includes both full facility closures and partial facility closures (*i.e.,* unit closures) in aggregate capacity terms; (2) incremental capacity closures as a percentage of baseline capacity; (3) post-compliance changes in variable production costs per MWh, calculated as the sum of total fuel and variable O&M costs divided by net generation; (4) post-compliance changes in energy price, where energy prices are defined as the wholesale prices received by facilities for the sale of electric generation; and (5) post-compliance changes in pre-tax income, where pre-tax income is defined as total revenue minus the sum of fixed and variable O&M costs, fuel costs, and annualized capital costs.

Exhibit VII–12 reports results for the three market model analysis Options for each of the five metrics above, with national totals and detail at level of regional electricity markets defined on the basis of the current NERC regions. These market model analysis options correspond to regulatory Options 1, 2, and 3 (EPA did not run Option 4 separately because EPA assumes baseline MW capacity basis Options 1 and 4 are similar, and Option 4 is less stringent than Option 1. Results for Option 1 can be viewed as an upper bound estimate of the market impacts of Option 4 in Exhibits VII–12, VII–13, VII–14, and VII–15). The NERC regions are as follows: ERCOT (Electric Reliability Council of Texas), FRCC (Florida Reliability Coordinating Council), MRO (Midwest Reliability Organization), NPCC (Northeast Power Coordination Council), RFC (ReliabilityFirst Corporation), SERC (Southeastern Electricity Reliability Council), SPP (Southwest Power Pool), and WECC (Western Electricity Coordinating Council).

Additional results are presented in Chapter 6 of the EBA report. Chapter 6 also presents a more detailed interpretation of the results of the market-level analysis.

EXHIBIT VII–12—IMPACT OF MARKET MODEL ANALYSIS OPTIONS ON NATIONAL AND REGIONAL MARKETS AT THE YEAR 2028

NERC region	Baseline capacity (MW)	Incremental closures		Change in variable production cost per MWh (%)	Change in energy price per MWh (%)	Change in pre-tax income (2009 $) (%)
		Capacity (MW)	Percent of baseline capacity			
Option 1: IM Everywhere						
ERCOT	98,757	151	0.2	¥0.1	0.0	¥0.4
FRCC	79,298	75	0.1	0.3	0.0	¥0.4
MRO	71,200	29	0.0	¥0.4	0.0	¥1.0
NPCC	79,688	682	0.9	¥0.4	0.1	0.3
RFC	244,700	¥279	¥0.1	0.2	0.1	¥0.1
SERC	286,461	¥79	0.0	¥0.1	0.0	¥0.4
SPP	67,703	13	0.0	0.0	0.0	¥0.5
WECC	219,764	9	0.0	0.0	0.0	¥0.1
Total	1,147,571	601	0.1	0.0	NA	¥0.3
Option 2: IM Everywhere and EM for Facilities with DIF > 125 MGD						
ERCOT	98,757	4,462	4.5	¥1.1	0.2	¥9.5
FRCC	79,298	36	0.0	1.2	0.1	¥4.7
MRO	71,200	806	1.1	1.5	0.1	¥8.4
NPCC	79,688	3,862	4.8	¥2.6	¥1.6	¥10.4
RFC	244,700	3,197	1.3	2.7	0.3	¥10.3
SERC	286,461	903	0.3	2.0	¥0.1	¥8.9
SPP	67,703	969	1.4	0.9	¥0.1	¥8.6
WECC	219,764	184	0.1	0.1	¥0.3	¥0.8
Total	1,147,571	14,418	1.3	1.0	NA	¥7.6
Option 3—I&E Mortality Everywhere						
ERCOT	98,757	4,498	4.6	¥1.2	0.2	¥9.5
FRCC	79,298	36	0.0	1.3	0.1	¥4.8
MRO	71,200	801	1.1	1.5	0.1	¥9.1
NPCC	79,688	3,861	4.8	¥2.7	¥1.7	¥11.0
RFC	244,700	3,195	1.3	2.7	0.5	¥10.2
SERC	286,461	997	0.3	2.0	0.0	¥8.9
SPP	67,703	1,004	1.5	0.9	0.0	¥8.7
WECC	219,764	183	0.1	0.1	¥0.3	¥0.9
Total	1,147,571	14,576	1.3	1.0	NA	¥7.7

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As reported in Exhibit VII–12, the market model analysis indicates that Option 1 would have very small effects on overall electricity markets, on both a national and regional sub-market basis, in the year 2028, the first analysis year of full compliance with the regulation. At the national level, the analysis indicates a total reduction in capacity from closures of 601 MW, or less than 0.1 percent of the total capacity baseline in 2028. At the regional level, the greatest capacity reduction, 682 MW, occurs in the NPCC region; this reduction would be approximately 0.9 percent of baseline capacity. Two NERC regions—RFC and SERC—are estimated to experience avoided capacity closures—*i.e.,* one or more generating units that are otherwise projected to cease operations in the baseline become more economically attractive sources of electricity in the post-compliance case, because of relative changes in the economics of electricity production across the full market, and thus avoid closure. This counterintuitive result is due to the integrated nature of electricity markets.

At the national level, the variable production cost of electricity stays essentially the same, but with small variations by region. The greatest increase occurs in FRCC (0.3 percent) and the largest decline occurring in MRO and NPCC (0.4 percent). Energy prices also change little across NERC regions, with NPCC and RFC recording small increases of 0.1 percent—these very small estimated changes in energy prices are essentially within the analytic "noise" of the market model analysis system. Given the additional costs from compliance with almost no change in electricity prices, national sector-level pre-tax income is projected to decline slightly, by 0.3 percent. All regions except NPCC experience a decrease in pre-tax income; the greatest decrease, approximately 1.0 percent, occurs in MRO.[89]

Option 2 requires that facilities with cooling water design intake of 125 MGD or less meet non-cooling tower-based impingement mortality requirements and site-specific entrainment mortality BTA (*i.e.,* Option 1 specifications), while facilities with cooling water design intake exceeding 125 MGD install cooling towers. As expected, the market model analysis projects that the more expensive Option 2 with some facilities installing cooling towers would have a greater impact than Option 1 on national and regional electricity markets. Under Option 2, capacity closures total 14,418 MW, or 1.3 percent of the baseline capacity value, with all regions projected to incur closures. The largest percentage impact occurs in NPCC, with a loss of approximately 4.8 percent of the baseline capacity value. Similarly, variable production costs for electricity generation increase nationally by approximately 1.0 percent, with the largest increase occurring in RFC, at 2.7 percent; only two of the 8 NERC regions—ERCOT and NPCC—experience a decline of 1.1 percent and 2.6 percent, respectively. The effect on energy prices varies across regions, with RFC recording the largest increase, at 0.3 percent, and NPCC recording the largest decline, 1.6 percent. Finally, as would be expected with the higher compliance outlays, longer installation downtimes, and energy penalties with some facilities installing cooling towers under Option 2, total sector pre-tax income is more materially affected compared to Option 1: At the national level, pre-tax income declines by 7.6 percent. All regions experience a loss in pre-tax income, with the largest loss occurring in NPCC, at 10.4 percent.

The market model analysis projects that the most expensive option, Option 3 (I&E Mortality Everywhere), would have a slightly greater impact on national and regional electricity markets than Option 2, as more in-scope facilities are required to install cooling towers (nearly all) to meet compliance requirements. Under Option 3, capacity loss is nearly the same as under Option 2—14,576 MW or 1.3 percent of the baseline capacity value—with all regions projected to incur closures. As under Option 2, the largest percentage impact under Option 3 occurs in NPCC, with a loss of approximately 4.8 percent of the baseline capacity value. Similarly, the impact on variable production costs for electricity generation under Option 3 is approximately the same as under Option 2 at the national and regional level. At the national level, variable production costs increase by 1.0 percent, with the largest increase also occurring in RFC, at 2.7 percent; again, only two of the 8 NERC regions—ERCOT and NPCC—record a decline of 1.2 percent and 2.7 percent, respectively. The effect on energy prices also varies across regions, with RFC recording the largest increase of 0.5 percent and NPCC recording the largest decline of 1.7 percent. The impact on total sector pre-tax income under Option 3 is also similar to the impact under Option 2; at the national level, pre-tax income declines by 7.7 percent with all regions experiencing a loss in pre-tax income.

(2) Impact on In-Scope Facilities

EPA used IPM V3.02 results for 2028 to assess the potential impact of the regulatory Options on the subset of electric generating facilities that are estimated to be within the scope of today's proposed regulation compliance requirements. Only results for in-scope facilities are reported in this analysis.

Exhibit VII–13 reports results for the first three of the regulatory Options for in-scope facilities, as a group. Chapter 6 of the EBA presents a more detailed interpretation of the results of the analysis of today's Proposed Existing Facilities Regulation.

EXHIBIT VII–13—IMPACT OF MARKET MODEL ANALYSIS OPTIONS ON IN-SCOPE FACILITIES, AT THE YEAR 2028

NERC region	Baseline capacity (MW)	Incremental closures		Change in variable production cost per MWh (percent)
		Capacity (MW)	Percent of baseline capacity	
Option 1—IM Everywhere				
ERCOT	35,985	¥99	¥0.3	¥0.2
FRCC	27,210	¥11	0.0	0.0

[89] IPM does not model traditional utility rate regulation but attempts to capture price effects as though they occur in competitive, deregulated markets. As a result, the price effects estimated in IPM may be less than those that would actually occur, given that most States continue to operate under traditional utility regulation. Likewise, the proposed rule's impact on electric generators' net income may be overstated. In contrast, the electricity rate impact analyses presented earlier in this section (Section VII. 2), assume full pass-through of compliance costs as increased electricity prices, which may more closely approximate the price effect in regulated markets, but could overstate the price effect in deregulated markets.

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EXHIBIT VII–13—IMPACT OF MARKET MODEL ANALYSIS OPTIONS ON IN-SCOPE FACILITIES, AT THE YEAR 2028—Continued

NERC region	Baseline capacity (MW)	Incremental closures		Change in variable production cost per MWh (percent)
		Capacity (MW)	Percent of baseline capacity	
MRO	29,131	298	1.0	¥0.3
NPCC	33,618	859	2.6	¥1.2
RFC	138,519	¥95	¥0.1	0.1
SERC	151,806	198	0.1	0.0
SPP	23,879	¥102	¥0.4	¥0.2
WECC	38,906	9	0.0	¥0.1
Total	479,054	1,056	0.2	¥0.1
Option 2—IM Everywhere and EM for Facilities With DIF 125 MGD				
ERCOT	35,985	5,486	15.2	¥4.3
FRCC	27,210	¥336	¥1.2	0.1
MRO	29,131	969	3.3	2.6
NPCC	33,618	4,415	13.1	¥8.8
RFC	138,519	3,329	2.4	1.9
SERC	151,806	433	0.3	2.1
SPP	23,879	2,285	9.6	¥1.2
WECC	38,906	234	0.6	0.7
Total	479,054	16,815	3.5	0.5
Option 3—I&E Mortality Everywhere				
ERCOT	35,985	5,528	15.4	¥4.9
FRCC	27,210	¥336	¥1.2	0.0
MRO	29,131	1,016	3.5	2.7
NPCC	33,618	4,415	13.1	¥9.0
RFC	138,519	3,329	2.4	2.0
SERC	151,806	699	0.5	2.1
SPP	23,879	2,259	9.5	¥2.3
WECC	38,906	234	0.6	0.8
Total	479,054	17,144	3.6	0.4

The market model analysis results for in-scope facilities show a greater degree of adverse impact than that observed over all generating units. These more substantial adverse impacts among the directly affected in-scope units are offset by generally positive changes in capacity and energy production at the facilities that are not directly by the proposed rule's requirements, and which are not included in this section's analysis.

Under Option 1, today's preferred option, looking over all in-scope facilities, the total capacity loss from early retirements is 1,056 MW at the national level, or 0.2 percent of baseline capacity in the in-scope units. The impact on capacity retirements varies across NERC regions with 4 out of 8 regions recording capacity closures and the remaining 4 experiencing *avoided* capacity closures. Some closures (or avoided closures) are full facility closures (*i.e.,* all generating units at the facility close or avoid closure), while others are partial closures (*i.e.,* at least one generating unit at the facility is assessed as closing, or avoiding closure, in the post-compliance case). Overall, 39 generating units close (approximately 9,874 MW) and 30 generating units avoid closure (approximately 8,819 MW) in the post-compliance case, resulting in net closure of 9 generating units (approximately 1,055 MW). The 39 generating unit closures reflect full closure of 20 units in 13 facilities (5,647 MW) and partial closure of 19 units in 16 facilities (4,227 MW). The largest capacity loss occurs in NPCC (859 MW or 2.6 percent of baseline capacity).

As described in the preceding section, these net losses of capacity due to early retirements among in-scope facilities are offset at the total market level by capacity increases among other facilities. These capacity increases typically occur through "earlier" construction of new generating units or repowering of existing units. These new units also typically operate with higher energy efficiency and lower electricity production cost. As a result, the early retirements among in-scope facilities under the proposed regulatory option have little impact at the level of national and regional electricity markets.

Finally, at the national level, variable production costs decline by approximately 0.1 percent as older, less-efficient plants close and are replaced by newer plants in the IPM model. These effects vary by region, with some regions experiencing slight increases, while other regions experience slight decreases. These findings of very small national and regional effects in these impact metrics confirm EPA's assessment, stated in the preceding paragraph, that the assessed capacity closures among in-scope facilities are of little economic consequence in national and regional electricity markets.

Again, the findings for the more expensive Option 2 (IM Everywhere and EM for Facilities with DIF > 125MGD) are of greater consequence, as some facilities would be required to incur the cost of cooling tower installation. The total loss in capacity in 2028 is assessed at 16,815 MW, with the largest capacity loss of 15.2 percent occurring in NPCC.

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In the same way as reported for Option 1, the capacity loss of 16,815 MW under Option 2 also reflects a combination of early retirements and avoided retirements of generating units. Under Option 2, 149 generating units close (36,163 MW) and 86 generating units avoid closure (19,186 MW), leading to an estimated net closure of 63 generating units (16,977 MW). Out of the 149 closed units, 72 units (22,976 MW) are in 35 fully closed facilities and 77 units (13,186 MW) are in 46 partially closed facilities.

Under Option 2, the findings for the change in variable production cost are also considerably larger compared to Option 1. At the national level, Option 2 results in a 0.5 percent increase in variable production cost. This effect varies considerably by region, with NPCC recording the largest decrease in variable production costs (8.8 percent) and MRO incurring the largest increase (2.6 percent).

The analysis results for Option 3 are similar to those for Option 2, and again show a greater degree of impact on capacity and electricity generation among in-scope facilities compared to the degree of impact observed at the market level. At the national level, Option 3 results in 17,144 MW of retired capacity (compared to 16,815 MW under Option 2), which is approximately 3.6 percent of total baseline in-scope capacity (compared to 3.5 percent under Option 2). As is the case for Options 1 and 2, the net capacity reduction of 17,144 MW reported for Option 3 includes early retirement and avoided retirement of generating units. Under Option 2, 162 generating units close (37,255 MW) and 88 generating units avoid closure (20,258 MW), leading to an estimated net closure of 74 generating units (16,997 MW). Out of the 162 closed units, 79 units (23,262 MW) are in 39 fully closed facilities and 83 units (13,992 MW) are in 50 partially closed facilities.

The impact on variable production costs observed for Option 3 is similar in magnitude to that observed for Option 2. At the national level, variable production costs decline by approximately 0.4 percent. Under Option 3, this effect also varies considerably by region, with NPCC, again, recording the largest decrease in variable production costs (9.0 percent) and MRO incurring the largest increase (2.7 percent).

(3) Impact on Individual In-Scope Facilities

Results for the group of in-scope facilities as a whole may mask shifts in economic performance among individual facilities subject to today's proposed rule. To assess potential facility-level effects, EPA analyzed facility-specific changes between the base case and the post-compliance cases for the following metrics: (1) Capacity utilization (defined as annual generation (MWh) divided by [capacity (MW) times 8,760 hours]), (2) electricity generation, (3) revenue, (4) variable production costs per MWh, defined as variable O&M cost plus fuel cost divided by net generation, and (5) pre-tax income, defined as total revenues minus the sum of fixed and variable O&M costs, fuel costs, and capital costs.

Exhibit VII–14 presents the estimated number of in-scope facilities with specific degrees of change in operations and financial performance as a result of today's regulatory options. This exhibit excludes in-scope facilities with estimated significant status changes in 2028 that render these metrics of change not meaningful—*i.e.,* under the analyzed Option, a facility that is assessed as either a full or partial closure between the base case and the post-compliance case. This is done because the measures presented in Exhibit VII–11 such as change in revenue would not be meaningful for these facilities. For example, for a facility that is projected to close in the post-compliance case, the reduction in revenue would be 100 percent. On this basis, 118 facilities are excluded from assessment under Option 1, 159 facilities under Option 2, and 165 facilities under Option 3.

In addition, the change in variable production cost per MWh of generation could not be developed for facilities that have zero generation in either the baseline or post-compliance cases. For these facilities—28, 21, and 18 facilities under Options 1, 2, or 3, respectively—variable production cost per MWh cannot be calculated for one or other of the two cases (because the divisor, MWh, is zero), and therefore the change in variable production cost per MWh cannot be meaningfully determined. Facilities excluded from this assessment are recorded in the "N/A" column.

EXHIBIT VII–14—IMPACT OF MARKET MODEL ANALYSIS OPTIONS ON INDIVIDUAL IN-SCOPE FACILITIES AT THE YEAR 2028—NUMBER OF FACILITIES BY IMPACT MAGNITUDE

Economic measures	Reduction			No change	Increase			N/A [b]
	> 3%	1–3%	< 1%		< 1%	1–3%	> 3%	
Option 1—IM Everywhere								
Change in Capacity Utilization [a]	0	1	23	398	41	5	3	118
Change in Generation	6	7	39	391	26	0	2	118
Change in Revenue	5	3	164	4	282	13	0	118
Change in Variable Production Costs/MWh	0	2	91	22	319	6	3	146
Change in Pre-Tax Income	40	126	243	0	55	4	3	118
Option 2—IM Everywhere and EM for Facilities With DIF > 125 MGD								
Change in Capacity Utilization [a]	13	18	102	147	104	24	22	159
Change in Generation	154	89	6	146	8	12	15	159
Change in Revenue	139	103	51	0	73	54	10	159
Change in Variable Production Costs/MWh	3	5	24	14	107	55	201	180
Change in Pre-Tax Income	267	33	55	0	28	23	24	159
Option 3—I&E Mortality Everywhere								
Change in Capacity Utilization [a]	10	16	132	96	118	25	27	165
Change in Generation	184	110	6	95	9	10	10	165
Change in Revenue	158	127	44	0	49	38	8	165
Change in Variable Production Costs/MWh	4	8	15	9	74	63	233	183

EXHIBIT VII–14—IMPACT OF MARKET MODEL ANALYSIS OPTIONS ON INDIVIDUAL IN-SCOPE FACILITIES AT THE YEAR 2028—NUMBER OF FACILITIES BY IMPACT MAGNITUDE—Continued

Economic measures	Reduction			No change	Increase			N/A [b]
	> 3%	1–3%	< 1%		< 1%	1–3%	> 3%	
Change in Pre-Tax Income	315	12	41	0	24	11	21	165

[a] The change in capacity utilization is the difference between the capacity utilization percentages in the base case and post-compliance cases. For all other measures, the change is expressed as the percentage change between the base case and post-compliance values.
[b] Facilities with status changes in either base case or post-compliance scenario have been excluded from these calculations. In addition, the change in variable production cost per MWh could not be developed for 28, 21, and 18 facilities with zero generation in either base case or Options 1, 2, or 3 post-compliance scenarios, respectively.

For Option 1, which corresponds to EPA's proposed option, the analysis of changes in individual facilities indicates that most facilities experience very slight effects—no change, or less than a 1 percent reduction or 1 percent increase—in all of the impact metrics except Change in Pre-Tax Income. Only 1 facility is estimated to incur a reduction in capacity utilization exceeding 1 percent; 13 facilities incur a reduction in generation exceeding 1 percent; and 8 facilities incur a reduction in revenue exceeding 1 percent. Only 9 facilities incur an increase in variable production costs exceeding one percent. The estimated change in pre-tax income is more consequential as 126 facilities are projected to incur reductions in pre-tax income of 1–3 percent and 40 facilities are projected to incur reductions in pre-tax income exceeding 3 percent of the baseline value.

The findings for Option 2 are substantially more consequential compared to those estimated for Option 1. For 243 facilities, the reduction in generation is estimated to exceed 1 percent; for 242 facilities, the reduction in revenue is estimated to exceed 1 percent; for 256 facilities, the increase in variable production costs is estimated to exceed 1 percent. Again, the change in pre-tax income is more substantial, with 33 facilities expected to incur reductions in pre-tax income of 1–3 percent and 267 facilities, greater than 3 percent.

As in the preceding discussions, the findings for Option 3 are slightly more consequential than those estimated for Option 2. For 294 facilities, the reduction in generation is estimated to exceed 1 percent; for 285 facilities, the reduction in revenue is estimated to exceed 1 percent; for 296 facilities, the increase in variable production costs is estimated to exceed 1 percent. The change in pre-tax income is more substantial, with 12 facilities expected to incur reductions in pre-tax income of 1–3 percent and 315 facilities, greater than 3 percent.

b. Analysis Results for the Years 2015, 2020, and 2025—To Capture the Effect of Installation Downtime

This section presents market-level results for today's proposed rule options for model run years 2015, 2020, and 2025. As discussed above, run year 2015 captures the period when in-scope facilities install IM technologies, while run years 2020 and 2025 capture the period when fossil fuel and nuclear facilities install cooling towers, respectively, and may incur installation downtime. Of particular importance as a potential impact, the additional unit downtime from installation of compliance technology would manifest as increased electricity production costs resulting from the dispatch of higher production cost generating units during the periods when units are taken offline to install compliance technologies. Because these effects are of most concern in terms of potential impact on national and regional electricity markets, this section presents results only for the total set of facilities analyzed in IPM (Exhibit VII–15) and does not present results for the subset of only in-scope facilities.

For the assessment of compliance technology installation downtime impacts at the national level, EPA considered five output metrics from IPM V3.02: (1) Changes in electricity generation, (2) changes in revenue, (3) cost changes, including changes in fuel costs, variable O&M costs, fixed O&M costs, and capital costs, (4) changes in pre-tax income, and (5) changes in variable production costs per MWh. For each measure of concern, Exhibit VII–15 presents the results for the base case and the existing facilities rule options for each downtime year, *i.e.,* 2015, 2020, and 2025 and the percentage difference between the two. This section of the preamble discusses downtime impact at the national level only; for regional-level results see Appendix 6.A of EBA report.

EXHIBIT VII–15—IMPACT OF MARKET MODEL ANALYSIS OPTIONS DURING THE PERIOD OF INSTALLATION DOWNTIME

Economic measures (all dollar values in $2009)	Baseline value	Option 1		Option 2		Option 3	
		Value	% Change	Value	% Change	Value	% Change
2015 (2013–2017)							
Generation (TWh)	4,320	4,320	0.0	4,320	0.0	4,320	0.0
Revenue ($Millions)	$212,857	$212,883	0.0	$214,124	0.6	$214,201	0.6
Costs ($Millions)	$144,212	$144,764	0.4	$144,251	0.0	$144,244	0.0
Fuel Cost	$81,076	$81,080	0.0	$80,896	¥0.2	$80,895	¥0.2
Variable O&M	$12,034	$12,080	0.4	$12,056	0.2	$12,054	0.2
Fixed O&M	$43,697	$44,140	1.0	$43,683	0.0	$43,680	0.0
Capital Cost	$7,405	$7,463	0.8	$7,616	2.8	$7,614	2.8
Pre-Tax Income ($Millions)	$68,646	$68,119	¥0.8	$69,873	1.8	$69,957	1.9
Variable Production Cost ($/MWh)	$21.55	$21.57	0.1	$21.52	¥0.2	$21.52	¥0.2

EXHIBIT VII–15—IMPACT OF MARKET MODEL ANALYSIS OPTIONS DURING THE PERIOD OF INSTALLATION DOWNTIME—Continued

Economic measures (all dollar values in $2009)	Baseline value	Option 1		Option 2		Option 3	
		Value	% Change	Value	% Change	Value	% Change
2020 (2018–2022)							
Generation (TWh)	4,530	.....	.....	4,530	0.0	4,530	0.0
Revenue ($Millions)	$261,531	.....	.....	$270,507	3.4	$270,709	3.5
Costs ($Millions)	$160,340	.....	.....	$167,450	4.4	$167,719	4.6
Fuel Cost	$83,418	.....	.....	$82,295	¥1.3	$82,295	¥1.3
Variable O&M	$13,349	.....	.....	$13,661	2.3	$13,673	2.4
Fixed O&M	$46,160	.....	.....	$50,888	10.2	$51,016	10.5
Capital Cost	$17,413	.....	.....	$20,605	18.3	$20,736	19.1
Pre-Tax Income ($Millions)	$101,191	.....	.....	$103,057	1.8	$102,990	1.8
Variable Production Cost ($/MWh)	$21.36	.....	.....	$21.18	¥0.8	$21.18	¥0.8
2025 (2023–2027)							
Generation (TWh)	4,746	.....	.....	4,746	0.0	4,746	0.0
Revenue ($Millions)	$280,613	.....	.....	$282,363	0.6	$282,381	0.6
Costs ($Millions)	$174,856	.....	.....	$184,900	5.7	$185,148	5.9
Fuel Cost	$86,633	.....	.....	$86,812	0.2	$86,834	0.2
Variable O&M	$13,907	.....	.....	$14,295	2.8	$14,299	2.8
Fixed O&M	$47,561	.....	.....	$53,500	12.5	$53,625	12.7
Capital Cost	$26,755	.....	.....	$30,294	13.2	$30,390	13.6
Pre-Tax Income ($Millions)	$105,757	.....	.....	$97,463	¥7.8	$97,233	¥8.1
Variable Production Cost ($/MWh)	$21.18	.....	.....	$21.30	0.6	$21.31	0.6

Because in-scope facilities would be required to meet compliance requirements not later than 5 years following rule promulgation, Option 1 has downtime effects during only the five-year period of 2013–2017. Results for the year 2015 are indicative of annual effects during each of these years. With few facilities having an increase in net downtime under Option 1, the estimated effects of downtime are relatively minor. Variable production costs increase by less than 0.1 percent. Another potential market level impact due to the incurrence of downtime is the possible increase in electricity prices and, consequently, revenue. At the market level, the change in total revenue is nearly zero, indicating very small overall effects on consumer prices. While these effects vary at the regional level, these effects are overall very small (see *Appendix 6.A* of the EBA).

Unlike Option 1, Option 2 would be expected to have downtime effects during each of the three five-year periods, as IM-only facilities comply during the first five years (2012–2017) following rule promulgation, fossil fuel facilities installing cooling tower technology comply during the second five years (2018–2022), and nuclear facilities installing cooling tower technology comply during the third five years (2023–2027).

During the first five-year period (2012–2017), downtime effects under Option 2, although larger than those under Option 1, remain small. Variable production costs decline by a very minor amount, 0.2 percent, as the market begins to adjust overall in anticipation of the larger effects on capacity availability as the result of cooling tower installation in later years. Total market-level revenue increases by $1.2 billion, or 0.6 percent, indicating small effects on consumer prices.

During the second five-year period (2018–2022), downtime effects are more pronounced under Option 2. At the market level, variable production costs decline again, by 0.8 percent, but revenue increases by nearly $9.0 billion, or 3.4 percent. Thus, the impact on consumer prices is greater during this period than during the preceding five years. Again, the reduction in variable production costs and revenue reflect replacement of generation from older, less efficient and higher fuel cost capacity, with generation from more energy efficient, lower production cost capacity.

The greatest impact on variable production cost under Option 2 occurs during the third five-year period (2023–2027), when nuclear facilities incur downtime during technology installation. Net downtime for cooling tower installation at nuclear facilities is estimated at 24 weeks compared to 0.3–4 weeks for installations at fossil fuel facilities. During this period, variable production costs increase by $0.12 per MWh or approximately 0.6 percent. Although variable production cost increases during this period (while declining during the preceding two five-year periods), annual revenue increases by a smaller amount, $1.8 billion, or a 0.6 percent increase above baseline. The smaller increase in revenue, and by inference in consumer prices, results from the ongoing market adjustment with replacement of less efficient, higher fuel cost generation with more efficient, lower fuel cost capacity. The effects at the national level vary at the regional level (see *Appendix 6.A* of the EBA).

Like Option 2, Option 3 would be expected to have downtime effects during each of the three five-year periods. During the first five-year period (2012–2017), impacts are nearly identical to those of Option 2 at the national and regional level. At the national level, variable production costs decline by 0.2 percent, and total revenue increases by $1.2 billion, or 0.6 percent, indicating small effects on consumer prices. While under Option 2, revenue declines by 0.2 percent, under Option 3 it increases by 0.5 percent. Further, under Option 3, the decline in variable production costs as well as the drop in electricity prices are slightly more significant.

During the second five-year period (2018–2022), downtime effects of Option 3 are again similar to, but slightly higher than, those of Option 2.

At the national level, variable production costs decline by 0.8 percent, while revenue increases by $9.2 billion, or 3.4 percent. Again, the impact on consumer prices under Option 3 is greater during this period than during the preceding five years.

As with Option 2, under Option 3 the greatest impact on variable production cost occurs during the third five-year period (2023–2027). During this period, market-level variable production costs increase by $0.13 per MWh or approximately 0.6 percent. Although variable production cost increases during this period (while declining during the preceding two five-year periods), annual revenue increases by a smaller amount, $1.8 billion, or a 0.6 percent increase above baseline.

At the regional level, as is the case for Option 2, under Option 3, these effects vary across regions. For all three analyzed five-year periods, the direction of the change in variable production costs, revenue, and electricity prices under Option 3 is the same as that under Option 2 for all NERC regions; the difference in the magnitude of change is not very pronounced either (see *Appendix 6.A* of the EBA).

5. Summary of Economic Impacts

EPA performed cost and economic impact assessment in two parts. The first set of cost and economic impact analyses—entity level impacts (at both the facility and parent company levels), an assessment of the potential electricity rate impact of compliance costs to the residential sector, and across sectors—reflects baseline operating characteristics of in-scope facilities and assumes no changes in those baseline operating characteristics—*e.g.,* level of electricity generation and revenue—as a result of the requirements of the proposed regulatory options. The second set of analyses look at broader electricity market impacts—taking into account the interconnection of regional and national electricity markets, for the full industry, for in-scope facilities only, and as the distribution of impacts at the facility level. No single metric or impact level definitively measures economic impacts. Rather, EPA has considered the totality of these measures of economic impacts in concluding that there are no significant economic impacts associated with Option 1 (the preferred option) or Option 4, while there are considerably greater economic impacts associated with Options 2 and 3.

VIII. Benefits Analysis

A. Introduction

This section presents EPA's estimates of the national environmental benefits of the options analyzed for 316(b) facilities. In this section, EPA describes how it calculated values for those benefits it could monetize. It also presents descriptive information for those benefits for which it could not develop a monetary value. The benefits assessed occur because of reductions in impingement, where fish and other aquatic life are trapped on equipment at the entrance to the CWIS, and entrainment, where aquatic organisms, eggs, and larvae are taken into the cooling system, passed through the heat exchanger, and then discharged back into the source water body, (I&E mortality) at cooling water intake structures (CWIS) affected by the proposed rulemaking. I&E mortality kills or injures large numbers of aquatic organisms at all life stages. Based on impingement mortality and entrainment data presented in I&E mortality facility studies, EPA assumes a mortality rate of 100% for both impinged and entrained individuals. Mortality rates are then adjusted based on the efficiency of technology in place.[90] By reducing I&E mortality rates, the proposed options are likely to increase the number of fish, shellfish, and other aquatic organisms in affected water bodies. In turn, this increased number of aquatic organisms directly improves welfare for individuals using the affected aquatic resources, generating so-called "use benefits" such as increases to the value of recreational and commercial fisheries. Reductions to I&E mortality also improve welfare for individuals absent any use of the affected resources, so-called "nonuse benefits," such as improved ecosystem function and resource bequest values. Section VIII.D provides an overview of the types and sources of benefits anticipated, how these benefits are estimated, the level of benefits that the proposed options would achieve, and how monetized benefits compare to costs.

EPA derived national benefit estimates for the proposed options from a series of regional studies representing a range of water body types and aquatic resources. Section VIII.B provides detail on the regional study design. Sections VIII.C through VIII.E briefly describe the methods EPA used to evaluate I&E mortality impacts at Section 316(b) facilities, and to derive an economic value associated with these losses.

[90] See discussion in Section III on entrainment mortality data and assumptions.

Further, because IPM does not predict where new capacity occurs, and EPA has not identified any other information projecting where new units would be located, EPA did not estimate benefits associated with new capacity (*i.e.* new units at an existing facility). As noted above, EPA also did not include costs for these new units in its social cost analysis. This is consistent with EPA's treatment of new facilities, such as new offshore oil and gas facilities in the Phase III rule.

The methodologies used to estimate benefits of proposed options are largely built upon those used to estimate benefits for the suspended Phase II regulation and the remanded rule for 316(b) Phase III existing facilities. In addition to updating these analyses, EPA more fully investigated the effects of I&E mortality on threatened and endangered (T&E) species, and improved its estimation of nonuse benefits. The 2011 Environmental and Economic Benefits Analysis document for the proposed 316(b) Existing Facility rule (hereafter EEBA) provides detailed descriptions of the these new methodologies used to analyze the benefits of proposed regulatory options, and provides references to (i) Part A of the 2004 Regional Benefits Analysis for the suspended Final Section 316(b) Phase II Rule, and (ii) Part A of the 2006 Regional Benefits Analysis Document for the Final Section 316(b) Phase III Existing Facilities Rule for analyses using similar methodologies.

The EEBA document provides EPA's benefit estimates for the proposed options. EPA relied on information on cooling water systems and intake structures already in place collected in the Section 316(b) Industry Surveys (the Industry Screener Questionnaire (SQ) and the Detailed Industry Questionnaire (DQ)) to estimate the number of manufacturing facilities that would potentially be in-scope of the regulatory options considered for the Proposed Existing Facilities Rule. Because the DQs were sent to a sample of the manufacturing industries that use cooling water, the respondents were assigned sample weights designed to represent other facilities that were not covered in the survey. For the analysis of in-scope Electric Generators, EPA used information on cooling water systems and intake structures already in place, from 656 in-scope facilities that responded to the 2000 Section 316(b) Surveys (the Industry Short Technical Questionnaire (STQ) and the Detailed Industry Questionnaire (DQ)). All in-scope facilities have design intake flow of at least 2 million gallons per day (MGD). Regional benefits are estimated

from the sample of facilities for which there is sufficient DQ information to estimate the environmental impacts of regulatory options. The environmental impacts from the set of explicitly analyzed facilities are then extrapolated to the universe of facilities within a region using statistical weights developed for this analysis. National benefits are estimated as the sum of all regional benefits.

B. Regional Study Design

EPA evaluated the benefits of today's rule in seven study regions (California,[91] North Atlantic, Mid Atlantic, South Atlantic, Gulf of Mexico, Great Lakes, and Inland). Regions were defined based on ecological similarities within regions (*e.g.* similar communities of aquatic species), and on characteristics of commercial and recreational fishing activities. The five coastal regions identified (California, North Atlantic, Mid-Atlantic, South Atlantic, and Gulf of Mexico) correspond to those of the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS). The Great Lakes region includes Lake Ontario, Lake Erie, Lake Huron (including Lake St. Clair), Lake Michigan, Lake Superior, and the connecting channels (Saint Mary's River, Saint Clair River, Detroit River, Niagara River, and Saint Lawrence River to the Canadian border) as defined in 33 U.S.C. 1268, Sec. 118(a)(3)(b). The Inland region includes all remaining facilities that withdraw water from freshwater lakes, rivers, and reservoirs. Notably, of the 521 facilities that are located on freshwater streams or rivers, 31 percent (164) of these facilities have average intake greater than5 percent of the mean annual flow of the source waters. During periods of low river flow, or during periods of higher than average withdrawals of cooling water, the proportionate withdrawal of source waters may be much higher. Thus, the potential for adverse environmental impacts may increase. The number and total operational intake flow of all 316(b) facilities by study region is presented in Exhibit VIII–1.

EXHIBIT VIII–1—NUMBER OF FACILITIES AND TOTAL MEAN OPERATIONAL FLOW (BGD), BY REGION

Region	Number of potentially regulated facilities [a]	Once-through flow	Closed-cycle flow	Total flow
California [b]	8	1.2	0.0	1.2
Great Lakes	67	18.8	0.2	19.0
Inland [c]	669	134.9	3.9	138.8
Mid-Atlantic	54	28.1	0.1	28.2
Gulf of Mexico	30	12.9	0.0	12.9
North Atlantic	26	7.0	0.0	7.0
South Atlantic	17	7.4	< 0.1	7.5
All Regions	871	210.3	4.2	214.5

[a] This table presents the unweighted number of facilities because weighted facilities counts are not estimated separately by benefits region. The estimated total weighted number of potentially regulated facilities is 1152 (including baseline closures).

[b] The California region includes manufacturing facilities in the state of California and four facilities in Hawaii. It excludes coastal electric generating facilities in the state of California due to state regulation of cooling water intakes for these facilities. There are no coastal facilities in Oregon and a single facility in Washington classified as a baseline closure.

[c] A facility in Texas has intakes located in both the Inland and Gulf of Mexico regions. It is included within the Inland region in the current table to prevent double-counting.

To estimate regional I&E mortality, EPA extrapolated loss data from 97 facilities that conducted I&E mortality studies (model facilities) to all in-scope facilities within the same region. EPA judged these 97 studies include the most representative studies with the best available data. EPA used regions to account for differences in ecosystems, aquatic species, and characteristics of commercial and recreational fishing activities. Extrapolation was conducted on the basis of actual intake flow reported for the period 1996–1998 by facilities in response to EPA's Section 316(b) Detailed Questionnaire and Short Technical Questionnaire. Chapter 3 of the EEBA document provides details of the extrapolation procedure. Because the goal of the analysis was to provide estimates of I&E mortality losses at regional and national scales, EPA recognizes that there may be substantial variability in the number of actual losses (and benefits) of individual facilities. However, EPA concludes that extrapolation is a reasonable basis for developing estimates of regional- and national-level benefits for the purposes of this proposed rulemaking.

C. Physical Impacts of I&E Mortality

EPA's benefits analysis is based on facility-provided I&E mortality monitoring data. Facility data consist of records of impinged and entrained organisms sampled at intake structures and cover organisms of all ages and life stages. Sampling protocols were not standardized across facilities. Differences among facility protocols included sampling methods and equipment used, the number of samples taken, sampling duration, and the unit of time and volume of intake flow used to express I&E mortality losses. To standardize estimates across facilities, EPA converted sampling counts into annual I&E mortality losses. Using standard fishery modeling techniques,[92] EPA constructed models that combined facility-derived I&E mortality counts with life history data from the scientific literature to derive annual estimates of:

- Age-one equivalent losses (A1Es)—the number of individuals of different ages impinged and entrained by facility

[91] The California region includes manufacturing facilities in the state of California and four facilities in Hawaii. It excludes coastal electric generating facilities in the state of California due to state regulation of cooling water intakes for these facilities. There are no coastal facilities in Oregon and a single facility in Washington classified as a baseline closure.

[92] Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations. Fisheries Research Board of Canada, Bulletin 191; Hilborn, R. and C.J. Walters. 1992. Quantitative Fisheries Stock Assessment, Choice, Dynamics and Uncertainty. Chapman and Hall, London and New York.; Quinn, T.J., II. and R.B. Deriso. 1999. Quantitative Fish Dynamics. Oxford University Press, Oxford and New York; Dixon, D.A. 1999. Catalog of Assessment Methods for Evaluating the Effects of Power Plant Operations on Aquatic Communities. Final Report. Report number TR_112013.

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intakes, standardized to equivalent numbers of 1-year old fish. A conversion rate between all life history stages and age 1 is calculated using species-specific survival tables. The loss of an individual younger than age 1 results in a conversion rate less than 1 while the loss of an individual older than age 1 results in a conversion rate greater than 1.

• Foregone fishery yield—pounds of commercial harvest and numbers of recreational fish and shellfish that are not harvested due to I&E mortality. EPA used the Thompson-Bell equilibrium yield model (Ricker, 1975) to convert I&E mortality losses to forgone fishery yield assuming that (1) I&E mortality losses reduce the future yield of harvested adults, and (2) reductions in I&E mortality rates will lead to an increase in harvested biomass. The general procedure involves multiplying age-specific harvest rates by age-specific weights to calculate an age-specific expected yield.

• Biomass Production Foregone—biomass that would have been produced had individuals not been impinged or entrained (Rago, 1984), calculated for all forage species from species- and age-specific growth rates and survival probabilities. It refers to the weight of impinged and entrained forage species that are not commercial or recreational fishery targets but serve as valuable components of aquatic food webs, particularly as an important food supply to other aquatic species, including commercial and recreational species.

Estimates of foregone fishery yield include direct and indirect losses of impinged and entrained species that are harvested. Indirect losses represent the yield of harvested species lost due to reductions in prey availability based on a simple trophic transfer model (*i.e.* forage species).[93] A detailed methodology for these analyses is provided in Chapter 3 of the EEBA document.

Studies from individual facilities may under or overestimate I&E mortality rates. For example, facility studies typically focus on a subset of fish species impacted by I&E mortality, resulting in some species being ignored, and thereby number of individuals lost to I&E mortality being underestimated. Due to the low number of replicate studies, estimating the magnitude of this underestimate is not possible. Moreover, studies often do not count early life stages of organisms that are difficult to identify. In addition, many of the I&E mortality studies used by the Agency were conducted over 30 years ago, prior to the improvement to aquatic conditions that have resulted from implementation of the Clean Water Act. In locations where water quality was degraded at the time of I&E mortality sampling relative to current conditions, the abundance and diversity of fish populations may have been depressed, resulting in low I&E mortality estimates. Therefore, use of these data may underestimate the magnitude of current I&E mortality losses. Alternatively, studies may have occurred in locations where local fish populations are currently lower than they were when the study occurred. Such a shift in fish populations may have occurred due to natural variability in populations, because of other anthropogenic effects (*i.e.,* pollution, over-harvesting, etc.), or because of competition from invasive species. In such cases, the use of these data may overestimate the magnitude of current I&E mortality losses.

The use of linear methods for projecting losses to fish and shellfish in the waterbody may also overstate or understate impacts. Nevertheless, EPA believes that the data from facility studies were sufficient to estimate the relative magnitude of I&E mortality losses nationwide. Exhibit VIII–2 presents EPA's estimates of baseline annual I&E mortality losses, and reductions to annual I&E mortality losses estimated to occur under various regulatory options. Option 3 results in the greatest reduction in I&E mortality, followed by Option 2, Option 1, and Option 4, respectively. EPA did not model the entrainment reductions for Option 1 and Option 4 because these are based on site-specific determinations of BTA, which are impossible to predict. While EPA does estimate potential ranges of costs for these site-specific determinations in section VII (though not as part of the primary cost estimates), EPA cannot estimate comparable ranges of monetized benefits because benefits are location specific and EPA has no way of predicting what entrainment technology would be adopted at any specific facility. However, EPA believes the entrainment reductions resulting from site-specific BTA determinations could be significant, depending on the technologies adopted.

VIII–2—BASELINE I&E MORTALITY LOSSES AND REDUCTIONS FOR ALL IN-SCOPE FACILITIES BY REGULATORY OPTION

Loss mode	Baseline I&E losses	Reduction in losses by regulatory option			
		Option 1	Option 2	Option 3	Option 4
Individuals (millions)					
IM	517.46	421.62	500.44	504.14	413.70
EM	527,968.21	0.00	400,351.83	407,417.58	0.00
E Mortality	528,485.67	421.62	400,852.27	407,921.72	413.70
Age-One Equivalents (millions)					
IM	747.40	614.97	722.53	728.35	602.42
EM	1,441.52	0.00	1,259.02	1,285.20	0.00
I&E Mortality	2,188.92	614.97	1,981.55	2,013.55	602.42
Forgone Fishery Yield (million lbs)					
IM	15.21	11.99	14.86	14.93	11.86
EM	56.30	0.00	43.66	44.31	0.00
I&E Mortality	71.50	11.99	58.52	59.24	11.86

[93] Indirect losses account for about 9 percent of commercial and recreational harvest reductions at baseline.

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VIII–2—BASELINE I&E MORTALITY LOSSES AND REDUCTIONS FOR ALL IN-SCOPE FACILITIES BY REGULATORY OPTION—Continued

Loss mode	Baseline I&E losses	Reduction in losses by regulatory option			
		Option 1	Option 2	Option 3	Option 4
Production Forgone (million lbs)					
IM	152.71	126.44	148.09	149.32	123.81
EM	485.07	0.00	393.39	406.88	0.00
I&E Mortality	637.78	126.44	541.48	556.20	123.81

Scenarios: Option 1 = IM limitations based on modified traveling screens for all facilities with flow greater than 2 million gallons per day (MGD); Option 2 = Intake flow commensurate with closed-cycle cooling for facilities that have a design intake flow of greater than 2 MGD and IM limitations based on modified traveling screens for all facilities with flow greater than 2 MGD; Option 3 = Intake flow commensurate with closed-cycle cooling for all facilities and IM limitations based on modified traveling screens for all facilities with flow greater than 2 MGD; Option 4 = IM limitations based on modified traveling screens for all facilities with flow greater than 50 million gallons per day (MGD).

Exhibit VIII–3 presents EPA's estimates of annual I&E mortality losses by option and by fish category. Estimates of annual forgone fishery yield include both direct losses to harvested species as well as indirect losses due to reductions in prey fish species. Because the vast majority of the biomass moving through food webs is lost due to low trophic transfer efficiency (*i.e.,* does not reach the higher trophic levels with direct use value to humans), the portion of I&E mortality losses with direct human use values (*i.e.,* those that contribute to forgone harvest) represent only a small percentage of all organisms suffering I&E mortality losses at CWIS. Neither forage species nor the unlanded portion of recreational and commercial species were assigned direct use values in this analysis, though losses in forage species did contribute to the overall losses in recreational and commercial species as noted above. Because the majority of annual I&E mortality losses include unharvested recreational and commercial fish and forage fish, considering nonuse values in the final Section 316(b) rule benefits analysis is particularly important.

EXHIBIT VIII–3—DISTRIBUTION OF ANNUAL BASELINE I&E MORTALITY LOSSES AND REDUCTIONS BY SPECIES CATEGORY AND REGULATORY OPTION, FOR ABSOLUTE LOSSES AND AGE-1 EQUIVALENTS

I&E loss metric	Baseline I&E losses	Reduction in losses by regulatory option			
		Option 1	Option 2	Option 3	Option 4
Individuals (millions)					
All Species	528,485.67	421.62	400,852.27	407,921.72	413.70
Forage Species	360,431.51	307.89	278,690.45	283,584.80	301.21
Commercial & Recreational Species	168,054.16	113.73	122,161.82	124,336.91	111.49
Commercial & Recreational Harvest	59.41	15.66	53.28	54.05	15.51
Lost Individuals with Direct Use Value (%)	0.01	3.71	0.01	0.01	3.75
Age-One Equivalents (millions)					
All Species	2,188.92	614.97	1,981.55	2,013.55	602.42
Forage Species	1,654.78	525.66	1,512.64	1,535.44	514.11
Commercial & Recreational Species	534.15	89.31	468.91	478.11	88.31
Commercial & Recreational Harvest (million fish)	59.41	15.66	53.28	54.05	15.51
A1E Losses with Direct Use Value (%)	2.71	2.55	2.69	2.68	2.57

Scenarios: Option 1 = IM limitations based on modified traveling screens for all facilities with flow greater than 2 million gallons per day (MGD); Option 2 = Intake flow commensurate with closed-cycle cooling for facilities that have a design intake flow of greater than 2 MGD and IM limitations based on modified traveling screens for all facilities with flow greater than 2 MGD; Option 3 = Intake flow commensurate with closed-cycle cooling for all facilities and IM limitations based on modified traveling screens for all facilities with flow greater than 2 MGD; Option 4 = IM limitations based on modified traveling screens for all facilities with flow greater than 50 million gallons per day (MGD).

D. National Benefits of Today's Considered Options

1. Overview

Economic benefits of the proposed options for in-scope facilities can be broadly defined into use and nonuse benefit categories of goods and services.

Use values include benefits that pertain to the use (direct or indirect) of affected fishery resources. Use value reflects the value of all current direct and indirect uses of a good or service. Direct use benefits can be further categorized according to whether or not affected goods and services are traded in the market (*e.g.* commercially-captured fish are traded, recreational catch is not). Likewise, indirect use benefits can be linked to either market or nonmarket goods and services. For example, reductions to I&E mortality losses of forage fish will enhance the biomass of species targeted for commercial (market) and recreational (nonmarket) uses.

Nonuse benefits are those benefits that are independent of any current or anticipated use of a resource. Nonuse benefits reflect human values associated with existence and bequest motives.

EPA estimated the economic benefits from national regulatory options using a range of valuation methods. Commercial fishery benefits were valued using market data. Recreational angling

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benefits were valued using a benefits transfer approach. To estimate indirect use benefits from reduced I&E mortality losses to forage species, EPA used a simple trophic transfer model. This model translated changes in I&E mortality losses of forage fish into changes in the harvest of commercial and recreational species. All benefits for fish saved under today's proposed rule are estimates based on projected numbers of age-one equivalent fish, converted to harvestable age equivalents on a species-by-species basis for those commercial species analyzed.

EPA calculated the monetary value of use benefits of the national categorical regulatory options for existing facilities using two discount rate values: 3% and 7%. All dollar values presented are in 2009$. Because avoided fish deaths occur mainly in fish that are younger than harvestable age (eggs, larvae, and juveniles), the benefits from avoided I&E mortality would be realized typically 3–4 years after their avoided death. A detailed description of the approaches used to address this can be found in Appendix C of the EEBA.

Neither forage species nor the unlanded portion of recreational and commercial were assigned direct use values in this analysis. Their potential value to the public is derived from several alternative sources: Their indirect use as both food and breeding population for those fish that are harvested, the willingness of individuals to pay for the protection of fish based on a sense of altruism, stewardship, bequest, or vicarious consumption, and their support of ecosystem stability and function (nonuse benefits). To estimate a subset of nonuse benefits from reducing losses to forage species, and landed and unlanded commercial and recreational species, EPA explored benefits transfer from nonmarket valuation studies of nonuse values of aquatic ecosystem improvements. These efforts generated partial estimates of nonuse values for resource changes expected to result in the North Atlantic and Mid-Atlantic benefits regions from the proposed options, but EPA was unable to estimate reliable nonuse valuations for changes expected to result in other study regions. EPA is in the process of developing a stated preference survey to estimate total willingness to pay (WTP) for improvements to fishery resources affected by I&E mortality from in-scope 316(b) facilities (75 FR 42,438). However EPA did not have sufficient time to fully develop and implement this survey for the proposed regulation. EPA will issue a Notice of Data Availability pending completing survey implementation and data analysis. As a consequence of the challenges associated with estimating nonuse benefits, some non-monetized benefits are described only qualitatively or quantitatively.

2. Timing of Benefits

Discounting refers to the economic conversion of future benefits and costs to their present values, thereby accounting for the fact that individuals value future outcomes less than comparable near-term outcomes. Discounting enables a valid comparison of benefits and costs that occur across different time periods. For the analysis of the proposed options, monetized benefits are calculated in a manner that makes the timing comparable to the annualized cost estimates. The benefits of the proposed options are estimated as the typical benefits expected once the rule takes effect. The need to discount arises from two different delays in the realization of benefits.

First, facilities will not always achieve compliance in the same year that costs are incurred. Facilities will face regulatory requirements once the rule takes effect, but it will take time to make the required changes. It is assumed that facilities installing impingement technology will achieve compliance sooner than facilities installing cooling towers. Facilities installing only impingement technology are assumed to have an average compliance year of 2015, non-nuclear electric generating facilities installing towers have an average compliance year of 2020, and nuclear electric generating facilities and manufacturing facilities installing towers have an average compliance year of 2025. To account for the lag between the incurrence of costs and the realization of benefits, benefits are discounted to a greater extent compared to the costs.

Second, an additional time lag will result between technology implementation and increased fishery yields. This lag occurs because several years may pass between the time an organism is spared from I&E mortality and the time of its potential harvest. For example, a larval fish spared from entrainment (in effect, at age 0) may be caught by a recreational angler at age 3, meaning that a 3-year time lag arises between the incurred technology cost and the realization of the estimated recreational benefit. Likewise, if a 1-year-old fish is spared from impingement and is then harvested by a commercial waterman at age 2, there is a 1-year lag between the incurred cost and the subsequent commercial fishery benefit. To account for this growth period, EPA applied discounting by species groups in each regional study.

3. Recreational Fishing Valuation

a. Recreational Fishery Methods

To estimate recreational benefits of the proposed options, EPA developed a benefits transfer approach based on a meta-analysis of recreational fishing valuation studies designed to measure the various factors that determine willingness to pay for catching an additional fish per trip. Regional benefits are summarized as follows (see Chapter 7 of the EEBA document for details):

1. Estimate annual foregone catch of recreational fish (number of fish) attributable to I&E mortality under current conditions.
2. Estimate the marginal value per fish.
3. Multiply forgone catch by the marginal value per fish to estimate the total annual value of forgone catch.
4. Estimate the annual value of reductions in forgone catch attributable to the regulatory analysis options.
5. Discount benefits at 3% and 7% to reflect the time lag between I&E mortality reductions and increased harvests.

b. Estimated Benefits to Recreational Anglers

Decreasing I&E mortality increases the number of fish available to be caught by recreational anglers, thereby increasing angler welfare. Exhibit VIII–4 shows the estimated benefits resulting from reduced I&E mortality under today's options. The total annualized recreational fishing benefit for all regions, discounted at 3% (I&E mortality combined), ranges from $15.3 to $44.9 million; and the total for all regions, discounted at 7%, ranges from $13.9 to $33.3 million.

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EXHIBIT VIII–4—ANNUAL RECREATIONAL FISHING BENEFITS FROM ELIMINATING OR REDUCING I&E MORTALITY LOSSES AT ALL IN-SCOPE FACILITIES BY REGULATORY OPTION

Regulatory Option	Increased harvest (*million fish*)	3% Discount rate (*million 2009$*)	7% Discount rate (*million 2009$*)
Baseline	26.79	$76.89	$75.64
Option 1	5.77	15.62	14.21
Option 2	23.55	43.52	32.40
Option 3	24.06	44.94	33.30
Option 4	5.65	15.34	13.94

Scenarios: Baseline = Eliminating Baseline I&E Mortality Losses; Option 1 = IM limitations based on modified traveling screens for all facilities with flow greater than 2 million gallons per day (MGD); Option 2 = Intake flow commensurate with closed-cycle cooling for facilities that have a design intake flow of greater than 2 MGD and IM limitations based on modified traveling screens for all facilities with flow greater than 2 MGD; Option 3 = Intake flow commensurate with closed-cycle cooling for all facilities and IM limitations based on modified traveling screens for all facilities with flow greater than 2 MGD; Option 4 = IM limitations based on modified traveling screens for all facilities with flow greater than 50 million gallons per day (MGD).

4. Commercial Fishing Valuation

Reductions in I&E mortality at cooling water intake structures are expected to benefit the commercial fishing industry. By reducing the number of fish killed, the number of fish available for harvest is expected to increase. The next section summarizes the methods EPA used to estimate benefits to the commercial fishing sector. The following section presents the estimated commercial fishing benefits.

a. Commercial Fishing Valuation Methods

The total loss to the economy from I&E mortality impacts on commercially harvested fish species is determined by the sum of changes in both producer and consumer surplus. EPA assumed a linear relationship between stock and harvest, such that if 10% of the current commercially targeted stock were harvested, then 10% of the commercially targeted fish lost to I&E mortality would have been harvested, absent I&E mortality. The percentage of fish harvested is based on data of historical fishing mortality rates.

Producer surplus provides an estimate of the economic damages to commercial fishers, but welfare changes can also be expected to accrue to final consumers of fish and to commercial consumers (including processors, wholesalers, retailers, and middlemen) if the projected increase in harvest is accompanied by a change in price. The analysis of market impacts involves the following steps (see Chapter 6 of the EEBA for details):

1. Assessing the net welfare changes for fish consumers due to changes in fish harvest and the corresponding change in fish price.
2. Assessing net welfare changes for fish harvesters due to the change in total revenue, which could be positive or negative.
3. Calculating the increase in net social benefits when the fish harvest changes by combining the welfare changes for consumers and harvesters.

For a more detailed description of the methodology for commercial fishing, see Chapter 6 of the EEBA.

b. Commercial Fishing Valuation Results

Exhibit VIII–5 presents the estimated annual commercial fishing benefits attributable to the proposed options. The results reported include the total reduction in losses in pounds of fish, and the value of this reduction discounted at 3%, and 7%. With a 3% discount rate, total estimated annualized commercial fishing benefits for the U.S., range from $1.0 to $4.5 million. Applying a 7% rate, these benefits range from $0.9 to $3.3 million. EPA estimated the expected price changes from eliminating baseline levels of I&E mortality losses and found them to be small, ranging from 0.13 percent to 2.1 percent.

EXHIBIT VIII–5 ANNUAL COMMERCIAL FISHING BENEFITS FROM ELIMINATING OR REDUCING I&E MORTALITY LOSSES AT ALL IN-SCOPE FACILITIES BY REGULATORY OPTION

Regulatory Option	Increased harvest (*million fish*)	3% Discount rate (*million 2009$*)	7% Discount rate (*million 2009$*)
Baseline	32.62	$8.05	$7.89
Option 1	9.89	0.99	0.89
Option 2	29.72	4.47	3.31
Option 3	29.99	4.52	3.34
Option 4	9.86	0.99	0.89

Scenarios: Baseline = Eliminating Baseline I&E Mortality Losses; Option 1 = IM limitations based on modified traveling screens for all facilities with flow greater than 2 million gallons per day (MGD); Option 2 = Intake flow commensurate with closed-cycle cooling for facilities that have a design intake flow of greater than 2 MGD and IM limitations based on modified traveling screens for all facilities with flow greater than 2 MGD; Option 3 = Intake flow commensurate with closed-cycle cooling for all facilities and IM limitations based on modified traveling screens for all facilities with flow greater than 2 MGD; Option 4 = IM limitations based on modified traveling screens for all facilities with flow greater than 50 million gallons per day (MGD).

5. Nonuse Benefits

Aquatic organisms without any direct uses account for the majority of cooling water intake structure losses (Exhibit VIII–6.). Although individuals do not use these resources directly, they may value changes in their status or quality. To assess the public policy significance of the ecological gains from the national categorical regulatory options for existing facilities, EPA developed a benefit transfer approach to partially monetize nonuse benefits associated with reductions in I&E mortality of fish, shellfish, and other aquatic organisms under the categorical regulatory options for the North Atlantic and Mid-Atlantic benefits regions. EPA applied estimated values from a study occurring in Rhode Island; these estimates are likely to be

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representative of nonuse values held by individuals residing in the Northeast US, and less accurate in other regions. EPA was unable to identify comparable studies occurring in other regions which could be used to estimate nonuse values. Chapter 8 of the EEBA provides further detail on this analysis.

a. Nonuse Valuation Methods

The preferred techniques for estimating total resource values (use plus nonuse) are to use values from the existing studies or conduct original stated preference surveys. There are many studies in the environmental economics literature that quantify benefits or willingness to pay (WTP) associated with various types of water quality and aquatic habitat changes. However, none of these studies allows the isolation of non-market WTP associated with quantified reductions in fish losses for forage fish. Most available studies estimate WTP for broader, and sometimes ambiguously defined, policies that simultaneously influence many different aspects of aquatic environmental quality and ecosystem services, but for which WTP associated with fish or aquatic life alone cannot be identified. Stated preference methods rely on surveys which ask people to state their willingness to pay (WTP) for particular ecological improvements, such as increased protection of aquatic species or habitats with particular attributes. EPA is in the process of developing a stated preferences survey to estimate total willingness to pay (WTP) for improvements to fishery resources affected by I&E mortality from in-scope 316(b) facilities. The survey will provide estimates of total values, will allow estimates of value associated with specific choice attributes (following standard methods for choice experiments), and will also allow the flexibility to provide insight into the relative importance of use versus nonuse values in the 316(b) context. However EPA did not have sufficient time to fully develop and deploy this survey and derive reliable estimates of the monetary value of reducing those impacts at the national level. Benefit transfer of values from existing stated preference studies was used by EPA in the absence of an original study.

EPA identified a recent study conducted by Johnston *et al.,* (2009) that is closely related to the 316(b) policy context. Both Johnston *et al.,* (2009) and the present context address policy changes that increase the number of forage fish in aquatic habitat with unknown effects on overall fish populations. Originally developed for a case study addressing Rhode Island residents' preferences for the restoration of migratory fish passage over dams in the Pawtuxet and Wood-Pawcatuck watersheds of Rhode Island, Johnston *et al.,* (2009) estimates nonuse values by asking respondents to consider changes in ecological indicators reflecting quantity of habitat, abundance of wildlife, ecological condition, and abundance of migratory fish species. Within this study, estimated values were based on the relative change in abundance of fish species impacted to the greatest extent by restoration.

Estimated benefit functions from the Johnston *et al.,* (2009) choice experiment survey allows one to distinguish benefits associated with resource uses from those associated primarily with nonuse motives. Within the benefit transfer application, WTP is quantified for increases in non-harvested fish alone, based on the implicit price for migratory fish changes. This transfer holds all effects related to identifiable human uses constant (*e.g.,* effects on catchable fish, public access, observable wildlife, etc.). The remaining welfare effect—derived purely from effects on forage fish with little or no direct human use—may therefore be most accurately characterized as a nonuse benefit realized by households.

The estimation of nonuse values involved the following steps:

1. Use a variant of the Johnston *et al.,* (2009) model (the survey variant which characterizes effects on the number of migratory fish passing upstream) to estimate household WTP per percent increase in the number of fish in a given watershed.

2. Calculate the relative change in abundance for the fish species impacted to the greatest extent by the regulation. By comparing increases in age-1 equivalent fish to estimates of biomass at species' carrying capacity, EPA found that of all species with habitats inside the boundaries of the North Atlantic and Mid-Atlantic benefits regions, winter flounder is likely to experience the largest percent change in population. This species is harvested; however fish and commercial species may be forage during early life-stages and have nonuse values.

3. Estimate total household WTP by applying model results for WTP per percentage to estimated winter flounder losses. Total regional WTP is the product of household WTP and the number of households within the affected region (see Chapter 8 of the EEBA for details.)

b. Estimated Nonuse Benefits for the North Atlantic and Mid Atlantic Regions

EPA expects that decreasing I&E mortality will lead to increased fish abundance in affected waterbodies, thus increasing nonuse benefits. Exhibit VIII–6 shows the benefits that would result from reducing I&E mortality losses through today's proposed options. Estimates of WTP were calculated based on the increase in age-1 equivalent winter flounder relative to estimated current biomass. Discounted at 3%, the total annualized nonuse benefit for the North Atlantic and Mid-Atlantic regions, ranges from $0.5 to $75.5 million. When discounted at 7%, annualized nonuse benefits range from $0.5 to $58.5 million.

EXHIBIT VIII–6—ANNUAL NONUSE BENEFITS FROM ELIMINATING OR REDUCING I&E MORTALITY LOSSES AT ALL IN-SCOPE FACILITIES BY REGULATORY OPTION

Regulatory option	Winter flounder I&E losses (million A1E)	Increased winter flounder age-1 equivalent abundance relative to virgin biomass (%)	3% Discount rate (millions 2009$)	7% Discount rate (millions 2009$)
Baseline	6.50	6.56	$128.64	$130.78
Option 1	0.03	0.03	0.52	0.48
Option 2	5.32	5.37	72.09	55.93
Option 3	5.57	5.63	75.48	58.52

EXHIBIT VIII–6—ANNUAL NONUSE BENEFITS FROM ELIMINATING OR REDUCING I&E MORTALITY LOSSES AT ALL IN-SCOPE FACILITIES BY REGULATORY OPTION—Continued

Regulatory option	Winter flounder I&E losses (million A1E)	Increased winter flounder age-1 equivalent abundance relative to virgin biomass (%)	3% Discount rate (millions 2009$)	7% Discount rate (millions 2009$)
Option 4	0.03	0.03	0.52	0.48

Scenarios: Baseline = Eliminating Baseline I&E Mortality Losses; Option 1 = IM limitations based on modified traveling screens for all facilities with flow greater than 2 million gallons per day (MGD); Option 2 = Intake flow commensurate with closed-cycle cooling for facilities that have a design intake flow of greater than 2 MGD and IM limitations based on modified traveling screens for all facilities with flow greater than 2 MGD; Option 3 = Intake flow commensurate with closed-cycle cooling for all facilities and IM limitations based on modified traveling screens for all facilities with flow greater than 2 MGD; Option 4 = IM limitations based on modified traveling screens for all facilities with flow greater than 50 million gallons per day (MGD).

6. Threatened and Endangered Species

This section summarizes methods and results of EPA's analysis of benefits from improved protection of threatened and endangered (T&E) species from the national categorical regulatory options considered in today's Proposal. Chapter 5 of the EEBA provides further detail on this analysis.

For T&E species, mortality due to I&E mortality from CWISs may represent a substantial portion of annual reproduction because of the reduced population levels that cause a species to be protected. Consequently, I&E mortality may either lengthen recovery time, or hasten the demise of these species. Adverse effects of CWIS on T&E species may occur in several ways:

- Populations of T&E species may suffer direct harm as a consequence of I&E mortality
- T&E species may suffer indirect harm if CWIS alters food webs
- CWIS may alter habitat critical to the long-term survival of T&E species (*e.g.,* thermal discharges associated with once through cooling)

Consequently, EPA believes that 316(b) regulation may help preserve a number of threatened and endangered species.

a. Qualitative Assessment of I&E Mortality Impacts to T&E Species

By definition, T&E species are characterized by low population levels. As such, it is unlikely that these species are recorded in I&E mortality monitoring studies which sample only a portion of all I&E mortality losses. Thus, losses are difficult to identify and quantify within a framework developed for common species. Consequently, EPA developed a qualitative methodology to estimate the number of T&E species affected by I&E mortality.

To qualitatively assess the potential for CWIS impacts on aquatic T&E species, EPA constructed a database that assessed the geographical overlap of CWIS and habitat used by aquatic T&E species. This database identified the number of T&E species potentially impacted by each in-scope 316(b) facility, and the number of facilities potentially impacting each T&E species. Additional details can be found in Chapter 5 of the EEBA document.

Using this database, EPA found 89 federally-listed T&E species that overlap with at least one in-scope 316(b) CWIS (Exhibit VIII–7) Species included freshwater, marine, and anadromous fish, freshwater mussels, and sea turtles. On average, the habitat of each T&E species overlapped with 20 in-scope facilities (Exhibit VIII–7), suggesting that the regulation of 316(b) facilities may have substantial positive benefits on ensuring the long-term sustainability and recovery of T&E species.

EXHIBIT VIII–7—NUMBER OF IN-SCOPE 316(B) CWIS WITHIN T&E SPECIES HABITAT ON A PER-SPECIES BASIS

Subset of affected species [1] [2]	Species	Interactions [3]	Facilities per T&E species [4]	
			Avg	Max
All T&E Species	88	1,734	19.70	135
Sea Turtles	6	652	108.67	135
T&E Freshwater Mussels	43	836	19.44	85
T&E Anadromous Fish	13	115	8.85	64
T&E Freshwater Fish	21	64	3.05	7
T&E Marine Fish	3	17	5.67	11

[1] T&E species included species of concern and species under review for listing by the US Fish and Wildlife Service (freshwater) or NOAA National Marine Fisheries Service (marine). Only species overlapping with a minimum of one CWIS are included.
[2] Two species of coral are included in the 'All Species' category, and not in any subcategory.
[3] Each interaction represents an overlap between the range of a T&E species and CWIS.
[4] Avg = average, Max = maximum.

b. Quantitative Assessment of I&E Mortality Impacts to T&E Species

Although difficult to observe and quantify, EPA identified 15 T&E species with confirmed I&E mortality losses. In addition to documented species-level instances of T&E mortality, EPA identified I&E mortality losses at the level of genera [94] when these genera contain a T&E species whose habitat range overlapped the reporting facility's CWIS. Although these are not confirmed I&E mortality losses of T&E species, they provide evidence that additional T&E species are likely to be directly affected by I&E mortality. A total of 19 genus-level matches were reported, suggesting that the 15 T&E species suffering I&E mortality losses may be an underestimate.

[94] Genera is the plural of genus. Genus is the rank superior to species in taxonomic biological classification. For example, the genus of Atlantic salmon (*Salmo falar*) is *Salmo*.

Of the 15 federally-listed T&E species for which losses were documented within I&E mortality studies, EPA was able to quantify losses for 2 species. Data were either qualitative or of insufficient quality to quantify regional losses for the remaining 13 federally-listed T&E species. EPA also quantified losses for the American Paddlefish (*Polyodon spathula*), listed as threatened or endangered on several state lists, using facility I&E mortality loss studies. Exhibit VIII–8 presents EPA's estimates of baseline annual I&E mortality losses, and reductions to I&E mortality losses estimated to occur under various regulatory options.

EXHIBIT VIII–8—BASELINE ANNUAL I&E MORTALITY LOSSES FOR T&E SPECIES AND REDUCTIONS FOR ALL IN-SCOPE FACILITIES BY REGULATORY OPTION (A1ES)

Species	Value	Baseline	Option 1	Option 2	Option 3	Option 4
Pallid Sturgeon	Use, Nonuse	88	73	85	86	72
American Paddlefish	Use, Nonuse	17,628	8,631	15,946	16,317	8,420
Topeka Shiner	Nonuse	3,669	3,069	3,546	3,581	2,994
Total		21,384	11,773	19,577	19,984	11,486

Scenarios: Baseline = Baseline I&E Mortality Losses; Option 1 = IM limitations based on modified traveling screens for all facilities with flow greater than 2 million gallons per day (MGD); Option 2 = Intake flow commensurate with closed-cycle cooling for facilities that have a design intake flow of greater than 2 MGD and IM limitations based on modified traveling screens for all facilities with flow greater than 2 MGD; Option 3 = Intake flow commensurate with closed-cycle cooling for all facilities and IM limitations based on modified traveling screens for all facilities with flow greater than 2 MGD; Option 4 = IM limitations based on modified traveling screens for all facilities with flow greater than 50 million gallons per day (MGD).

I&E mortality is only one of many factors that adversely affect T&E species. Estimating total population impacts from changes in I&E losses requires estimates of current populations of these fish and estimates of other anthropogenic effects which were not readily available for all T&E species with quantified I&E mortality losses at the time of this analysis. Therefore, EPA was unable to quantify effects on T&E population from the 316(b) regulation.

c. Valuation Methods of T&E Fish Species

EPA believes that for T&E species, the primary value is non-use value. Harvest of these species is prohibited (or at least restricted), reflecting a societal judgment that protection and preservation of these species is of greater value than harvest. As noted above, EPA had sufficient data from I&E mortality studies to quantify I&E mortality loss estimates for three T&E species (Exhibit VIII–8). EPA applied estimates from a Random Utility Model (RUM) analysis conducted for the suspended 316(b) Phase II regulation to evaluate recreational fishing benefits for I&E loss reductions for two of these species. EPA applied transfer values from this analysis to monetize I&E mortality losses for these species (see Chapter 5 for details). EPA emphasizes that nonuse values for T&E fish species are likely to be significantly greater than any use values, and these EPA was not able to quantify. With this caveat, the results of the analysis of recreational fishing benefits for two T&E species are shown below.

d. Estimated Monetary Benefits From Reduced Mortality of T&E Fish Species

Using a 3% discount rate, total annualized use benefits for the two T&E species with monetized I&E mortality losses are estimated to range from $0.5 to $0.7 million. Applying a 7% discount rate, annualized benefits range from $0.4 to $0.6 million.

EXHIBIT VIII–9—ANNUAL USE BENEFITS FROM ELIMINATING OR REDUCING I&E MORTALITY LOSSES OF T&E SPECIES AT ALL IN-SCOPE FACILITIES BY REGULATORY OPTION

Regulatory option	Increased harvest *(number of fish)*	3% Discount rate *(million 2009$)*	7% Discount rate *(million 2009$)*
Baseline	17,715.55	$1.14	$1.14
Option 1	8,704.08	0.50	0.45
Option 2	16,030.56	0.72	0.56
Option 3	16,403.11	0.72	0.55
Option 4	8,491.59	0.49	0.44

Note: Values are included for pallid sturgeon and paddlefish in the Inland region.
Scenarios: Baseline = Eliminating Baseline I&E Mortality Losses; Option 1 = IM limitations based on modified traveling screens for all facilities with flow greater than 2 million gallons per day (MGD); Option 2 = Intake flow commensurate with closed-cycle cooling for facilities that have a design intake flow of greater than 2 MGD and IM limitations based on modified traveling screens for all facilities with flow greater than 2 MGD; Option 3 = Intake flow commensurate with closed-cycle cooling for all facilities and IM limitations based on modified traveling screens for all facilities with flow greater than 2 MGD.; Option 4 = IM limitations based on modified traveling screens for all facilities with flow greater than 50 million gallons per day (MGD).

EPA notes that the benefit values presented in Exhibit VIII–9 represent only a fraction of values for T&E species potentially affected by the proposed regulation: the Agency was able to obtain use values for only a small subset of all affected T&E species. Moreover, because of the nature of T&E species, even a small increase in population may yield economic and ecological benefits (*e.g.,* Richardson and Loomis 2008, Huppert *et al.,* 2004; Berrens *et al.,* 1996)

e. Valuation Methods for T&E Sea Turtles

In addition to estimating values of T&E fish with quantitative estimates of I&E mortality losses, EPA estimated the WTP for sea turtle conservation. In this analysis, EPA applied estimates from a

study using a stated preference valuation approach to estimate total economic value of a management program that reduces the risk of extinction of loggerhead sea turtles (Whitehead 1993).

Although I&E mortality is relatively low compared to mortality from shrimp trawling and other fisheries (Plotkin 1995), it is known that low levels of turtle mortality during juvenile and subadult life stages can have a substantial effect on population growth (Crouse *et al.,* 1987). EPA believes that the marginal decrease in extinction probability of sea turtles due to 316(b) regulatory options is likely to be at least 0.01, or a 1% decrease in the probability of extinction over 25 years. This assessment is based upon reports that I&E mortality may result in the loss of more than 100 turtles per year, and because turtle population growth rates are known to be sensitive to changes in juvenile and subadult life stages (Crouse *et al.,* 1987).

f. Estimated Monetary Benefits From Reduced Mortality of T&E Sea Turtles

The U.S. range of loggerhead sea turtles includes the Gulf of Mexico, South Atlantic, Mid-Atlantic, and North Atlantic 316(b) regions (USFWS 2010). To calculate national WTP for an increased 25-year survival probability of loggerhead sea turtles, EPA assumed the affected population to include households in states with in-scope 316(b) facilities that occur within loggerhead sea turtle habitat. Using this assumption, EPA determined 53.4 million households would be willing to pay for improved protection of loggerhead sea turtles. Although incidences of mortality have been reported at facilities in California, Texas, Florida, South Carolina, North Carolina, and New Jersey EPA does not have sufficient information to quantify total sea turtle losses due to intakes, or the reductions in such losses that might occur from the various options. But as an illustrative example, assuming that the survival probability of loggerhead sea turtles over 25 years was increased by 1%, and applying a mean household value of $0.35 (2009$, see the EEBA Chapter 5), the monetized value would be $16.6 million and $16.0 million using discount rates of 3% and 7%, respectively. Because EPA does not currently have accurate national estimates of I&E mortality for turtle species, nor are population models available that estimate the effect of 316(b) regulation on population size and extinction risk, these estimates are presented only as an illustrative example, and are not included in national totals.

g. Other Indications of Society's WTP for Protection of T&E Species

Many sources provide information that indicates that society places significant value on protecting T&E species. These include, but are not limited to:

- The Endangered Species Act of 1973 which provides for the conservation of T&E species of fish and wildlife. To comply with this law the federal government and state governments spent a total of $467.6 million during fiscal year 2008 on protection of federally listed T&E species with habitat overlapping CWIS.
- Restrictions placed on the habitat occupied by T&E species. For example, water diversions on the San Joaquin-Sacramento River delta, in place to protect the Delta Smelt (*Hypomesus transpacificus*), limit the extraction of water for drinking and agriculture.
- The willingness of individuals to volunteer their time to conserve T&E species. For example, dozens of organizations recruit thousands of volunteers every year to participate in sea turtle conservation and research projects; volunteers are often required to undergo substantial training and commit to long hours.

While costs to replace, protect or enhance stocks, and costs to users affected by efforts to conserve stocks are not direct measures of economic benefits, they indicate that society is willing to pay significant sums to protect and restore populations of T&E species. Although I&E mortality is only one of many stressors on these species, reducing the magnitude of these losses may contribute to the recovery of populations over time, thereby eliminating some costs associated with conserving threatened and endangered species.

7. Assessment of Thermal Discharge Impacts

Since thermal discharges are a product of once-through cooling water systems, the impacts of thermal discharges are a relevant consideration when assessing appropriate technologies to reduce the effects of cooling water intakes. Thermal pollution has long been recognized to cause harm to the structure and function of aquatic ecosystems. Concerns about the impacts of thermal discharges are addressed by provisions of CWA Section 316(a) regulations. NPDES permits are required to limit thermal discharges in order to ensure that that there is no appreciable harm to a balanced, indigenous population of shellfish, fish and wildlife. Permit requirements, however, may not totally eliminate all adverse impacts in all cases. In addition to reducing total I&E mortality, closed cycle cooling reduces thermal pollution. Most retrofit installations of cooling towers at electric generating facilities have been required by NPDES permits for the sole purpose of reducing thermal discharges.

EPA did not quantify nationally the impacts of thermal discharges. However, numerous studies have shown that thermal discharges may substantially alter the structure of aquatic communities by modifying photosynthetic, metabolic, and growth rates. Thermal discharges also harm aquatic life by reducing levels of dissolved oxygen, altering the location and timing of fish behavior such as spawning, aggregation, and migration, and may cause thermal shock-induced mortality for some species. Adverse temperature effects may also be more pronounced in aquatic ecosystems that are already subject to other environmental stressors such as high levels of biochemical oxygen demand, sediment contamination, or pathogens. Within mixing zones, which often extend several miles downstream from outfalls, thermal discharges may impair efforts to restore and protect the waterbody. For example, permit requirements to limit nitrogen discharges in a watershed, and thereby reduce harmful algal blooms, may be counteracted by thermal discharges which promote growth of harmful algae. Thermal discharges may have indirect effects on fish and other vertebrate populations through increasing pathogen growth and infection rates.

Thermal discharges may thus alter the ecological services, and reduce the benefits, of aquatic ecosystems that receive heated effluent. The magnitude of thermal effects on ecosystem services is related to facility-specific factors, including the volume of the waterbody from which cooling water is withdrawn and returned, other heat loads, the rate of water exchange, the presence of nearby refugia, and the assemblage of nearby fish species. Again, EPA emphasizes that thermal impacts are supposed to be minimized through implementation of Section 316(a), but to the extent that any impacts remain after the requirements in 316(a) have been satisfied, replacing once-through cooling with closed-cycle cooling may provide additional benefits.

8. National Monetized Benefits

Quantifying and monetizing reductions in I&E mortality losses due to

the regulatory options is extremely challenging. National benefit estimates are subject to uncertainties inherent in valuation approaches used to assess the benefits categories (See Chapters 5, 6, 7, and 8 of the EEBA document.). The combined effect of these uncertainties is of unknown magnitude or direction—that is, the estimates may over- or understate the anticipated national-level benefits. While EPA has no data to indicate that the results for each benefit category are atypical or unreasonable, EPA believes that some potentially significant benefit categories have not been fully monetized, and thus the national monetized benefits presented below likely underestimate total benefits, challenging the Agency's ability to base BTA decision making on the relationship of quantified costs and benefits alone.

Exhibit VIII–10 presents EPA's estimates of the partial monetized benefits from I&E mortality reduction of the considered regulatory options. These monetized values represent use values from increased commercial and recreational catch, recreational fishing benefits from increased catch of threatened and endangered species, and nonuse values associated with an increase in fish abundance (those fish that are not caught) in the North and Mid-Atlantic benefit regions. Partial estimated benefits from reducing I&E mortality under the proposed rule and alternative options range from $17.3 to $125.6 million (2009$) per year, discounted at 3%, and from $15.8 to $95.7 million (2009$) per year when discounted at 7%. EPA was not able to fully monetize the benefits for this proposal. Thus, the estimates presented represent a conservative (*i.e.* low) estimate of total regulatory benefits.

EXHIBIT VIII–10—SUMMARY OF NATIONAL BENEFITS FOR ALL IN-SCOPE FACILITIES BY REGULATORY OPTION

Regulatory option	Monetized benefit categories				
	Recreational fishing	Commercial fishing	Nonuse	T&E Species [a]	Total
3% Discount Rate (Millions 2009$)					
Baseline	76.89	8.05	12.64	1.14	214.72
Option 1	15.62	0.99	0.52	0.50	17.63
Option 2	43.52	4.47	72.09	0.72	120.79
Option 3	44.94	4.52	75.48	0.72	125.65
Option 4	15.34	0.99	0.52	0.49	17.33
7% Discount Rate (Millions 2009$)					
Baseline	75.64	7.89	130.78	1.14	215.45
Option 1	14.21	0.89	0.48	0.45	16.04
Option 2	32.40	3.31	55.93	0.56	92.20
Option 3	33.30	3.34	58.52	0.55	95.71
Option 4	13.94	0.89	0.48	0.44	15.76

[a] Benefits estimates for T&E species are restricted to recreational fishing benefits from increased catch of T&E species. They do not include benefits for reduced mortality of T&E sea turtles and other nonuse values associated with T&E species.

Scenarios: Baseline = Eliminating Baseline I&E Mortality Losses; Option 1 = IM Everywhere; Option 1 = IM limitations based on modified traveling screens for all facilities with flow greater than 2 million gallons per day (MGD); Option 2 = Intake flow commensurate with closed-cycle cooling for facilities that have a design intake flow of greater than 2 MGD and IM limitations based on modified traveling screens for all facilities with flow greater than 2 MGD; Option 3 = Intake flow commensurate with closed-cycle cooling for all facilities and IM limitations based on modified traveling screens for all facilities with flow greater than 2 MGD; Option 4 = IM limitations based on modified traveling screens for all facilities with flow greater than 50 million gallons per day (MGD).

E. Uncertainty and Limitations

EPA recognizes that its estimates of ecological and economic benefits projected to occur under regulation are impacted by uncertainty at many levels (uncertainty and limitations are discussed in detail in Chapters 2, 3, 4, 5, 6, 7, and 8). Moreover, due to incomplete data availability, and limited resources, the Agency recognizes that there are limitations to the analyses presented above and in the EEBA. Examples of uncertainty and limitations include, but are not limited to:

• Not all ecological goods and services impacted by CWIS at in-scope 316(b) facilities are modeled or monetized, suggesting that the total benefits of regulation may be underestimated. For example, potential increases to ecosystem stability that may occur as a result of regulation is not explicitly estimated nor monetized, though it is difficult to parse out what exactly is or is not included in WTP estimates for non-use values, which were included for the North Atlantic and Mid-Atlantic regions.

• When particular ecological goods and services are monetized, data is not always available at a national scale. For example, EPA was able to estimate nonuse benefits of I&E mortality reductions only within the North and Mid-Atlantic regions, suggesting that nonuse values are significantly underestimated.

• EPA makes simplifying assumptions that allow for I&E mortality losses and benefits to be estimated on a national scale. For example, EPA assumes that I&E mortality losses from model facilities are representative of all facilities within a region. The effect of these assumptions are unknown, and may lead to over- or under-estimates of modeled losses and benefits. However, EPA notes that the age of the studies and likely improvements to waters make them less representative of current conditions.

• EPA relies on biological and economic data of various scope, duration, and date to estimate regional and national baseline and benefits. The effect of these various differences on total regional and national benefits is uncertain.

• EPA developed methodologies to estimate regional and national baselines and benefits of 316(b) regulation. As such, location- and species-specific quantitative estimates may not be precise. Overall, however, EPA believes its approach is valid for regional and national-scale analyses that incorporate a large number of facilities and species.

Overall, EPA recognizes many sources of uncertainty in its models, and is aware of the limitations of analysis. However, EPA has used the best available scientific and economic methodologies to partially monetize benefits using available resources. As noted above, EPA expects to improve its benefits estimates by incorporating the results of a national survey of WTP to protect fish and aquatic resources into the analysis for the final rule. Because EPA was only able to partially monetize non-use benefits, EPA expects that true benefits are greater than the estimates presented here.

IX. Implementation

The following sections describe how the Agency expects the proposed rule requirements to be implemented.

A. How would the proposed requirements be applied?

The requirements of today's proposal would be applied to individual facilities through NPDES permits issued by the EPA or authorized States under Section 402 of the Clean Water Act. Today's proposed requirements would apply to each cooling water intake structure located at a facility subject to the requirements. In cases where a facility has more than one cooling water intake structure, and each cooling water intake structure provides cooling water to one or more generating or manufacturing units, the proposed requirements would apply to each cooling water intake structure individually and compliance would be required at each cooling water intake structure.

B. When would affected facilities be required to comply?

These promulgated regulations would become effective sixty (60) days after the date of publication in the **Federal Register**. After the effective date of a regulation, permitting authorities often allow facilities some time period to come into compliance. As proposed, facilities would have to comply with the impingement mortality requirements as soon as possible. Facilities may request additional time (not to exceed eight years as described below) to comply with the requirements for impingement mortality. With respect to entrainment requirements, under the proposal, existing facilities must comply as soon as possible under a schedule of compliance established by the permitting authority.

EPA found during site visits that the vast majority of facilities indicated they could comply with the impingement requirements of the Phase II rule within a single permit term (5 years), with most sites needing less time and some sites needing slightly more. For example, facilities that already have traveling screens should be able to modify the existing traveling screens, add fish return systems, conduct necessary testing, and achieve the IM limits within a few years. On the other hand, EPA identified certain technical and logistical issues at some facilities that may warrant additional time, such as replacing intake structures to utilize wedgewire screens, adding additional intake bays to reduce intake velocity, or pilot testing of other technologies. As discussed in section 6, the need for outages by multiple facilities in one geographic area would need to be coordinated so as to minimize any impacts on the consistency and reliability of power generation; this could also result in the need for slightly more time. In these circumstances EPA expects a facility could reasonably require as long as 8 years to attain compliance.

For those existing facilities that will be subject to both impingement mortality and entrainment mortality requirements, the Director should take this into account when establishing a deadline for compliance, which may also result in the facility needing more time to comply with the IM requirements. For example, if a facility plans to retrofit to wet cooling towers to both reduce entrainment mortality and to use the resulting lower intake velocity to comply with requirements for impingement mortality, the Director may be able to allow for compliance with the IM requirements to extend to the same schedule as the entrainment mortality requirements. However, where the Director determines a facility would need longer than 8 years to comply with the EM requirements established by the Director, the proposed rule would not allow the compliance schedule for IM to extend beyond 8 years. EPA recognizes that this limitation may penalize facilities that might install cooling towers to meet both IM and EM requirements but are unable to complete installation within 8 years. EPA requests comment on this limitation.

The Director would have the discretion to implement a shorter (*i.e.,* more stringent) timeline for compliance, but in no event should the Director allow a compliance schedule to extend beyond the dates specified at §125.93. Furthermore, EPA expects today's proposal gives advance notice to affected facilities what the Agency's expectations are regarding compliance schedules.

The record demonstrates that biological organisms subject to impingement and entrainment from cooling water intake structures may vary considerably from site to site with respect to types of species, quantity of organisms, distribution of life stages, feeding habits, and other factors. As a result, EPA envisions that each facility subject to today's proposal would study available technologies and operational measures, and subsequently install, incorporate and optimize the technology most appropriate for each site. EPA believes the proposed §125.93 affords flexibility for a reasonable amount of time to conduct biological studies, assess and select appropriate technologies, apply for necessary permits, complete construction, and optimize the technologies' performance. The permitting authority would establish any additional interim milestones within these timelines in accordance with the existing NPDES provisions at §122.47.

C. What are my requirements?

As proposed, all existing facilities subject to the proposed rule that withdraw a DIF of greater than two MGD would be required to comply with the impingement mortality requirements at §125.94(b). EPA estimates that 1262 facilities would be subject to impingement mortality requirements. As many as 93 percent of electric generators and 73 percent of manufacturers already employ traveling or other intake screens which could be modified to meet today's proposed requirements. In addition, 374 facilities already have full or partial cooling towers, and most of these facilities already have a maximum intake velocity of less than 0.5 feet per second. As a result, half of all manufacturers and more than three-fourths of all electric generators may already meet some or all of today's proposed requirements for impingement mortality.

To provide flexibility in meeting proposed rule IM requirements, EPA is offering facilities two options for compliance with IM requirements. Facilities may install technologies and demonstrate that they are meeting the impingement mortality restrictions at §125.94(b)(1), or demonstrate compliance with the monthly and annual intake velocity standards as described at §125.94(b)(2). As discussed in Section VI, intake velocity is an important parameter for minimizing impingement and therefore reducing impingement mortality. Data in the record demonstrate that facilities with a maximum intake velocity of 0.5 feet per second significantly reduce the potential for impingement and impingement mortality to a level equal

to or better than the impingement mortality restrictions. EPA is therefore proposing an alternative standard that would allow facilities to demonstrate to the Director that either the maximum design intake velocity, or the maximum actual intake velocity as it passes through the structural components of a screen measured perpendicular to the mesh (under §125.94(b)(2)(i)) or through the opening of the intake (under §125.94(b)(2)(ii)), will not exceed 0.5 feet per second.

Under either option for compliance with the Impingement Mortality standard, facilities that withdraw water from an ocean or estuary would also be required to reduce IM of shellfish to a level commensurate with properly deployed barrier nets. EPA expects passive screens would meet or exceed this level of performance, and has identified passive screens in the proposed regulations as being pre-approved for purposes of meeting this requirement. Also, under either option, facilities would be required to ensure that their intakes are structured so as to avoid entrapment (*i.e.,* organisms being trapped in an intake bay or canal and unable to escape). Facilities with traveling screens located in a forebay would be expected to install fish handling and return systems to meet this requirement. EPA expects passive screens such as cylindrical wedgewire would also meet this requirement.

In addition, facilities would be required to meet entrainment mortality standards as determined by the Director on a case-by-case basis. Under today's proposal, facilities with an actual intake flow of 125 MGD or greater would be required to submit with their application studies as described in this section to assist the Director in establishing appropriate entrainment mortality controls for that facility. The Director would evaluate each facility's application materials to make a site-specific determination of BTA for entrainment mortality for the facility. In some cases, the Director may determine that additional requirements are not necessary to satisfy BTA for entrainment.

Cooling water intakes with flows totaling less than two MGD are not subject to the proposed requirements. In addition, intakes where less than 25% of flow is used for cooling are also not subject to these requirements. Emergency back-up water flows would not be considered cooling water for purposes of this calculation. Furthermore, EPA seeks to promote water reuse in the proposed rule by specifically exempting wastewater, process water, and other gray water (even when used for cooling) from the definition of cooling water used in this calculation. However, once an intake satisfies these threshold requirements, all flow from the intake is subject to the impingement requirements. To the extent that any entrainment requirements are based on flow commensurate with closed cycle cooling, these would be applied to the non-contact cooling portion of the intake only, and could be met, in full or in part, by reusing water for non-cooling purposes. Intakes not subject to the rule may still be subject to requirements under other Federal, state, or local authorities.

New units at existing facilities would be required to meet the impingement mortality requirements at §125.94(b) and entrainment mortality requirements at §125.94(d). The impingement mortality requirements would be the same as those identified for existing facilities, *i.e.* either numerical restrictions on impingement mortality or a maximum intake velocity. The entrainment mortality requirements are based on the level of EM reductions achieved by closed-cycle cooling. The proposed rule would allow facilities to demonstrate performance commensurate with the closed-cycle cooling identical to the Phase I rule provision for new facilities.

D. What information must I submit in my permit application?

All existing facilities would be required to complete and submit application studies to describe the source water body, cooling water intake structures, cooling water system; characterize the biological community in the vicinity of the cooling water intake structure; develop a plan for controlling impingement mortality; describe biological survival studies that address technology efficacy and other studies on impingement and entrainment at the facility; and, discuss the operational status of the facility. The application studies would be used by the Director to assess the impingement and entrainment impacts of the cooling water intake structure and determine appropriate technological and/or operational controls, as necessary. Facilities withdrawing more than 125 MGD and existing facilities with new units would also complete and submit studies to characterize entrainment mortality and assess the costs and benefits of installing various potential technological and operational controls. A list of the proposed application materials is presented below. EPA request comment on the practicability and burden for facilities to prepare and submit this information. EPA is particularly interested in the burden to facilities with DIF < 50 MGD. EPA also requests comment on the practical utility of this information.

List of Proposed Application Materials

Facilities that already employ closed-cycle cooling and new units at existing facilities that plan to employ closed cycle would submit:

- 122.21(r)(2) Source water physical data
- 122.21(r)(3) Cooling water intake structure data
- 122.21(r)(4) Source water baseline biological characterization data
- 122.21(r)(6) Proposed Impingement Mortality Reduction Plan

All other existing facilities *would submit:*

- 122.21(r)(2) Source water physical data
- 122.21(r)(3) Cooling water intake structure data
- 122.21(r)(4) Source water baseline biological characterization data
- 122.21(r)(5) Cooling water system data
- 122.21(r)(6) Proposed Impingement Mortality Reduction Plan
- 122.21(r)(7) Performance studies
- 122.21(r)(8) Operational status

Facilities withdrawing more than 125 MGD (except those with closed cycle), and existing facilities with new units that plan to demonstrate performance equivalent to closed cycle would also submit:

- 122.21(r)(9) Entrainment characterization study
- 122.21(r)(10) Comprehensive technical feasibility and cost evaluation study
- 122.21(r) (11) Benefits valuation study
- 122.21(r) (12) Non-water quality impacts assessment

A summary of each application requirement follows. The proposed timeline for submittal of the application materials is outlined in the next section.

Section 122.21(r)(2) Source Water Physical Data

This requirement is unchanged from the Phase I rule and the suspended Phase II rule. The facility would be required to submit data to characterize the facility and evaluate the type of waterbody and species potentially affected by the cooling water intake structure. The applicant would be required to submit: A narrative description and scaled drawings showing the physical configuration of all source water bodies used by the facility, including areal dimensions, depths, salinity and temperature regimes, and other documentation that supports the determination of the water body type where each cooling water intake structure is located; identification and characterization of the source waterbody's hydrological and geomorphological features, as well as the methods used to conduct any physical studies to determine the

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intake's area of influence within the waterbody and the results of such studies; and locational maps. The Director would use this information to evaluate the appropriateness of any design or technologies proposed by the applicant.

Section 122.21(r)(3) Cooling Water Intake Structure Data

This requirement is unchanged from the Phase I rule and the suspended Phase II rule. This data would be used to characterize the cooling water intake structure and evaluate the potential for impingement and entrainment of aquatic organisms. Information on the design of the intake structure and its location in the water column would allow evaluation of which species and life stages would potentially be subject to impingement and entrainment. A diagram of the facility's water balance would be used to identify the proportion of intake water used for cooling, make-up, and process water. The water balance diagram also provides a picture of the total flow in and out of the facility, and would be used to evaluate gray water, waste water, and other reuses within the facility. The applicant would be required to submit: A narrative description of the configuration of each of cooling water intake structure and where it is located in the water body and in the water column; latitude and longitude in degrees, minutes, and seconds for each cooling water intake structure; a narrative description of the operation of each of cooling water intake structure, including design intake flows, daily hours of operation, number of days of the year in operation and seasonal changes, if applicable; a flow distribution and water balance diagram that includes all sources of water to the facility, recirculating flows, and discharges; and engineering drawings of the cooling water intake structure.

Section 122.21(r)(4) Source Water Baseline Biological Characterization Data

This information would be required to characterize the biological community in the vicinity of the cooling water intake structure and to characterize the operation of the cooling water intake structures. This supporting information must include existing data if they are available. However, the facility may supplement the data using newly conducted field studies if it chooses to do so. The information the applicant would submit includes: Identification of data that are not available and efforts made to identify sources of the data; a list of species (or relevant taxa) for all life stages and their relative abundance in the vicinity of the cooling water intake structure; identification of the species and life stages that would be most susceptible to impingement and entrainment. Species evaluated should include the forage base as well as those most important in terms of significance to commercial and recreational fisheries. In addition, the applicant must provide identification and evaluation of the primary period of reproduction, larval recruitment, and period of peak abundance for relevant taxa; data representative of the seasonal and daily activities (*e.g.,* feeding and water column migration) of biological organisms in the vicinity of the cooling water intake structure; identification of all threatened, endangered, and other protected species that might be susceptible to impingement and entrainment at your cooling water intake structures; and documentation of any public participation or consultation with Federal or State agencies undertaken in development of the plan. If the applicant supplements the information with data collected using field studies, supporting documentation for the Source Water Baseline Biological Characterization would include a description of all methods and quality assurance procedures for sampling, and data analysis including a description of the study area; taxonomic identification of sampled and evaluated biological assemblages (including all life stages of fish and shellfish); and sampling and data analysis methods. The sampling and/or data analysis methods used must be appropriate for a quantitative survey and based on consideration of methods used in other biological studies performed within the same source water body. The study area should include, at a minimum, the area of influence of the cooling water intake structure. The applicant may also identify protective measures and stabilization activities that have been implemented, and describe how these measures and activities affected the baseline water condition in the vicinity of the intake. Existing facilities with closed-cycle cooling would not be required to submit this information under the proposed rule.

Section 122.21(r)(5) Cooling Water System Data

This data would be used by the Director in determining the appropriate standards that would be applied to the facility. Facilities would be able to use this information, along with the water balance diagram required by 122.21(r)(5), to demonstrate the extent to which flow reductions have already been achieved. The applicant would provide the following information for each cooling water intake structure they use: A narrative description of the operation of the cooling water system and its relationship to cooling water intake structures; the proportion of the design intake flow that is used in the system including a distribution of water used for contact cooling, non-contact cooling, and process uses; a distribution of water reuse (to include cooling water reused as process water, process water reused for cooling, and the use of gray water for cooling); description of reductions in total water withdrawals including cooling water intake flow reductions already achieved through minimized process water withdrawals; description of any cooling water that is used in a manufacturing process either before or after it is used for cooling, including other recycled process water flows; the proportion of the source waterbody withdrawn (on a monthly basis); the number of days of the year the cooling water system is in operation and seasonal changes in the operation of the system, if applicable. The applicant would also submit a description of existing impingement and entrainment technologies or operational measures and a summary of their performance, including but not limited to reductions in entrainment mortality due to intake location and reductions in total water withdrawals and usage, and efficiencies in energy production for each producing unit that result in the use of less cooling water, including but not limited to combined cycle and cogeneration. For example, the applicant may provide comparative density data for the intake to demonstrate the extent to which location of the intake has reduced adverse environmental impact.

Section 122.21(r)(6) Proposed Impingement Mortality Reduction Plan

The facility's proposed Impingement Mortality Reduction Plan would identify the approach the facility would use to meet proposed rule IM requirements, *i.e.,* direct measure of impingement mortality through sampling, or demonstration that the maximum intake velocity is equal to or less than 0.5 fps. For the former, the Plan would include the duration and frequency of monitoring (which EPA assumes would generally be conducted on a biweekly basis, although the exact frequency would be determined case-by-case), the monitoring location, the organisms to be monitored, and the method in which naturally moribund organisms would be identified and taken into account. The Plan would also address the impingement mortality of

shellfish, as appropriate, for intakes that withdraw from oceans and tidal waters, *e.g.,* seasonal deployment of barrier nets, passive screens, or an appropriate handling and return system. The Plan would document all methods and quality assurance/quality control procedures for sampling and data analysis. The proposed sampling and data analysis methods would be appropriate for a quantitative survey and include consideration of the methods used in other studies performed in the source waterbody. The Plan would include a description of the study area (including the area of influence of the cooling water intake structure(s)), and provide a taxonomic identification of the sampled or evaluated biological assemblages (including all life stages of fish and shellfish).

For facilities that plan to meet IM requirements by demonstrating that the maximum intake velocity is equal to or less than 0.5 fps, the Plan would provide for each intake either, (1) documentation that the design intake velocity is equal to or less than 0.5 feet per second, as described at §125.94(b)(2)(i–ii), or, (2) documentation of the facility's proposed method for demonstrating the required maximum intake velocity (equal to or less than 0.5 feet per second) in accordance with §125.94(b)(2)(i–ii). This velocity must be maintained while as much as 15 percent of the intake surface area is blocked due to debris, ice, plant growth, or any other clogging materials. EPA notes that its proposed definition of intake velocity at §125.92 provides that this requirement would be applicable for screen/mesh type intakes as well as offshore intakes. For facilities with traveling screens, EPA believes the low cost and ease of installing an effective fish handling and return system warrants the retrofit of such controls, even if the maximum intake velocity is less than 0.5 feet per second, however, this is not required by the proposed rule. If intake velocity is not maintained at less than 0.5 feet per second, the regulation requires modified traveling screens to include collection buckets designed to minimize turbulence to aquatic life, the addition of a guard rail or barrier to prevent loss of fish from the collection bucket, replacement of screen panel materials with smooth woven mesh, a low pressure wash to remove fish prior to any high pressure spray to remove debris on the ascending side of the screens, and a fish handling and return system with sufficient water flow to return the fish to the source water in a manner that does not promote predation or re-impingement of the fish.

Under the proposed impingement requirements, the owner or operator of the facility must ensure that there is a means for impingeable fish or shellfish to escape the cooling water intake system or be returned to the waterbody through a fish return system. Thus, a facility would need to demonstrate that their cooling water intake structure does not lead to entrapment. This provision is intended to avoid the collection of impingeable organisms into a cooling water intake system where there is neither a fish handling and return system nor an opportunity for the organisms to escape the cooling water intake system. For example, a facility may have an offshore intake with a velocity cap that meets the maximum velocity requirements for IM. The intake then leads to a pipe, canal, or forebay for which there is no means to return the organisms to the source water. In this example, this provision would require that the facility implement a fish handling and return system. Note since the facility would meet the maximum velocity requirements for IM, the facility would not have to conduct biological monitoring to demonstrate compliance with the IM limits. EPA anticipates facilities that already employ closed-cycle cooling would document the maximum intake velocity is equal to or less than 0.5 feet per second. EPA requests comment on the additional controls to address entrapment at facilities that employ closed-cycle cooling or other technologies with velocity equal to or less than 0.5 feet per second.

Section 122.21(r)(7) Performance Studies

Under the proposal, the applicant would submit a description of any biological survival studies conducted at the facility and a summary of any conclusions or results, including: Site-specific studies addressing technology efficacy, through-plant entrainment survival, and other impingement and entrainment mortality studies; studies conducted at other locations including a justification as to why the data is relevant and representative of conditions at the facility. Due to changes in the water body over time, studies older than 10 years should include an explanation of why (or why not) the data is still relevant and representative of conditions at the facility. The Director would use such studies when assessing the facility's approach to IM and when establishing technology based requirements for EM. Permit applicants are not required to conduct new studies to fulfill this requirement. This requirement is rather aimed at obtaining results for studies that have already been conducted as part of past permit proceedings or for other purposes.

Section 122.21(r)(8) Operational Status

Under the proposal, the applicant would submit a description of the operational status of each unit including: Descriptions of each individual unit's operating status including age of the unit, capacity utilization for the previous 5 years, and any major upgrades completed within the last 15 years (*e.g.,* boiler or condenser replacement, changes to fuel type); a description of completed, approved, or scheduled uprates and NRC relicensing status for nuclear facilities; a description of plans or schedules for decommissioning or replacement of units; and a description of current and future production schedules for manufacturing facilities. The Director would use such information in determining compliance schedules. Further, such information would be used to determine flow reductions due to unit closures, which may affect a facility's DIF or AIF, and therefore may result in changes to a facility's regulatory status and requirements. Where the remaining useful plant life is considerably shorter than the useful life of an EM technology, this information would also be used to support a discussion of benefits for that EM technology.

Section 122.21(r)(9) Entrainment Characterization Study

Under the proposal, this study would include a plan for collecting entrainment mortality data, requires a peer review process, and then requires the owner or operator of the facility to carry out the data collection. This study would provide data necessary to evaluate EM for that facility. EPA envisions the information already collected to meet 122.21(r)(4) requirements would be used in developing the Entrainment Characterization Study. For all species and life stages identified under the requirements of 122.21(r)(4), the owner or operator of the facility would develop and submit an entrainment mortality data collection plan for review by the Director. The entrainment mortality data collection plan would include: The duration and frequency of monitoring; the monitoring location, including a description of the study area and the area of influence of the cooling water intake structure(s); a taxonomic identification of the sampled or

evaluated biological assemblages (including all life stages of fish and shellfish); the organisms to be monitored, including species of concern and threatened or endangered species; any other organisms identified by the Director; the method in which latent mortality would be identified; and documentation of all methods and quality assurance/quality control procedures for sampling and data analysis. The proposed sampling and data analysis methods must be appropriate for a quantitative survey.

The owner or operator of the facility must also provide for peer review of the entrainment mortality data collection plan. The Director may consult with Federal, State and Tribal fish and wildlife management agencies with responsibility for fish and wildlife potentially affected by the cooling water intake structure(s). Further, the Director may require the owner or operator of the facility to include additional peer reviewers of the plan. EPA expects peer reviewers would have appropriate qualifications (*e.g.,* in the fields of biology, engineering, etc.) for the subject matter. An explanation for any significant reviewer comments not accepted must be included in the final plan submission. Additional guidance on conducting peer review may be found in EPA's Peer Review handbook, available online at *http://www.epa.gov/peerreview/pdfs/Peer%20Review%20HandbookMay06.pdf.*

The Entrainment Characterization Study would include the following components:

1. Taxonomic identifications of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal Law (including threatened or endangered species) that are in the vicinity of the cooling water intake structure(s) and are susceptible to entrainment;

2. Characterization of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal Law (including threatened or endangered species), including a description of the abundance and temporal and spatial characteristics in the vicinity of the cooling water intake structure(s), based on sufficient data to characterize annual, seasonal, and diel variations in entrainment (*e.g.,* related to climate and weather differences, spawning, feeding and water column migration). These may include historical data that are representative of the current operation of your facility and of biological conditions at the site; and,

3. Documentation of the current entrainment of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal Law (including threatened or endangered species). The documentation may include historical data that are representative of the current operation of your facility and of biological conditions at the site. Entrainment samples to support the facility's calculations would be collected during periods of representative operational flows for the cooling water intake structure and the flows associated with the samples would be documented.

EPA expects this information would be used to help determine the site-specific BTA for EM. For facilities with no EM technologies, this information would characterize the potential for EM. The information would also be used to demonstrate that technologies and other measures already in place, or site-specific factors such as intake location or design, already reduce EM. For example, abundance data may demonstrate lower comparative densities which can significantly lower entrainment rates. The information could also be used by new units to demonstrate that alternative technologies or a combination of technologies reduce EM at that site to a level commensurate with closed-cycle cooling.

Section 122.21(r)(10) Comprehensive Technical Feasibility and Cost Evaluation Study

Under the proposal, the owner or operator of the facility would submit an engineering study of the technical feasibility and incremental costs of candidate entrainment mortality control technologies. The study would include an evaluation of technical feasibility of closed-cycle cooling and fine mesh screens with a mesh size of 2mm or smaller, as well as any other entrainment reduction technologies identified by the applicant or requested by the Director. This study would include: a description of all technologies and operational measures considered (which could include alternative designs of closed-cycle recirculating systems such as natural draft cooling towers, hybrid designs, and compact or multi-cell arrangements); documentation of factors that make a candidate technology impractical or infeasible for further evaluation. For example, a discussion of land availability might include an evaluation of adjacent land and acres potentially available due to generating unit retirements, production unit retirements, other buildings and equipment retirements, ponds, coal piles, rail yards, transmission yards, and parking lots; decommissioning of existing units; repurposing of existing land uses; documentation that insufficient acres are available on-site; and evidence that the purchase or other acquisition of property adjacent to the facility is not feasible. EPA is exploring providing guidance on assessing land availability that might suggest a threshold ratio of acres/capcity that could serve as a guideline for when sufficient land may not be available. EPA has not identified any electric generating facilities with more than the 160 acres per GW capacity that EPA believes would be unable to construct retrofit cooling towers. EPA specifically solicits comment on this ratio, and solicits data for determining whether alternative thresholds are more appropriate.

The proposed rule would require that costs be presented as the net present value (NPV) of the social costs and the corresponding annual value. In addition to the required social costs, the owner or operator may choose to provide facility level compliance costs, however such costs must be provided and discussed separately from social costs. The cost evaluation component of this study would include engineering cost estimates of all technologies considered above and also discuss and provide documentation of any outages, downtime, energy penalties or other impacts to revenue. The cost evaluation should be based on least-cost approaches to implementing each candidate technology while meeting all regulatory and operational requirements of the plant. Depreciation schedules, interest rates, further consideration of remaining useful life of the facility as discussed in 122.21(r)(8), and any related assumptions would be identified.

The owner or operator of the facility must obtain peer review of the Comprehensive Technical Feasibility and Cost Evaluation Study, as described above for the Entrainment Characterization Study. EPA expects peer reviewers would have appropriate qualifications (*e.g.,* engineering, hydrology, planning and design, etc.) for the subject matter.

Section 122.21(r)(11) Benefits Valuation Study

Under the proposal, the owner or operator of the facility would submit a detailed discussion of the magnitude of water quality benefits, both monetized and non-monetized, of the candidate entrainment mortality reduction technologies evaluated in 122.21(r)(8), including incremental changes in the impingement mortality and entrainment mortality of fish and shellfish; and

monetization of these changes to the extent appropriate and feasible using the best available scientific, engineering, and economic information. This may include monetization using market values, market proxies (e.g., models based on travel costs or other methodologies), and stated preference methods. Benefits that cannot be monetized should be quantified where feasible and discussed qualitatively. The study would also include discussion of recent mitigation efforts already completed and how these have affected fish abundance and ecosystem viability in the intake structure's area of influence. Finally, the study would identify other benefits to the environment and the community, including improvements for mammals, birds, and other organisms and aquatic habitats. The owner or operator of the facility must obtain peer review of the benefits evaluation study, as described above for the Entrainment Characterization Study. EPA expects peer reviewers would have appropriate qualifications (*e.g.,* biologist, hydrologist) for the subject matter.

Section 122.21(r)(12) Non-Water Quality Impacts Assessment

The owner or operator of the facility would submit a detailed discussion of the changes in non-water quality factors attributed to technologies and/or operational measures considered. These changes may include, but are not limited to, increases or decreases in the following: Energy consumption; thermal discharges including an estimate of increased facility capacity, operations, and reliability due to relaxed permitting constraints related to thermal discharges; air pollutant emissions and their health and environmental impacts; noise; safety such as the potential for plumes, icing, and availability of emergency cooling water; grid reliability including an estimate of changes to facility capacity, operations, and reliability due to cooling water availability; consumptive water use, and facility reliability such as production of steam and impacts to production based on process unit heating or cooling. The owner or operator of the facility would provide for peer review of the Non-water Quality Impacts Assessment as described above for the Entrainment Characterization Study. EPA expects peer reviewers would have appropriate qualifications (*e.g.,* biologist, safety engineer, power engineer, hydrologist) for the subject matter. EPA recognizes that in some cases it may be efficient for permit applicants to combine several of the required studies into a single document and have them reviewed holistically by a single set of peer reviewers. Such an approach is not precluded by the proposed rule as long as the peer review panel has the background appropriate to conduct the combined review and the permitting authority approves. EPA requests comment on the peer review requirements and the level of specificity regarding peer review in the draft rule text.

EPA is aware that specialized experience may be useful or appropriate in assessing some of the factors indentified in 122.21(r). EPA solicits comment on further guidance or rule language that could assist in the consistent development of these studies and more uniform review of these factors by the Director. For example, EPA could establish modeling of plume drift as part of the assessment of icing and safety. This requirement could also be included as part of the technical feasibility and costs analysis required at 122.21 (r)(10). Similarly, required emissions estimates could include more specific criteria under 122.21(r)(11).

Facilities Demonstrating Flow Reduction Commensurate With Closed-Cycle Recirculating System

Under §125.94(d), new units at existing facilities would be subject to entrainment mortality requirements. These facilities may choose to demonstrate that they have already reduced actual intake flow (AIF) to a level commensurate with a closed-cycle recirculating system in their permit application to meet rule requirements. In general, flow reduction may be achieved through the use of a closed-cycle cooling system such as a wet cooling tower (mechanical or natural draft), a dry cooling system, variable speed pumps, or operational measures such as seasonal reductions in flow. Under today's proposal, each facility would have the flexibility to select the flow reduction technique or combinations thereof that best meets their operational needs, so long as the total reduction in flow is commensurate with that of a closed-cycle cooling system.[95]

For today's proposal, EPA is clarifying the term "commensurate" in the context of flow reductions. EPA examined its record to clarify how a facility could demonstrate a reduced flow "commensurate" with a closed-cycle recirculating system. EPA's record demonstrates that for the traditional steam electric utility industry, facilities located in freshwater areas (with a salinity of less than 0.5 parts per thousand) that have closed-cycle recirculating cooling water systems typically reduce water use by 97.5% percent from the amount they would use if they had once-through cooling water systems.[96] Similarly, facilities that have closed-cycle recirculating cooling systems using salt (or brackish) water [97] typically reduce water usage by 94.9 percent.[98] Therefore, if a facility selects to demonstrate flow reduction commensurate with closed-cycle cooling using flow reduction technologies and controls other than through closed-cycle cooling (*e.g.,* through seasonal flow reductions, unit retirements, and other flow reductions), EPA is proposing that it would have to demonstrate total flow reductions approximating 97.5% for freshwater withdrawals and 94.9% for saltwater withdrawals. Today's proposal includes these criteria in the definition of closed-cycle recirculating systems at §125.92. EPA solicits comment on whether to establish these metrics as a binding requirement, or whether the determination of what flow measure is commensurate with closed-cycle cooling should be left to the Director for each facility.

EPA expects the Director to carefully consider the approach proposed by the facility to ensure that it is reasonable. For example, many facilities have two pumps installed per unit, but typically only operate one pump at a time. The second pump may provide additional pumping capacity (such as may be required in summer) or it may only serve as a back-up or for use during maintenance of the main pump. In the former case, the facility's intake flow

[95] The term "commensurate" is intended to be viewed in terms of a reduction in the facility's actual intake flow. The facility's DIF reflects the maximum volume of water that the facility can withdraw (and would be the basis for applicability) but the AIF (based on the facility's average flows over the previous 3 year period) represents the impacts to aquatic communities. Reducing the AIF is the most appropriate approach, as it represents actual impacts and is most representative of a facility's actual operational schedule. EPA fully expects, however, that many facilities would construct a closed-cycle cooling system based on its DIF to comply with the proposed rule, as this enables the facility to utilize its full DIF at any given time, thereby maintaining full operational flexibility. EPA's costs reflect the costs for the entire DIF. See below for more information on how a facility can demonstrate that it has achieved a reduction in flow that is commensurate with closed-cycle cooling.

[96] Assuming a cycle of concentration of 3.0 and a condenser delta T of 20°F. See Section V for more information.

[97] Saltwater also includes brackish water, tidal rivers, and estuaries where the water has a salinity of equal to or greater than 0.5 parts per thousand (by mass) at a time of annual low flow.

[98] Assuming a cycle of concentration of 1.5 and a condenser delta T of 20°F. See Section V for more information.

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(both DIF and AIF) should properly account for the pumping capacity of both pumps. In the latter, the true flow for the intake structure may be equivalent to the pumping capacity of only a single pump.[99] Also, EPA is aware that some facilities may elect to retire units to demonstrate a reduced flow and wants to ensure that such facilities would qualify for this alternative provided they meet the applicable requirements.[100] EPA is proposing that these credits for unit closures be valid for 10 years from the date of the closure.[101] EPA believes this approach reasonably allows facilities to get credit for flow reductions attributable to unit closures, but also requires such facilities to make future progress to ensure its operations reflect best available technology to control entrainment. EPA is seeking comment on this approach.

Under 125.94(d)(2), EPA would allow facilities to implement technologies other than closed-cycle cooling systems that reduce entrainment mortality by at least 90 percent of what would have been obtained via flow reduction commensurate with closed-cycle cooling under 125.94(d)(1). This compliance provision mirrors the Track II provision of the Phase I rule, and is intended to provide opportunities for facilities to consider technologies such intake relocation or fine mesh screens, or operational measures such as the recyle and reuse of cooling water for other purposes. Further, facilities could adopt a combination of such technologies and practices, provided the facility can demonstrate reductions in entrainment mortality of 90 percent or better as compared to closed-cycle cooling. EPA seeks comment on this provision.

E. When are application studies due?

EPA recognizes that facilities previously subject to the withdrawn Phase II rule (existing electric generating facilities with a DIF greater than 50 MGD) should have already compiled much of the proposed application information and expects that these data would be used to meet many of the requirements under today's proposal. In some cases the information may have been collected, but reports may not have been generated or finalized. EPA also understands that many other facilities may not have collected this information, *e.g.,* smaller power plants and manufacturers, and in those cases facilities would have to initiate new data collection efforts. For this reason, EPA is proposing two different timelines for application submittal, as illustrated in Exhibits IX–1 and IX–2. EPA is proposing that facilities previously subject to the Phase II rule would be required to submit some application studies six months after rule promulgation. Other studies would follow in sequence over a period of time not to exceed five years. Other existing facilities not previously subject to the withdrawn Phase II rule (*e.g.,* small power plants and all existing manufacturers) would begin submitting application studies three years after rule promulgation. Additional required studies would be submitted over a period not to exceed seven years and six months. EPA believes that these proposed schedules will afford facilities ample time to plan, complete, and submit application materials as well as provide Directors time to evaluate the submissions and develop appropriate permit conditions. These schedules are linked to the effective date of the rule in order to establish a level playing field and to avoid delays implementing the rule regardless of a facility's current permit status. EPA solicits comment on the proposed schedule, and specifically seeks comment and data on the appropriate amount of time to collect data, write reports, conduct peer reviews, obtain comment, provide for public participation, and issue final permit conditions.

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[99] In this scenario, EPA does not envision that a facility would be able to remove the second pump to demonstrate a reduction in flow, as the pump is simply redundant equipment and would not reduce the overall water withdrawals.

[100] As a point of clarification, EPA notes that flow reduction credit would be available to a facility regardless of the rationale for maintaining the reduced flow. In other words, a facility may have ceased operation of a unit for reasons other than today's proposed regulation, and as such, withdraws much less water than before. Nevertheless, the net effect is that entrainment would be reduced.

[101] Some facilities have intake systems for units that have not operated for an extended time period. These units have essentially ceased operations; such facilities may include the pumping capacity associated with these units in their DIF even though it may not accurately represent their actual operations (i.e., it may be inappropriate to consider these units under 125.94(c)(5)(ii)).

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Exhibit IX-1: Application Requirements and Due Dates for Initial Permit Term* - Power Plants with DIF of 50 MGD or more

Application Requirement and Submittal Date	Submittal Date (all dates from rule promulgation)	Existing Facility Category: Power Plants with DIF of 50 MGD or more
	6 months	§ 122.21(r)(2) *Source water physical data* § 122.21(r) (3) *Cooling water intake structure data* § 122.21(r) (4) *Source water baseline biological characterization data* § 122.21(r) (5) *Cooling water system data* § 122.21(r) (6) *Proposed IM reduction plan* § 122.21(r) (7) *Performance studies* § 122.21(r) (8) *Operational status* AIF>125 MGD and facilities with new units: § 122.21(r) (9) *Entrainment characterization study:(i) EM plan with peer reviewers identified*
	1 year	AIF>125 MGD and facilities with new units: § 122.21(r) (9) *Entrainment characterization study:(ii) peer reviewed EM plan and (iii) implement EM plan*
	3.5 years	§ 122.21(r) (6) *Proposed IM reduction plan results*
	4 years	AIF>125 MGD and facilities with new units: § 122.21(r) (9) *Entrainment characterization study: (iii) completed study*
	5 years	AIF>125 MGD and facilities with new units: § 122.21(r) (10) *Comprehensive technical feasibility and cost evaluation study* § 122.21(r) (11) *Benefits valuation study* § 122.21(r) (12) *Non-water quality and other environmental impacts study*

*Subsequent Permit Terms

After the initial submission of the §122.21(r) application studies, the owner or operator of a facility may submit a request to reduce the information required, if conditions at the facility and in the waterbody remain substantially unchanged since the previous application such that relevant previously submitted information remains representative of current source water, intake structure, cooling water system, and operating conditions. The request for reduced information requirements must be submitted to the Director at least one year prior to the expiration of its NPDES permit. The Director may accept or reject any part of the request. (See § 125.95(c)).

For subsequent permit terms, information collection activities required under §122.21(r) must begin no later than eighteen months prior to permit expiration (see § 125.95(d)).

For subsequent permit terms, all permit application materials are expected to be submitted to the Director with the application for permit renewal at least 6 months prior to permit expiration.

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Exhibit IX-2: Application Requirements and Due Dates for Initial Permit Term* - Other Existing Facilities with DIF > 2 MGD

Application Requirement and Submittal Date	Submittal Date (all dates from rule promulgation)	Existing Facility Category: Other Existing Facilities with DIF > 2 MGD
	3 years	§ 122.21(r)(2) *Source water physical data* § 122.21(r) (3) *Cooling water intake structure data* § 122.21(r) (4) *Source water baseline biological characterization data* § 122.21(r) (5) *Cooling water system data* § 122.21(r) (6) *Proposed IM reduction plan* § 122.21(r) (7) *Performance studies* § 122.21(r) (8) *Operational status* AIF>125 MGD and facilities with new units: § 122.21(r) (9) *Entrainment characterization study:(i) EM plan with peer reviewers identified*
	3.5 years	AIF>125 MGD and facilities with new units: § 122.21(r) (9) *Entrainment characterization study:(ii) peer reviewed EM plan and (iii) implement EM plan*
	6 years	§ 122.21(r) (6) *Proposed IM reduction plan results*
	6.5 year	AIF>125 MGD and facilities with new units: § 122.21(r) (9) *Entrainment characterization study: (iii) completed study*
	7.5 years	AIF>125 MGD and facilities with new units: § 122.21(r) (10) *Comprehensive technical feasibility and cost evaluation study* § 122.21(r) (11) *Benefits valuation study* § 122.21(r) (12) *Non-water quality and other environmental impacts study*

*Subsequent Permit Terms

After the initial submission of the §122.21(r) application studies, the owner or operator of a facility may submit a request to reduce the information required, if conditions at the facility and in the waterbody remain substantially unchanged since the previous application such that relevant previously submitted information remains representative of current source water, intake structure, cooling water system, and operating conditions. The request for reduced information requirements must be submitted to the Director at least one year prior to the expiration of its NPDES permit. The Director may accept or reject any part of the request. (See § 125.95(c)).

For subsequent permit terms, information collection activities required under §122.21(r) must begin no later than eighteen months prior to permit expiration (see § 125.95(d)).

For subsequent permit terms, all permit application materials are expected to be submitted to the Director with the application for permit renewal at least 6 months prior to permit expiration.

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F. What are the monitoring requirements in today's proposal for existing facilities?

1. Monitoring Requirements for Impingement Mortality

Today's proposed rule proposes impingement mortality requirements for all existing facilities. As such, facilities would be required to monitor to demonstrate compliance with the impingement mortality restrictions at §125.94(b)(1), demonstrating a monthly average of fish impingement mortality of 31% or less, and an annual average of 12% or less. (Different monitoring requirements apply for compliance with the alternative requirements at §125.94(b)(2) for design intake velocity; these are discussed in a later section.) To demonstrate compliance with the impingement mortality standards at §125.94(b)(1), the facility would be required to monitor at a frequency specified by the Director. EPA assumes the facility would monitor no less than

once per week during primary periods of impingement as determined by the Director, and no less than biweekly during all other times. For each monitoring event, the facility would determine the number of organisms that are collected or retained on a 3/8 inch sieve (*i.e.,* that are impinged [I]), and the number that die within 24–48 hours of impingement (*i.e.,* impingement mortality [IM]). Fish that are included in any carryover from a traveling screen or removed from a screen as part of debris removal would be counted as fish impingement mortality. Under the proposed definition at 125.92, naturally moribund fish and invasive species would be excluded from the totals for both impingement and impingement mortality. The percentage of impingement mortality is defined by the following equation:

$$\% IM = \left(\frac{IM}{I}\right) x\ 100$$

For each calendar month, the facility would calculate the arithmetic average of the percentage impingement mortalities observed during each of the sampling events. For example, if a facility conducted four sampling events in December, it would calculate the monthly average from the weekly values. If a facility's calculated monthly average is less than the monthly average limitation (31%), then it would be in compliance that month. To demonstrate compliance with the annual average limit, the facility would calculate the arithmetic average of all of its sampling events during the year. If the facility's calculated annual average percentage impingement mortality is less than the annual average limitation, then it would be in compliance.

EPA envisions that the permitting authority would review and approve the Impingement Mortality Reduction Plan including the frequency and duration of monitoring, the monitoring location, the organisms to be monitored, and the method in which naturally moribund organisms would be identified and taken into account. In establishing the monitoring requirements, EPA expects facilities and permitting authorities would consider whether data collection should cover the entire daily and (where appropriate) tidal cycles. Typically, facilities have collected impingement samples continuously for 6 or 8 hours, and repeated this cycle to cover an entire 24-hour period. Stratifying collection in this manner allows an analysis of the diel variation exhibited by many aquatic organisms. EPA expects that facilities would continue to conduct sampling in such a manner to account for diel variations, where appropriate. EPA also expects the plan would ensure that sampling occurs during periods of representative flow and not during periods of non-peak flow or scheduled outages. The sampling plan would cover all five years of the permit term.

EPA is not proposing a list of the species to be monitored due to the site-specific nature of the biological organisms impacted by an intake structure. Rather, EPA is proposing that a facility provide data on the composition of all species in its waterbody as part of its NPDES permit application (information from the source water baseline characterization data required at §122.21(r)(4) and impingement plan at §125.95(b)) to help inform the Director's determination of the species that would be monitored for compliance with the proposed impingement mortality limitations. In addition, the permitting authority may impose additional monitoring requirements such as consideration of threatened or endangered species, as appropriate. EPA is also not including provisions for reducing the monitoring frequency in the future; given that the source waterbody may change over time (including hosting different or increased numbers of individuals or species), EPA believes that weekly monitoring at a minimum is appropriate.

The ideal point to measure impingement mortality is the location where organisms are returned to the waterbody. However, for ease of sampling and access, EPA envisions most facilities would collect samples from the fish return system(s) at some point prior to the fish return discharge point.[102] Based on the studies in EPA's database, EPA envisions facilities would either (1) divert some or all of the flow from the fish return into a fish collection and holding area or (2) place a net or debris basket fitted with 3/8" mesh spacing in the fish return and collect and transfer the retained organisms to a holding tank. Facilities would handle the organisms in the collection device as little as possible and transfer them to a holding area with conditions as close as practicable to the source water. Facilities would count the number of living organisms in the holding area and subsequently hold the sample using proper technique[103] to maintain the health of the collected organisms.[104] At a time period of 48 hours after the initial collection, the facility would count the number of dead organisms. The facility would then determine the percentage of organisms that died after 48 hours in comparison to the total number of living organisms measured initially. Any organisms not collected by the fish handling and return system, such as organisms in the carryover of a traveling screen or organisms collected by a high pressure wash and sent to debris bins, would be counted as 100% mortality. Naturally moribund organisms would be excluded from the calculation. The facility would keep records of this information and subsequently compare its result to today's proposed impingement mortality limitations.

EPA requests comment on all aspects of these monitoring requirements. In particular, EPA requests comment on whether EPA should specific minimum sampling frequencies or leave this determination to the Director. EPA also requests comment on methods for evaluating latent mortality effects resulting from impingement. EPA's record demonstrates that a holding time of no more than 48 hours is optimal for evaluating the latent mortality associated with impingement while at the same time minimizing mortality associated with holding the organisms. In the majority of recent studies, 48 hours appears to be the standard holding time. EPA specifically requests comment and supporting data on whether it should: Specifically establish 48 hours after initial impingement as the time at which to monitor impingement mortality; allow a range such as 24 to 48 hours; establish 24 hours as the standard holding time; or adopt some other technique for standardizing results. EPA also requests comment on whether survival under monitored holding conditions as discussed above is reflective of survival in the wild and thus an appropriate measure of the impingement mortality achieved by the facility.

As explained in Section VI, the impingement mortality restrictions proposed today are based on the

[102] Based on EPA's site visits and other data, even facilities with multiple intakes (and multiple screens, etc.) typically only have one fish handling and return system. This is consistent with EPA's proposed approach to determine compliance at the facility level. For facilities with more than one return system (including those that are bi-directional in tidal waters), compliance is still determined at the facility level.

[103] EPA recognizes that there are no standard methods for conducting impingement and entrainment studies and that there can be variability in designing a sampling plan between sites. However, there are elements that should be incorporated into any sampling plan, as outlined in DCN 10–6708.

[104] Facilities that divert the flow directly would similarly pass the flow through a net or debris basket fitted with 3/8" mesh spacing or would only count organisms that would have been collected with such a basket or net.

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operation of a modified coarse mesh traveling screen with a fish return. Because EPA wants to ensure that a facility's monitoring plan is consistent with the technical basis for today's restrictions, EPA is proposing to require facilities to monitor impingement mortality using a sample that has been passed through a sieve or net with a 3/8" mesh size, so that only organisms that do not pass through this mesh size are counted.[105] In doing so, facilities would only retain (and therefore count) organisms that would have been impinged on a coarse mesh screen, which was the technological basis used for developing the proposed impingement mortality limits.[106] Facilities could similarly apply a "hypothetical net" in that they could elect to only count organisms that would not have passed through a net with 3/8" mesh. For example, a facility that uses a fine-mesh screen or diverts the flow directly to a sampling bay would only need to count organisms that would remain if the flow passed through a net, screen, or debris basket fitted with 3/8" mesh spacing. EPA further believes the IM restrictions could be applied to other screen-based fish protection technologies, and allows for future better performing technologies. EPA solicits comment on this approach to measuring impingement mortality. EPA specifically solicits comment on ways to ensure that the procedures used to collect and analyze samples do not inadvertently lead to greater mortality than would occur among organisms that were returned to the water body without being sampled.

If the Director has approved a plan for compliance with the velocity requirements specified in §125.94(b)(2) and the facility has documented a maximum design intake flow for the intake equal to or less than 0.5 feet per second, there are no compliance monitoring requirements. If the facility cannot document a design intake flow for the intake equal to or less than 0.5 feet per second under all conditions, including during minimum ambient source water surface elevations (based on the Director's judgment using hydrological data) and maximum head loss across the screens, the permit must require compliance monitoring for intake velocity to demonstrate the intake velocity is consistent with the requirements of §125.94(b)(2). The frequency of monitoring would be no less than twice per week. In this circumstance facilities would not be subject to the impingement mortality monitoring requirements otherwise specified in §125.96(a)(1) and (2). EPA requests comment on whether it should specify a minimum frequency for intake velocity monitoring or leave this determination to the Director.

EPA notes the proposed rule does not specify the owner or operator of a facility with a cooling water intake structure that supplies cooling water exclusively for operation of a wet or dry cooling tower(s) and that meets the definition of closed-cycle recirculating system at §125.92 is deemed to meet this impingement mortality standard. This is because the largest facilities with closed cycle cooling still have the potential to withdraw 100 MGD or more in makeup water. EPA's record shows virtually all facilities with wet cooling towers have a maximum intake velocity of 0.5 feet per second. EPA expects a facility that operates a cooling tower would be able to demonstrate the maximum design intake velocity does exceed 0.5 feet per second, and the proposed rule already provides that such facilities do not have any additional monitoring requirements for impingement mortality.

2. Monitoring Requirements for Entrainment Mortality

Existing Facilities

Whenever the Director is establishing entrainment control, monitoring requirements must also be developed. As proposed, the permit application studies at §122.21(r) would be required for each permit renewal. EPA expects the Director would use these studies, including the Entrainment Characterization Study at §122.21 (r)(9), as a basis for any additional monitoring requirements for entrainment mortality.

New Units at Existing Facilities

Under §125.96(c), existing facilities with new units would be required to conduct compliance monitoring to demonstrate flow reductions consistent with the requirements of §125.94(d)(1) and (2), or equivalent I&E reductions. For facilities required to demonstrate flow reductions consistent with the requirements of §125.94(d)(1), the frequency of monitoring would be no less than once per week and would be representative of normal operating conditions. Flow monitoring would include measuring cooling water withdrawals, make-up water, and blowdown volume. The Director may require additional monitoring necessary to demonstrate compliance with both §125.94(d) as well as any more stringent standards under §125.94(f).

To meet requirements under §125.94(d)(1), EPA expects facilities would first measure AIF in order to establish a site-specific baseline prior to installing any new technologies or employing new operational measures. EPA has defined AIF as the average volume of water withdrawals on an annual basis over the past three calendar years (see §125.92). Facilities would then conduct flow monitoring which would include measuring cooling water withdrawals, make-up water, and blowdown volume. The Director may require additional monitoring necessary to demonstrate compliance with §125.94(d). These flows would be used to document the facility has minimized make-up and blowdown flows.

To meet requirements under §125.94(d)(2), facilities would again measure AIF in order to establish a site-specific baseline prior to installing any new technologies or employing new operational measures. The facility would also measure the density of entrainable organisms (E_D) at a proximity to the intake that is representative of the entrainable organisms present in the absence of the cooling water intake structure and is representative of annual average abundance. For the purpose of today's rule, entrainable is defined as any organism that passes through a 3/8 inch sieve. As discussed in Section VI, this would avoid any confusion as to which organisms would be subject to which standards. Facilities would also monitor the latent entrainment mortality in front of the intake structure. Entrainable organisms passing the cooling water intake structure would be counted as 100 percent entrainment mortality unless the facility demonstrates to the approval of the Director that the mortality for each species of concern is less than 100 percent. Samples would be collected at a minimum to monitor each species of concern or other species as required by the Director over a 24-hour period. Samples would be collected no less than biweekly during the primary period of reproduction, larval recruitment, and peak abundance identified during the source water

[105] See section 3 for a discussion of how EPA has changed its view of screen mesh size. EPA recognizes that fine mesh screens may simply "convert" smaller organisms that previously would have passed through the screen to impinged organisms.

[106] EPA's analysis of impingement survival rates is based on data from facilities with coarse mesh screens; these limits may be applied differently at facilities with smaller mesh size. Therefore, these limits do not provide a disincentive to facilities from using finer-meshed screens (i.e., screens with a mesh opening smaller than 3/8") on their traveling screens. As long as the organisms that are large enough to have been impinged upon a coarse mesh screen achieve the required survival rates, the facility would be considered to meet the impingement mortality requirements.

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baseline characterization required under §122.21(r)(4). Samples would be representative of the cooling water intake when the structure is in operation. In addition, sufficient samples would be collected to allow for calculation of annual average entrainment levels. The sampling would measure the total count of entrainable organisms or density of organisms, unless the Director approves of a different metric for such measurements. In addition, facilities would monitor the AIF for each intake. The AIF would be measured at the same time as the samples of entrainable organisms are collected.

The following equation illustrates how to calculate a baseline level of entrainment (E_B):

$E_B = E_D \times AIF$

Performance commensurate with a closed-cycle cooling system (E_{BTA}) can therefore be determined by reducing E_B by the percentage of flow reduced through the use of a closed-cycle cooling system. For example, a facility withdrawing makeup water from a freshwater source (as described above, would achieve a reduction of 97.5 percent) would calculate its performance as:

$E_{BTA} = (E_B) \times (100 ¥ 97.5) \div 100$

The resulting value, E_{BTA}, is the required level of entrainment performance (as measured by entrainment mortality). The facility could implement any combination of flow reduction, technologies, and operational measures to meet the required level of entrainment performance. For example, a facility withdraws 200 MGD AIF from a freshwater river. The annual average entrainment density in the proximity of the intake structure is 6,400 organisms per 100 cubic meters withdrawn.

$E_B = E_D \times AIF$

6,400 organisms/100m^3 × (100m^3/26,417 gallons) × 200,000,000 gallons per day = 48 million organisms per day

The maximum entrainment mortality for a closed-cycle cooling system is thus

$E_{BTA} = (E_B) \times (100 ¥ 97.5) \div 100 = (48 \times 10^6$ organisms per day) × $(100 ¥ 97.5) \div 100 = 1.2 \times 10^6$ organisms.

The minimum required level of performance for demonstrating entrainment mortality at a comparable level (E_C) to a closed-cycle cooling system is the level corresponding to 90 percent[107] of the reduction that a facility with a closed-cycle cooling system could achieve:

$E_C = (E_B) \times (100 ¥ (97.5 \times .9)) \div 100 = (48 \times 10^6$ organisms per day) × $(100 ¥ (97.5 \times .9)) \div 100 = 5.9 \times 10^6$ organisms.

The Director may require additional monitoring necessary to demonstrate compliance with both §125.94(d) as well as any more stringent standards under §125.94(f).

EPA requests comment on all aspects of these monitoring requirements. EPA specifically requests comment on whether it should specify minimum monitoring frequencies or leave this to the determination of the Director.

Visual or Remote Inspections—All Existing facilities

All facilities would either conduct visual inspections or employ remote monitoring devices during the period the cooling water intake structure is in operation. The facility would conduct such inspections at least weekly to ensure that any technologies installed to comply with §125.94 are maintained and operated to ensure that they will continue to function as designed. EPA is aware that for some facilities, this requirement could pose a feasibility challenge (*i.e.,* ice cover during the winter season, inability of divers to *see* through more than a few inches of water, or certain intakes located in deep water during rough weather). The proposed rule therefore authorizes the Director to establish alternative procedures during periods of inclement weather. EPA solicits comment and data on this provision. EPA specifically requests comment on whether it should establish minimum frequencies for inspections, or leave this to the determination of the Director.

G. What reports would I be required to submit?

1. Status Reports

Facilities that establish a compliance schedule (under §125.93) would submit (at a minimum) quarterly status reports as to the progress of the facility towards meeting the terms of the compliance schedule and the applicable limits. These reports may include updates on biological monitoring, technology testing results, construction schedules, or other appropriate topics.

2. Monitoring Reports

As described above, facilities would have ongoing impingement mortality monitoring requirements; some facilities would also have entrainment mortality monitoring requirements. The proposed monitoring activities are similar to monitoring required for other effluent discharges already included in NPDES permits. Facilities would be required to include impingement mortality monitoring reports with their Discharge Monitoring Reports (DMRs) (or equivalent) and their permit annual report to the Director. As described at §125.97, those reports would be required to include:

- The compliance measurement location;
- Identification of species of concern;
- Counts and percentage mortality of organisms sampled, as well as the average for all measurements taken during the preceding 12-month period (*i.e.,* a 12-month "rolling" average);
- Time period for evaluating latent mortality effects;
- Intake velocity measurements, as appropriate, to determine compliance with the design intake velocity requirement of 0.5 fps or less; and
- Any other monitoring requirements specified in the permit.

The Director would evaluate these reports for compliance with monthly and annual impingement mortality limits, velocity limits, and other permit requirements where appropriate.

For facilities that require entrainment mortality controls, the Director would require ongoing entrainment mortality flow monitoring. Facilities would be required to include entrainment mortality flow monitoring reports with their DMRs (or equivalent) and their annual report to the Director. Those reports would be required to include:

- The compliance measurement location;
- A description of the flow monitoring procedure;
- Documentation of flow reductions; and
- Any other monitoring requirements specified in the permit.

The Director would evaluate these reports for compliance with monthly entrainment mortality limits, flow reductions and flow monitoring, and permit requirements as required.

3. Annual Certifications

Today's proposal would require a facility to submit an annual certification statement signed by the responsible corporate officer. This statement would indicate each technology is being maintained and operated as set forth in its permit, or a justification to allow modification of the practices listed in the facility's most recent annual certification. If the Director has approved impingement mortality or

[107] §125.86 specifies "reduced both impingement mortality and entrainment of all life stages of fish and shellfish to 90 percent or greater of the reduction that would be achieved through §125.84(b)(1) and (2)."

entrainment mortality compliance alternatives, the statement would specify the information submitted in the most recent annual certification is still valid and appropriate, or provide a justification to allow modification of the practices listed in the most recent annual certification. For example, the statement would include data and information documenting compliance with the requirement in §124.94(d)(1) that flow commensurate with a closed-cycle recirculating system is met. If the Director has approved the IM maximum intake velocity compliance alternative and the facility cannot document a design intake velocity for the intake equal to or less than 0.5 feet per second, the statement would include data and information documenting compliance with the maximum allowable intake velocity.

If the information contained in the previous year's annual certification is still applicable, the statement would simply state as such and, along with any applicable data submission requirements specified in this section, would constitute the annual certification. However, if the facility has substantially modified its operation of any unit that impacts cooling water withdrawals or operation of cooling water intake structures, it would submit revisions to the information required in the permit application.

H. What records would I be required to keep?

As described at §125.97(d), facilities would be required to keep all application, status, monitoring, and annual reports and related supporting information and materials for a minimum of 5 years, but facilities may wish to keep records for a longer period to maintain a complete regulatory history of the facility. For example, existing source water biological studies submitted with a facility's permit application may contain data that has been collected within the past 10 years. The proposed rule requires that records be kept from the preceding permit term when the Director has approved a request for reduced information collection in the permit application. The Director may establish additional record keeping requirements in the permit, such as additional records documenting the EM determination and related compliance monitoring or data collection.

I. Are there other Federal statutes that could be incorporated into a facility's permit?

EPA's NPDES permitting regulations at §122.49 contain a list of Federal laws that might apply to Federally-issued NPDES permits. These include the Wild and Scenic Rivers Act, 16 U.S.C. 1273 *et seq.;* the National Historic Preservation Act of 1966, 16 U.S.C. 470 *et seq.;* the Endangered Species Act, 16 U.S.C. 1531 *et seq.;* the Coastal Zone Management Act, 16 U.S.C. 1451 *et seq.;* and the National Environmental Policy Act, 42 U.S.C. 4321 *et seq.* See §122.49 for a brief description of each of these laws. In addition, the provisions of the Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. 1801 *et seq.,* relating to essential fish habitat might be relevant. Nothing in this proposal would authorize activities that are not in compliance with these or other applicable Federal laws (*e.g.,* Marine Mammal Protection Act, 16 U.S.C. 1361 *et seq.,* and Migratory Bird Treaty Act, 16 U.S.C. 703 *et seq.*).

J. What is the Director's role under today's proposal?

Under today's proposed rule, the Director would need to review all materials submitted by an existing facility with its permit application each permit term to determine appropriate NPDES permit requirements for impingement mortality, entrainment mortality for new units at existing facilities, and site-specific entrainment mortality, as necessary. The Director is encouraged to provide any comments expeditiously on submitted materials so the facility can make responsive modifications to its information gathering activities. More specific responsibilities are described below:

(1) The Director would review materials to determine compliance with the applicable requirements. The proposed rule also provides some discretion to the Director to waive the submittal requirements under certain conditions. First, if the circumstances at the facility have not changed after a five year permit cycle, the Director can reduce the submission requirements. Second, if the Director has made a BTA determination prior to the effective date of the rule, and substantially the same information was already submitted and considered by the Director in making that determination, the Director can reduce the submission requirements. To clarify further, EPA has included a "transition" provision in the submission requirements of today's proposed rule that makes it clear that for any facility that has submitted a permit application before the effective date of the regulation, the Director can select the best approach to permit development and implementation. These provisions are further intended to avoid any unnecessary delay in recently issued permits. EPA expects facilities would continue with any monitoring requirements, study requirements, and compliance schedules in recently issued permits.

(2) If the Director establishes an alternate schedule under §125.93, the Director would establish a schedule that is as expeditious as possible, but does not extend beyond the dates specified in §125.93. In establishing the schedule, the Director is encouraged to consider the extent to which those technologies proposed to be implemented to meet the requirements of §125.95(c) and/or (d) will be used, or may otherwise affect a facility's choice of technology(ies), to meet the requirements of §125.95(b). Impacts of thermal discharges, along with other stressors, may be a relevant consideration when assessing benefits of technologies to reduce impacts of cooling water intakes or discharges. See EEA for more information. The Director is also encouraged to consider energy reliability and grid requirements when establishing a schedule for electric power generating facilities. The Director may consult with local and regional electric power agencies when establishing a schedule for electric power generating facilities. The Director may determine that extenuating circumstances (*e.g.,* lengthy scheduled outages, future production schedules) warrant establishing a different compliance date for any manufacturing facility.

(3) The Director would review and approve the species of fish and shellfish identified as species of concern.

(4) The Director would review and approve the site-specific impingement mortality plan including the duration and frequency of any monitoring beyond the minimum specified by the rule, the monitoring location, the organisms to be monitored, and the method in which naturally moribund organisms would be identified and taken into account. EPA solicits comment on whether the Director should review, but not approve, the identified plans.

(5) The Director would review the permit application materials and studies submitted under §122.21(r) on a case-by-case basis and determine which entrainment requirements are necessary.

(6) The Director would review and approve the site-specific entrainment mortality sampling plan for new units at existing facilities (other than those employing closed cycle cooling) including the duration and frequency of monitoring, the monitoring location, the organisms to be monitored, and the method in which latent mortality would

be identified. EPA solicits comment on whether the Director should review, but not formally approve, the identified plans.

(7) The Director would issue a written explanation for the BTA determination and make this determination, and any other information submitted by third parties, available along with the draft permit for public review. This determination is discussed in more detail in Section VI above. In addition, the following discussion guides the Director when considering cost-benefit analysis for permit determinations.

Social Cost-Benefit Analysis for Permit Determinations

In deciding whether and which technology to require a permittee to install to address entrainment mortality, the Director may undertake an evaluation of social costs and benefits of implementing such requirements. This analysis would be based on the information submitted by the applicant, supplemented by information submitted by third parties, and additional information as determined appropriate by the Director. EPA recognizes the resource limitations faced by permitting authorities and does not generally expect that the Director would develop additional information on which to base the evaluation of social benefits and costs, though the Director may opt to do so. This analysis should evaluate benefits and costs from the perspective of society as a whole.

A number of cost elements should be accounted for in assessing the social cost of entrainment technology implementation. These are summarized below.

• *Technology installation cost.* These peer reviewed engineering cost estimates of the physical construction of candidate entrainment technologies at the facility are required in section 122.21(r)(10). These costs would be provided by the applicant under 122.21(r)(10).

• *Installation downtime cost.* Installation of closed cycle cooling systems will often require generating facilities to take additional downtime beyond ordinary annual maintenance downtime. An estimate of downtime cost to the facility is required under 122.21(r)(10). Downtime costs include the value of lost production minus any variable cost savings, as well as any other costs to the facility associated with downtime (shutdown and startup routines, special maintenance protocols, etc) minus any savings associated with downtime.

• *Energy penalty cost.* Operation of closed cycle cooling systems generally imposes an energy penalty, which means additional energy input is required to generate the same quantity of electricity otherwise available for sale to end-use consumers. Again, an assessment of these costs to the facility would be determined under the section 122.21(r)(10) demonstration. The appropriate cost measure is the cost of additional production costs to the facility, if the permittee's facility has sufficient capacity to make up the lost electricity production, or the net revenue loss to the permittee, if the permittee's facility cannot make up the lost electricity production.

• *Operation and maintenance costs* for the entrainment technology equipment. The cost of energy to operate the entrainment technology for electric generators would be accounted for in the assessment of energy penalty costs and should not reappear in the O&M costs. These cost which would be estimated as part of the 122.21(r)(10) assessment would enter the social cost framework unchanged.

• *Other administrative expenses—e.g.,* additional permitting and/or reporting expenses. Being a social cost concept the estimate must include not only the costs to the facility but those expected to be incurred by the permitting authority as well. Permitting costs would generally be lower if a facility opts to install a closed cycle cooling system without going through the BTA site-specific determination, as this allows the facility to minimize the amount of permit application information submitted.

For the assessment of social cost, the cost elements outlined above would typically be accounted for on a real cost basis—that is, pre-tax and excluding the effects of inflation. Costs are tallied over an appropriate timeframe, which will typically be the expected useful life of the technology installation or the remaining life of the facility, if less. Costs should be calculated as both net present value and annualized values, using an appropriate discount rate. The applicant should document the basis for the discount rate chosen.

In assessing the benefits of entrainment technology installation, the Director would assess the value to society from the reductions in I&E mortality that would result from installation of a closed cycle cooling system or alternative entrainment technology. All benefits, including quantified and non-quantified benefits, should be considered in this assessment. The benefits assessment would typically look at a range of potential benefit mechanisms, including increased harvest for commercial fisheries, increased use values for recreational fisheries, and non-use values (existence and bequest values). The latter may be difficult to quantify and/or monetize. If appropriate data are available from stated preference studies or other sources that can be applied to the site being evaluated, these should be used to monetize non-use values. Otherwise, non-use values should be evaluated qualitatively. Quantitative analysis, even in the absence of monetization, can be quite useful in evaluating non-use benefits. For example, quantifying impacts to forage and T&E species, and other indirect impacts on the aquatic environment, may allow the permitting authority to derive a more complete understanding of benefits.

Quantifying and valuing the benefit categories listed above involves significant challenges, as described in the Environmental and Economic Benefits Analysis report. For example, assessing the productivity and value of commercial fisheries involves estimating the expected increases in commercial yield of economically valued species over time as a result of reduced I&E mortality, and valuing these at market prices minus any incremental production costs associated with the incremental catch. Similarly, the assessment of recreational use benefits involves estimating the improvements in recreational fishing opportunities resulting from reduced I&E mortality, and assigning a value to these improvements. The assignment of value is based on the estimated population profile—in particular, number and proximity to affected water resources—of recreational users, the availability of alternative competing water resources for recreational usage, and the resulting estimated change in demand for use and value of the affected water resources based on reduced I&E mortality and increased recreational fishing performance. EPA acknowledges this may be hard to do on a site-specific basis, and solicits comment on tools EPA could consider producing to aid this process.

Non-use benefits, which encompass existence and bequest values, include impacts in such areas as population resilience and support, nutrient cycling, natural species assemblages, and ecosystem health and integrity. These may be assessed on the basis of benefits transfer analysis (using findings from prior analyses involving a similar study context) or by performance of a peer reviewed stated preference survey to assess the value assigned for the environmental improvements resulting from the technology installation. Non-

use values include improving the survival probability of a threatened or endangered species if present in the vicinity of the facility. Benefits may also need to be assessed beyond the vicinity of the facility's intake if migratory species are affected by the intake. Residual impacts of thermal discharges may also be appropriate to consider in the social benefits calculation.

In much the same way as described for the social cost assessment, social benefits are tallied on a year-by-year basis over the expected performance life of the compliance technology. If possible, this tallying should account for the "phase-in" of benefits (*e.g.,* benefits may build up over time as the I&E mortality reductions affect commercial fisheries productivity) and "phase-down" of benefits at the end of the technology equipment's performance life (*e.g.,* the I&E mortality reduction benefits may continue beyond the performance life of the compliance technology). Benefits are computed on a present value basis and annualized using an appropriate discount rate as described above. The same discount rate should be used for benefits and costs. Often, it is appropriate to calculate benefits and costs using more than one discount rate. For example, for regulatory impact analysis, the Office of Management and Budget recommends that costs and benefits be annualized using both a 7% and a 3% rate. However, comparisons between specific benefit and cost numbers should always involve values computed using the same rate.

The resulting estimates of social cost and benefits must be taken into account in reaching determinations on whether to require a permittee to install entrainment technology and the specific level of entrainment technology to be installed. The Director may reject an otherwise available technology as BTA standards for entrainment mortality if the social costs of compliance are not justified by the social benefits, or if there are adverse impacts that cannot be mitigated that the Director deems to be unacceptable. If all technologies considered have social costs not justified by the social benefits, or have unacceptable adverse impacts that cannot be mitigated, the Director may determine that no additional control requirements are necessary beyond what the facility is already doing. The director should document the basis for this determination and include it in the public notice for the draft permit. (8) The Director would review I&E mortality monitoring reports. EPA is shifting towards an electronic DMR system, and many of the IM and EM standards could be incorporated into the DMR itself, rather than requiring a separate report. EPA solicits comment on whether such reports should accompany monthly Discharge Monitoring Reports (DMRs). EPA expects the more detailed monitoring information would be submitted in annual reports and as part of the facility's subsequent permit application submission.

X. Related Acts of Congress, Executive Orders, and Agency Initiatives

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under section 3(f)(1) of Executive Order (EO) 12866 (58 FR 51735, October 4, 1993), this action is an "economically significant regulatory action" because it is likely to have an annual effect on the economy of $100 million or more. Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under EO 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

In addition, EPA prepared an analysis of the potential costs and benefits associated with this action. This analysis is contained in Chapter 12 of the EA report. A copy of the analysis is available in the docket for this action and the analysis is briefly summarized here.

Exhibit X–1 (drawn from Table 12–2 of the EA) provides the results of the benefit-cost analysis. Placeholders for nonmonetized benefits are represented by B_1, B_2, B_3, and B_4 which are expected to be option specific in value. EPA's analysis using a habitat equivalence approach (see EEBA, Chapter 9) suggests that B_1, B_2, B_3, and B_4 have the potential to be significant, though EPA does not have the same confidence in those estimates as in the monetized estimates, and is therefore using placeholders.

EXHIBIT X–1—TOTAL ANNUALIZED BENEFITS AND COSTS OF THE REGULATORY OPTIONS

[Millions; 2009 $] [a]

Option	Social costs [b]	Benefits
1. IM Everywhere	$384	$18 + B_1
2. IM Everywhere, EM for Facilities with DIF > 125 MGD	4,463	121 + B_2
3. I&E Mortality Everywhere	4,632	126 + B_3
4. IM for Facilities with DIF > 50 MGD	327	17 + B_4

[a] All costs and benefits were annualized over 50 years and discounted using 3 percent rate.

[b] Total Social Costs include compliance costs to facilities and government administrative costs. Costs and benefits for Options 1, 2, and 4 do not include costs or benefits associated site-specific BTA determinations. In section VI.I, EPA presents several scenarios to illustrate potential costs associated with these determinations for Options 1 and 4. EPA believes the costs and benefits of these determinations could be substantial, and could be significantly larger than the costs and benefits shown for Options 1 and 4. For Option 2, only facilities with AIF < 125 MGD would be subject to site-specific BTA and additional costs and benefits for these facilities are likely to be small relative to the costs and benefits already estimated for this option.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act,* 44 U.S.C. 3501 *et seq.* The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2060.05.

Compliance with the applicable information collection requirements imposed under a final rule based on this proposal would be mandatory. Today's proposed rule would require several distinct types of information collection as part of the NPDES permit application. In general, the information will be used to identify how a 316(b) existing facility would meet the impingement mortality and entrainment requirements. Today's rule would also require other reporting and recordkeeping requirements to demonstrate and document compliance with the proposed requirements.

The OMB previously approved information collection requirements contained in the 2004 Phase II final rule and assigned OMB control number 2040–0257. The 2004 Phase II final rule required applicable facilities to perform several data-gathering activities as part of the permit renewal application process. It also required certain monitoring and reporting after permit issuance. The previously-approved information collection requirements included one-time burden associated with the initial permit application and those activities associated with monitoring and reporting once the permit was issued. The total average annual burden associated with the 2004 Phase II rule information collection requirements for the entire Phase II industry was estimated at 1,700,392 hours. The annual average reporting and record keeping burden associated with the 2004 Final Phase II rule for a 316(b) existing facility was estimated to be 5,428 hours per respondent (*i.e.,* total annual average burden of 1,595,786 hours divided by an anticipated 294 respondents). The Director's reporting and record keeping burden for the review, oversight, and administration of the 2004 final Phase II rule was estimated to average 2,615 hours per respondent (*i.e.,* a total annual average burden of 104,606 hours divided by an anticipated 40 States).

Today's proposal streamlines some aspects of the permit application and implementation process and would impose reduced information collection requirements in comparison to the 2004 Phase II rule (for existing power plants with DIF > 50 MGD). For example, under the 2004 Phase II rule, facilities would have been required to submit a Technology Implementation and Operations Plan, which is not required as part of today's proposed rule. Like the 2004 Phase II rule, today's proposal would require facilities to collect and report impingement mortality compliance monitoring data. Under certain alternatives provided in today's proposed rule, design documentation and flow data would be provided instead of biologically monitoring data. The information reporting requirements under today's proposed compliance alternatives, described at §125.95, include some additional requirements such as submission of an initial certification statement and annual certification statements thereafter, submission of monitoring reports along with DMRs, and submission of annual reports, as well as maintenance of various records.

Facilities that were not part of Phase II would have additional reporting and recordkeeping requirements relative to the current BPJ permitting approach. EPA is currently preparing a revised ICR that will estimate the total burden of the proposed rule using the Phase II burden estimates as a starting point. These will be adjusted to account for differences in what is required under the proposed rule, as well as the extension of new requirements to Phase III facilities. EPA will announce in the **Federal Register** when this information has been placed in the docket for today's rule and will allow a separate 60-day comment period on the proposed paperwork requirements, including the revised burden estimates.

Burden is defined at 5 CFR 1320.3(b).

An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule, which includes this ICR, under Docket ID number EPA–HQ–OW–2008–0667. Submit any comments related to the ICR to EPA and OMB. See **ADDRESSES** section at the beginning of this proposed rule for where to submit comments to EPA. Send comments to OMB at the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street, NW., Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after April 20, 2011, a comment to OMB is best assured of having its full effect if OMB receives it by May 20, 2011. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act (RFA)

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

1. Definition of Small Entities and Estimation of the Number of Small Entities Subject to Today's Proposed Regulation

For EPA's assessment of the impact of today's proposed rule on small entities, small entity is defined as either a: (1) A small business as defined by the Small Business Administration's (SBA) regulations at 13 CFR 121.201; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; or (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field. Federal or State entities owning in-scope facilities are not small entities.

a. Electric Generators

For assessing the impacts of today's rule on small Electric Generator entities, small entity is defined in accordance with SBA criteria for identifying small, non-government entities in the electric power industry, as follows:

- For non-government entities with electric power generation as a primary business, small entities are those with total annual electric output less than 4 million MWh; small governments are those serving a population of less than 50,000.
- For entities with a primary business other than electric power generation, the relevant size criteria are based on revenue or number of employees by NAICS sector (*see* Exhibit X–2).

EXHIBIT X–2—NAICS CODES AND SBA ENTITY SIZE STANDARDS FOR IN-SCOPE ELECTRIC GENERATORS WITH A PRIMARY BUSINESS OTHER THAN ELECTRIC POWER GENERATION [108]

NAICS code	NAICS description	SBA size standard
221112	Fossil Fuel Electric Power Generation	4,000,000 MWh.
221113	Nuclear Electric Power Generation	4,000,000 MWh.
221119	Other Electric Power Generation	4,000,000 MWh.
221122	Electric Power Distribution	4,000,000 MWh.

EXHIBIT X–2—NAICS CODES AND SBA ENTITY SIZE STANDARDS FOR IN-SCOPE ELECTRIC GENERATORS WITH A PRIMARY BUSINESS OTHER THAN ELECTRIC POWER GENERATION [108]—Continued

NAICS code	NAICS description	SBA size standard
221210	Natural Gas Distribution	500 Employees.
238210	Electrical Contractors	$14,000,000 Revenue.
331111	Iron and Steel Mills	1,000 Employees.
331315	Aluminum Sheet, Plate, and Foil Manufacturing	750 Employees.
523910	Miscellaneous Intermediation	$7,000,000 Revenue.
486210	Pipeline Transportation of Natural Gas	$7,000,000 Revenue.
523920	Portfolio Management	$7,000,000 Revenue.
523930	Investment Advice	$7,000,000 Revenue.
524126	Direct Property and Casualty Insurance Carriers	1,500 Employees.
525990	Other Financial Vehicles	$7,000,000 Revenue.
525910	Open-End Investment Funds	$7,000,000 Revenue.
541990	All Other Professional, Scientific, and Technical Services	$7,000,000 Revenue.
551112	Offices of Other Holding Companies	$7,000,000 Revenue.
561499	All Other Business Support Services	$7,000,000 Revenue.
562212	Solid Waste Landfill	$12,500,000 Revenue.
562219	Other Nonhazardous Waste Treatment and Disposal	$12,500,000 Revenue.
562920	Materials Recovery Facilities	$12,500,000 Revenue.
611310	Colleges, Universities, and Professional Schools	$7,000,000 Revenue.

For this analysis, EPA identified the domestic parent entity of each electric generating facility subject to today's proposed rule (for a discussion on determination of parent entities of in-scope Electric Generators see Chapter 5 of the EA report). To determine whether these entities are small entities based on the size criteria outlined above, EPA compared the relevant measure for the identified parent entities to the appropriate SBA size criterion.

From this analysis, EPA estimates that 33 small entities (out of a total of 143 entities that own in-scope Electric Generators) own Electric Generators that would be subject to today's proposed rule, representing 1.6 percent of total estimated small entities in the electric power industry (see Exhibit X–3). Municipalities make up the largest number of small entities owning in-scope facilities (17 out of 33); these small entities represent 1.8 percent of all small entities in that category. Small entities owning in-scope facilities as a percentage of total small entities range, by ownership category, from 0.9 percent for rural electric cooperatives and other political subdivisions, to 10.9 percent for the investor-owned utilities.[109]

EXHIBIT X–3—NUMBER OF SMALL ENTITIES OWNING IN-SCOPE ELECTRIC GENERATING FACILITIES AS A PERCENTAGE OF THE TOTAL NUMBER OF SMALL ENTITIES IN THE INDUSTRY, BY OWNERSHIP TYPE

Ownership type	Total number of small entities in the industry [a]	Small entities owning in-scope facilities	
		Number of in-scope entities [b]	Small in-scope entities as percentage of all in-scope entities in the industry
Investor-Owned Utilities	18	2	10.9
Nonutilities	130	5	3 .8
Rural Electric Cooperatives	848	8	0.9
Municipality	968	17	1.8
Other Political Subdivision	113	1	0.9
Federal	0	0	0
State	0	0	0
All Entity Types	2,078	33	1.6

[a] State and Federal entities are considered large.
[b] The entity counts include entities owning known 316(b) Electric Generators and are not weighted estimates.

b. Manufacturers

For purposes of assessing the impacts of today's rule on small Manufacturers, small entity is defined in accordance with SBA criteria. Exhibit X–4 lists the SBA size threshold guidelines for entities owning Manufacturers facilities.

[108] Certain in-scope facilities are owned by entities whose primary business is not electric power generation.

[109] The entity counts include entities owning known 316(b) Electric Generators and are not weighted estimates.

EXHIBIT X–4—NAICS CODES AND SBA ENTITY SIZE STANDARDS FOR IN-SCOPE ENTITIES IN MANUFACTURERS SECTORS

NAICS Code	NAICS Description	SBA Size standard
111930	Sugarcane Farming	$750,000 in Revenue
113110	Timber Tract Operations	$7,000,000 in Revenue
211111	Crude Petroleum and Natural Gas Extraction	500 Employees
212210	Iron Ore Mining	500 Employees
212391	Potash, Soda, and Borate Mineral Mining	500 Employees
221119	Other Electric Power Generation	4,000,000 MWh of Electric Generation
311221	Wet Corn Milling	750 Employees
311311	Sugarcane Mills	500 Employees
311312	Cane Sugar Refining	750 Employees
311313	Beet Sugar Manufacturing	750 Employees
311942	Spice and Extract Manufacturing	500 Employees
313210	Broadwoven Fabric Mills	1,000 Employees
321113	Sawmills	500 Employees
322121	Paper (except Newsprint) Mills	750 Employees
322122	Newsprint Mills	750 Employees
322130	Paperboard Mills	750 Employees
322211	Corrugated and Solid Fiber Box Manufacturing	500 Employees
322222	Coated and Laminated Paper Manufacturing	500 Employees
322291	Sanitary Paper Product Manufacturing	500 Employees
324110	Petroleum Refineries	1,500 Employees
324191	Petroleum Lubricating Oil and Grease Manufacturing	500 Employees
325120	Industrial Gas Manufacturing	1,000 Employees
325181	Alkalis and Chlorine Manufacturing	1,000 Employees
325188	All Other Basic Inorganic Chemical Manufacturing	1,000 Employees
325199	All Other Basic Organic Chemical Manufacturing	1,000 Employees
325211	Plastics Material and Resin Manufacturing	750 Employees
325311	Nitrogenous Fertilizer Manufacturing	1,000 Employees
325320	Pesticide and Other Agricultural Chemical Manufacturing	500 Employees
325412	Pharmaceutical Preparation Manufacturing	750 Employees
325510	Paint and Coating Manufacturing	500 Employees
325992	Photographic Film, Paper, Plate and Chemical Manufacturing	500 Employees
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing	500 Employees
331111	Iron and Steel Mills	1,000 Employees
331112	Electrometallurgical Ferroalloy Product Manufacturing	750 Employees
331210	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel	1,000 Employees
331221	Rolled Steel Shape Manufacturing	1,000 Employees
331222	Steel Wire Drawing	1,000 Employees
331312	Primary Aluminum Production	1,000 Employees
331315	Aluminum Sheet, Plate and Foil Manufacturing	750 Employees
332312	Fabricated Structural Metal Manufacturing	500 Employees
337910	Mattress Manufacturing	500 Employees
339999	All Other Miscellaneous Manufacturing	500 Employees
423310	Lumber, Plywood, Millwork, and Wood Panel Merchant Wholesalers	100 Employees
423930	Recyclable Material Merchant Wholesalers	100 Employees
424510	Grain and Field Bean Merchant Wholesalers	100 Employees
424690	Other Chemical and Allied Products Merchant Wholesalers	100 Employees
424710	Petroleum Bulk Stations and Terminals	100 Employees
447190	Other Gasoline Stations	$9,000,000 in Revenue
522220	Sales Financing	$7,000,000 in Revenue
523910	Miscellaneous Intermediation	$7,000,000 in Revenue
523930	Investment Advice	$7,000,000 in Revenue
524126	Direct Property and Casualty Insurance Carriers	1,500 Employees
525990	Other Financial Vehicles	$7,000,000 in Revenue
531110	Lessors of Residential Buildings and Dwellings	$7,000,000 in Revenue
551112	Offices of Other Holding Companies	$7,000,000 in Revenue
561110	Office Administrative Services	$7,000,000 in Revenue

To determine entity size, EPA started with information reported in the Detailed Industry Questionnaire and Industry Screener Questionnaire, and updated information on each owner's primary NAICS, current revenue, and employment size data from SEC filings, Dun & Bradstreet (D&B, 2009), and corporate Web sites. For details of this process, see Chapter 4 of the EA report. EPA compared the relevant measure for the identified parent entities to the appropriate SBA size criterion.

Because EPA undertook this assessment for the sample of Manufacturers facilities and related owning entities responding to the previous 316(b) questionnaires, it was necessary to estimate the number of owning entities and to assess whether these entities are small, based on application of sample weights. Because the sample weights are based on facilities instead of entities, the facility-based weights do not provide statistically precise estimates of the numbers of owning entities. As a result, EPA applied alternative sample-weighting assumptions that yield lower and upper bound estimates of the

numbers of small entities in the Primary Manufacturing Industries owning in-scope Manufacturers facilities, as reported in Exhibit X–5. Because the analysis of facilities in Other Industries is not based on a statistically valid sample, EPA could not estimate the number of entities in Other Industries that would be subject to the requirements of the regulatory analysis options, or the percentage that are small entities. However, based on a review of nationwide water withdrawals and cooling water use, the *Census of Manufacturers,* and comments received on the Phase III proposed rule, EPA does not expect a significant number of additional small entities would be subject to today's proposed regulatory requirements.

EXHIBIT X–5—NUMBER AND PERCENTAGE OF SMALL ENTITIES IN PRIMARY MANUFACTURING INDUSTRIES SUBJECT TO THE PROPOSED REGULATION, BY INDUSTRY

Sector	Total sector small entities [a]	Lower bound estimate of number of entities		Upper bound estimate of number of entities	
		Estimated 316(b) small entities	Percentage of small entities subject to regulation	Estimated 316(b) small entities	Percentage of small entities subject to regulation
Paper	218	9	4.1	29	13.2
Chemicals	2,506	4	0.2	18	0.7
Petroleum	188	4	2.1	4	2.2
Steel	1,149	3	0.3	8	0.7
Aluminum	227	2	0.9	5	2.0
Food	23,546	1	0.0	1	0.0
Total for primary manufacturing industries [b]	27,834	23	0.1	64	0.2

[a] Includes all firms with less than 500 employees from 2006 Statistics of U.S. Businesses (SUSB) of the U.S. Department of Commerce (U.S. DOC). The Small Business Administration defines firms in nearly all profiled NAICS codes according to the firm's number of employees; however, for some in-scope manufacturing NAICS codes this threshold is 500 employees while for others this threshold is 750, 1,100, or 1,500 employees. Because the SUSB employment size categories do not correspond to the SBA entity size classifications, EPA used the 500 employee threshold for all in-scope NAICS.

[b] Due to rounding columns may not sum.

From this analysis, EPA estimates that 23 to 64 small entities own Manufacturers facilities that are subject to today's proposed rule, representing 0.1 to 0.2 percent of total estimated small entities in the Primary Manufacturing Industries (see Exhibit X–5). Of the six Primary Manufacturing Industries, Paper has the largest number of small entities (9 to 29), and these small entities also account for the largest percentage of total small entities in any of the six industries—4.1 to 13.2 percent of estimated total small entities in the Paper industry. The percentage of estimated total small entities subject to regulation reaches 2 percent for two of the remaining Primary Manufacturing Industries (Petroleum and Aluminum).

From the 316(b) survey data, EPA identified an additional 4 entities in the Other Industries that are also small entities; however, as noted, EPA is unable to estimate the total number of small in-scope entities in the Other Industries.

c. Total Estimate of Small In-Scope Entities

On a combined basis, EPA estimates that 56–96 small entities would be within the scope of the existing facilities rule options. These counts do not include the additional known 4 small entities in the Other Industries.

2. Statement of Basis

As described above, EPA began its assessment of the impact of today's proposed regulatory options on small entities by first estimating the number of small entities within the two industry segments subject to the proposed rule—Electric Generators and Manufacturers—that would be expected to be within the scope of today's proposed rule. EPA then assessed whether these small entities would be expected to incur costs that constitute a significant impact; and assessed whether the number of those small entities estimated to incur a significant impact represent a substantial number of small entities.

To assess whether small entities' compliance costs might constitute a significant impact, EPA summed annualized compliance costs [110] for the Electric Generators and Manufacturers facilities estimated to be owned by a given small entity and calculated these costs as a percentage of entity revenue (Cost-to-Revenue Test). EPA compared the resulting percentages to impact criteria of 1 percent and 3 percent of revenue. Small entities estimated to incur compliance costs exceeding one or more of these impact thresholds were identified as potentially incurring a significant impact.

For both Electric Generators and Manufacturers, EPA used alternative sample-weighting approaches, which provide a range of estimates of the numbers of small entities and in-scope facilities owned by these small entities.

The results of this analysis using both weighting approaches are summarized below. In the following summary table (Exhibit X–6), the estimated numbers of small entities incurring costs exceeding 1 percent and 3 percent of revenue are presented as ranges, based on the alternative sample weighting approaches. In addition, EPA compared the estimated numbers of small entities with costs exceeding a given impact threshold with the estimated number of small in-scope entities. The resulting estimated numbers and percentages of small in-scope entities that may incur a significant impact, as reported in Exhibit X–6, provide a measure of the potential impact of the existing facilities rule options on small in-scope entities.

From these analyses, EPA estimates under Option 1, the proposed option, that 5 to 7 small entities will incur costs exceeding 1 percent of revenue, and 3 small entities will incur costs exceeding 3 percent of revenue. As percentages of the estimated total of 56 to 96 small in-scope entities,[111] these small entities

[110] Option 1 does not include an assessment of site-specific entrainment costs. However, Option 3 includes EM based on closed-cycle cooling at all existing facilities.

[111] The estimated total of small in-scope entities does not include the known 4 small Manufacturers

represent 5 to 13 percent of small in-scope entities at the 1 percent of revenue threshold, and 3 to 5 percent of small in-scope entities at the 3 percent of revenue threshold. Both the number of small in-scope entities incurring a potential impact and the total of small in-scope entities are estimated as ranges. EPA calculated the range of percentage of total small in-scope entities incurring a potential impact by comparing (1) the lower of the estimated number of small in-scope entities incurring a potential impact with the higher of the estimated total of small in-scope entities (yields the lower value of the percentage range) and (2) the higher of the estimated number of small in-scope entities incurring a potential impact with the lower of the estimated total of small in-scope entities (yields the higher value of the percentage range).

For Option 2, EPA estimates that 5 to 7 small entities will incur costs exceeding 1 percent of revenue (5–13 percent of small in-scope entities), and 3 to 7 small entities will incur costs exceeding 3 percent of revenue (3–13 percent of small in-scope entities). For Option 3, EPA estimates that 10 to 22 small entities will incur costs exceeding 1 percent of revenue (10–39 percent of small in-scope entities), and 7 to 15 small entities will incur costs exceeding 3 percent of revenue (7–27 percent of small in-scope entities). For Option 4, EPA estimates that 4 to 6 small entities will incur costs exceeding 1 percent of revenue (4–11 percent of small in-scope entities), and 2 small entities will incur costs exceeding 3 percent of revenue (2–4 percent of small in-scope entities) (see Exhibit X–6).

For more details on this analysis see EA Chapter 7: Regulatory Flexibility Act (RFA) Analysis.

EXHIBIT X–6—ESTIMATED COST-TO-REVENUE IMPACT FOR SMALL IN-SCOPE ENTITIES

Regulatory option	Cost impact category			
	Cost > 1% of revenue		Cost >3% of revenue	
	Number of small entities	% of small in-scope entities [c]	Number of small entities [a,c]	% of small in-scope entities [b]
Option 1: IM Everywhere	5–7	5%–13%	[b] 3	3%–5%
Option 2: IM Everywhere and EM for Facilities with DIF>125 MGD	5–7	5%–13%	3–7	3%–13%
Option 3: I&E Mortality Everywhere	10–22	10%–39%	7–15	7%–27%
Option 4: IM for Facilities with DIF > 50 MGD	4–6	4%–11%	[b] 2	2%–4%

[a] The number of entities with cost-to-revenue ratios exceeding 3 percent is a subset of the number of entities with such ratios exceeding 1 percent.
[b] The estimated number of small entities exceeding the impact threshold is the same under both estimation approaches; however, the total number of entities differs.
[c] For both Electric Generators and Manufacturers, EPA used alternative sample-weighting approaches, which provide a range of estimates of the numbers of small entities and in-scope facilities owned by these small entities (*see* Section VII(D)(a)(iv) for manufacturers and see Section VII(D)(b)(1)(b) for electric generator weighting approaches).

As described in the preamble above, EPA eliminated 115 facilities from the analysis that are projected to close as a result of baseline financial conditions. Of the 115 baseline closures, 18 are small entities.

To summarize, for the Proposed Option [112]—Option 1, EPA estimates that 5 to 7 small entities would incur costs exceeding 1 percent of revenue and 3 small entities would incur costs exceeding 3 percent of revenue. These numbers of adversely affected small entities represent 5–13 percent of the estimated total of small in-scope entities for the 1 percent of revenue threshold, and 3–5 percent of the estimated total of small in-scope entities for the 3 percent of revenue threshold. Given the small number and percentage of small in-scope entities estimated to incur a potentially significant economic impact, EPA judges that the Proposed Option, Option 1, will not cause a significant economic impact on a substantial number of small entities (SISNOSE).

3. Certification Statement

After considering the economic impacts of this proposed rule on small entities, EPA certifies that this action will not have a significant economic impact on a substantial number of small entities.

D. Unfunded Mandates Reform Act (UMRA)

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), 2 U.S.C. 1531–1538, requires Federal agencies, unless otherwise prohibited by law, to assess the effects of their regulatory actions on State, local, and tribal governments and the private sector. This rule contains a Federal mandate that may result in expenditures of $100 million or more for State, local, and tribal governments, in the aggregate, or the private sector in any one year. Accordingly, EPA has prepared under section 202 of the UMRA a written statement which is summarized below (see Chapter 8 of the EA report).

1. Summary of Written Statement

a. Authorizing Legislation

Today's proposed rule is issued under the authority of sections 101, 301, 304, 306, 308, 316, 401, 402, 501, and 510 of the Clean Water Act (CWA), 33 U.S.C. 1251, 1311, 1314, 1316, 1318, 1326, 1341, 1342, 1361, and 1370. See section III of this preamble for detailed information on the legal authority of this rule.

b. Cost-Benefit Analysis

Today's proposed options are expected to have total annualized pre-tax (social) costs of $383.80 million (2009 $) under Option 1, of $4,462.90 million under Option 2, $4,631.62 million under Option 3, and of $326.55 under Option 4, including direct costs incurred by facilities and implementation costs incurred by federal, State, and local governments (annualized over 50 years and discounted at 3 percent).[113] The total monetized use and non-use benefits of

entities in the Other Industries. EPA assessed the potential impact of the regulatory options on these 4 small entities; none were found to incur a significant impact under any of the four regulatory options.

[112] Option 1 does not include an assessment of site-specific entrainment costs.

[113] These social cost estimates use a different estimate of downtime than the private cost estimates cited above, and are thus lower. For more details see Chapter 11 in the EA report.

today's proposed options are estimated to be $17.63 million under Option 1, $120.79 million under Option 2, $125.65 million under Option 3, and $17.33 million under Option 4 (annualized over 50 years and discounted at 3 percent).[114] Thus, the total social costs exceed the total monetized benefits of the proposed options by $366.17 million for Option 1, by $4,342.11 million for Option 2, by $4,505.97 million for Option 3, and by $309.22 under Option 4. EPA notes that these differences are based on a comparison of a partial measure of benefits with a more complete measure of costs;[115] therefore, the results must be interpreted with caution. After considering the monetized and non-monetized benefits of the proposed option, EPA has determined that the benefits of this option justify the costs. For a more detailed comparison of the costs and benefits of today's proposed rule, see Chapter 12 of the EA report.

EPA notes that States may be able to use existing sources of financial assistance to revise and implement this proposed rule. Section 106 of the Clean Water Act authorizes EPA to award grants to States, Tribes, intertribal consortia, and interstate agencies for administering programs for the prevention, reduction, and elimination of water pollution. These grants may be used for various activities to develop and carry out a water pollution control program, including permitting, monitoring, and enforcement. Thus, State and Tribal NPDES permit programs represent one type of State program that can be funded by section 106 grants.

c. Summary of State, Local, and Tribal Government Input

EPA consulted with State governments and representatives of local governments in developing the rule. The outreach activities are discussed in section III.A.3 of this preamble.

d. Least Burdensome Option

EPA considered and analyzed several alternative regulatory options to determine the best technology available for minimizing adverse environmental impact. These regulatory options are discussed in today's proposed rule at 67 FR 17154–17168, as well as in section VIII of this preamble. These options included a range of technology-based approaches including impingement mortality technology at all facilities with a DIF greater than 50 MGD to additionally requiring impingement mortality controls and intake flow commensurate with closed-cycle cooling for all facilities.[116] As discussed in detail in section VI, EPA did not select options exclusively because they were the most cost-effective among the options that fulfill the requirements of section 316(b). EPA selected the preferred option because it meets the requirement of section 316(b) of the CWA that the location, design, construction, and capacity of CWIS reflect the best technology available for minimizing adverse environmental impact. In addition, EPA has determined that the benefits of this option justify the costs, taking quantified and non-quantified costs and benefits into account. The preferred option reflects a flexible approach among the options considered that allows consideration of costs and benefits on a site-specific basis in determining BTA.

2. Impact of Compliance Requirements on Small Governments

This rule is not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments (*i.e.,* governments with a population of less than 50,000). For its assessment of the impact of compliance requirements on small governments, EPA compared total costs and costs per facility as estimated to be incurred by small governments with those values as estimated to be incurred by large governments. EPA also compared costs for small government-owned facilities with those of non-government-owned facilities. The Agency evaluated costs per facility on the basis of both average and maximum annualized cost per facility. In these comparisons, both for the cost totals and, in particular, for the average and maximum cost per facility, the costs for small government-owned facilities were less than those for large government-owned facilities or for small non-government-owned facilities. On this basis, EPA concluded that the compliance cost requirements of the proposed 316(b) Existing Facilities Rule would not significantly or uniquely affect small governments.

Because no Manufacturers facility is government-owned, EPA conducted this analysis for Electric Generators only.

a. Government-Owned Electric Generator Facilities by Ownership and Entity Size Category

Exhibit X–8 provides an estimate of the number of non-Federal Government entities that operate Electric Generators subject to today's proposed rule, by ownership type and size of government entity. As reported in Exhibit X–8, 24 large government entities operate 41 Electric Generators subject to this proposed rule, and 18 small government entities operate 18 Electric Generators subject to the rule. Of the 59 facilities that are owned by government entities, 43 are owned by Municipalities, 9 are owned by State Governments, and 7 are owned by an Other Political Subdivision.

EXHIBIT X–8—NUMBER OF GOVERNMENT ENTITIES AND GOVERNMENT-OWNED ELECTRIC GENERATOR FACILITIES

Ownership Type	Number of government entities (by Size)[a]			Number of facilities (by government entity size)[b]		
	Large	Small	*Total*	Large	Small	*Total*
Municipality	18	17	*35*	26	17	*43*
State Government	4	0	*4*	9	0	*9*
Other Political Subdivision	2	1	*3*	6	1	*7*
Total	24	18	*42*	41	18	*59*

[a] Counts of entities owning explicitly and implicitly analyzed Electric Generators; these are not weighted entity counts.
[b] Counts of explicitly and implicitly analyzed Electric Generators; these are not weighted estimates.

[114] EPA was able to estimate nonuse benefits for the North Atlantic and Mid-Atlantic benefit regions.

[115] The costs reflect the costs for facilities do comply with the primary BTA requirements, and do not reflect any facilities with reduced costs due to the available compliance alternatives and flexibilities. Since EPA anticipates a facility would generally participate in a compliance alternative if it was less burdensome or less costly to do so, today's costs may be overstated.

[116] All options also require site-specific determinations of BTA where uniform national controls are not included.

b. Compliance Costs for Small Government-Owned Electric Generators Facilities

EPA estimates that 10 of the 41 (24%) non-federal government-owned Electric Generators facilities subject to today's proposed rule are owned by small governments (Table X–9).[117,118] Exhibit X–9 summarizes total, average annualized compliance costs, and maximum annualized compliance costs for government (State, local, and Tribal governments) and non-government-owned facilities for the three regulatory options and by size category of owning entity.

EPA first looked at the relationship between costs incurred by small governments and small government-owned Electric Generators in comparison to those incurred by large governments and large government-owned facilities. As reported in Exhibit X–9, the estimated total annualized compliance costs for all non-federal government-owned Electric Generators are $10.8 million for Option 1, $102.3 million for Option 2, $120.1 million for Option 3, and $9.5 million for Option 4. The 31 facilities owned by large governments would incur costs of $9.2 million under Option 1, $100.7 million under Option 2, $107.6 million under Option 3, and $8.1 million under Option 4. In comparison, the 10 facilities owned by small governments would incur costs of $1.5 million under Options 1 and 2, $12.5 million under Option 3, and $1.4 million under Option 4. On an average cost per facility basis, these costs are $0.1 million under Options 1, 2, and 4, and $1.2 million under Option 3, for facilities owned by small governments, with large government-owned facility costs of $0.3 million under Options 1 and 4, $3.2 million under Option 2, and $3.4 million under Option 3. In addition, the maximum per facility costs owned by small governments are $0.2 million under Options 1, 2, and 4, and $2.1 million under Option 3. The comparable values for large government-owned facilities are $1.0 million under Options 1 and 4, and $17.8 million under Options 2 and 3. Accordingly, the costs for small government-owned facilities are considerably lower than those for large governments on the basis of total costs, average cost per-facility, and maximum cost per-facility. EPA therefore concludes that the compliance requirements of today's proposed rule do not significantly or uniquely affect small governments in comparison to large governments.

EXHIBIT X–9—ELECTRIC GENERATORS FACILITIES AND COMPLIANCE COSTS BY OWNERSHIP TYPE AND SIZE FOR 316(B) EXISTING FACILITIES RULE OPTIONS

[Millions; 2009$]

Ownership type	Entity size	Number of facilities (weighted)	Total compliance costs	Average cost per facility	Maximum facility cost [c]
Option 1: IM Everywhere					
Government (excluding Federal)	Small	10	$1.5	$0.1	$0.2
	Large	31	9.2	0.3	1.0
Private	Small	16	7.7	0.5	2.5
	Large	485	354.4	0.7	7.2
All Facilities [b]		559	394.2	0.7	7.2
Option 2: IM Everywhere and EM for Facilities with DIF > 125 MGD					
Government (excluding Federal)	Small	10	$1.5	$0.1	$0.2
	Large	31	100.7	3.2	17.8
Private	Small	16	32.3	2.0	10.9
	Large	485	4,171.7	8.6	59.9
All Facilities [b]		559	4,811.3	8.6	59.9
Option 3: I&E Mortality Everywhere					
Government (excluding Federal)	Small	10	$12.5	$1.2	$2.1
	Large	31	107.6	3.4	17.8
Private	Small	16	34.0	2.2	10.9
	Large	485	4,300.3	8.9	59.9
All Facilities [b]		559	4,959.4	8.9	59.9
Option 4: IM for Facilities with DIF > 50MGD					
Government (excluding Federal)	Small	10	$1.4	$0.1	$0.2
	Large	31	8.1	0.3	1.0
Private	Small	16	6.0	0.4	2.5
	Large	485	346.1	0.7	7.2

[117] A small governmental jurisdiction is defined " as the government of a city, county, town, township, village, school district, or special district with a population of less than 50,000 (5 U.S.C. 601(5)).

[118] The entity counts described in this section were developed on a weighted basis and differ from the values reported in the preceding section, where were developed on an un-weighted basis. The values in this section were developed on a weighted basis because compliance costs were estimated only for explicitly analyzed facilities and facility weights are used to extend these results to the full set of in-scope facilities.

EXHIBIT X–9—ELECTRIC GENERATORS FACILITIES AND COMPLIANCE COSTS BY OWNERSHIP TYPE AND SIZE FOR 316(B) EXISTING FACILITIES RULE OPTIONS—Continued

[Millions; 2009$]

Ownership type	Entity size	Number of facilities (weighted)	Total compliance costs	Average cost per facility	Maximum facility cost [c]
	Small	559	383.0	0.7	7.2

a. Facility counts are weighted estimates and differ from the values reported in Exhibit X–8, above, which are un-weighted counts. Sample weighted values are needed in this table because costs were developed only for the explicitly analyzed Electric Generators facilities. See EA Appendix A.3: Used of Sample Weights in the Proposed Existing Facilities Rule Analysis for more detail.

b. The *All Facilities* counts and cost values include 15 federal government-owned facilities and 10 private facilities owned by entities of unknown size. The individual facility count and cost estimates for the small and large entity categories exclude the values for these 25 facilities.

c. Reflects maximum of un-weighted costs to explicitly analyzed facilities only.

EPA's analysis also considered whether this proposed rule may significantly or uniquely affect small governments in relation to non-government-owned Electric Generators. As reported in Exhibit X–9 the total compliance cost for 10 small government-owned Electric Generators incurring costs under today's proposed rule are $1.5 million under Options 1 and 2, $12.5 million under Option 3, and $1.4 million under Option 4, or on a per facility basis, approximately $0.1 million for Options 1, 2, and 4, and $1.2 million for Option 3. In addition, the highest annualized compliance cost for a small government-owned facility is $0.2 million under Options 1, 2, and 4, and $2.1 million under Option 3. In comparison, all small non-government-owned Electric Generators subject to today's proposed rule are expected to incur annualized compliance costs of $7.7 million under Option 1, $32.3 million under Option 2, $34.0 million under Option 3, and $6.0 million under Option 4, or $0.5, $2.0, $2.2, and $0.4 million per facility, respectively by regulatory option. The highest annualized cost for a small non-government-owned facility is $2.5 million under Options 1 and 4, and $10.9 million under Options 2 and 3. On the basis of this comparison, as well, EPA further concludes that the compliance requirements of the proposed rule do not significantly or uniquely affect small governments. The EA report provides more detail on EPA's analysis of impacts on governments.

3. Administrative Costs

The requirements of Section 316(b) are implemented through the NPDES (National Pollutant Discharge Elimination System) permit program. Forty-six States and territories with NPDES permitting authority under section 402(b) of the CWA are expected to incur costs to administer the Existing Facilities Rule in their jurisdictions. EPA estimates that States and territories will incur costs associated with five types of activities for implementing the requirements of today's proposed rule: (1) Start-Up activities to learn and understand the requirements of today's regulation and to implement administrative structures and procedures for administering the regulation; (2) first permit issuance activities; (3) permit reissuance activities; (4) entrainment study costs, and (5) annual activities. EPA estimates that the total annualized cost for these activities will be $5.31 million for Option 1, $2.19 for Option 2, $1.28 million for Option 3, and $4.06 for Option 4. Monitoring costs comprise the largest share of administrative costs under all three regulatory options. Exhibit X–10 presents the annualized costs of the major administrative activities.

EXHIBIT X–10—ANNUALIZED GOVERNMENT ADMINISTRATIVE COSTS

[Millions; 2009$]

Activity	Cost		
	Electric Generators	Manufacturers	Total In-Scope
Option 1: IM Everywhere			
Start-up Activities	$0.02	$0.02	$0.04
First Permit Issuance Activities	$0.23	$0.24	$0.45
Annual Monitoring Activities	$1.17	$1.12	$2.29
Entrainment Study	$1.19	$0.97	$2.16
Permit Reissuance Activities	$0.18	$0.18	$0.36
Total	$2.79	$2.52	$5.31
Option 2: IM Everywhere and EM for Facilities with DIF > 125 MGD			
Start-up Activities	$0.02	$0.02	$0.04
First Permit Issuance Activities	$0.17	$0.23	$0.35
Annual Monitoring Activities	$0.36	$1.07	$1.37
Entrainment Study	$0.00	$0.00	$0.00
Permit Reissuance Activities	$0.14	$0.17	$0.31
Total	$0.69	$1.48	$2.19

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EXHIBIT X–10—ANNUALIZED GOVERNMENT ADMINISTRATIVE COSTS—Continued

[Millions; 2009$]

Activity	Cost		
	Electric Generators	Manufacturers	Total In-Scope
Option 3: I&E Mortality Everywhere			
Start-up Activities	$0.02	$0.02	$0.04
First Permit Issuance Activities	$0.16	$0.13	$0.29
Annual Monitoring Activities	$0.20	$0.52	$0.72
Entrainment Study	$0.00	$0.00	$0.00
Permit Reissuance Activities	$0.13	$0.10	$0.23
Total	$0.51	$0.77	$1.28
Option 4: IM for Facilities with DIF > 50MGD			
Start-up Activities	$0.02	$0.02	$0.04
First Permit Issuance Activities	$0.23	$0.06	$0.29
Annual Monitoring Activities	$1.04	$0.31	$1.35
Entrainment Study	$1.19	$0.97	$2.16
Permit Reissuance Activities	$0.18	$0.05	$0.23
Total	$2.65	$1.41	$4.06

E. Executive Order 13132: Federalism

Under Executive Order 13132, EPA may not issue an action that has federalism implications, that imposes substantial direct compliance costs on the State and local governments, and that is not required by statute, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by State and local governments, or EPA consults with State and local officials early in the process of developing the proposed action.

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. This proposed rule would not alter the basic State-federal scheme established in the Clean Water Act under which EPA authorizes States to carry out the NPDES permitting program. EPA expects today's proposed rule would have little effect on the relationship between, or the distribution of power and responsibilities among, the federal and State governments. EPA expects an average annual burden of 21,785 hours with total average annual cost of $1.1 million under Option 1, 6,538 hours and $346,000 under Option 2, and 20,395 hours and $1.0 million under Option 3, for States to collectively administer this rule during the compliance period.[119] After the initial compliance period, EPA expects an average annual burden of 23,550 hours with an average annual cost of $1.2 million for Option 1, 2,528 hours and $154,000 for Option 2, and 16,988 hours and $841,000 for Option 3. EPA has identified 47 Phase II facilities that are owned by State or local government entities. The estimated average annual compliance cost incurred by these facilities is approximately $452,000 per facility under Option 1, $4.5 million under Option 2, and $1.1 million under Option 3. EPA does not expect Option 4 to impose substantial direct compliance costs on the State and local governments higher than Option 1, and therefore is not expected to pose Federalism implications. Thus, Executive Order 13132 does not apply to this rule.

In the spirit of Executive Order 13132, and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

[119] Because of late revisions to the Existing Facilities Rule's administrative requirements, EPA was unable to update these values from those developed earlier in the regulatory analysis. In addition, EPA did not estimate administrative costs for Option 4, but expects that these costs would be very similar to those estimated for Option 1.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). It would not have substantial direct effects on tribal governments, on the relationship between the Federal government and the Indian tribes, or the distribution of power and responsibilities between the Federal government and Indian tribes as specified in Executive Order 13175. The national cooling water intake structure requirements would be implemented through permits issued under the NPDES program. No tribal governments are currently authorized pursuant to section 402(b) of the CWA to implement the NPDES program. In addition, EPA's analyses show that no facility subject to today's proposed rule is owned by tribal governments and thus this rule does not affect Tribes in any way in the foreseeable future. Thus, Executive Order 13175 does not apply to this action.

EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

This action is not subject to EO 13045 because it does not establish an environmental standard intended to mitigate health or safety risks. This rule establishes requirements for cooling

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water intake structures to protect aquatic organisms.

H. Executive Order 13211: Actions That Significantly Affect Energy Supply, Distribution, or Use

Executive Order 13211 (66 FR 28355 (May 22, 2001)) requires EPA to prepare and submit a Statement of Energy Effects to the Administrator of the Office of Information and Regulatory Affairs, Office of Management and Budget, for actions identified as "significant energy actions." Based on the Office of Management and Budget's guidance for assessing the potential energy impact of regulations (*http://www.whitehouse.gov/omb/memoranda/m01_27.html*), the Agency does not anticipate that today's rule will have a significant adverse effect on the supply, distribution, or use of energy and thus will not constitute a significant regulatory action under Executive Order 13211.

The Agency analyzed the potential energy effects of today's rule and other regulatory options considered for proposal. The potentially significant effects of today's rule on energy supply, distribution or use concern the electric power sector. This analysis found that the rule's compliance requirements would not cause effects in the electric power sector that would constitute a significant adverse effect under Executive Order 13211. Namely, the Agency's analysis found that today's rule would not reduce electricity production in excess of 1 billion kilowatt hours per year or in excess of 500 megawatts of installed capacity, and therefore would not constitute a significant regulatory action under Executive Order 13211.

For more detail on the potential energy effects of this proposal, see Section VII of this preamble or Chapter 9 in the EA report.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 ("NTTAA"), Public Law 104–113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (*e.g.,* materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards.

This proposed rulemaking may involve technical standards, for example in the measurement of impingement and entrainment. Nothing in this proposed rule would prevent the use of voluntary consensus standards for such measurement where available, and EPA encourages permitting authorities and regulated entities to do so.

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order (EO) 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. Because EPA expects that this proposed rule will help to preserve the health of aquatic ecosystems located in reasonable proximity to 316(b) Existing Facilities, EPA believes that all populations, including minority and low-income populations, will benefit from improved environmental conditions as a result of this rule.[120]

To meet the objectives of Executive Order 12898, EPA assessed whether today's proposed rule could distribute benefits among population sub-groups in a way that is significantly unfavorable to low-income and minority populations. EPA compared key demographic characteristics of affected sub-state populations to those demographic characteristics at the level of the state. If the demographic profile of the sub-state "benefit population" were found to differ in a statistically significant and unfavorable[121] way from the demographic profile of the state, generally, then the proposed rule might be assessed as yielding an unfavorable distribution of benefits, from the perspective of the public policy principles of Executive Order 12898. The two demographic variables of interest for this EJ analysis are those within the Fish Consumption Pathway (FCP) Module that best capture the minority and low-income aspects of the populations affected, which are annual household income and race.[122] [123] Variable averages at the sub-state and state levels were compared to determine whether or not the demographic profile of the affected population was consistent with the state profile (for details see Chapter 9 of the EA report).

The comparison of minority populations affected by the 316(b) Existing Facilities to the affected states' overall populations found no statistically significant difference between these groups. While low-income populations were less present in the benefit population than in the State's overall population in many states, the differences were generally very small and the two groups were not found to be significantly different. EPA thus believes that the proposed regulation does not systematically discriminate against, or exclude or deny participation of, the lower income population group or the minority population group in the benefits of the proposed regulation in a way that would be contrary to the intent of E.O. 12898. Because today's proposed regulation requires all 316(b) Existing Facilities to achieve compliance regardless of

[120] Affected populations include all individuals who live within a 50-mile radius of the facility who will be receiving a non-use benefit from the improved health of the aquatic ecosystem in the area, and any additional anglers who live outside of the 50-mile facility buffer and within a 50-mile radius of the reaches nearest to 316(b) Existing Facilities, who will be receiving the use benefit of improved catches as a result of the proposed rule.

[121] That is, the estimated benefit population is comprised of a significantly lower share of low-income and/or minority populations than the general population of the state.

[122] Annual household income data in the FCP Module is available for the following categories: Less than $10,000; $10,000 to $19,999; $20,000 to $24,999; $25,000 to $29,999; $30,000 to $34,999; $35,000 to $39,999; $40,000 to $49,999; $50,000 to $74,999; $75,000 to $99,999; and more than $100,000. For this analysis as well as previous 316(b) rule analyses, these categories were combined into low- and not low-income groups based on the U.S. Department of Health and Human Services' poverty guidelines for a family of four living in the contiguous United States or D.C. The current (2009) poverty guideline is $22,050, which falls within the $20,000 to $24,999 income range (U.S. HHS, 2009). For the current analysis, EPA used $20,000 as the threshold for separating populations into low- and not low-income groups.

[123] Race categories used in the analysis include white, black or African American, Asian or Native Hawaiian or Other Pacific Islander, American Indian or Alaska Native, and some other race.

location, there can be no systematic discrimination or exclusion of low income or minority populations from participation in the rule's benefits, based, for example, on selection of only specific facilities to which the regulation would apply.[124] EPA thus concludes, overall, that the proposed regulation is consistent with the policy intent of E.O. 12898. Anecdotally, minority (*e.g.,* Native American) and low-income populations may be more likely to include a larger proportion of subsistence fishermen. Since this rule will increase abundance of all fish species in the areas affected by cooling water intakes, it may provide a particular benefit to subsistence fishermen. To the extent that minority and low-income populations are over-represented in this group, they may especially benefit from this rule.

K. Executive Order 13158: Marine Protected Areas

Executive Order 13158 (65 FR 34909, May 31, 2000) requires EPA to "expeditiously propose new science-based regulations, as necessary, to ensure appropriate levels of protection for the marine environment." EPA may take action to enhance or expand protection of existing marine protected areas and to establish or recommend, as appropriate, new marine protected areas. The purpose of the Executive Order is to protect the significant natural and cultural resources within the marine environment, which means "those areas of coastal and ocean waters, the Great Lakes and their connecting waters, and submerged lands thereunder, over which the United States exercises jurisdiction, consistent with international law."

Today's proposed rule recognizes the biological sensitivity of tidal rivers, estuaries, oceans, and the Great Lakes and their susceptibility to adverse environmental impact from cooling water intake structures. This rule provides requirements to minimize adverse environmental impact for cooling water intake structures located on these types of waterbodies.

EPA used GIS data of the locations of Marine Protected Areas (MPAs) from the national MPA program (*http://www.mpa.gov/helpful_resources/inventory.html*) to locate 316(b) existing facilities with intakes within MPAs. Under Option 1, 87 percent of in-scope facilities within MPAs obtain reductions in impingement mortality, while reductions in entrainment mortality cannot be estimated because they will be based on site-specific determinations of BTA. Under Options 2 and 3, impingement mortality is reduced at 92 and 97 percent of 316(b) facilities in MPAs, while the addition of closed-cycle cooling towers results in reduced entrainment mortality at 72 and 92 percent of in-scope facilities found in MPAs, respectively. Therefore, EPA expects today's proposed regulation would advance the objective of the Executive Order to protect marine areas. For more details of the methodology used in this analysis and the specific water bodies expected to be improved, *see* Section 5 in Chapter 9 in the EA report.

XI. Solicitation of Data and Comments

A. General Solicitation of Comment

EPA encourages public participation in this rulemaking. EPA asks that commenters address any perceived deficiencies in the record supporting this proposal and that suggested revisions or corrections to the rule, preamble or record be supported by data. EPA invites all parties to coordinate their data collection activities with the Agency to facilitate cost-effective data submissions. Please refer to the **FOR FURTHER INFORMATION CONTACT** section at the beginning of this preamble for technical contacts at EPA.

Requests for comment on specific issues are scattered throughout this preamble in the sections where such issues are discussed. In addition, EPA specifically requests comment on the issues discussed below.

B. Specific Solicitation of Comments and Data

Definition of "Design Intake Flow"

EPA requests comment on whether the definition of DIF should be further revised to clarify that EPA intends for the design intake flow to reflect the maximum volume of water that a plant can physically withdraw from a source waterbody over a specific time period. This would mean that a facility that has permanently taken a pump out of service or has flow limited by piping or other physical limitations should be able to consider such constraints when reporting its DIF. See Section V.G.

2. National BTA Categorical Standards for Offshore Oil and Gas Extraction and Seafood Processing Facilities

EPA requests comment and data on the appropriateness of a single BTA categorical standards for offshore oil and gas extraction facilities and seafood processing facilities. Today's rule would continue to require that the BTA for existing offshore oil and gas extraction facilities and seafood processing facilities be established by NPDES permit directors on a case-by-case basis using best professional judgment. See Section V.H.

3. Cost-cost Alternative From Phase II Rule

EPA does not have technical data for all existing facilities. EPA concluded that the Phase II rule costs provided in Appendix A are not appropriate for use in a facility-level cost-cost test. See Section III. Moreover, under the national requirements EPA is proposing today, EPA concluded that a specific cost-cost variance is not necessary because the Director already has the discretion to consider such factors. EPA requests comment on these conclusions.

4. Entrainment Survival

There are circumstances where certain species of eggs have been shown to survive entrainment under certain conditions, however EPA has not received any new data for either the most common species or the species of concern most frequently identified in available studies. For purposes of today's national rulemaking, entrainment is still presumed to lead to 100 percent mortality. See Section VI. Today's proposed rule would allow facilities to demonstrate, on a site-specific basis, that entrainment mortality of one or more species of concern is not 100 percent. EPA requests comment on this approach.

5. Alternative Impingement Mortality Compliance Requirements

EPA requests comment and data on a provision that would require facilities seeking to comply with the impingement mortality standard by meeting an intake velocity requirement either to demonstrate that the species of concern is adequately protected by the maximum intake velocity requirements, or else to employ fish friendly protective measures including a fish handling and return system. EPA is considering this provision because the Agency is concerned that some facilities that comply with the impingement mortality requirements by reducing intake velocity to 0.5 fps or less, may still impact species of concern. See Section VI.D.1.a.

6. Monthly and Annual Limits on Impingement Mortality

EPA requests comment on the need to tailor the impingement mortality requirements of today's proposal to

[124] Additionally, in states in which low-income populations are less present in the benefits group than in the state population overall, these populations are not subject to the environmental damages today's rule seeks to ameliorate to the same extent as other income groups.

account for site-specific circumstances and/or technologies, including location of cooling water intakes that impinge relatively few fish or other approaches that achieve impingement mortality reductions equivalent to the proposed performance standards. For example, if EPA were to consider number of fish killed as an alternative, it might statistically model the data or select the minimum observed value. Studies and information supporting these alternatives would be most helpful. EPA also requests comment on the monthly and annual limits in the proposed rule and way in which they were calculated.

7. Flow Basis for Option

EPA requests comment on both the threshold and the flow basis for a variation of option 2 that would use 125 MGD Actual Intake Flow (AIF) rather than a 125 MGD Design Intake Flow (DIF) as the threshold. See Section VI.D.2.

8. Waterbody Type as a Basis for Different Standards

EPA's reanalysis of impingement and entrainment data does not support the premise that the difference in the density of organisms between marine and fresh waters justifies different standards. More specifically, the average density of organisms in fresh waters may be less than that found on average in marine waters, but the actual density of aquatic organisms in some specific fresh water systems exceeds that found in some marine waters. EPA also believes the different reproduction strategies of freshwater versus marine species make broad characterizations regarding the density less valid a rationale for establishing different standards for minimizing adverse environmental impact. EPA requests comment on its proposal not to differentiate requirements by water body type.

9. Capacity Utilization Rating as a Basis for Different Standards

Electric generating facilities may still continue to withdraw significant volumes of water when not generating electricity. Further, EPA found that load-following and peaking plants operate at or near 100 percent capacity (and therefore 100 percent design intake flow) when they are operating. Peaking facilities (those with a CUR of less than 15 percent, as defined in the 2004 Phase II rule) may withdraw relatively small volumes on an annual basis, but if they operate during biologically important periods such as spawning seasons or migrations, then they may have nearly the same adverse impact as a facility that operates year round. EPA requests comment on its decision not to exclude facilities with a low capacity utilization rate. Comments who believe that EPA should include a CUR threshold in the final rule should provide a suggested threshold and explain the basis for it.

10. Flow Commensurate With Closed-Cycle Cooling

EPA requests comment on whether the demonstration that a facility's flow reduction will be commensurate with closed-cycle cooling should be based on a defined metric, or determined by the permitting authority on a site-specific basis for each facility. EPA is proposing that a facility seeking to demonstrate flow reduction commensurate with closed-cycle cooling using flow reduction technologies and controls other than through closed-cycle cooling (*e.g.,* through seasonal flow reductions, unit retirements, and other flow reductions) would have to demonstrate total flow reductions approximating 97.5% for freshwater withdrawals and 94.9% for saltwater withdrawals. *See* Section IX.D.

11. Credits for Unit Closures

EPA requests comments on the proposed approach to allow credits for unit closures to be valid for 10 years from the date of the closure. In EPA's current thinking this approach reasonably allows facilities to get credit for flow reductions attributable to unit closures, but also requires such facilities to make future progress to ensure its operations reflect best available entrainment controls. See Section IX.D.

12. Land Constraints

EPA requests comment on the use of a ratio for determining the land constraint threshold for retrofit construction of cooling tower, as well as data for determining alternative thresholds. EPA has not identified any facilities with more than 160 acres/1000MWs that EPA believes would be unable to construct retrofit cooling towers. EPA is exploring the use of such a ratio to support determinations regarding adequate land area to construct retrofit cooling towers. See Section IX.D (footnote 1).

13. Proposed Implementation Schedule

EPA requests comment on its proposed schedule for implementing the proposed rule. The proposed schedule uses a phased approach for information submittal, requiring some facilities to submit application materials as soon as six months after rule promulgation. The longest timeframe for information submittal would not exceed seven years and six months. EPA solicits comment on the proposed schedule, and specifically seeks comment and data on the appropriate amount of time to collect data, conduct reviews, obtain comment, provide for public participation, and issue final permit conditions. See Section IX.E.

14. Methods for Evaluating Latent Mortality Effects Resulting From Impingement

EPA requests comment on methods for evaluating latent mortality effects resulting from impingement. EPA requests comment on whether it should specifically establish 24 or 48 hours after initial impingement as the time at which to monitor impingement mortality. EPA's record demonstrates that a holding time of no more than 48 hours is optimal for evaluating the latent mortality associated with impingement while at the same time minimizing mortality associated with holding the organisms. See Section IX.F.1.

15. Counting Impinged Organisms With the "Hypothetical Net"

EPA requests comment on the "hypothetical net" approach to measuring impingement mortality. Facilities could apply a "hypothetical net" in that they could elect to only count organisms that would not have passed through a net with 3/8" mesh. For example, a facility that uses a fine-mesh screen or diverts the flow directly to a sampling bay would only need to count organisms that could be collected if the flow passed through a net, screen, or debris basket fitted with 3/8" mesh spacing. See Section IX.F.1. EPA further solicits comment on alternative approaches that would not penalize facilities for employing fine mesh screens.

16. Incentives for Reducing I&E by Reducing Water Withdrawals

EPA requests comment on incentives or alternative requirements for exceptionally energy efficient or water efficient facilities. See Section III. EPA also solicits comment on the regulatory provisions that encourage the use of recycled water as cooling water, including reclaimed water from wastewater treatment plants and process water from manufacturing facilities, EPA solicits comment on other incentives to encourage use of recycled water to supplement or replace marine, estuarine, or freshwater intakes.

17. Options Which Provide Closed-Cycle Cooling as BTA

EPA solicits comment on regulatory options that establish closed-cycle cooling as BTA. EPA specifically requests comment on the regulatory options 2 and 3 included in today's proposal, which would establish closed-cycle cooling as BTA for EM at a DIF of 2 MGD and 125 MGD, respectively. See Section VI and VII. EPA further solicits comment and supporting data on alternative thresholds, including whether such alternative thresholds should be based on DIF or AIF. EPA also solicits comment and supporting data for alternative criteria that would establish closed-cycle cooling as BTA for some facilities.

18. Costs of Controls To Eliminate Entrapment

EPA assumes facilities with modified traveling screens including a fish handling and return system would meet the proposed requirements to eliminate entrapment of fish and shellfish. EPA believes those facilities with an offshore velocity cap leading to a forebay but without a fish return system would incur costs to meet the proposed requirements for entrapment. For facilities with closed-cycle cooling systems, EPA does not have data on the number of facilities that also have a fish handling and return system. Further, EPA does not have data on the number of facilities that have less than 0.5 feet per second intake velocity but have a cooling water intake system that may cause entrapment. EPA solicits comment and data on the types and numbers of facilities with a cooling water intake system that may cause entrapment, and the costs to eliminate entrapment.

19. Analysis of New Capacity

EPA requests comment on the number of new units and the amount of new capacity construction projected. See Section VII.

20. Monitoring Reports

EPA solicits comment on how frequently I&E mortality monitoring reports should be submitted. EPA further solicits comment on incorporating the monitoring reports into monthly DMRs, or whether less frequent reporting is appropriate. EPA also requests comment on whether minimum monitoring frequencies should be established in this rule or left to the discretion of the Director. See Section IX.

21. Seasonal Operation of Cooling Towers

EPA solicits comment on an option that would require cooling towers on some or all facilities but recognize the site-specific nature of EM by allowing seasonal operation of cooling towers during peak entrainment season. EPA also requests comment on including a similar provision for new units at existing facilities, which are required to achieve I&E reductions commensurate with closed cycle cooling in the proposed rule.

22. New Unit Provision

EPA solicits comment on the new unit provision. Specifically, EPA solicits comment on the clarity of the definition of new unit, and whether it should be expanded to include other units such as those that are repowered or rebuilt. EPA also solicits comment on whether the new unit provision should be deleted, therefore subjecting these units to the same site-specific entrainment BTA determination required of existing units.

23. Review Criteria To Guide Evaluation of Entrainment Feasibility Factors

EPA solicits comment on the criteria specified in the regulation for guiding the evaluation of closed-cycle cooling as BTA for EM. EPA further solicits comment on additional criteria that EPA should address, and whether such criteria should be developed in the regulation or provided in guidance.

24. Alternative Procedures for Visual or Remote Inspections

EPA requests comment on its proposal to permit the Director to establish alternative procedures for conducting visual or remote inspections during periods of inclement weather. EPA also requests comment on whether the rule should specific minimum frequencies for visual or remote inspections, or leave this to the determination of the permitting authority. See Section IX.F.

25. Threshold for In-Scope Facilities

EPA requests comment on the threshold of DIF greater than 2 MGD for identifying facilities in-scope of this rule.

26. Application Requirements

EPA requests comment on the burden and practical utility of all of the proposed application requirements. EPA is particularly interested in the burden of application requirements to facilities with DIF < 50 MGD. EPA also requests comment on its proposal to limit application requirements for facilities that have already installed closed-cycle cooling, or opt to do so without a site-specific assessment of BTA, and whether there are additional requirements that could be relaxed for this group.

27. Comment From State and Local Officials

EPA specifically requests comment on this proposed rule from State and local officials. See Section X.E.

28. Comment From Tribal Officials

EPA specifically requests additional comment on this proposed action from Tribal officials. See Section X.F.

List of Subjects

40 CFR Part 122

Environmental protection, Administrative practice and procedure, Confidential business information, Hazardous substances, Reporting and recordkeeping requirements, Water pollution control.

40 CFR Part 125

Environmental protection, Cooling water intake structure, Reporting and recordkeeping requirements, Waste treatment and disposal, Water pollution control.

Dated: March 28, 2011.

Lisa P. Jackson,

Administrator.

For reasons set out in the preamble, Chapter I of Title 40 of the Code of Federal Regulations is proposed to be amended as follows:

PART 122—EPA ADMINISTERED PERMIT PROGRAMS: THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

1. The authority citation for part 122 continues to read as follows:

Authority: The Clean Water Act, 33 U.S.C. 1251 *et seq.*

2. The suspension of 40 CFR 122.21(r)(1)(ii) and (r)(5), published on July 9, 2007 (72 FR 37109) is lifted.

3. Section 122.21 is amended as follows:

a. Revising paragraph (r)(1)(ii).

b. Revising paragraphs (r)(2) introductory text, (r)(2)(i) though (iii), and (r)(3) through (5).

c. Adding paragraphs (r)(6) through (12).

§122.21 Application for a permit (applicable to State programs, see §123.25)

* * * * *

(r) * * *

(1) * * *

(ii) *Existing facilities.* (A) The owner or operator of an existing facility as

defined in 40 CFR part 125, subpart J, with a cooling water intake structure that supplies cooling water exclusively for operation of a wet or dry cooling system and that meets the definition of closed cycle recirculating system at 40 CFR 125.92 must submit to the Director for review the information required under paragraphs (r)(2), (3), and (6) of this section. The owner or operator of all other existing facilities as defined in part 125, subpart J, of this chapter must also submit to the Director for review the information required under paragraphs (r) (5), (7), and (8) of this section as part of its permit application.

(B) The owner or operator of an existing facility as defined in 40 CFR part 125, subpart J, of this chapter that withdraws greater than 125 MGD actual intake flows (AIF) of water for cooling purposes must submit to the Director for review the information required under paragraphs (r)(9), (10), (11), and (12) of this section.

(C) *New units at existing facilities.* New units at existing facilities with cooling water intake structures as defined in part 125, subpart J, of this chapter must provide an update to the information required under paragraphs (r)(2), (3), and (6) of this section and §125.95 of this chapter. Requests for alternative requirements under §125.94(d)(4) of this chapter must be submitted with your permit application.

* * * * *

(2) *Source water physical data.* The owner or operator of the facility must submit:

(i) A narrative description and scaled drawings showing the physical configuration of all source water bodies used by your facility, including areal dimensions, depths, salinity and temperature regimes, and other documentation that supports your determination of the water body type where each cooling water intake structure is located;

(ii) Identification and characterization of the source waterbody's hydrological and geomorphological features, as well as the methods you used to conduct any physical studies to determine your intake's area of influence within the waterbody and the results of such studies;

(iii) Locational maps; and

* * * * *

(3) *Cooling water intake structure data.* The owner or operator of the facility must submit:

(i) A narrative description of the configuration of each of your cooling water intake structures and where it is located in the water body and in the water column;

(ii) Latitude and longitude in degrees, minutes, and seconds for each of your cooling water intake structures;

(iii) A narrative description of the operation of each of your cooling water intake structures, including design intake flows, daily hours of operation, number of days of the year in operation and seasonal changes, if applicable;

(iv) A flow distribution and water balance diagram that includes all sources of water to the facility, recirculating flows, and discharges; and

(v) Engineering drawings of the cooling water intake structure.

(4) *Source water baseline biological characterization data.* The owner or operator of each facility must submit the following information in order to characterize the biological community in the vicinity of the cooling water intake structure and to characterize the operation of the cooling water intake structures. This supporting information must include any available existing data. However, you may also supplement the data using newly conducted field studies. In the case of a new facility, the Director may also use this information in subsequent permit renewal proceedings to determine if your Design and Construction Technology Plan as required in §125.86(b)(4) of this chapter should be revised. The information you submit must include:

(i) A list of the data in paragraphs (r)(4)(ii) through (vi) of this section that are not available and efforts made to identify sources of the data;

(ii) A list of species (or relevant taxa) for all life stages and their relative abundance in the vicinity of the cooling water intake structure;

(iii) Identification of the species and life stages that would be most susceptible to impingement and entrainment. Species evaluated must include the forage base as well as those most important in terms of significance to commercial and recreational fisheries;

(iv) Identification and evaluation of the primary period of reproduction, larval recruitment, and period of peak abundance for relevant taxa;

(v) Data representative of the seasonal and daily activities (*e.g.,* feeding and water column migration) of biological organisms in the vicinity of the cooling water intake structure;

(vi) Identification of all threatened, endangered, and other protected species that might be susceptible to impingement and entrainment at your cooling water intake structures;

(vii) Documentation of any public participation or consultation with Federal or State agencies undertaken in development of the plan; and

(viii) If you supplement the information requested in paragraph (r)(4)(i) of this section with data collected using field studies, supporting documentation for the Source Water Baseline Biological Characterization must include a description of all methods and quality assurance procedures for sampling, and data analysis including a description of the study area; taxonomic identification of sampled and evaluated biological assemblages (including all life stages of fish and shellfish); and sampling and data analysis methods. The sampling and/or data analysis methods you use must be appropriate for a quantitative survey and based on consideration of methods used in other biological studies performed within the same source water body. The study area should include, at a minimum, the area of influence of the cooling water intake structure.

(ix) Identification of protective measures and stabilization activities that have been implemented, and a description of how these measures and activities affected the baseline water condition in the vicinity of the intake.

(5) *Cooling water system data.* The owner or operator of the facility must provide the following information for each cooling water intake structure used:

(i) A narrative description of the operation of the cooling water system and its relationship to cooling water intake structures; the proportion of the design intake flow that is used in the system including a distribution of water used for contact cooling, non-contact cooling, and process uses; a distribution of water reuse (to include cooling water reused as process water, process water reused for cooling, and the use of gray water for cooling); description of reductions in total water withdrawals including cooling water intake flow reductions already achieved through minimized process water withdrawals; description of any cooling water that is used in a manufacturing process either before or after it is used for cooling, including other recycled process water flows; the proportion of the source waterbody withdrawn (on a monthly basis); the number of days of the year the cooling water system is in operation and seasonal changes in the operation of the system, if applicable;

(ii) Design and engineering calculations prepared by a qualified professional and supporting data to support the description required by paragraph (r)(5)(i) of this section;

(iii) Description of existing impingement and entrainment

technologies or operational measures and a summary of their performance, including but not limited to reductions in entrainment mortality due to intake location and reductions in total water withdrawals and usage.

(6) *Impingement Mortality Reduction Plan.* The Impingement Mortality Reduction Plan must identify the approach the owner or operator of the facility will use to meet the BTA standards for impingement mortality at 40 CFR 125.94(b), including:

(i) Identification of the method of intended compliance with the BTA standards for impingement mortality for each intake by either conducting a direct measure of impingement mortality through sampling, by demonstrating that the maximum design intake velocity is equal to or less than 0.5 feet per second, or by measuring the intake velocity and demonstrating that the actual intake velocity is equal to or less than 0.5 feet per second.

(ii) If you plan to comply with the BTA standards for impingement mortality requirements by conducting a direct measure of impingement mortality through sampling, you must provide a description of the study area including the area of influence of each cooling water intake structure and a taxonomic identification of the sampled or evaluated biological assemblages including all life stages of fish and shellfish that may be susceptible to impingement.

(iii) If you plan to comply with the BTA standards for impingement mortality requirements by conducting a direct measure of impingement mortality through sampling, you must also provide a description of any sampling or monitoring approach to be used in measuring impingement mortality, including:

(A) The duration and frequency of monitoring, subject to the minimum monitoring requirements established by the Director under 40 CFR 125.96 but in no case less frequently than a biweekly basis;

(B) The monitoring locations;

(C) The organisms to be monitored, and

(D) The method in which naturally moribund organisms are identified and taken into account.

(iv) If you plan to comply with the BTA standards for impingement mortality requirements by demonstrating that the design intake velocity is equal to or less than 0.5 feet per second, documentation including:

(A) A demonstration that the maximum design intake velocity is equal to or less than 0.5 feet per second;

(B) A description of technologies or operational measures to keep any debris from blocking the intake at no more than 15 percent of the opening of the intake; and

(C) A description of technologies or operational measures to prevent entrapment of fish or shellfish by the cooling water intake system.

(v) If you plan to comply with the BTA standards for impingement mortality by measuring the intake velocity to demonstrate the intake velocity is equal to or less than 0.5 feet per second, documentation including:

(A) Velocity monitoring to demonstrate that the actual intake velocity is equal to or less than 0.5 feet per second;

(B) Documentation of the technologies and operational measures taken to ensure the actual intake velocity will not exceed 0.5 feet per second; and,

(C) A description of technologies or operational measures to prevent entrapment of impingeable fish or shellfish by the cooling water intake system.

(vi) For intakes that withdraw from oceans and tidal waters, a description of the measures and technologies to reduce impingement mortality of shellfish to a level comparable to that achieved by properly deployed and maintained barrier nets, including but not limited to cylindrical wedgewire screens, seasonal deployment of barrier nets, intake location, and/or an appropriate handling and return system.

(vii) You must demonstrate that the cooling water intake structure does not lead to entrapment. This demonstration must include documentation that organisms are excluded from entering any portion of the intake where there is not an opportunity for them to escape. If your cooling water intake structure results in entrapment and the only way for fish to escape is by being impinged upon the screens or to pass through the facility (in the case of open intakes), you must document that additional protective measures will be deployed such as, for example, modification of traveling screens with collection buckets designed to minimize turbulence to aquatic life, addition of a guard rail or barrier to prevent loss of fish from the collection bucket, replacement of screen panel materials with smooth woven mesh, a low pressure wash to remove fish prior to any high pressure spray to remove debris on the ascending side, and a fish return with adequate flow to ensure fish return to the source water body. If you cannot document these additional protective measures, you must count all entrapment of organisms as mortality.

(viii) Documentation of all methods and quality assurance/quality control procedures for sampling and data analysis. The proposed sampling and data analysis methods must be appropriate for a quantitative survey.

(7) *Performance studies.* If the owner or operator has conducted studies, or chooses to use previously conducted studies obtained from other facilities, you must submit a description of those biological survival studies conducted, together with underlying data, and a summary of any conclusions or results, including but not limited to:

(i) Site-specific studies addressing technology efficacy, through-plant entrainment survival, and other impingement and entrainment mortality studies;

(ii) Studies conducted at other locations including an explanation as to why the data from other locations is relevant and representative of conditions at your facility;

(iii) Studies older than 10 years must include an explanation of why the data is still relevant and representative of conditions at your facility.

(8) *Operational status.* The owner or operator of the facility must submit a description of its operational status for each generating, production, or process unit, including but not limited to:

(i) Descriptions of individual unit operating status including age of each unit, capacity utilization (or equivalent) for the previous 5 years, and any major upgrades completed within the last 15 years, including but not limited to boiler replacement, condenser replacement, turbine replacement, or changes to fuel type;

(ii) Descriptions of completed, approved, or scheduled uprates and NRC relicensing status of each unit at nuclear facilities;

(iii) Descriptions of plans or schedules for decommissioning or replacement of units;

(iv) Descriptions of current and future production schedules at manufacturing facilities; and

(v) Descriptions of plans or schedules for any new units planned within the next 5 years.

(9) *Entrainment characterization study.* For all species and life stages identified under the requirements of paragraph (r)(4) of this section, the owner or operator of the facility must:

(i) Develop and submit an entrainment mortality data collection plan for review and comment by the Director. The entrainment mortality data collection plan must include, at a minimum:

(A) The duration and frequency of monitoring;

(B) The monitoring locations, including a description of the study area and the area of influence of the cooling water intake structure(s);

(C) A taxonomic identification of the sampled or evaluated biological assemblages;

(D) Identification of all life stages of fish and shellfish, including identification of any surrogate life stages used, and identification of data representing both motile and non-motile life-stages of organisms;

(E) The organisms to be monitored, including species of concern and threatened or endangered species;

(F) Any other organisms identified by the Director;

(G) The method by which latent mortality would be identified;

(H) Documentation of all methods and quality assurance/quality control procedures for sampling and data analysis. The proposed sampling and data analysis methods must be appropriate for a quantitative survey.

(ii) Obtain peer review of the entrainment mortality data collection plan. You must select peer reviewers in consultation with the Director, including that the Director may require additional peer reviewers. The Director may consult with EPA and Federal, State and Tribal fish and wildlife management agencies with responsibility for fish and wildlife potentially affected by the cooling water intake structure(s) to determine which peer review comments must be addressed by the final plan. You must provide an explanation for any significant reviewer comments not accepted. Peer reviewers must have appropriate qualifications in biology, engineering, hydrology, or other fields and their names and credentials must be included in the peer review report.

(iii) Implement the entrainment mortality data collection plan no later than 6 months after submission of the entrainment mortality data collection plan to the Director.

(iv) The Entrainment Characterization Study must include all of the following components:

(A) Taxonomic identifications of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal Law (including threatened or endangered species) that are in the vicinity of the cooling water intake structure(s) and are susceptible to entrainment;

(B) Characterization of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal Law (including threatened or endangered species), including a description of the abundance and temporal and spatial characteristics in the vicinity of the cooling water intake structure(s), based on sufficient data to characterize annual, seasonal, and diel variations in entrainment, and including but not limited to variations related to climate and weather differences, spawning, feeding and water column migration. These may include historical data that are representative of the current operation of your facility and of biological conditions at the site; and,

(C) Documentation of the current entrainment of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal Law (including threatened or endangered species). The documentation may include historical data that are representative of the current operation of your facility and of biological conditions at the site. Entrainment samples to support the facility's calculations must be collected during periods of representative operational flows for the cooling water intake structure and the flows associated with the samples must be documented. Data for specific organism mortality or survival that is applied to other life-stages or species must be identified. The owner or operator of the facility must identify and document all assumptions and calculations used to determine the total entrainment and entrainment mortality for that facility.

(D) Information collected to meet paragraphs (r)(4) and (r)(7) of this section may be used in developing the Entrainment Characterization Study.

(10) *Comprehensive technical feasibility and cost evaluation study.* The owner or operator of the facility must submit an engineering study of the technical feasibility and incremental costs of candidate entrainment mortality control technologies. The study must include the following:

(i) *Technical feasibility.* At a minimum, the owner or operator of the facility must conduct a study to evaluate the technical feasibility of closed-cycle recirculating systems (cooling towers) and fine mesh screens with a mesh size of 2mm or smaller. This study must include:

(A) A description of all technologies and operational measures considered (including alternative designs of closed-cycle recirculating systems—such as natural draft cooling towers, mechanical draft cooling towers, hybrid designs, and compact or multi-cell arrangements);

(B) A discussion of land availability, including an evaluation of adjacent land and acres potentially available due to generating unit retirements, production unit retirements, other buildings and equipment retirements, and ponds, coal piles, rail yards, transmission yards, and parking lots, and

(C) Documentation of factors other than cost that may make a candidate technology impractical or infeasible for further evaluation.

(ii) *Other entrainment mortality control technologies.* Following submission of the engineering study, the Director may require evaluation of additional technologies for reducing entrainment mortality.

(iii) *Cost evaluations.* The study must include engineering cost estimates of all technologies considered in paragraphs (r)(10)(i) and (ii) of this section. All costs must be presented as the net present value (NPV) of the social costs and the corresponding annual value. In addition to the required social costs, you may choose to provide facility level compliance costs, however you must separately discuss facility level compliance costs and social costs. You must discuss and provide documentation for:

(A) Any outages, downtime, or other impacts to facility revenue. Depreciation schedules, interest rates and related assumptions must be identified.

(B) Costs and explanation of any additional facility modifications necessary to support construction and operation of technologies considered in paragraphs (r)(10)(i) and (ii) of this section, including but not limited to relocation of existing buildings or equipment, reinforcement or upgrading of existing equipment, and additional construction and operating permits. Depreciation schedules, interest rates, useful life of the technology considered, and any related assumptions must be identified.

(C) Costs and explanation for addressing any non-water quality impacts identified in paragraph (r)(12) of this section. The cost evaluation must include a discussion of all reasonable attempts to mitigate each of these impacts.

(iv) *Peer review.* Obtain peer review of the comprehensive technical feasibility and cost evaluation study. You must select peer reviewers in consultation with the Director, including that the Director may require additional peer reviewers. The Director may consult with EPA and Federal, State and Tribal fish and wildlife management agencies with responsibility for fish and wildlife potentially affected by the cooling water intake structure(s) to determine which peer review comments must be addressed by the final study. You must provide an explanation for any significant reviewer comments not accepted. Peer reviewers must have

appropriate qualifications in biology, engineering, hydrology, or other fields and their names and credentials must be included in the peer review report.

(11) *Benefits valuation study.* The owner or operator of the facility must submit an evaluation of the magnitude of water quality benefits, both monetized and non-monetized, of the candidate entrainment mortality reduction technologies and operational measures evaluated in paragraph (r)(10) of this section, including but not limited to:

(i) Incremental changes in the numbers of fish and shellfish, for all life stages, lost due to impingement mortality and entrainment mortality as defined in 40 CFR 125.92;

(ii) Identification of basis for any monetized values you assigned to changes in commercial and recreational species, forage fish, and shellfish, and to any other ecosystem or non-use benefits;

(iii) Discussion of recent mitigation efforts already completed;

(iv) Identification of other benefits to the environment and local communities, including but not limited to improvements for mammals, birds, and other organisms and aquatic habitats.

(v) Peer review. Obtain peer review of the benefits valuation study. You must select peer reviewers in consultation with the Director, including that the Director may require additional peer reviewers. The Director may consult with EPA and Federal, State and Tribal fish and wildlife management agencies with responsibility for fish and wildlife potentially affected by the cooling water intake structure(s) to determine which peer review comments must be addressed by the final study. You must provide an explanation for any significant reviewer comments not accepted. Peer reviewers must have appropriate qualifications in biology, engineering, hydrology, or other fields and their names and credentials must be included in the peer review report.

(12) *Non-water Quality and Other Environmental Impacts Study.* The owner or operator of the facility must submit a detailed site-specific discussion of the changes in non-water quality factors and other environmental impacts attributed to each technology and operational measure considered in paragraph (r)(10) of this section, including but not limited to both increases and decreases of each factor. The study must include the following:

(i) Estimates of changes to energy consumption, including but not limited to parasitic load and turbine backpressure energy penalties;

(ii) Estimates of changes to thermal discharges, including an estimate of any increased facility capacity, operations, and reliability that may be possible due to relaxed permitting constraints related to thermal discharges;

(iii) Estimates of air pollutant emissions and of the human health and environmental impacts associated with such emissions;

(iv) Estimates of changes in noise;

(v) Discussion of impacts to safety, including documentation of the potential for plumes, icing, and availability of emergency cooling water;

(vi) Impacts to grid reliability for the facility and for each power generating unit, including an estimate of changes to facility capacity, operations, and reliability due to cooling water availability;

(vii) Facility reliability, including but not limited to facility availability, production of steam, and impacts to production based on process unit heating or cooling;

(viii) Significant changes in consumption of water, including a site-specific comparison of the evaporative losses of both once-through cooling and closed cycle recirculating systems, and documentation of impacts attributable to changes in water consumption;

(ix) A discussion of all reasonable attempts to mitigate each of these factors.

(x) Peer review. Obtain peer review of the non-water quality and other environmental impacts study. You must select peer reviewers in consultation with the Director, including that the Director may require additional peer reviewers. The Director may consult with EPA and Federal, State and Tribal fish and wildlife management agencies with responsibility for fish and wildlife potentially affected by the cooling water intake structure(s) to determine which peer review comments must be addressed by the final study. You must provide an explanation for any significant reviewer comments not accepted. Peer reviewers must have appropriate qualifications in biology, engineering, hydrology, or other fields and their names and credentials must be included in the peer review report.

PART 125—CRITERIA AND STANDARDS FOR THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

4. The authority citation for part 125 continues to read as follows:

Authority: Clean Water Act, 33 U.S.C. 1251 *et seq.;* unless otherwise noted.

Subpart I—[Amended]

5. Section 125.84 is amended as follows:

a. In the heading of paragraph (c) by removing the words "equal to or greater than 2 MGD" and adding in their place the words "greater than 2 MGD."

b. By revising paragraph (d)(1).

§125.84 As an owner or operator of a new facility, what must I do to comply with this subpart?

* * * * *

(d) * * *

(1) You must demonstrate to the Director that the technologies employed will reduce the level of adverse environmental impact from your cooling water intake structures to a comparable level to that which you would achieve were you to implement the requirements of paragraphs (b)(1) and (2) of this section. This demonstration must include a showing that the impacts to fish and shellfish, including important forage and predator species, within the watershed will be comparable to those which would result if you were to implement the requirements of paragraphs (b)(1) and (2) of this section. The Director may consider information provided by any fishery management agency(ies) along with data and information from other sources.

* * * * *

6. Section 125.86 is amended as follows:

a. Revise paragraph (b)(3) introductory text.

b. Revise paragraph (b)(4)(iii).

b. Remove and reserve paragraph (c)(2)(iv)(C).

c. Remove and reserve paragraph (c)(2)(iv)(D)(2).

§125.86 As an owner or operator of a new facility, what must I collect and submit when I apply for my new or reissued NPDES permit?

* * * * *

(b) * * *

(3) *Source waterbody flow information.* You must submit to the Director the following information to demonstrate that your cooling water intake structure meets the flow requirements in §125.84(b)(3) or (c)(2).

* * * * *

(4) * * *

(iii) The owner or operator of a new facility required to install design and construction technologies and/or operational measures must develop a plan explaining the technologies and measures selected that is based on information collected for the Source Water Biological Baseline Characterization required by 40 CFR 122.21(r)(4). (Examples of appropriate technologies include, but are not limited to, wedgewire screens, fine mesh

screens, fish handling and return systems, barrier nets, aquatic filter barrier systems, etc. Examples of appropriate operational measures include, but are not limited to, seasonal shutdowns or reductions in flow, continuous operations of screens, etc.) The plan must contain the following information:

* * * * *

7. Section 125.87 is amended by revising paragraph (a) introductory text and paragraph (a)(2) to read as follows:

§125.87 As an owner or operator of a new facility, must I perform monitoring?

* * * * *

(a) *Biological monitoring.* You must monitor both impingement and entrainment of the commercial, recreational, and forage base fish and shellfish species identified in either the Source Water Baseline Biological Characterization data required by 40 CFR 122.21(r)(4) or the Comprehensive Demonstration Study required by §125.86(c)(2), depending on whether you chose to comply with Track I or Track II. The monitoring methods used must be consistent with those used for the Source Water Baseline Biological Characterization data required in 40 CFR 122.21(r)(4) or the Comprehensive Demonstration Study required by §125.86(c)(2). You must follow the monitoring frequencies identified below for at least two (2) years after the initial permit issuance. After that time, the Director may approve a request for less frequent sampling in the remaining years of the permit term and when the permit is reissued, if the Director determines the supporting data show that less frequent monitoring would still allow for the detection of any seasonal and daily variations in the species and numbers of individuals that are impinged or entrained.

* * * * *

(2) *Entrainment sampling.* You must collect samples at least biweekly to monitor entrainment rates (simple enumeration) for each species over a 24-hour period during the primary period of reproduction, larval recruitment, and peak abundance identified during the Source Water Baseline Biological Characterization required by 40 CFR 122.21(r)(4) or the Comprehensive Demonstration Study required in §125.86(c)(2). You must collect samples only when the cooling water intake structure is in operation.

* * * * *

8. Section 125.89 is amended by revising paragraph (b)(1)(ii) to read as follows:

§125.89 As the Director, what must I do to comply with the requirements of this subpart?

* * * * *

(b) * * *

(1) * * *

(ii) For a facility that chooses Track II, you must review the information submitted with the Comprehensive Demonstration Study required in §125.86(c)(2), evaluate the suitability of the proposed design and construction technologies and operational measures to determine whether they will reduce both impingement mortality and entrainment of all life stages of fish and shellfish to 90 percent or greater of the reduction that could be achieved through Track I. In addition, you must review the Verification Monitoring Plan in §125.86(c)(2)(iv)(D) and require that the proposed monitoring begin at the start of operations of the cooling water intake structure and continue for a sufficient period of time to demonstrate that the technologies and operational measures meet the requirements in §125.84(d)(1). Under subsequent permits, the Director must review the performance of the additional and/or different technologies or measures used and determine that they reduce the level of adverse environmental impact from the cooling water intake structures to a comparable level that the facility would achieve were it to implement the requirements of §125.84(b)(1) and (2).

* * * * *

9. The suspension of 40 CFR 125.90(a), (c), and (d), published on July 9, 2007 (72 FR 37109) is lifted.

10. The suspension of 40 CFR 125.91 through 125.99, published on July 9, 2007 (72 FR 37109) is lifted.

11. Subpart J to part 125 is revised to read as follows:

Subpart J—Requirements Applicable to Cooling Water Intake Structures for Existing Facilities Under Section 316(b) of the Clean Water Act

Sec.

125.90 Purpose of this subpart.
125.91 Applicability.
125.92 Special definitions.
125.93 Compliance.
125.94 As an owner or operator of an existing facility, what must I do to comply with this subpart?
125.95 Permit application and supporting information requirements.
125.96 Monitoring requirements.
125.97 Other permit reporting and recordkeeping requirements.
125.98 Director requirements.
125.99 [Reserved]

Subpart J—Requirements Applicable to Cooling Water Intake Structures for Existing Facilities Under Section 316(b) of the Clean Water Act

§125.90 Purpose of this subpart.

(a) This subpart establishes the section 316(b) requirements that apply to cooling water intake structures at existing facilities that are subject to this subpart. These requirements include a number of components. These include standards for minimizing adverse environmental impact associated with the use of cooling water intake structures and required procedures (*e.g.,* permit application requirements, information submission requirements) for establishing the appropriate technology requirements at certain specified facilities as well as required monitoring, reporting, and recordkeeping requirements to demonstrate compliance. In combination, these components represent the best technology available for minimizing adverse environmental impact associated with the use of cooling water intake structures. These requirements are to be established and implemented in National Pollutant Discharge Elimination System (NPDES) permits issued under authority of sections 301, 308, and 402 of the Clean Water Act (CWA).

(b) Cooling water intake structures not subject to requirements under this or another subpart of this part must meet requirements under section 316(b) of the CWA established by the Director on a case-by-case, best professional judgment (BPJ) basis.

(c) Nothing in this subpart shall be construed to preclude or deny the right of any State or political subdivision of a State or any interstate agency under section 510 of the CWA to adopt or enforce any requirement with respect to control or abatement of pollution that is more stringent than those required by Federal law.

§125.91 Applicability.

(a) An existing facility, as defined in §125.92, is subject to this subpart if it meets each of the following criteria:

(1) It is a point source;

(2) It uses or proposes to use cooling water intake structures with a total design intake flow (DIF) of greater than 2 million gallons per day (MGD) to withdraw water from waters of the United States; and

(3) Twenty-five percent or more of the water it withdraws is used exclusively for cooling purposes, measured on an average annual basis for each calendar year.

(b) Use of a cooling water intake structure includes obtaining cooling water by any sort of contract or arrangement with one or more independent suppliers of cooling water if the independent supplier withdraws water from waters of the United States but is not itself a new or existing facility as defined in subparts I or J of this part, except as provided in paragraph (d) of this section. An owner or operator of an existing facility may not circumvent these requirements by creating arrangements to receive cooling water from an entity that is not itself a facility subject to subparts I or J of this part.

(c) Notwithstanding paragraph (b) of this section, obtaining cooling water from a public water system, using reclaimed water from wastewater treatment facilities or desalination plants, or recycling treated effluent as cooling water does not constitute use of a cooling water intake structure for purposes of this subpart.

(d) This subpart does not apply to seafood processing facilities, offshore liquefied natural gas terminals, and offshore oil and gas extraction facilities that are existing facilities as defined in §125.92. The owners and operators of such facilities must meet requirements established by the Director on a case-by-case, best professional judgment (BPJ) basis.

§125.92 Special definitions.

In addition to the definitions provided in §122.2 of this chapter, the following special definitions apply to this subpart:

Actual Intake Flow (AIF) means the average volume of water withdrawn on an annual basis by the cooling water intake structures over the past three calendar years.

All life stages means eggs, larvae, juveniles, and adults. All life stages of fish and shellfish does not include members of the infraclass Cirripedia in the subphylum Crustacea (barnacles), green mussels (*Perna viridis*), or zebra mussels (*Dreissena polymorpha).* The Director may determine that all life stages of fish and shellfish does not include specified invasive species and naturally moribund species.

Closed-cycle recirculating system means a system designed, using minimized make-up and blowdown flows, to withdraw water from a natural or other water source to support contact or noncontact cooling uses within a facility, or a system designed to include cooling ponds that are not themselves a waters of the U.S. and that does not rely upon continuous intake flows of water. New source water (make-up water) is added to the system to replenish losses that have occurred due to blowdown, drift, and evaporation. *Closed-cycle recirculating system* includes, but is not limited to, wet or dry cooling towers. For cooling towers where the source for make-up water is freshwater or has a salinity equal to or less than 0.5 parts per thousand, minimized make-up and blow down means operating at a minimum cycles of concentration of 3.0. For cooling towers where the source for make-up water is saltwater, brackish water, or has a salinity of greater than 0.5 parts per thousand, minimized make-up and blow down means operating at a minimum cycles of concentration of 1.5. For facilities with a closed-cycle recirculating system other than a cooling tower, minimized make-up and blowdown flows means a reduction in actual intake flow of 97.5 percent for freshwater, and 94.9 percent for salt water or brackish water.

Contact cooling water means water used for cooling which comes into direct contact with any raw material, product, or byproduct. Examples of contact cooling water may include but are not limited to quench water at iron and steel plants, cooling water in a cracking unit, and cooling water directly added to food and agricultural products processing.

Cooling pond means a man-made canal, channel, lake, pond or other impoundment designed and constructed to provide cooling for a nearby electric generating or manufacturing unit. A cooling pond may comprise a closed-cycle recirculating system when waters of the U.S. are withdrawn only for the purpose of replenishing losses of cooling water due to blowdown, drift, and evaporation.

Cooling water means water used for contact or noncontact cooling, including water used for equipment cooling, evaporative cooling tower makeup, and dilution of effluent heat content. The intended use of the cooling water is to absorb waste heat rejected from the process or processes used, or from auxiliary operations on the facility's premises. Cooling water obtained from a public water system, reclaimed water from wastewater treatment facilities or desalination plants, treated effluent from a manufacturing facility, or cooling water that is used in a manufacturing process either before or after it is used for cooling as process water, is not considered cooling water for the purposes of calculating the percentage of a facility's intake flow that is used for cooling purposes in §125.91(a)(3).

Cooling water intake structure means the total physical structure and any associated constructed waterways used to withdraw cooling water from waters of the United States. The cooling water intake structure extends from the point at which water is withdrawn from the surface water source up to, and including, but not limited to, the intake pumps.

Design intake flow (DIF) means the value assigned during the cooling water intake structure design to the maximum volume of water the cooling water intake system is capable of withdrawing from a source waterbody over a specific time period. The facility's DIF may be adjusted to reflect permanent changes to the maximum capabilities of the cooling water intake system to withdraw cooling water, including but not limited to pumps permanently removed from service, flow limit devices, and physical limitations of the piping. DIF does not include values associated with emergency and fire suppression capacity or redundant pumps (*i.e.,* back-up pumps).

Entrainment means the incorporation of any life stages of fish and shellfish with the intake water flow entering and passing through a cooling water intake structure and into a cooling water system. Entrainable organisms includes any organisms potentially subject to *entrainment.* For purposes of this subpart, *entrainment* includes those organisms that pass through a 3/8 inch sieve, and excludes those organisms collected or retained on a 3/8 inch sieve.

Entrainment mortality means death as a result of entrainment through the cooling water intake structure, or death as a result of exclusion from the cooling water intake structure by fine mesh screens or other protective devices intended to prevent the passage of entrainable organisms through the cooling water intake structure.

Entrapment means the condition where impingeable fish and shellfish lack the means to escape the cooling water intake system. Entrapment includes but is not limited to: organisms caught in the bucket of a traveling screen and unable to reach a fish return; organisms caught in the forebay of a cooling water intake system without any means of being returned to the source waterbody without experiencing mortality; or cooling water intake systems where the velocities in the intake pipes or in any channels leading to the forebay prevent organisms from being able to return to the source waterbody through the intake pipe or channel.

Existing facility means any facility that commenced construction as described in 40 CFR 122.29(b)(4) on or before January 17, 2002; and any modification of, or any addition of a

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unit at such a facility that is not a new facility at §125.83.

Flow reduction means any modification that serves to reduce the volume of cooling water withdrawn. Examples include, but are not limited to, variable speed pumps, seasonal flow reductions, wet cooling towers, dry cooling towers, hybrid cooling towers, and unit closures.

Impingement means the entrapment of any life stages of fish and shellfish on the outer part of an intake structure or against a screening device during periods of intake water withdrawal. *Impingement* includes those organisms collected or retained on a ¾ inch sieve, and excludes those organisms that pass through a ¾ inch sieve.

Impingement mortality means death as a result of impingement.

Independent supplier means an entity, other than the regulated facility, that owns and operates its own cooling water intake structure and directly withdraws water from waters of the United States. The supplier provides the cooling water to other facilities for their use, but may also use a portion of the water itself. An entity that provides potable water to residential populations (*e.g.,* public water system) is not a supplier for purposes of this subpart.

Moribund means dying; close to death.

New unit means any addition of an operating unit at an existing facility where the construction begins after [effective date of the final rule], including but not limited to a new unit added to a new or existing facility for the same general industrial operation, but that does not otherwise meet the definition of a new facility at §125.83. *New unit* includes any additional unit where that unit is not subject to the requirements of Subpart I. For purposes of this subpart, new unit refers to newly built units added to increase capacity at the facility and does not include any rebuilt, repowered or replacement unit, including any units where the generation capacity of the new unit is equal to or greater than the unit it replaces.

Operational measure means a modification to any operation that serves to minimize impact to all life stages of fish and shellfish from the cooling water intake structure. Examples of operational measures include, but are not limited to, more frequent rotation of traveling screens, use of a low pressure wash to remove fish prior to any high pressure spray to remove debris on the ascending side of a traveling screen, maintaining adequate volume of water in a fish return, and debris minimization measures such as air sparging of intake screens and/or other measures taken to maintain the design intake velocity.

§125.93 Compliance.

(a) The owner or operator of a facility subject to this subpart must comply with the applicable BTA standards for impingement mortality in §125.94(b) as soon as possible based on the schedule of requirements set by the Director, but in no event later than [date 8 years after the effective date of the final rule].

(b) The owner or operator of a facility subject to this subpart must comply with the applicable BTA standards for entrainment mortality in §125.94(c) as soon as possible, based on the schedule of requirements set by the Director.

(c) The owner or operator of an existing facility subject to this subpart that commences construction of a new unit after [effective date of the final rule] must comply with the BTA standards with respect to the new unit in §125.94(b) and §125.94(d) upon commencement of the new unit's operation. With respect to the existing units at the existing facility, the owner or operator must comply with paragraphs (a) and (b) of this section.

§125.94 As an owner or operator of an existing facility, what must I do to comply with this subpart?

(a) *Applicable BTA standards.* (1) The owner or operator of an existing facility with a design intake flow (DIF) greater than 2 MGD is subject to the impingement mortality standard under paragraph (b) of this section.

(2) The owner or operator of an existing facility with a design intake flow (DIF) greater than 2 MGD is subject to the BTA standards for entrainment mortality under paragraph (c) of this section. The owner or operator may choose instead to comply with the entrainment mortality standard at paragraph (d) of this section.

(3) New units at an existing facility that are not a new facility under §125.83 and that have a design intake flow (DIF) greater than 2 MGD are subject to the BTA standards for impingement mortality at paragraph (b) of this section and the entrainment mortality standards at paragraph (d) of this section.

(b) BTA Standards for Impingement Mortality. By the dates specified in §125.93, the owner or operator of an existing facility subject to this subpart must achieve the impingement mortality standards provided in paragraphs (b)(1), or (2), of this section:

(1) The owner or operator of an existing facility must:

(i) Achieve the following impingement mortality limitations for all life stages of fish that are collected or retained in a ¾ inch sieve and held for a period of 24 to 48 hours to assess latent mortality. The annual average comprises the average for all measurements taken during the preceding 12-month period. The compliance period for the annual average will be established by the Director.

IMPINGEMENT MORTALITY NOT TO EXCEED

Regulated parameter	Annual average (percent)	Monthly average (percent)
Fish Impingement Mortality	12	31

(ii) The owner or operator of a facility that withdraws water from an ocean or tidal waters must also reduce impingement mortality of shellfish at a minimum to a level comparable to that achieved by properly deployed and maintained barrier nets. Passive screens such as cylindrical wedgewire screens, and through-flow or carry-over free intake screens such as dual-flow screens and drum screens, will meet this requirement.

(iii) The owner or operator of a facility that employs traveling screens or equivalent active screens must:

(A) Count any fish that are included in carryover from a screen or removed from a screen as part of debris removal as fish impingement mortality.

(B) Incorporate protective measures including but not limited to: modified traveling screens with collection buckets designed to minimize turbulence to aquatic life, addition of a guard rail or barrier to prevent loss of fish from the collection bucket,

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replacement of screen panel materials with smooth woven mesh, a low pressure wash to remove fish prior to any high pressure spray to remove debris on the ascending side of the screens, and a fish handling and return system with sufficient water flow to return the fish to the source water in a manner that does not promote predation or re-impingement of the fish.

(iv) The owner or operator of the facility must ensure that there is a means for impingeable fish or shellfish to escape the cooling water intake system or be returned to the waterbody through a fish return system. Passive screens such as cylindrical wedgewire screens, and through-flow or carry-over free intake screens such as dual-flow screens and drum screens, will meet this requirement;

(2) The owner or operator of an existing facility must demonstrate to the Director that its cooling water intake system has a maximum intake velocity of 0.5 feet per second. In addition, you must meet the following criteria:

(i) The maximum velocity must be demonstrated as either the maximum actual intake velocity or the maximum design intake velocity as water passes through the structural components of a screen measured perpendicular to the screen mesh;

(ii) The maximum velocity limit must be achieved under all conditions, including during minimum ambient source water surface elevations (based on BPJ using hydrological data) and during periods of maximum head loss across the screens or other devices during normal operation of the intake structure. If the intake does not have a screen, the maximum intake velocity perpendicular to the opening of the intake must not exceed 0.5 feet per second during minimum ambient source water surface elevations.

(iii) Each intake must be operated and maintained to keep any debris blocking the intake at no more than 15 percent of the opening of the intake. A demonstration that the actual intake velocity is less than 0.5 feet per second through velocity measurements will meet this requirement;

(iv) The owner or operator of a facility that withdraws water from the ocean or tidal waters must also reduce impingement mortality of shellfish at a minimum to a level comparable to that achieved by properly deployed and maintained barrier nets. Passive screens such as cylindrical wedgewire screens, and through-flow or carry-over free intake screens such as dual-flow screens and drum screens, will meet this requirement.

(v) The owner or operator of a facility that employs traveling screens or equivalent active screens must:

(A) Count any fish that are included in carryover from a screen or removed from a screen as part of debris removal as fish impingement mortality.

(B) Incorporate protective measures including but not limited to: modified traveling screens with collection buckets designed to minimize turbulence to aquatic life, addition of a guard rail or barrier to prevent loss of fish from the collection bucket, replacement of screen panel materials with smooth woven mesh, a low pressure wash to remove fish prior to any high pressure spray to remove debris on the ascending side of the screens, and a fish handling and return system with sufficient water flow to return the fish to the source water in a manner that does not promote predation or re-impingement of the fish.

(vi) The owner or operator of the facility must ensure that there is a means for impingeable fish or shellfish to escape the cooling water intake system or be returned to the waterbody through a fish return system. Passive screens such as cylindrical wedgewire screens, and through-flow or carry-over free intake screens such as dual-flow screens and drum screens, will meet this requirement;

(c) *BTA standards for entrainment mortality for existing facilities.* The Director must establish BTA standards for entrainment mortality on a case-by-case basis. These standards must reflect the Director's determination of the maximum reduction in entrainment mortality warranted after consideration of all factors relevant for determining the best technology available at each facility, including the factors specified in §125.98.

(d) *BTA standards for entrainment mortality for new units at existing facilities.* The owner or operator of a new unit at an existing facility must achieve the entrainment standards provided in either paragraph (d)(1) or (d)(2) of this section.

(1) The owner or operator of a facility must reduce actual intake flow (AIF) at a new unit, at a minimum, to a level commensurate with that which can be attained by the use of a closed-cycle recirculating system for the same level of cooling. The owner or operator of a facility with a cooling water intake structure that supplies cooling water exclusively for operation of a wet or dry cooling tower(s) and that meets the definition of closed cycle recirculating system at §125.92 meets this entrainment mortality standard.

(2) The owner or operator of a facility must demonstrate to the Director that it has installed, and will operate and maintain, technologies for each intake at the new unit that reduce entrainment mortality of all stages of fish and shellfish that pass through a ¾ inch sieve. The owner or operator of a facility must demonstrate entrainment mortality reductions equivalent to 90 percent or greater of the reduction that could be achieved through compliance with paragraph (d)(1) of this section.

(3) This standard does not apply to:

(i) Process water, gray water, waste water, reclaimed water, or other waters reused as cooling water in lieu of water obtained by marine, estuarine, or freshwater intakes;

(ii) Cooling water used by manufacturing facilities for contact cooling purposes;

(iii) Portions of those water withdrawals for auxiliary plant cooling uses totaling less than two MGD;

(iv) Any volume of cooling water withdrawals used exclusively for make-up water at existing closed-cycle recirculating systems. For facilities with a combination of closed-cycle recirculating systems and other cooling water systems the entrainment mortality standard does not apply to that portion of cooling water withdrawn as make-up water for the closed-cycle recirculating system;

(v) Any quantity of emergency back-up water flows.

(4) The Director may establish alternative requirements if:

(i) The data specific to the facility indicate that compliance with the requirements of paragraphs (d)(1) or (2) of this section for the new unit would result in compliance costs wholly out of proportion to the costs EPA considered in establishing the requirements at issue or would result in significant adverse impacts on local air quality, significant adverse impacts on local water resources other than impingement or entrainment, or significant adverse impacts on local energy markets;

(ii) The alternative requirements must achieve a level of performance as close as practicable to the requirements of paragraphs (d)(1) or (2) of this section;

(iii) The alternative requirements will ensure compliance with other applicable provisions of the Clean Water Act and any applicable requirement of state law;

(iv) The burden is on the owner or operator of the facility requesting the alternative requirement to demonstrate that alternative requirements should be authorized for the new unit.

(5) For cooling water flows specified in paragraph (d) of this section that are

not subject to this standard, the Director may establish additional BTA standards for entrainment mortality on a case by case basis.

(e) *Nuclear facilities.* If the owner or operator of a nuclear facility demonstrates to the Director, upon the Director's consultation with the Nuclear Regulatory Commission, that compliance with this subpart would result in a conflict with a safety requirement established by the Commission, the Director must make a site-specific determination of best technology available for minimizing adverse environmental impact that would not result in a conflict with the Commission's safety requirement.

(f) *More stringent standards.* The Director may establish more stringent requirements as best technology available for minimizing adverse environmental impact if the Director determines that your compliance with the applicable requirements of this section would not meet the requirements of applicable State and Tribal law, or other Federal law.

(g) The owner or operator of a facility subject to this subpart must:

(1) Submit and retain permit application and supporting information as specified in §125.95;

(2) Conduct compliance monitoring as specified in §125.96; and

(3) Report information and data and keep records as specified in §125.97.

§125.95 Permit application and supporting information requirements.

(a) The Director may waive some or all of the information requirements of 40 CFR 122.21(r)(8), (9), (10), (11), and (12) in the first permit application submitted after [effective date of the final rule] if:

(1) The Director has already made a BTA determination requiring operation commensurate with a closed-cycle recirculating system;

(2) The owner or operator of the facility uses cooling water exclusively for operation of a wet or dry cooling system that meets the definition of closed cycle recirculating system at 40 CFR 125.92; or

(3) The Director determines substantially all of the information requirements specified at 40 CFR 122.21(r)(8), (9), (10), (11), and (12) have already been submitted by the owner or operator.

(b) *Permit application submittal timeframe for existing facilities.* The owner or operator of a facility subject to this subpart must submit to the Director the following according the following schedule:

(1) For existing power producers with a DIF of 50 MGD or above:

(i) Information required in 40 CFR 122.21(r)(2), (r)(3), (r)(4), (r)(5), (r)(6), (r)(7), and (r)(8) must be submitted to the Director no later than six months after [effective date of the final rule].

(ii) Results of the Impingement Mortality Reduction Plan as required in 40 CFR 122.21(r)(6) must be submitted to the Director no later than 3 years and six months after [effective date of the final rule].

(2) For existing power producers with an AIF of greater than 125 MGD:

(i) Information required in 40 CFR 122.21(r)(9)(i), including the Entrainment Mortality Data Collection Plan with peer reviewers identified must be submitted to the Director no later than six months after [effective date of the final rule].

(ii) Information required in 40 CFR 122.21(r)(9)(ii), including the peer reviewed Entrainment Mortality Data Collection Plan, must be submitted to the Director no later than 12 months after [effective date of the final rule].

(iii) Information required in 40 CFR 122.21(r)(9)(iii), including the completed Entrainment Characterization Study, must be submitted to the Director no later than 4 years after [effective date of the final rule].

(iv) Information required in 40 CFR 122.21(r)(10), including the Comprehensive Technical Feasibility and Cost Evaluation Study, 40 CFR 122.21(r)(11), including the Benefits Valuation Study, and 40 CFR 122.21(r)(12), including the Non-water Quality and Other Environmental Impacts Study, must be submitted to the Director no later than 5 years after [effective date of the final rule].

(3) For the owner or operator of all other existing facilities subject to this subpart, with the exception of those facilities identified in §125.95(b):

(i) Information required in 40 CFR 122.21(r)(2), (r)(3), (r)(4), (r)(5), (r)(6), (r)(7), and (r)(8) must be submitted to the Director no later than three years after [effective date of the final rule].

(ii) Results of the Impingement Mortality Reduction Plan as required in 40 CFR 122.21(r)(6) must be submitted to the Director no later than 6 years after [effective date of the final rule].

(4) For the owner or operator of all other existing facilities subject to this subpart with an actual intake flow (AIF) of greater than 125 MGD, with the exception of those facilities identified in §125.95(b)(2):

(i) Information required in 40 CFR 122.21(r)(9)(i), including the Entrainment Mortality Data Collection Plan, with peer reviewers identified, must be submitted to the Director no later than three years after [effective date of the final rule].

(ii) Information required in 40 CFR 122.21(r)(9)(ii), including the peer reviewed Entrainment Mortality Data Collection Plan, must be submitted to the Director no later than three years and six months after [effective date of the final rule].

(iii) Information required in 40 CFR 122.21(r)(9)(iii), including the completed Entrainment Characterization Study, must be submitted to the Director no later than 6 years and six months after [effective date of the final rule].

(iv) Information required in 40 CFR 122.21(r)(10), including the Comprehensive Technical Feasibility and Cost Evaluation Study, 40 CFR 122.21(r)(11), including the Benefits Valuation Study, and 40 CFR 122.21(r)(12), including the Non-water Quality and Other Environmental Impacts Study, must be submitted to the Director no later than 7 years and six months after [effective date of the final rule].

(c) *Permit application submittal timeframe for new units.* For the owner or operator of any new units at existing facilities subject to this subpart:

(1) Information required in 40 CFR 122.21(r)(2), (r)(3), r(4)and (r)(6) specific to the new unit must be submitted to the Director 6 months prior to the commencement of operation of the new unit.

(2) *Application requirements.* To demonstrate compliance of the new unit with requirements in §125.94(b) and (d), you must collect and submit to the Director the information in paragraphs (c)(2)(i), (ii), (iii) and (iv) of this section 6 months prior to the start of facility operations.

(i) *Impingement information.* If you choose to comply with the impingement mortality requirements in §125.94(b)(1), you must submit a plan to implement a monitoring program as specified in §125.96(a) upon the start of the new unit operation.

(ii) *Velocity information.* If you choose to comply with the impingement mortality requirements in §125.94(b)(2), you must submit the following information 6 months prior to the start of facility operations:

(A) A narrative description of the design, structure, equipment, and operation used to meet the velocity requirement; and

(B) Design calculations showing that the velocity requirement will be met at minimum ambient source water surface elevations (based on best professional judgment using available hydrological data) and maximum head loss across the screens or other device.

(iii) *Flow reduction information.* If you choose to comply with the flow reduction requirements in §125.94(d)(1), you must submit the following information to the Director to demonstrate that you have reduced your flow to a level commensurate with that which can be attained by a closed-cycle recirculating cooling water system:

(A) A narrative description of your system that has been designed to reduce your intake flow to a level commensurate with that which can be attained by a closed-cycle recirculating cooling water system and any engineering calculations, including documentation demonstrating that your make-up and blowdown flows have been minimized consistent with the definition of closed-cycle recirculating system at §125.92; and

(B) If the flow reduction requirement is met entirely, or in part, by reusing or recycling water withdrawn for cooling purposes in subsequent industrial processes, you must provide documentation that the reused or recycled water, along with other technologies you employ, including additional flow reductions, meets the flow reduction requirement of §125.94(d)(1) or the entrainment mortality reduction requirement of §125.94(d)(2).

(iv) *Comprehensive Demonstration Study.* If you choose to comply with the entrainment mortality requirements in §125.94(d)(2), you must perform and submit the results of a Comprehensive Demonstration Study (Study). This information is required to characterize the source water baseline in the vicinity of the cooling water intake structure(s), characterize operation of the cooling water intake(s), and to confirm that the technology(ies) proposed and/or implemented at your cooling water intake structure reduce the impacts to fish and shellfish to levels comparable to those you would achieve were you to implement the requirements in §125.94(d)(1). To meet the "comparable level" requirement, you must demonstrate that:

(A) You have reduced entrainment mortality of all life stages of fish and shellfish to 90 percent or greater of the reduction that would be achieved through §125.94(d)(1); and

(B) You must develop and submit a plan to the Director containing a proposal for how information will be collected to support the study. The plan must include:

(*1*) A description of the proposed and/or implemented technology(ies) to be evaluated in the Study;

(*2*) A list and description of any historical studies characterizing the physical and biological conditions in the vicinity of the proposed or actual intakes and their relevancy to the proposed Study. If you propose to rely on existing source water body data, it must be no more than 5 years old, you must demonstrate that the existing data are sufficient to develop a scientifically valid estimate of potential entrainment impacts, and provide documentation showing that the data were collected using appropriate quality assurance/quality control procedures;

(*3*) Any public participation or consultation with Federal or State agencies undertaken in developing the plan; and

(*4*) A sampling plan for data that will be collected using actual field studies in the source water body. The sampling plan must document all methods and quality assurance procedures for sampling, and data analysis. The sampling and data analysis methods you propose must be appropriate for a quantitative survey and based on consideration of methods used in other studies performed in the source water body. The sampling plan must include a description of the study area (including the area of influence of the cooling water intake structure and at least 100 meters beyond); taxonomic identification of the sampled or evaluated biological assemblages (including all life stages of fish and shellfish); and sampling and data analysis methods.

(C) You must submit documentation of the results of the Study to the Director. Documentation of the results of the Study must include:

(*1*) *Source Water Biological Study.* If your new unit will use a new cooling water intake structure, you must update your Source Water Biological Study to include:

(*i*) A taxonomic identification and characterization of aquatic biological resources including: a summary of historical and contemporary aquatic biological resources; determination and description of the target populations of concern (those species of fish and shellfish and all life stages that are most susceptible to impingement and entrainment); and a description of the abundance and temporal/spatial characterization of the target populations based on the collection of multiple years of data to capture the seasonal and daily activities (*e.g.,* spawning, feeding and water column migration) of all life stages of fish and shellfish found in the vicinity of the cooling water intake structure;

(*ii*) An identification of all threatened or endangered species that might be susceptible to entrainment by the proposed cooling water intake structure(s); and

(*iii*) A description of additional chemical, water quality, and other anthropogenic stresses on the source waterbody.

(*2*) *Evaluation of potential cooling water intake structure effects.* This evaluation will include:

(*i*) Calculations of the reduction in entrainment mortality of all life stages of fish and shellfish that would need to be achieved by the technologies you have selected to implement to meet requirements under §125.94(d)(1). To do this, you must determine the reduction in entrainment mortality that would be achieved by implementing the requirements of §125.94(d)(1) at your site.

(*ii*) An engineering estimate of efficacy for the proposed and/or implemented technologies used to minimize entrainment mortality of all life stages of fish and shellfish. You must demonstrate that the technologies reduce entrainment mortality of all life stages of fish and shellfish to a comparable level to that which you would achieve were you to implement the requirements in §125.94(d)(1). The efficacy projection must include a site-specific evaluation of technology(ies) suitability for reducing impingement mortality and entrainment based on the results of the Source Water Biological Study of this section. Efficacy estimates may be determined based on case studies that have been conducted in the vicinity of the cooling water intake structure and/or site-specific technology prototype studies.

(*3*) *Verification monitoring plan.* You must include in the Study the following: A plan to conduct, at a minimum, two years of monitoring to verify the full-scale performance of the proposed or implemented technologies, operational measures. The verification study must begin at the start of operations of the cooling water intake structure and continue for a sufficient period of time to demonstrate that the facility is reducing the level of entrainment to the level documented in paragraph (c)(2) of this section. The plan must describe the frequency of monitoring and the parameters to be monitored. The Director will use the verification monitoring to confirm that you are meeting the level of entrainment mortality reduction required in §125.94(d), and that the operation of the technology has been optimized.

(d) After the initial submission of the 40 CFR 122.21(r) application studies, the owner or operator of a facility may, in subsequent permit applications, request to reduce the information

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required, if conditions at the facility and in the waterbody remain substantially unchanged since the previous application so long as the relevant previously submitted information remains representative of current source water, intake structure, cooling water system, and operating conditions. The owner or operator of a facility must submit its request for reduced cooling water intake structure and waterbody application information to the Director at least one year prior to the expiration of its NPDES permit. The owner or operator's request must identify each element in this subsection that it determines has not substantially changed since the previous permit application and the basis for the determination. The Director has the discretion to accept or reject any part of the request.

(e) After issuance of the first permit pursuant to this subpart, the owner or operator of a facility must:

(1) Commence information collection activities pursuant to this subsection no later than eighteen months prior to permit expiration;

(2) Submit all required 40 CFR 122.21(r) application studies, or the reduced permit application studies if approved by the Director under §125.95, to the Director no later than six months prior to permit expiration.

(f) The Director has the discretion to request or determine additional information to supplement the permit application process, including inspection of the facility.

(g) *Permit application records.* The owner or operator of a facility must keep records of all submissions that are part of its permit application for a minimum of 5 years to document compliance with the requirements of this section. If the Director approves a request for reduced permit application studies under §125.95(d), the owner or operator of a facility must keep records of all submissions that are part of the previous permit application for an additional 5 years.

§125.96 Monitoring requirements.

(a) *Monitoring requirements for impingement mortality.* The owner or operator of an existing facility subject to §125.94(b) must monitor as follows:

(1) Permit compliance monitoring is required at each intake, or where appropriate other points of compliance as approved by the Director including but not limited to forebays, barrier nets, or fish handling and return systems, to demonstrate compliance with the impingement mortality limitations listed in §125.94(b).

(2) You must collect samples to monitor impingement rates (simple enumeration) for each species over a 24-hour period and no less than once per month when the cooling water intake structure is in operation.

(3) If the Director has approved a compliance alternative provided under §125.94(b)(2), the monitoring requirement in paragraphs (a)(1) and (a)(2) of this section is waived.

(4) *Compliance monitoring for intake velocity.* If your facility is subject to §125.94(b)(2) and you cannot document a design intake flow for the intake equal to or less than 0.5 feet per second under all conditions, including during minimum ambient source water surface elevations (based on BPJ using hydrological data) and maximum head loss across the screens, compliance monitoring is required to demonstrate the intake velocity is consistent with the requirements of §125.94(b)(2). The frequency of monitoring must be no less than twice per week.

(b) *Monitoring requirements for entrainment mortality for new units.* Monitoring is required to demonstrate compliance with the requirements of §125.94(d).

(1) If you are required to demonstrate flow reductions consistent with the requirements of §125.94(d)(1), the frequency of monitoring must be no less than once per week and must be representative of normal operating conditions. Flow monitoring must include measuring cooling water withdrawals, make-up water, and blowdown volume. The Director may require additional monitoring necessary to demonstrate compliance with §125.94(d).

(2) If you are required to demonstrate reductions consistent with the requirements of §125.94(d)(2), you must monitor entrainable organisms that pass through a 3/8-inch sieve at a proximity to the intake that is representative of the entrainable organisms in the absence of the intake structure. You must also monitor the latent entrainment mortality in front of the intake structure. Mortality after passing the cooling water intake structure must be counted as 100 percent mortality unless you have demonstrated to the approval of the Director that the mortality for each species of concern is less than 100 percent. Samples must be representative of the cooling water intake when the structure is in operation. In addition, sufficient samples must be collected to allow for calculation of annual average entrainment levels of all life stages of fish and shellfish. Specific sampling protocols and frequency of sampling will be determined by the Director. The sampling must measure the total count of entrainable organisms or density of organisms, unless the Director approves of a different metric for such measurements. In addition, you must monitor the AIF for each intake. The AIF must be measured at the same time as the samples of entrainable organisms are collected. The Director may require additional monitoring necessary to demonstrate compliance with §125.94(d).

(c) *Visual or remote inspections.* You must either conduct visual inspections or employ remote monitoring devices during the period the cooling water intake structure is in operation. You must conduct such inspections at least weekly to ensure that any technologies installed to comply with §125.94 are maintained and operated to ensure that they will continue to function as designed. The Director may establish alternative procedures for use during periods of inclement weather.

§125.97 Other permit reporting and recordkeeping requirements.

The owner or operator of an existing facility subject to this subpart is required to submit to the Director the following information:

(a) *Monitoring reports.* You must include the applicable impingement mortality and entrainment mortality monitoring reports with both your Discharge Monitoring Reports (DMRs) (or equivalent State reports) and your permit annual report to the Director.

(1) *Impingement mortality.* If you intend to comply with the Impingement Mortality requirements by biological measurements, your report must describe the compliance measurement location for each intake, the species of concern, the counts and percentage mortality of organisms sampled, the time period for evaluating latent mortality effects, and other information specified in the permit. If you intend to comply with the Impingement Mortality requirements by demonstrating an intake velocity of less than 0.5 feet per second, your report must describe the compliance measurement location for each intake, the method for velocity measurements, the intake velocity measurements and calculations, and other information specified in the permit.

(2) *Impingement mortality compliance monitoring.* Your report must contain impingement mortality compliance monitoring data to document compliance with the requirements of §125.94(b) for each intake. If you intend to comply with the Impingement Mortality requirements by biological measurements, you must also

update and submit your calculated annual average for each month covered by the report. The annual average comprises the average for all measurements taken during the preceding 12-month period.

(3) *Entrainment mortality at existing facilities.* The Director will determine what (if any) other reporting requirements are necessary.

(4) *Entrainment mortality for new units at existing facilities.* The owner or operator of a facility complying with §125.94(d) must describe the compliance measurement location for the facility, the species of concern, the counts and percentage mortality of organisms sampled, and other information specified in the permit.

(5) *Entrainment mortality compliance monitoring for new units at existing facilities.* The owner or operator of a facility must submit monthly reports containing compliance monitoring data to document compliance with the requirements of §125.94(d)(1) or (d)(2).

(i) For compliance with §125.94(d)(1), flow measurements of water withdrawn for make-up and blowdown.

(ii) For compliance with §125.94(d)(2), measurements of entrainment mortality, and your monthly actual intake flow. You must also update and submit your calculated annual average of entrainment mortality. The annual average comprises the average for all measurements taken during the preceding 12-month period.

(b) *Status reports.* If you have a schedule established under §125.93 you must submit a quarterly status report as to the progress of meeting the applicable standards. These reports may include updates on pilot study results, construction schedules, maintenance outages, or other appropriate topics.

(c) *Annual certification statement and report.* You must submit an annual certification statement signed by the responsible corporate officer as defined in 40 CFR 403.12(l) or 40 CFR 122.22. This statement must include, at a minimum the following information:

(1) An annual certification statement which indicates that each technology as approved by the Director is being maintained and operated as set forth in its permit, or a justification to allow modification of the practices listed in the facility's most recent annual certification.

(2) If your facility is subject to BTA standards for impingement mortality or entrainment mortality specified in §124.94(b)(2) or (d)(2), you must include a statement in your annual certification that specifies the information submitted in your most recent annual certification is still valid and appropriate or a justification to allow modification of the practices listed in the most recent annual certification.

(i) If you cannot document that you are operating a closed-cycle recirculating system, you must also submit data and information in the annual certification statement documenting compliance with the requirement in §124.94(d)(1) that flow commensurate with a closed-cycle recirculating system is met.

(ii) If your facility is subject to the Impingement Mortality Standard specified in §125.94(b)(2) and you cannot document a design intake velocity for the intake equal to or less than 0.5 feet per second, you must also submit data and information in the annual certification documenting compliance with the intake velocity requirements.

(3) If the information contained in the previous year's annual certification is still applicable, you may simply state as such in a letter to the Director, and the letter, along with any applicable data submission requirements specified in this section shall constitute the annual certification. However, if you have substantially modified operation of any unit at your facility that impacts cooling water withdrawals or operation of your cooling water intake structures, you must submit revisions to the information required in the permit application.

(d) *Permit reporting records retention.* You must keep records of all submissions that are part of the permit reporting requirements of this section for a period of at least five (5) years from the date of permit issuance.

(e) The Director has the discretion to require additional supplemental permit reporting when necessary to establish permit compliance and may provide for periodic inspection of the facility.

§125.98 Director requirements.

(a) *Permit application.* The Director must review the materials submitted on a timely basis by the applicant under §122.21(r) before each permit renewal or reissuance to determine compliance with all applicable requirements. The Director is encouraged to provide comments expeditiously so that the permit applicant may modify its information gathering activities and provide any necessary supplemental materials.

(b) *Alternate schedule.* When the Director establishes an alternate schedule under §125.93, the schedule must provide for compliance as expeditiously as possible. In no event may the schedule provide for compliance beyond the dates specified in §125.93. In establishing the schedule, the Director is encouraged to consider the extent to which those technologies proposed to be implemented to meet the requirements of §125.94(c) and/or (d) will be used, or may otherwise affect choice of technology(ies), to meet the requirements of §125.94(b). When establishing a schedule for electric power generating facilities, the Director should consider measures to maintain adequate energy reliability and necessary grid reserve capacity during any facility outage. These may include establishing a staggered schedule for multiple facilities serving the same localities. The Director may consult with local and regional electric power agencies when establishing a schedule for electric power generating facilities. The Director may determine that extenuating circumstances (*e.g.,* lengthy scheduled outages, future production schedules) warrant establishing a different compliance date for any manufacturing facility. In no event may the schedule provide for compliance beyond the dates specified in §125.93.

(c) *Species of concern.* The Director must review and approve the species of fish and shellfish identified as species of concern, including but not limited to:

(1) Any species of concern identified using the source water baseline biological characterization data submitted under 40 CFR 122.21(r)(4);

(2) Any fish and shellfish identified for evaluation under §125.94;

(3) Data submitted as part of the impingement mortality reduction plan under 40 CFR 122.21(r)(6);

(4) Data submitted as part of the site-specific entrainment mortality data collection plan under 40 CFR 122.21(r)(9);

(5) The Director may request additional information in determining the site-specific species of concern and any additional fish and shellfish to be included in the impingement mortality reduction plan and, where applicable, the entrainment mortality data collection plan;

(6) The Director may determine invasive species, naturally moribund species, and other specific species may be excluded from any monitoring, sampling, or study requirements of 40 CFR 122.21 and §125.94.

(7) The Director may consider data submitted by other interested parties.

(d) *Site-specific impingement mortality reduction plan.* The Director must review and approve the site-specific Impingement Mortality Reduction Plan required under 40 CFR 122.21(r)(6). The plan must include, at a minimum, the duration and frequency

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of required monitoring, the monitoring location, the organisms to be monitored and, where appropriate, the method in which naturally moribund organisms would be identified and taken into account.

(e) *Site-specific entrainment mortality controls.* The Director must establish case-by-case BTA standards for entrainment mortality for any facility subject to such requirements after reviewing the information submitted under 40 CFR 122.21(r) and §125.95. These entrainment mortality controls must reflect the Director's determination of the maximum reduction in entrainment mortality warranted after consideration of factors relevant for determining the best technology available at each facility. Prior to any permit renewal, the Director must review the performance of the entrainment mortality technologies used and determine that they continue to meet the BTA requirements of §125.94(c). The Director must provide a written explanation of the proposed BTA determination in the fact sheet pursuant to 40 CFR 124.8 (or statement of basis pursuant to 40 CFR 124.7) for the proposed permit. The written explanation must describe why the Director has rejected any entrainment mortality control technologies or measures that are better performing than the selected technologies or measures, and must reflect consideration of all reasonable attempts to mitigate any adverse impacts of otherwise available better performing entrainment technologies. The Director may reject an otherwise available technology as BTA standards for entrainment mortality if the social costs of compliance are not justified by the social benefits, or if there are adverse impacts that cannot be mitigated that the Director deems to be unacceptable. If all technologies considered have social costs not justified by the social benefit, or have unacceptable adverse impacts that cannot be mitigated, the Director may determine that no additional control requirements are necessary beyond what the facility is already doing. At a minimum, the proposed determination in the fact sheet or statement of basis must be based on consideration of the following factors:

(1) Numbers and types of organisms entrained;

(2) Entrainment impacts on the waterbody;

(3) Quantified and qualitative social benefits and social costs of available entrainment technologies, including ecological benefits and benefits to any threatened or endangered species;

(4) Thermal discharge impacts;

(5) Impacts on the reliability of energy delivery within the immediate area;

(6) Impact of changes in particulate emissions or other pollutants associated with entrainment technologies;

(7) Land availability inasmuch as it relates to the feasibility of entrainment technology; and

(8) Remaining useful plant life; and

(9) Impacts on water consumption.

(f) *Ongoing permitting proceedings.* Where ongoing permit proceedings have begun prior to [effective date of the final rule] and the Director has determined that the information already submitted by the owner or operator of the facility is substantially the same as required under 40 CFR 122.21(r)(9), (10), (11) and (12), the Director may proceed with any site-specific determination of BTA standards for entrainment mortality without requiring the owner or operator of the facility to resubmit the information required in 40 CFR 122.21(r)(9), (10), (11) and (12), and the Director may choose to address the factors specified in §125.98(e). If the Director has received permit application information from the owner or operator of the facility, and the Director has determined that the information is substantially the same as required under 40 CFR 122.21(r)(9), (10), (11) and (12) but the Director has not yet made a BTA standards for entrainment mortality determination, the Director must address the factors specified in §125.98 (e). In all subsequently issued permits for that facility the Director must address the factors specified in §125.98 (e).

(g) *Site-specific entrainment mortality data collection plan and studies.* The Director must review and approve the site-specific entrainment mortality data collection plan for new units at existing facilities. The plan must include, at a minimum, the duration and frequency of monitoring, the monitoring location, the organisms to be monitored, and the method in which latent mortality would be identified. The Director may require the owner or operator of a facility to include additional peer reviewers for the entrainment mortality data collection plan, the comprehensive technical feasibility and cost evaluation study, the benefits valuation study, and the non-water quality and other environmental impacts assessment.

(h) *Annual certification statement.* The Director must review and verify the Annual Certification Statement required under §125.97(c).

(i) *Additional information.* In implementing the Director's responsibilities under this provision, the Director is authorized to request additional necessary information and to inspect the facility.

§125.99 [Reserved]

[FR Doc. 2011–8033 Filed 4–19–11; 8:45 am]

BILLING CODE 6560–50–P

FOIA 2014-009508 Interim 5

Clean Water Act Section 316(b) Proposal

Regulations for Cooling Water Intake Structures at Existing Facilities

April 6, 2011

ED_000110_LN_RW_00001889-00001

Background

- Section 316(b) of the Clean Water Act (CWA) requires that National Pollutant Discharge Elimination System (NPDES) permits for facilities with cooling water intake structures ensure that the location, design, construction, and capacity of the structures reflect the best technology available (BTA) to minimize harmful impacts on the environment.
- Withdrawal of cooling water removes aquatic organisms, including fish, fish larvae and eggs, crustaceans, shellfish, sea turtles, and marine mammals, from waters of the U.S. each year.
- Most impacts are to early life stages of fish and shellfish through impingement and entrainment.
  - Impingement happens when fish and other organisms are trapped against screens when water is drawn into the facility's cooling system.
  - Entrainment happens when organisms are drawn into the facility, resulting in their exposure to pressure and high temperatures.
  - EPA estimates that 2.1 billion fish, crabs, and shrimp on an age-1 equivalent basis are killed annually by impingement and entrainment.

Rulemaking History

- Under a consent decree with environmental organizations, the section 316(b) rulemaking was divided into three phases:
  - Phase I addressed all new facilities except offshore oil and gas exploration facilities (December 2001)
  - Phase II addressed existing large electric-generating facilities (February 2004)
  - Phase III addressed existing small electric-generating, all manufacturing facilities, and new offshore oil and gas exploration facilities (June 2006)
    - EPA conducted a Small Business Advocacy Review Panel for this rulemaking in 2004, and incorporated a number of recommendations of SERs in the existing facilities proposal
- Phase II and the existing facility portion of Phase III were remanded to EPA for reconsideration
- This proposal, called the Existing Facilities proposal, combines Phases II and III into one rule and provides a holistic approach to protecting aquatic life impacted by cooling water intakes

Scope of Rule

- Potentially affected facilities are existing power plants and manufacturing facilities that generate electricity or manufacture other goods and that withdraw at least 2 million gallons per day (MGD)of cooling water, at least 25 percent of which is for cooling purposes
- The proposed rule covers roughly 1,260 existing facilities that dissipate waste heat through water withdrawals
  - Approximately 590 are manufacturers
  - Other 670 are power plants
  - Approximately 740 facilities already use technologies that are likely to comply with the impingement requirements of the proposal

Identification of Best Technology Available

- In selecting the BTA, a number of factors were considered:
  - Availability and feasibility of various technologies
    - Costs including potential costs to facilities as well as households, and economic impacts of different technologies
  - Efficacy of technologies in reducing impingement and entrainment mortality, including cost-effectiveness relationships
  - Age, size, and type of facility
  - Non-water quality effects of different technologies on energy production and availability
  - Electricity reliability
  - Potential adverse environmental effects from the use of the different controls
  - US Supreme Court's decision in *Entergy Corp. v. Riverkeeper, Inc., et al.*, that EPA has the authority to balance costs and benefits in promulgating 316(b) regulations

Identification of BTA for Impingement Mortality

- The use of fish-friendly modified traveling screens with a fish handling and return system or reduced intake velocity is proposed as BTA for impingement mortality
    - EPA's record shows modified traveling screens are available for all facilities, whereas reduced intake velocity may not be available at all locations
  - Facility would determine technology best suited to meeting the limit
  - Subject to an upper limit on how many fish can be killed by the facility through impingement – impingement mortality not to exceed:
    - 12% on an annual average
    - 31% on a monthly average
    - Requires facility to sample and hold up to 48 hours to determine mortality
  - Alternately, facility could reduce their intake velocity to 0.5 feet per second
    - Data indicate that at this velocity, there is a significant reduction in the potential for impingement and impingement mortality to a level equal to/better than the numeric impingement mortality restrictions
    - Most fish can swim away from the cooling water intake of the facility at this velocity
    - Facility can comply either through an engineering design demonstration, or through monthly monitoring and reporting of velocity

Identification of BTA for Entrainment Mortality

- For entrainment, no single technology that represented BTA for all facilities could be identified
  - Four key factors support determining entrainment mortality controls on a site-specific basis (except with respect to new units) in lieu of a national basis: energy reliability, increased air emissions, land availability, and remaining useful life
  - Instead, EPA is proposing to adopt regulations that establish a process for the permitting authority to determine entrainment BTA controls on a site-specific basis
    - Permitting authority could consider social costs and benefits on a site specific basis in establishing additional entrainment mortality controls, if any
    - Facilities above 125 MGD actual intake flow are required to submit additional studies to permit authority, and have studies peer reviewed
    - Facilities may have to meet impingement requirements before learning what are their entrainment requirements
    - Permitting process includes opportunity for public input

Identification of BTA for New Units at Existing Facilities

- Closed cycle cooling (or wet cooling towers) are proposed as BTA for both impingement mortality and entrainment mortality for new units at existing facilities
  - Applies only to new unit portion of facility, not to entire facility
  - Capital costs for closed-cycle cooling are lower than capital costs for once-through cooling when constructing a new unit
  - Requirements for entrainment mortality require the facility to reduce their intake flow to a level similar to a closed cycle cooling system
  - Alternately, facility could demonstrate to permitting authority that it has installed, and will operate/maintain technologies capable of achieving entrainment mortality reductions equal to at least 90% of the reduction achievable through compliance with the intake flow reduction requirement
- Proposal establishes January 17, 2002 as the date for distinguishing existing facilities from new facilities because that is the effective date of the Phase I new facility rule

Compliance

- Requirements would be applied to individual cooling water intake structures through NPDES permits issued by authorized States or EPA
- Regulations would become effective 60 days after FR publication of the promulgation notice (~July 2012 + 60 days)
- Technologies to meet the impingement requirements of the rule would have to be implemented as soon as possible but facilities may request additional time (not to exceed 8 years)
  - Most facilities should be able to comply within in 5 years
- Existing facilities subject to entrainment requirements would have to comply as soon as possible under a schedule of compliance established by the permitting authority
- New units have to comply by the time they begin operating

Benefits & Costs of Proposed Rule

- Proposal would reduce impingement and entrainment mortality by 615 million fish, on an age-1 equivalent basis , of total of 2.2 billion lost to I&E mortality
- Annual monetized benefits are estimated at $17.6 million (2009$; 3% discount rate)
- Annualized social costs are estimated at $384 million (2009$; 3% discount rate)
  - Electric Generators segment of the proposed rule accounts for the majority of total cost (direct compliance costs of $319 million at 3% discount rate, including cost of studies)
  - Annual costs of closed cycle cooling at new generating units are estimated separately as $15 million, but benefits, even in age-1 equivalent terms, cannot be calculated
  - Estimates do not include costs associated with complying with permit authority determinations on site-specific BTA
- Majority of facilities (86%) and parent entities (89%) that would be subject to the proposed rule are estimated to incur annualized costs of less than 1% of revenue (assuming zero cost pass-through)
- National compliance cost of proposed rule, on average, is estimated to be 0.013¢ per KWh (assuming full cost pass-through)
- For a typical U.S. household , proposed rule is estimated to result in costs of $1.41 per household per year (assuming full cost pass-through)

316(b) NODA
Briefing for OMB

Ex. 5 - Deliberative

Reminder of key elements of the proposal:

Upper limit on how many fish can be killed by being pinned against intake (impingement mortality or "IM")

- Facility determines which technology would be best suited to meet this limit.
- As an alternative, facility could reduce their intake velocity to 0.5 feet per second. At this intake velocity, most of the fish can swim away from the intake.
- The national IM requirements would reduce adverse environmental impact by 31 percent.

Entrainment ("E") requirements for each facility determined case-by-case.

- Existing facilities that withdraw very large amounts of water would conduct studies to help the permitting authority determine whether and what site-specific controls are appropriate.

New units that add electrical generation capacity to an existing facility required to have equivalent of closed-cycle cooling.

Four Proposed Rule Options

1) IM everywhere, with BPJ for entrainment; studies required by facilities with greater than 125 MGD water withdrawal
2) IM everywhere, and closed-cycle cooling for facilities greater than 125 MGD design intake flow
3) IM everywhere, and closed-cycle cooling for facilities greater than 2 MGD design intake flow
4) BPJ for IM at facilities below 50 MGD design intake flow, IM requirements for greater than 50 MGD, and BPJ for entrainment everywhere

Ex. 5 - Deliberative

Ex. 5 - Deliberative

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316(b) NODA
Briefing for OMB

Ex. 5 - Deliberative

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Ex. 5 - Deliberative

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Proposed TPs and Background for Administrator conversation with Lew Hay

Issue: Mr. Hay would like to discuss the EPA 316(b) NODA with you. This discussion will particularly focus on the consideration of velocity caps as Best Technology Available (BTA) for reducing impingement at power plant intakes.

Status: The 316(b) NODA is under inter-agency review.

Proposed Talking Points:

- Currently the NODA is under inter-agency review.
- The NODA will be out for public comment and we encourage you to submit your comments and recommendations.
- EPA intends for each facility to select appropriate technology(ies) to meet the impingement mortality limitation. EPA is not prescribing any one technology.
- EPA may provide a mechanism for a facility with a velocity cap to demonstrate they already meet the impingement mortality limitation. Moreover, we invite facilities to demonstrate that their technologies meet the impingement mortality limitation.
- Velocity caps cannot be installed in most facilities due to location constraints. Therefore, velocity caps cannot be declared Best Technology Available.

Ex. 5 - Deliberative

Background/CWA §316(b): Section 316(b) of the Clean Water Act mandates technology-based standards for cooling water intakes to minimize adverse environmental impacts from cooling water intake structures at power plants and manufacturing facilities. The withdrawal of cooling water harms billions of aquatic organisms each year, including fish, shellfish, and marine mammals.

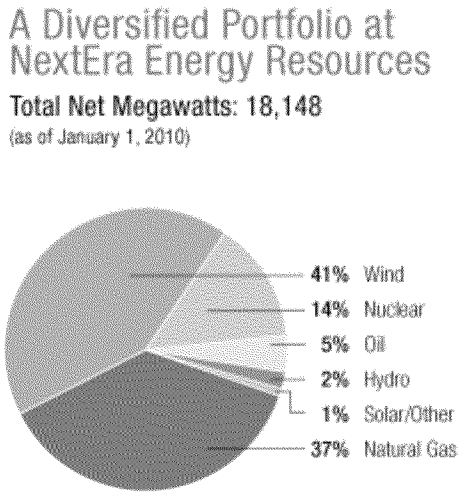
Background on NODA: In March 2011, EPA proposed standards under the Clean Water Act to reduce injury and death of fish and other aquatic life caused by cooling water intake structures existing at power plants and factories. This rule covers roughly 1,260 existing facilities that each withdraw at least 2 million gallons per day of cooling water. EPA estimates that approximately 590 of these facilities are manufacturers, and the other 670 are power plants.

As part of the proposal, EPA indicated it was in the process of developing a stated preference survey to estimate total willingness to pay (WTP) for improvements to fishery resources affected by in-scope 316(b) facilities. EPA indicated its intent to issue a Notice of Data Availability pending survey implementation and data analysis. This NODA presents the new data and analysis for the Northeast region.

This notice also presents a summary of significant data EPA received or collected since proposal, a discussion of how EPA is considering incorporating these data in revised analyses supporting the final rule, and a discussion of alternative approaches to the impingement mortality requirements that EPA is considering for the final rule.

Background/NextEra Energy: New name for the former FPL Group (Florida Power and Light). Up to 56 percent of their portfolio could be subject to 316(b) requirements. They own mostly coastal facilities that use once-through cooling. They specialize in repowering to combined cycle, but may not be planning for cooling towers. They are also the majority owner of Seabrook Station nuclear plant in New Hampshire. They may argue for velocity caps to be an approved compliance technology; Ex. 5 - Deliberative

Ex. 5 - Deliberative



316(b) NODA
Briefing for OMB

Notice of Data Availability

Ex. 5 - Deliberative

Reminder of key elements of the proposal:

Upper limit on fish killed by being pinned against intake (impingement mortality or "IM")

- Based on modified traveling screens, but facility determines which technology would be best suited to meet this limit.
- As an alternative, facility could reduce their intake velocity to 0.5 feet per second. At this intake velocity, most of the fish can swim away from the intake.
- The national IM requirements would reduce adverse environmental impact by 31 percent.

Entrainment ("E") requirements for each facility determined case-by-case.

- Existing facilities that withdraw very large amounts of water would conduct studies to help the permitting authority determine whether and what site-specific controls are appropriate.

New units that add electrical generation capacity to an existing facility required to have equivalent of closed-cycle cooling.

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3) IM everywhere, and closed-cycle cooling for facilities greater than 2 MGD design intake flow
4) BPJ for IM at facilities below 50 MGD design intake flow, IM requirements for greater than 50 MGD, and BPJ for entrainment everywhere

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Ex. 5 - Deliberative

To: CN=Lynn Zipf/OU=DC/O=USEPA/C=US@EPA[]
Cc: CN=Robert Wood/OU=DC/O=USEPA/C=US@EPA;CN=John Senn/OU=DC/O=USEPA/C=US@EPA[]; N=John Senn/OU=DC/O=USEPA/C=US@EPA[]
From: CN=Cara Lalley/OU=DC/O=USEPA/C=US
Sent: Thur 1/26/2012 9:18:20 PM
Subject: Fw: ACTION: Inside EPA followup on 316b NODA (to correct her article)

The Inside EPA reporter essentially has 2 questions:

1) Does this NODA affect our finalizing of the rule?

Ex. 5 - Deliberative

2) Will EPA make its July 27, 2012 deadline for Administrator signature of the final rule?

Thanks,

Cara Lalley
Communications Coordinator
Office of Science and Technology, Office of Water
U.S. Environmental Protection Agency
Ph: 202-566-0372
Fax: 202-566-0441

----- Forwarded by Cara Lalley/DC/USEPA/US on 01/26/2012 04:07 PM -----

From: Travis Loop/DC/USEPA/US
To: Cara Lalley/DC/USEPA/US@EPA, John Senn/DC/USEPA/US@EPA
Date: 01/26/2012 04:02 PM
Subject: Fw: Was I wrong on this?

Need answers ASAP.

Travis Loop
Communications Director
Office of Water
U.S. Environmental Protection Agency
office: 202-564-0183
cell: 202-870-6922
----- Forwarded by Travis Loop/DC/USEPA/US on 01/26/2012 04:01 PM -----

From: Betsaida Alcantara/DC/USEPA/US
To: Travis Loop/DC/USEPA/US@EPA, Alex Barron/DC/USEPA/US@EPA

Cc: Enesta Jones/DC/USEPA/US@EPA
Date: 01/26/2012 03:57 PM
Subject: Fw: Was I wrong on this?

See below. Does it affect finalizing of the rule?
----- Forwarded by Betsaida Alcantara/DC/USEPA/US on 01/26/2012 03:57 PM -----

From: Erica Martinson <EMartinson@politico.com>
To: Betsaida Alcantara/DC/USEPA/US@EPA
Date: 01/26/2012 03:53 PM
Subject: RE: Was I wrong on this?

Thanks! So, does this new NODA affect the finalizing of the rule? Changing the benefits seems fairly significant. And I've heard that some people are hearing from agency folks that EPA may not make the deadline to finalize the rule.

Thanks,

Erica Martinson
Energy and Environment Reporter
POLITICO
571-235-0423
Twitter: @EricaMartinson

-----Original Message-----
From: Betsaida Alcantara [mailto:Alcantara.Betsaida@epamail.epa.gov]
Sent: Thursday, January 26, 2012 3:35 PM
To: Erica Martinson
Cc: Brendan Gilfillan; Enesta Jones
Subject: RE: Was I wrong on this?

here's more info

EPA has submitted a draft notice of data availability (NODA) to the Office of Management and Budget (OMB) for review. The NODA summarizes significant data EPA has received or collected since publishing our April 2011 proposed rule, Requirements for Cooling Water Intake Structures at Existing Facilities and Phase I Facilities. For example, EPA obtained more than 80 studies that provide additional biological data related to fish impingement. The NODA requests public comments on possible revisions for the final rule and presents preliminary data on the benefits of the proposed rule for the Northeast Region of the U.S., based on the results of a stated preference survey. Upon completion of similar analyses for the other regions and a national analysis, EPA would replace the proposed rule benefits with this new analysis. Once review of the NODA has been completed by OMB, EPA will publish the notice in the Federal Register and accept public comments on it for 30 days.

From: Erica Martinson <EMartinson@politico.com>
To: Betsaida Alcantara/DC/USEPA/US@EPA
Cc: Brendan Gilfillan/DC/USEPA/US@EPA, Enesta

Jones/DC/USEPA/US@EPA
Date: 01/26/2012 03:28 PM
Subject: RE: Was I wrong on this?

Arg! Thanks. So what NODA info is this? Is there something in the docket I can point to? If I'm going to do a correction, I might as well provide some more information!
Thanks for your help.

Thanks,

Erica Martinson
Energy and Environment Reporter
POLITICO
571-235-0423
Twitter: @EricaMartinson

-----Original Message-----
From: Betsaida Alcantara [mailto:Alcantara.Betsaida@epamail.epa.gov]
Sent: Thursday, January 26, 2012 3:26 PM
To: Erica Martinson
Cc: Brendan Gilfillan; Enesta Jones
Subject: Re: Was I wrong on this?

just sent you an email!

From: Erica Martinson <EMartinson@politico.com>
To: Betsaida Alcantara/DC/USEPA/US@EPA, Brendan Gilfillan/DC/USEPA/US@EPA, Enesta Jones/DC/USEPA/US@EPA
Date: 01/26/2012 03:25 PM
Subject: Was I wrong on this?

A reader suggested that EPA may have sent over a NODA? That's not what the OMB site says (I thought if it's a NODA it says so?), but it does also say "notice" stage, and not final rule… Do I need to do a correction? (Story below)

AGENCY: EPA-WATER RIN: 2040-AE95 TITLE: Criteria and Standards for Cooling Water Intake Structures STAGE: Notice ECONOMICALLY SIGNIFICANT:
No ** RECEIVED DATE: 01/25/2012 LEGAL DEADLINE: Judicial

Thanks,

Erica Martinson
Energy and Environment Reporter
POLITICO
571-235-0423
Twitter: @EricaMartinson

From: POLITICO Pro [mailto:politicoemail@politicopro.com]

Sent: Thursday, January 26, 2012 2:51 PM
To: Erica Martinson
Subject: White House reviewing EPA cooling water intake plan

White House reviewing EPA cooling water intake plan

By Erica Martinson
1/26/12 2:50 PM EST

The White House on Wednesday began review of EPA's controversial final rule for cooling water intake structures.

The regulations govern the design, location and construction of electric generating plants that use more than 50 million gallons a day of water to keep the plants from overheating.

EPA's regulations for cooling water structures have seen their fair share of legal controversy, including in 2009 when the Supreme Court decided that under the Clean Water Act, EPA may consider cost-benefit analysis when it makes decisions, although it doesn't have to.

That case hinged on the difficult question EPA faces in creating the
rule: the value of a fish (or fish eggs for that matter), since cooling water towers generally draw in water from a local river or other water source, and also discharge into those same waters.

Environmentalists want "closed cycle" towers, which are extremely expensive to build, though generally more efficient. EPA isn't likely to require that though, and is considering more flexible options.

The final rule EPA sent for review requires "uniform controls at all existing facilities to prevent fish from being trapped against screens (impingement), site-specific controls for existing facilities other than new units to prevent fish from being drawn through cooling systems (entrainment), and uniform controls equivalent to closed cycle cooling for new units at existing facilities (also entrainment)," according to the White House Office of Management and Budget website.

The so-called Phase III regulations are part of a 2010 appeals court remand, at EPA and environmentalists' request, of the portion of the rule governing about 1,200 existing electric generating and manufacturing plants. At the same time, the court upheld another portion of the rule that covers new offshore oil and gas facilities.

EPA agreed in a court settlement to finalize the rule by July 27, 2012.

To read and comment online:
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Clean Water Act §316(b) Rulemaking

Background

- § 316(b) of the Clean Water Act (CWA) provides for the establishment of technology-based standards to minimize the ecological damage to eggs, larvae, fish and other aquatic creatures from cooling water intake structures. The regulations focus on ecological damage due to impingement (fish hitting screens) and entrainment (smaller fish, larvae and eggs passing through screens and drawn into the facility). Several technologies exist to deal with impingement, but the most effective technology for entrainment is closed cycle cooling, also called cooling towers.
- In order to settle outstanding litigation over a previous consent decree and another case, EPA entered into a settlement agreement with Riverkeeper.
- The Administrator signed the proposed existing facility rule on March 28, 2011, in accordance with the settlement agreement, addressing the outstanding issues associated with previous 316(b) rules. This proposal was published in the FR on April 20, 2011. The 120-day public comment period closed on August 18, 2011.
- The proposed rule requires all facilities to meeting national impingement requirements, but entrainment requirements are dealt with on site-specific basis by the permitting authority. The proposed rule requires larger facilities to perform studies to aid the permitting authority in its site-specific determination. This study must include information on energy consumption, grid reliability, and facility reliability. In addition, any new units added to an existing facility would be required to adopt closed cycle cooling.
- EPA intends to soon issue a Notice of Data Availability (NODA) summarizing significant data we received as a result of public comment. EPA has additional information related to fish impingement and requests public comment on revisions to the impingement aspects of the proposal. EPA will also publish preliminary results, pertaining to the Northeast US, on a revised benefits analysis based on a stated preference survey. A 30-day public comment period is anticipated.
- This settlement agreement requires the Administrator to sign a final rule by July 27, 2012.

316(b) in Relation to CAA Rules Affecting Electricity Generators

- A number of studies of the electricity generation sector have attempted to analyze the cumulative impacts of the various EPA rules they are facing. Many of these studies make extreme assumptions about the required adoption of closed cycle cooling, ignoring the flexibility EPA provided in its proposed rule.
    - The November 2011 NERC study assumed that the impingement mortality limits could only be met by retrofitting to closed cycle cooling. EPA has made clear that it is looking for a common sense standard that primarily requires the installation of affordable and widely deployed screens to reduce impingement. For example, EPA has acknowledged that an attractive option is adopting an alternative technology-based compliance approach that would be more flexible than a numeric standard.
    - The NERC analysis also assumes 100% adoption of closed cycle cooling as its stringent case, despite EPA's explicit rejection of that option, because closed cycle cooling is not available everywhere.
    - NERC appears to assume that EPA's cooling water rule will require all units to comply with the entrainment standard by 2018, despite the fact that even the Edison Electric

Institute acknowledges that firms are likely to have up to 10 or more years to comply (i.e., 2022 and beyond).

- In proposed rule, EPA considered the potential for localized energy impacts. This is one of the factors that lead EPA to reject closed-cycle cooling as a national requirement and to conclude that entrainment requirements should be established on a site-specific basis. Moreover, in establishing the site-specific entrainment requirement, and its timeline for implementation, the permitting director is required to consider localized energy impacts
- OW's energy market analysis uses the IPM model. EPA found that for the proposed rule, only 601 MW of capacity was lost nationally.
- As part of the site-specific entrainment determination, state permitting authorities are directed in the proposed rule to discuss how it took account of local energy reliability in determining the appropriate, if any, entrainment technology. Should the permitting authority prescribe entrainment technology, it has the discretion to prescribe a compliance schedule that accounts for energy reliability.

More background

- In 1995, EPA settled a CWA mandatory duty suit brought by Riverkeeper and other environmental groups through a consent decree (Cronin decree) requiring EPA to take final action on the issuance of regulations in three phases. Phase I addressed requirements for new facilities, except for new offshore oil and gas facilties; Phase II addressed large existing power plants; and Phase III addressed new offshore oil and gas facilities, small existing small power plants, and all existing manufacturing facilities.
- All three phases of the cooling water regulations were litigated.
    - We must redo the Phase II rule because of an adverse 2nd Circuit decision. In 2009, the US Supreme Court upheld one aspect of Phase II rule, but EPA must address other remanded aspects of the rule. The Supreme Court decision gives us more discretion in our decision-making process.
    - Phase III rule was stayed in the 5th Circuit pending the US Supreme Court decision.
    - We requested voluntary remand of both cases (except for new offshore oil and gas; the 5th Circuit ruled in our favor) to review them together, as an existing facilities rule.

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From: CN=Richard Witt/OU=DC/O=USEPA/C=US
Sent: Tue 6/21/2011 4:31:46 PM
Subject: Re: 316 & SE ELG reqs and deadlines
Section 316 summary of proposed remand rule and Phase I rule.docx

Ex. 5 - Attorney Client

From: Joel Beauvais/DC/USEPA/US
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Cc: Steven Neugeboren/DC/USEPA/US@EPA
Date: 06/21/2011 10:48 AM
Subject: 316 & SE ELG reqs and deadlines

Hi, folks - I have a meeting this evening at 5:00 for which I could use some help on a few things. Any chance you could send me something brief on these?

Ex. 5 - Attorney Client

Joel Beauvais
Special Counsel to the Office of the Administrator
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Section 316(b) –

Proposed requirements for existing facilities and new units at existing facilities – EPA has proposed requirements for all existing power generating facilities and existing manufacturing and industrial facilities that withdraw more than 2 MGD per day of water from waters of the U.S. and use at least twenty-five (25) percent of the water they withdraw exclusively for cooling purposes.

Under the proposed requirements, all 2 MGD or greater facilities must meet specified **impingement mortality controls**. (Impingement mortality either must not to exceed 31 percent monthly average fish impingement. or the facility must demonstrate that its cooling water intake system has a maximum intake velocity of 0.5 feet per second). A facility subject to the proposed rule must comply with impingement controls as soon as possible but no later than 8 years from the effective date of the final rule. In the case of **entrainment mortality controls**, the facility must meet entrainment controls established by the permit writer on a case-by-case basis. The entrainment controls must reflect the maximum entrainment reduction warranted after taking specified factors into account, including cost/benefit. There is no deadline for compliance with entrainment controls for existing facilities. **New units at existing facilities** under certain circumstances would be subject to the same impingement controls and to achieve flow reductions commensurate with closed cycle or entrainment mortality reduction that are 90 percent of those that would be achieved by the flow reductions associated with closed cycle cooling. New units must comply upon commencement of the new unit's operation. New units **do not** include rebuilt, repowered or replacement units, only new units that add capacity.

Existing requirements for new facilities. Under the current Phase I rule, cooling water intake structures at new facilities must comply with the rule's requirements when an NPDES permit with the requirements is issued to it. The rule (40 CFR 125, Subpart I) establishes requirements applicable to the location, design, construction, and capacity of cooling water intake structures at new facilities that have a design capacity to withdraw at least two million gallons per day (MGD) and use at least twenty-five percent of the water they withdraw solely for cooling purposes.

The rule adopted a two-track approach. Under Track I, for facilities that withdraw equal to or greater than 10 MGD, the intake flow of the cooling water intake structure is restricted, at a minimum, to a level commensurate with that which could be attained by use of a closed-cycle, recirculating cooling system. For facilities that withdraw greater than 2 MGD, the design through-screen intake velocity is restricted to 0.5 feet per second and the total quantity of intake is restricted to a proportion of the mean annual flow of a freshwater river or stream, or to maintain the natural thermal stratification or turnover patterns (where present) of a lake or reservoir except in cases where the disruption is beneficial, or to a percentage of the tidal excursions of a tidal river or estuary. If certain environmental conditions exist, an applicant that withdraws equal to or greater than 10 MGD must select and implement appropriate design and construction technologies for further minimizing impingement mortality and entrainment. Applicants with greater than 2 MGD but less than 10 MGD flows are not required to reduce intake flow to a level commensurate with a closed-cycle, recirculating cooling system, but must still meet specific operational criteria.

Under Track II, the facility may demonstrate to the NPDES permitting authority that a proposed technology will reduce the level of adverse environmental impact to a comparable level to what would be achieved by meeting the Track I requirements for restricting intake flow and velocity.

In addition, the permitting authority may establish less stringent alternative requirements for a facility if compliance with the Phase I standards would result in compliance costs wholly out of proportion to those EPA considered in establishing the requirements at issue or would result in significant adverse impacts on local air quality, water resources, or local energy markets.

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EPA's Regulation of Coal-Fired Power: Is a "Train Wreck" Coming?

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July 11, 2011

Congressional Research Service
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R41914

CRS Report for Congress
Prepared for Members and Committees of Congress

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Summary

Given the central role of electric power in the nation's economy, and the importance of coal in power production, concerns have been raised recently about the cost and potential impact of regulations under development at the Environmental Protection Agency (EPA) that would impose new requirements on coal-fired power plants. Six of the rules, which have drawn much of the recent attention, are Clean Air Act regulations. Two others are Clean Water Act rules, and one is a Resource Conservation and Recovery Act rule. The majority are expected to be promulgated over the next 18 months. All together, these rules have been characterized by critics as a regulatory "train wreck" that would impose excessive costs and lead to plant retirements that could threaten the adequacy of electricity capacity (i.e., reliability of supply) across the country, especially from now through 2017.

Although some question why EPA is undertaking so many regulatory actions in such a short time-frame, supporters of the regulations assert that it is decades of regulatory delays and court decisions that have led to this point, resulting in part from special consideration given electric utilities by Congress under several statutes. Further, several of the current regulatory developments have been under consideration for a decade or longer, or are being reevaluated after an earlier action was vacated or remanded to EPA by the courts. The regulations are supported by proponents and EPA as having substantial benefits for public health and the environment.

Recent reports by industry trade associations and others have discussed potential harm of EPA's prospective regulations to U.S. electricity generating capacity, with emphasis on coal-fired generation. One of these reports, by the Edison Electric Institute, which represents investor-owned utilities, has attracted considerable attention by depicting a timeline in which multiple rules would take effect more or less simultaneously over the next five years. Congress has shown significant interest in these issues, and bills have been introduced that would de-fund or restrict EPA's ability to develop rules, and which would legislate new regulatory analytic requirements. This report describes nine rules in seven categories that are at the core of recent critical analyses, with background on the rule and its requirements and, where possible, a discussion of the rule's potential costs and benefits.

The EEI and other analyses discussed here generally predate EPA's actual proposals and reflect assumptions about stringency and timing (especially for implementation) that differ significantly from what EPA actually may propose or has promulgated. Some of the rules are expected to be expensive; costs of others are likely to be moderate or limited, or they are unknown at this point because a rule has not yet been proposed. Rules when actually proposed or issued may well differ enough that a plant operator's decision about investing in pollution controls or facility retirement will look entirely different from what these analyses project. Further, promulgation of standards is not the end of the road: court challenges are likely, potentially delaying implementation for years, and even when final, EPA rules must be adopted by states and implemented over time through state-issued permits. The primary impacts of many of the rules will largely be on coal-fired plants more than 40 years old that have not, until now, installed state-of-the-art pollution controls. Many of these plants are inefficient and are being replaced by more efficient combined cycle natural gas plants, a development likely to be encouraged if the price of competing fuel—natural gas—continues to be low, almost regardless of EPA rules.

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Introduction

Given the central role of electric power in the nation's economy, and the importance of coal in power production, concerns have been raised about the cost and potential impact of numerous regulatory actions that would impose new requirements on coal-fired power plants. In the summer of 2010, for example, the Edison Electric Institute (EEI), which represents the nation's investor-owned electric utilities, prepared a chart, "Possible Timeline for Environmental Regulatory Requirements for the Electric Utility Industry," which is reproduced here as **Figure 1**. Using color-coded categories, the chart identified rules under development at the U.S. Environmental Protection Agency (EPA) and depicted a schedule for development and implementation of the rules between 2008 and 2017.

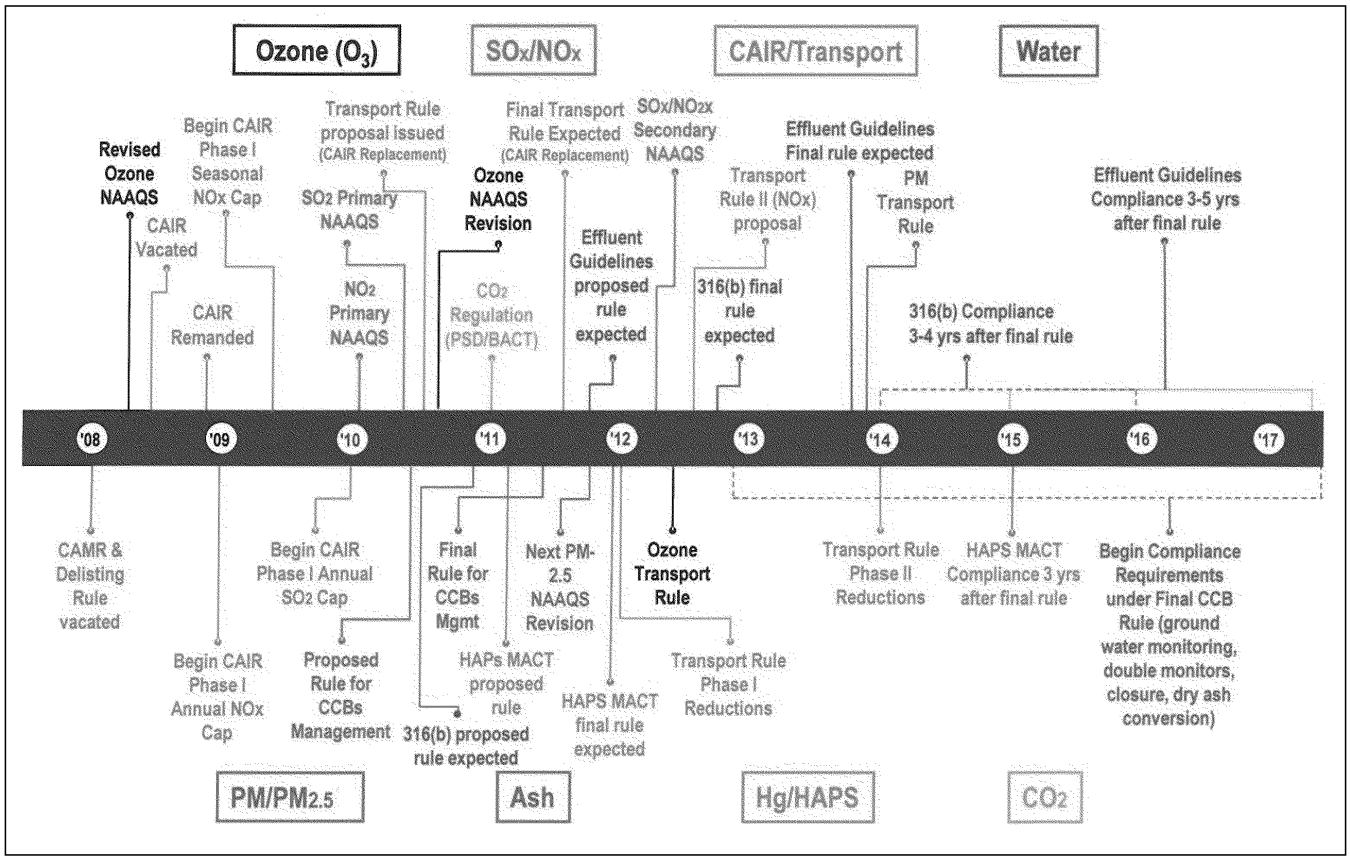
The rules identified by EEI were:

- the Cross-State Air Pollution Rule, and its predecessor, the Clean Air Interstate Rule (identified as "CAIR/Transport" on the timeline), which would establish cap-and-trade programs for utility emissions of sulfur dioxide and nitrogen oxides;
- Maximum Achievable Control Technology emission standards for mercury and other hazardous air pollutants, a rule generally referred to as the "Utility MACT" ("Hg/HAPS" on the timeline);
- National Ambient Air Quality Standards (NAAQS) for ozone, sulfur dioxide, nitrogen dioxide, and particulate matter ("Ozone," "SOx/NOx," and "PM/$PM_{2.5}$" on the timeline);
- regulation of greenhouse gas emissions ("CO_2" on the timeline);
- cooling water intake regulations ("316(b)" on the timeline);
- clean water effluent guidelines (identified under "Water" on the timeline); and
- coal combustion waste management rules ("Ash" or "CCBs Management").

EEI subsequently produced a report, *Potential Impacts of Environmental Regulation on the U.S. Generation Fleet*, which concluded that new EPA regulations would cause the unplanned retirement of 17 to 59 gigawatts (GW) of coal-fired electric capacity (5.4% to 18.8% of the current coal-fired total of about 315 GW) by 2015, and would require incremental capital expenditures of $85 billion to $129 billion.[1]

[1] ICF International, *Potential Impacts of Environmental Regulation on the U.S. Generation Fleet*, Final Report, prepared for the Edison Electric Institute, January 2011, available at http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Integrated_Resource_Plan/2011IRP/EEIModelingReportFinal-28January2011.pdf. Hereinafter referred to as the "EEI report."

Figure 1. EEI's Timeline for Environment Requirements for the Electric Utility Industry



Source: Edison Electric Institute, http://www.eei.org/whatwedo/PublicPolicyAdvocacy/TFB%20Documents/100525SheaCongressCoalImpacts.pdf (Figure 7).

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EEI is not the only group to have focused on EPA's prospective regulations. The American Legislative Exchange Council (ALEC) picked up EEI's chart, added to it the separate EPA rules that will affect industrial and commercial boilers, and labeled it "EPA's Regulatory Train Wreck." The National Mining Association also refers to "EPA's Regulatory Train Wreck" in materials that it distributes, and the North American Electric Reliability Corporation (NERC), in an October 2010 Special Reliability Assessment, concluded that implementation of four EPA rules could result in a loss of up to 19% of fossil-fuel-fired steam capacity in the United States by 2018, with the potential for "significantly deteriorating future … system reliability."[2] In addition to these, a large number of other analyses have been prepared by other policy and research groups; some are similarly critical of EPA's rules, while others counter or rebut the criticisms. Many of these reports are identified below in **Appendix B**.

The "train wreck" charts and related studies have been widely circulated on Capitol Hill, where they have stimulated concern. Several bills aimed at reducing the regulatory burden or requiring additional analyses of the combined rules' impacts have been introduced. As discussed below in "Legislation," as of early July 2011, two of these bills had passed the House.

Opponents of these bills maintain that regulation of the affected plants is overdue. Coal-fired power plants are major sources of pollution; many are decades old; and regulation of their emissions, effluent, and waste has lagged that of other industries.

Coal's Place in Electric Power Production

Coal fueled 44.6% of the nation's electric power in 2009. This was a decline from 52% in 2000, but coal is still the electric power industry's dominant fuel source (as shown in **Figure 2**).

Many coal-fired electric generating units, along with most nuclear and hydroelectric plants, provide what is called "base-load" power. Many of the plants run 24 hours a day and provide the relatively cheap power that is the foundation of electric service. (Other plants, known as peaking plants, are brought into service at times of peak demand. Peaking plants tend to have higher operating costs, but since they operate for short periods of time, the higher cost is of less concern.)

Low Cost

Coal-fired power has been cheap for multiple reasons. The average coal-fired power plant is more than 40 years old and its capital cost fully amortized, whereas many natural gas plants (the second largest source, producing about 23% of the nation's electricity) have been built in the last 10 years. Coal itself (i.e., the fuel) is abundant and cheap: as shown in **Figure 3**, its price—expressed in dollars for the same energy content, i.e., dollars per million Btu—has sometimes been less than one-fourth the cost of natural gas, its main competitor. Averaged over a 12-year period, coal cost less than one-third as much as gas.

[2] North American Electric Reliability Corporation, *2010 Special Reliability Scenario Assessment: Resource Adequacy Impacts of Potential U.S. Environmental Regulations*, October 2010, pp. I and IV, http://www.nerc.com/files/EPA_Scenario_Final.pdf. Hereinafter referred to as the "NERC report." NERC is an independent organization, founded by the electric utility industry, that conducts periodic, independent assessments of the reliability and adequacy of the bulk power system in North America.

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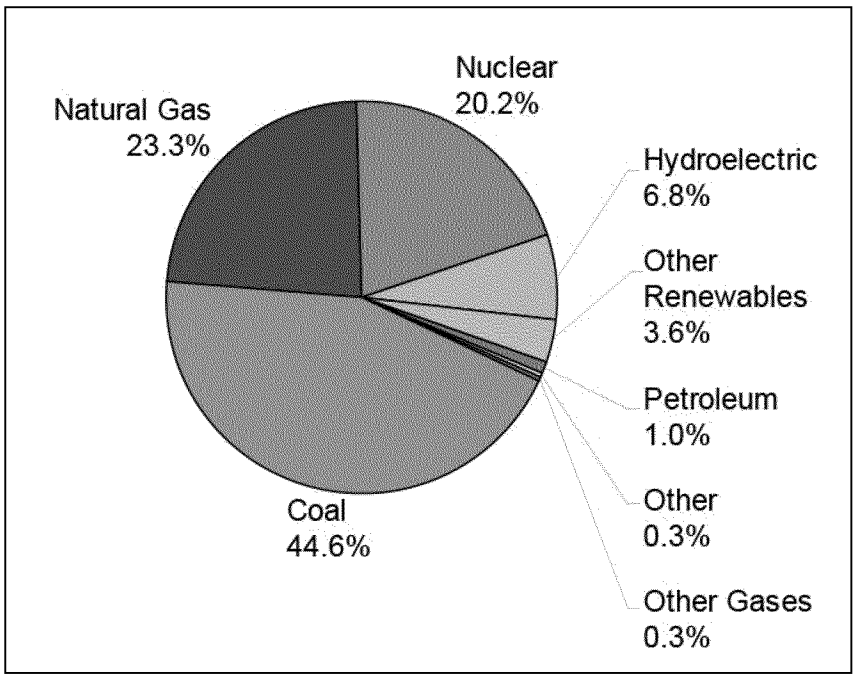
Figure 2. U.S. Electric Power,2009, by Fuel Type

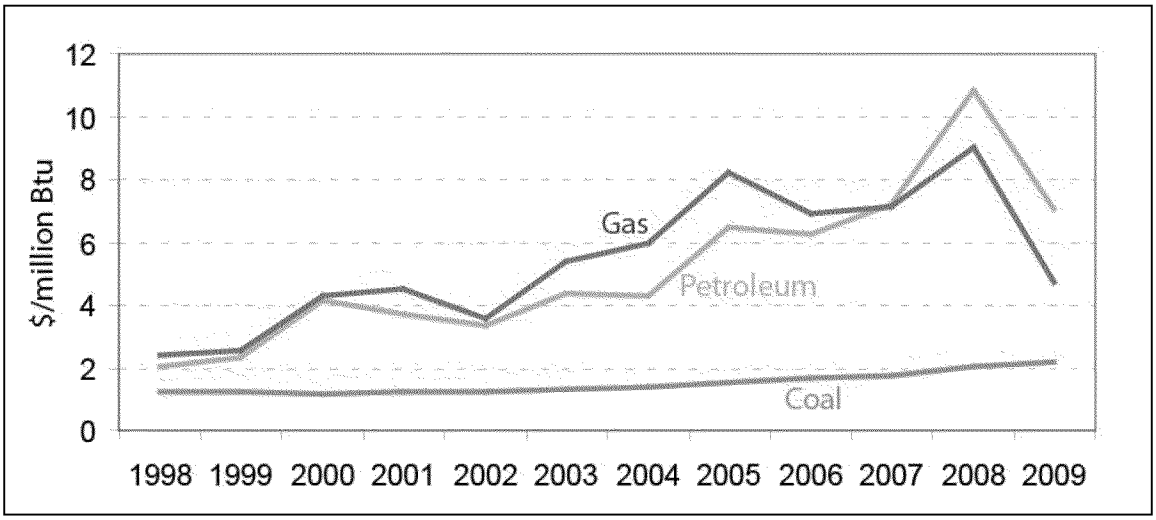


Source: U.S. Energy Information Administration, *Electric Power Annual, 2009*, April 2011, Table 2.1.

Of course, other factors also affect the price of power, including the efficiency with which the plant converts fuel into electric power, maintenance costs, and the cost of operating the unit—which, in the case of coal must include costs for removal and management of ash. But, in general, these factors did not outweigh coal's basic cost advantage until the advent of natural gas combined cycle technology in the 1990s.

Figure 3. Average Cost of Fossil Fuels for the Electric Power Industry, 1998 through 2009

($/million Btu)



Source: U.S. EIA, Electric Power Annual 2009, April 2011, Table 3.5.

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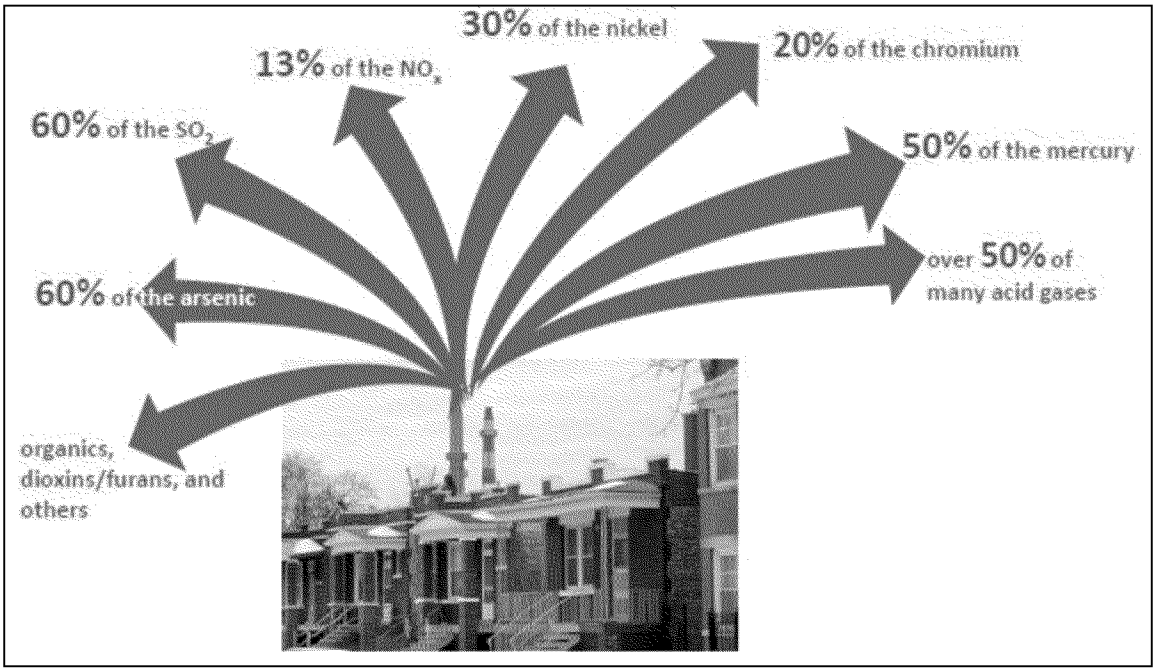
Clean Air Act Exceptions

Besides the age of the plants and the cost of the fuel, a third factor that has resulted in lower cost is that many of the coal-fired plants, particularly the older ones, have been allowed to operate with little in the way of pollution control equipment. Coal is an inherently "dirty" fuel. Burning it produces sulfur dioxide (SO_2), nitrogen oxides (NOx), particulates, mercury, acid gases, and other pollutants, in greater abundance than other fossil fuels. As shown in **Figure 4**, coal-fired power is *a* major or *the* major source of the air emissions of many of these pollutants.

Figure 4. Emissions from Fossil-Fueled Power Plants as a Percent of TotalU.S. Air Emissions



Source: U.S. EPA, "Reducing Toxic Pollution from Power Plants," March 16, 2011, p. 6.

Note: The figure includes emissions from oil-fired units as well as coal-fired, but oil-fired units account for only 1% of U.S. electric generation. Air emissions are not necessarily the major source of exposure for each of these pollutants.

Despite the industry's emissions, the structure of the Clean Air Act has allowed many of the older coal plants to operate with minimal controls. The statute's focus is on new sources of pollution (including major modifications of existing plants). Under Sections 165 and 169 of the act, new plants and major modifications are required to install the Best Available Control Technology (BACT) in order to obtain an operating permit. Other plants (so-called "grandfathered plants") are not required to have best available controls, unless subject to state or local requirements needed to address local air quality. The majority of the grandfathered plants are coal-fired.

In addition, the act's major requirements for existing power plants, the acid rain program and the NOx control program (generally known as the "NOx SIP call"), have both been cap-and-trade programs. These allowed companies to decide how they wanted to meet system-wide emission caps: by switching to lower sulfur fuels, by installing the best control equipment on a few plants, by operating their dirtiest plants less frequently, or by purchasing allowances from facilities that

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had over-complied. Since controls weren't required on each individual plant, many of the older plants could keep running without them.[3]

The "Train Wreck" Rules

General Observations

Burning coal to generate electricity can affect the environment in a number of ways, producing air pollution, water pollution, and solid waste residuals. As reflected in the EEI timeline and other analyses, EPA'sregulatory activities touch on all of these, although much of the recent critical attention has focused on air pollution.

EEI's chart contains 32 entries covering a 10-year period, 2008-2017. Not all of these entries represent actions by the Obama Administration's EPA. Of the first seven, for example, three are court decisions vacating and remanding Bush Administration EPA rules, and the other four are rules that were promulgated during the Bush Administration with implementation scheduled for 2009 or 2010. Because the Bush Administration's Clean Air Interstate Rule (CAIR) was the subject of two court decisions and was designed to be implemented in phases, it gets numerous entries: three entries for implementation (for its seasonal NOx cap), its annual NOx cap, and its SO_2 cap) and two for the court decisions that vacated and remanded it.

CAIR and its replacement rules are the extreme example of repetition on the "train wreck" charts, accounting for 10 of the 32 total entries, but most of the other rules on the chart have at least three entries—for proposal, promulgation, and implementation. Only implementation imposes an actual burden on the regulated community. Thus, the chart tends to exaggerate the regulatory burden through repetition.

The timeline also treats as imminent the promulgation of rules that may not be so. For example, the coal combustion waste rule, which has been the object of some concern, was authorized in the Solid Waste Disposal Act Amendments of 1980. The legislation required that EPA conduct a study of whether such waste should be considered hazardous waste and report to Congress before taking regulatory action. EPA has conducted numerous studies over the three decades since then and proposed to regulate the management of the waste in June 2010. Since then, however, the agency has stated that it does not anticipate promulgating a final rule in 2011, leaving uncertain when a rule will be promulgated. The EEI timeline assumed promulgation in 2011 with compliance five years later.

Nevertheless, it is safe to say that several major rules under development at EPA are due to be promulgated within the next 18 months and will affect coal-fired power plants, as shown in **Table 1**. Some of them are expected to be expensive; the costs of others are likely to be moderate or limited, or they are unknown at this point because a rule has not yet been proposed.

[3] Power plant operations also can affect water quality in several ways, and EPA is developing regulations to strengthen requirements for both water intake and water effluent. These regulations affect a broader range of power plants, however, including natural gas and nuclear, as well as coal-fired.

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Table 1. Timing of EPA Rules and Impacts on Coal-Fired Utilities

Rule or Standard	Final Rule	EPA Estimate of Costs/Impacts[a]
Cross-State Air Pollution Rule	Finalized July 6, 2011	$2.4 billion/year[b]
Utility MACT Rule	Expected November 16, 2011	$10-$11 billion/year
National Ambient Air Quality Standard (NAAQS) for sulfur dioxide	Promulgated June 22, 2010	$1.5 billion/year for all sources, but limited impact on electric generating units (EGUs)[a]
NAAQS for ozone	Expected July 2011	$19-$25 billion/year for all sources but limited impact on EGUs[a]
NAAQS for particulate matter	Not yet proposed; expected in 2012	Unknown
New Source Performance Standards for Greenhouse Gases	Not yet proposed; expected May 26, 2012	Unknown
Cooling Water Intake Structure Rule	Expected July 27, 2012	$319 million/year
Clean Water Effluent Limitation Guidelines Rule	Not yet proposed; expected January 31, 2014	Unknown
Coal Combustion Waste Rule	Expected 2012 or later	$587 million-$1.5 billion/year

Source: Compiled by CRS.

a. Costs as estimated by EPA. See text for discussion of costs and impacts of specific rules.

b. Of the $2.4 billion annual cost, $1.6 billion is attributed to the Clean Air Interstate Rule (CAIR), a 2005 rule that the Cross-State Rule is replacing.

This report will discuss each of the rules identified on EEI's timeline individually; but before discussing individual rules, a few general statements are in order.

First, most of these rules have been a long time in the making. As noted, the coal combustion waste rule is the result of legislation passed in 1980; another rule, the utility air toxics rule (or "Utility MACT"), which appears to be the most costly of the rules thus far proposed, is required by the Clean Air Act Amendments of 1990. Some may question why EPA is undertaking so many regulatory actions at once, but it is the decades of regulatory inaction that led to this point that strike other observers.

The inaction stemmed in large part from special consideration given electric utilities by Congress: both the Clean Air Act and the Solid Waste Disposal Act required special studies and reports to Congress before EPA could set standards for certain pollutants emitted or wastes disposed by electric utilities. Meanwhile, other industries that emitted the same pollutants or similar wastes (e.g., municipal solid waste incinerators and medical waste incinerators, and any industry

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generating hazardous waste) have been subject to more stringent emission controls or waste management standards for a decade or more.

Second, as we have noted in an earlier report on EPA regulations,[4] both the legislative authority for these rules and, in most cases, the development of the rules themselves predate the current Administration. With the exception of greenhouse gas emission rules, all of the rules discussed below began development under the Bush Administration or earlier, including several that were promulgated under that Administration and subsequently were vacated or remanded to EPA by the courts. The Cross-State Air Pollution Rule, the Utility MACT rule, and the Cooling Water Intake rule, for example, fit that description. Other EPA actions, such as the Obama Administration's reconsideration of the ozone National Ambient Air Quality Standard, have actually delayed for several years implementation of Bush Administration rules that would have strengthened existing standards. Each of these actions is described in more detail below.

Third, one criticism highlighted by the EEI and others of EPA'spending and upcoming rules is the impact of multiple requirements. The critics point out that, although EPA conducts detailed economic impact analyses of individual rules, the CAA and other federal environmental laws do not provide a mechanism or require that the agency analyze cumulative impacts, including jobs. Viewed separately, they argue, a particular rule may have limited economic impact, while the second, third, or fourth rule that takes effect more or less simultaneously may drive the power plant operator to decide to retire a given facility. As discussed in this report, such decisions are highly case-specific, involving unique considerations and potentially mitigating factors.

The following sections of this report describe seven rules or categories of rules that are the core of the "train wreck" debate, with background on the rule, information on its requirements (for those rules that have been proposed or promulgated), and where possible, a discussion of the rule's potential costs and benefits. We also examine two of the studies—those of the electric industry's trade association (EEI) and the North American Electric Reliability Corporation—that have attempted to estimate their cumulative economic impacts.

Cross-State Air Pollution (Clean Air Transport) Rule

The Cross-State Air Pollution Rule (hereinafter, the "Cross-State Rule") replaces EPA'smajor clean air initiative under the Bush Administration, the Clean Air Interstate Rule (CAIR). CAIR was promulgated in 2005, but was vacated and remanded to the agency by the D.C. Circuit Court of Appeals in 2008.[5] On appeal, the court left the rule in place until such time as EPA promulgated a replacement. The agency proposed the replacement August 2, 2010,[6] and it finalized the rule July 6, 2011.[7]

[4] CRS Report R41561, *EPA Regulations: Too Much, Too Little, or On Track?*, by James E. McCarthy and Claudia Copeland.

[5] The promulgated rule was published at 70 *Federal Register* 25162, May 12, 2005. The court decision was North Carolina v. EPA, 531 F.3d 896 (D.C. Cir. 2008).

[6] U.S. Environmental Protection Agency, "Federal Implementation Plans To Reduce Interstate Transport of Fine Particulate Matter and Ozone; Proposed Rule," 75 *Federal Register* 45210, August 2, 2010.

[7] The final rule has not appeared in the *Federal Register* as of this writing, but a pre-publication copy as well as explanatory and background material can be found on EPA's website at http://www.epa.gov/crossstaterule/actions.html. When proposed in August 2010, the Cross-State Rule was referred to as the Clean Air Transport Rule. The name change to "Cross-State Rule" occurred late in the development of the final rule. As a result, many of the (continued...)

Both CAIR and its replacement, the Cross-State Rule, are designed to control emissions of air pollution that cause air quality problems in downwind states. The original, Bush-era rule did so by establishing region-wide cap-and-trade programs[8] for SO_2 and NOx emissions from coal-fired electric power plants in 28 Eastern states, at an estimated annual compliance cost of $3.6 billion in 2015.[9] CAIR covered only the eastern half of the country, but since most of the coal-fired generation capacity lacking emission controls is located there, EPA projected that nationwide emissions of SO_2 would decline 53% and NOx emissions 56% by 2015, as compared to nationwide emissions from electric generating units (EGUs) in 2001.

The replacement rule, finalized July 6, 2011, is a modified cap-and-trade rule. It would allow unlimited trading of allowances within individual states; interstate trading would be allowed so long as a state remained within 18%-21% of its emissions caps. Limiting interstate trading would address the D.C. Circuit's ruling, which found CAIR's interstate allowance trading program unlawful.

The rule applies to 28 states (adding Oklahoma, Kansas, and Nebraska to the 28 covered by CAIR, but removing Connecticut, Delaware, and Massachusetts from the CAIR group). Its annual compliance cost is estimated at $3.0 billion in 2012 and $2.4 billion in 2014.[10]

The Cross-State Rule would leave the CAIR Phase 1 (2009-2010) caps in place and would set new limits replacing CAIR's second phase in 2012 and 2014, up to three years earlier than CAIR would have done. The 2012 and 2014 requirements place particular emphasis on SO_2—emissions of which would decline to 2.4 million tons in the covered states (73% below 2005 levels) in 2014.

To insure that the Cross-State Rule is implemented quickly, EPA is promulgating a Federal Implementation Plan (FIP) for each of the states: the FIP specifies emission budgets for each state based on controlling emissions from electric power plants. States may develop their own State Implementation Plans and may choose to control other types of sources if they wish, but the federal plan will take effect until the state acts to replace it.

The CAIR Phase 1 rules already appear to be having substantial effects. In August 2010, EPA reported that emissions of SO_2 had declined sharply in both 2008 and 2009: in the latter year, emissions from fossil-fueled power plants in the lower 48 states (at 5.7 million tons) were 44%

(...continued)

explanatory materials, including the final Regulatory Impact Analysis, refer to the "Transport Rule."

[8] A cap-and-trade system sets a declining national cap on emissions and allocates emission allowances that can be bought and sold on open markets.

[9] 70 *Federal Register* 25306, May 12, 2005.

[10] These cost estimates include $1.6 billion in annualized costs already incurred to comply with Phase 1 of CAIR. EPA estimates the additional cost of the Cross-State Rule at $1.4 billion in 2012 and $0.8 billion in 2014. The 2014 cost of compliance with the Cross-State is less than that estimated for 2012 or for final implementation of CAIR in 2015 because the Regulatory Impact Analyses for the two rules use different base years for comparison. As the agency's RIA for the Cross-State Rule notes, "The base case in this RIA assumes that CAIR is not in effect, but does take into account emissions reductions associated with the implementation of all federal rules, state rules and statutes, and other binding, enforceable commitments finalized by December 1, 2010, that are applicable (sic) the power industry and which govern the installation and operation of SO_2 and NOx emissions controls in the timeframe covered in the analysis." Thus, the base with which control requirements are compared already accounts for some reductions realized since the original CAIR rule was promulgated. See U.S. EPA, Office of Air and Radiation, *Regulatory Impact Analysis (RIA) for the final Transport Rule*, June 2011, p. 244, at http://www.epa.gov/cro ssstaterule/pdfs/FinalRIA.pdf. Hereafter, "Cross-State Rule RIA."

below 2005 levels. NOx emissions from the same sources declined to 1.8 million tons in 2009, a decline of 45% compared to 2005.[11] The reductions occurred well in advance of CAIR's compliance dates: in fact, for both SO_2 and NOx, the affected units had achieved about 80% of the required 2015 reductions six years ahead of that deadline. Further reductions of both SO_2 and NOx can be expected as Phase 1 takes effect. The Cross-State Rule would build on these reductions.

As noted earlier, EPA estimated that compliance with the rule will cost the power sector $2.4 billion annually when fully effective. It expects the benefits to be 50 to almost 120 times as great—an estimated $120 billion to $280 billion annually. The most important benefit would be 13,000 to 34,000 fewer premature deaths annually. Avoided deaths and other benefits would occur throughout the East, Midwest, and South, according to EPA, with Ohio and Pennsylvania benefitting the most.[12]

Both EEI and NERC included the Cross-State Rule in their analyses, and their estimates of the rule's cost and the impact on coal-fired power do not appear to differ greatly from those of EPA, particularly in the "train wreck" years, from now until 2017. NERC, for example, concluded that the Cross-State Rule as proposed (then referred to as the "Transport Rule") would lead to 2.9 GW of deratings[13] or retirements by 2015.[14] This would represent less than 1% of coal-fired capacity, and less than 0.3% of all EGU capacity. EPA, by comparison, projects that 4.8 GW of coal-fired capacity would be uneconomic to maintain as a result of the rule.[15]

EEI's analysis stated that it used EPA's Integrated Planning Model assumptions with "no additional controls for SO_2-specific compliance" and with EPA's preferred option for NOx compliance through 2017. With the same assumptions and the same model, EEI's projected compliance costs should not differ from those of EPA.

For the years after 2017, however, EEI's analysis did differ from that of EPA: it assumed that selective catalytic reduction (SCR) would be required on all units to reduce NOx emissions. This *would* impose additional cost, since about 54% of coal-fired capacity will not have installed SCR to comply with the Cross-State Rule's 2014 requirements, according to EPA.[16] These costs are speculative: to date, EPA has not proposed additional post-2014 requirements, and, as a result, the agency has not estimated costs of compliance or a schedule for implementation of any future pollution transport regulations.[17]

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[11] Data are from EPA's "2009 Acid Rain Program Emission and Compliance Data Report," August 11, 2010, at http://www.epa.gov/airmarkets/progress/ARP09.html. Some of the emission reduction was the result of the recession, which resulted in a decline in electric power generation of 5% from 2007 to 2009. Coal use for electricity generation declined even more (11% from 2007 to 2009).

[12] U.S. EPA, Office of Air and Radiation, "Final Air Pollution Cross-State Air Pollution Rule," Overview Presentation, undated, pp. 12-14, at http://www.epa.gov/crossstaterule/pdfs/CSAPRPresentation.pdf.

[13] "Derating," in these analyses, refers to the loss of available capacity because of the power needed to operate the pollution control equipment.

[14] NERC report, p. 20.

[15] Cross-State Rule RIA, p. 262.

[16] Cross-State Rule RIA, p. 259.

[17] Given the need to meet the more stringent ambient air quality standard (NAAQS) requirements, especially those for ozone and PM (described below), which EPA is expected to propose or promulgate this year, the agency stated its intention to propose a further set of requirements addressing interstate transport of air pollution in 2011. (These potential further rules appear on EEI's chart as "Transport Rule II (NOx) Proposal" and "PM Transport Rule.")

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To summarize, CAIR and its replacement, the Cross-State Air Pollution Rule, would impose annual costs in the $2 billion to $3 billion range on previously uncontrolled coal-fired electric generating units. Although these are significant costs, the industry has already complied with Phase 1, which was the most ambitious of the rules' requirements. Prompted by the ability to generate tradable allowances, the industry complied well ahead of schedule. The final version of the Cross-State Rule allows additional allowance trading as compared to the proposed rule, giving EGUs additional flexibility in determining how to comply and lowering compliance costs.

The Utility MACT

In 2005, EPA promulgated regulations establishing a cap-and-trade system to limit emissions of mercury from coal-fired power plants. Coal-fired electric generating units (EGUs) account for about half of U.S. mercury emissions. Mercury is a potent neurotoxin that can harm health (principally delayed development, neurological defects, and lower IQ in fetuses and children) at very low concentrations.[18]

The mercury cap-and-trade rules promulgated in 2005 were a change in policy by EPA. All previous sources of mercury subject to emission standards had been required to meet plant-specific Maximum Achievable Control Technology (MACT) standards under CAA Section 112.[19] Section 112 sets out very detailed requirements for MACT standards, including a list of the pollutants that need to be controlled (not just mercury, but any of 187 hazardous air pollutants, or HAPs) and the level of control that the standards must achieve. The 2005 cap-and-trade rules addressed only mercury, and would have allowed many power plants to avoid control provided they obtained allowances from others who achieved lower pollution levels than required, or reduced emissions sooner than required. The ability of plants to avoid emission control by purchasing allowances could lead to the continuation of "hot spots," areas where mercury concentrations in waterbodies are greater than elsewhere.

By contrast, the statute requires MACT standards applicable at each existing plant to be no less stringent than the average emission limitation achieved by the best performing 12% of existing sources in the industry subcategory.[20] These statutory requirements are referred to as the "MACT floor," because the agency is not allowed to set less stringent standards, nor may it take economic factors into account in determining what the floor will be.

Whether the agency could substitute cap-and-trade rules for the MACT requirements was challenged by the State of New Jersey and others, and, in a 3-0 decision, the D.C. Circuit Court of Appeals vacated the cap-and-trade rules in 2008.[21] The court found that, under Section 112,

[18] The principal route of exposure to mercury is through consumption of fish. Mercury enters water bodies, often through air emissions, and is taken up through the food chain, ultimately affecting humans as a result of fish consumption. All 50 states have issued fish consumption advisories due to mercury pollution, covering 16.8 million acres of lakes, 1.25 million river miles, and the coastal waters of 20 entire states. For a more detailed discussion of mercury's health effects, see CRS Report RL32420, *Mercury in the Environment: Sources and Health Risks*, by Linda-Jo Schierow. For EPA's "2008 Biennial National Listing of Fish Advisories," September 2009, see http://water.epa.gov/scitech/swguidance/fishshellfish/fishadvisories/upload/ 2009_09_16_fish_advisories_tech2008.pdf.

[19] EPA identified 174 industrial categories to be regulated under the MACT provisions. Standards have been promulgated for almost all these categories except EGUs.

[20] For new sources, the standards are to be based on the emission control achieved by the best controlled similar source.

[21] New Jersey v. EPA, 517 F.3d 574 (D.C. Cir. 2008).

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unless EPA "delisted" the category of sources, it had to require that each plant in the category meet MACT standards. Under the statute, delisting would have required a finding that no EGU's emissions exceeded a level adequate to protect public health with an ample margin of safety, and that no adverse environmental effect would result from any source.

Rather than appeal the court's ruling to the Supreme Court or attempt to delist the category, EPA proposed what is referred to as the "Utility MACT," March 16, 2011.[22] The proposal appeared in the *Federal Register* May 3, beginning a public comment period that runs through August 4. Under a consent agreement, the final MACT standards are to be promulgated by November 16, 2011.

The Proposed Rule

As proposed, the Utility MACT would require coal-fired power plants to achieve a 91% reduction from uncontrolled emissions of mercury, nine other toxic metals, and three acid gases, all of which were listed by Congress as hazardous air pollutants in the 1990 Clean Air Act Amendments. Power plants are the largest emitters of many of these pollutants, accounting for about 50% of the nation's mercury emissions, 62% of arsenic emissions, and 82% of hydrochloric acid emissions, for example.[23] The Utility MACT would also reduce emissions of fine particulates ($PM_{2.5}$), which, although not categorized as hazardous air pollutants, are estimated to cause thousands of premature deaths annually.

In proposing the standards, EPA noted that while the requirements are stringent for those facilities lacking controls, 56% of existing coal-fired power plants already are in compliance. Thus, the standards are expected to level the playing field, bringing older, poorly controlled plants up to the standards being achieved by a majority of the existing units. In this respect, the proposed standards reflect the statute's requirement that existing sources of HAPs should meet standards based on the current emissions of the best performing similar sources.

The agency also concluded that some plants, representing less than 10 GW of coal-fired capacity, will be retired by 2015, rather than invest in control technologies. In all, it said, coal-fired generation will decline about 2% compared to estimated generation in the absence of the rule.[24]

Costs, Benefits, and Control Technology

EPA projected the annualized cost of compliance with the proposed rule at $10.9 billion in 2015, and remaining at $10 billion - 11 billion annually through 2030.[25] The average consumer would see an increase of $3-$4 per month in the cost of electricity due to the rule, according to the agency.[26] These costs will go largely to the installation of scrubbers and fabric filters. As a result

[22] For a link to the proposed rule as well as explanatory material, see U.S. EPA, "Reducing Toxic Air Emissions from Power Plants," at http://www.epa.gov/airquality/powerplanttoxics/actions.html.

[23] See U.S. EPA, "Emissions Overview: Hazardous Air Pollutants in Support of the Proposed Toxics Rule," Memorandum from Madeleine Strum, Emission Inventory and Analysis Group, to Marc Houyoux, Group Leader, Emission Inventory and Analysis Group, March 15, 2011, Tables 3 and 4.

[24] U.S. EPA, *Regulatory Impact Analysis of the Proposed Toxics Rule: Final Report*, March 2011, p. 8-17 at http://www.epa.gov/ttn/ecas/regdata/RIAs/ToxicsRuleRIA.pdfHereafter, "Utility MACT RIA."

[25] Utility MACT RIA, p. 8-12.

[26] U.S. EPA, "Power Plant Mercury and Air Toxics Standards: Overview of Proposed Rule and Impacts," p. 3, at (continued...)

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of the rule, 26 GW of coal-fired units, about 9% of total coal-fired capacity, are expected to install scrubbers. (EPA estimated that by the time the rule requires compliance, 203 GW will already have installed scrubbers anyway, as a result of other regulations.)[27]

More than half of the coal-fired EGU capacity (166 GW) are expected to add fabric filters because of the rule, while 77 GW would have them whether or not there were a rule. In most cases, the fabric filters will be coupled with activated carbon injection or dry sorbent injection.[28] Mercury and other HAPs become attached to the carbon or sorbent after it is injected into the flue gas, and the fabric filter collects the particles, removing them from the plant's emissions. EPA estimates that 62 GW of coal-fired capacity (about one-fifth of the U.S. total) would have either activated carbon or dry sorbent injection in 2015 without the rule. The rule adds another 149 GW of carbon/sorbent installations.

This is not complicated or new technology. Other types of facilities (notably solid waste incinerators) have used this technology for the past 15 years to reduce their mercury and other HAP emissions by 95% or more. As a result of state-level pollution control regulations, a growing percentage of coal-fired power plants do the same.

The benefits of the rule are estimated by EPA at $59 billion to $140 billion annually—5 to 13 times as great as the costs—due primarily to the avoidance of 6,800 to 17,000 premature deaths each year.[29] Other benefits, only some of which were given dollar values, include the annual avoidance of 11,000 nonfatal heart attacks, 120,000 cases of aggravated asthma, and developmental effects on children, including effects on IQ, learning, and memory.[30]

Of the proposed EPA rules, the Utility MACT is probably the most costly and most likely to affect older coal-fired plants that have not yet installed current pollution control technology. EPA'sproposal does allow averaging of emissions from multiple units at a single location, which may allow some older units that are operated infrequently to remain in service, but the absence of broader allowance trading provisions in the law and the stringency of the emission requirements mean that most units will not be able to escape regulation.

EEI's and NERC's Analyses of the Utility MACT Rule

In its report, which was written before EPA's Utility MACT proposal, EEI concluded that, "All coal units [would be] required to install a scrubber (wet or dry), activated carbon injection (ACI) and a baghouse/fabric filter" for compliance with the MACT.[31] This goes well beyond what EPA proposed. Compared to EPA'sprojections, it concluded that five times as much scrubber capacity, nearly three times as much ACI, and about one and one-half times as much baghouse capacity

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http://www.epa.gov/airquality/powerplanttoxics/pdfs/overviewfactsheet.pdf.

[27] U.S. EPA, "Reducing Toxic Pollution from Power Plants: EPA's Proposed Mercury and Air Toxics Standards," Overview Presentation, March 16, 2010, p. 15, http://www.epa.gov/airquality/powerplanttoxics/pdfs/presentation.pdf.

[28] Ibid.

[29] Ibid., p. 13.

[30] U.S. EPA, "Fact Sheet: Proposed Mercury and Air Toxics Standards," March 2011, p. 3, at http://www.epa.gov/airquality/powerplanttoxics/pdfs/proposalfactsheet.pdf.For additional information, see Utility MACT RIA, pp. 1-2 to 1-10, and Chapter 5.

[31] EEI report, p. 43.

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would need to be added, making the rule substantially more costly and far more difficult to comply with in the limited time provided by the statute.

NERC's report, which was also written before EPA proposed the Utility MACT, also assumed that vastly more pollution control equipment would need to be added to coal-fired plants than EPA believes will be necessary. The NERC analysis assumed wet scrubbers would be added to all coal-fired plants that don't already have them, that selective catalytic reduction (SCR) will be added to all bituminous coal-powered facilities, and that activated carbon injection and baghouses would be added at all facilities burning other types of coal.[32] These assumptions are similar to EEI's except that by assuming wet scrubbers (instead of EPA'sgeneral assumption that dry scrubbers will suffice) and by assuming SCR at bituminous facilities, the cost impacts would most likely be even greater than the costs in EEI's assessment.[33] NERC concluded that 8.4 GW to 17.6 GW of capacity would be retired or derated as a result of the MACT rule. If fewer units need controls and less expensive pollution control equipment is needed on those that do, the retirements and deratings would be fewer.

Following promulgation of these standards, existing power plants will have three years, with a possible one-year extension, to meet the standards. (The three-to-four-year timeframe is mandated by the statute.) Many in industry argue that three or four years is not enough time to complete the required pollution control equipment installation, and as a result that the reliability of the nation's electric power supply could be affected by the rule. NERC did not say this directly, in part because its analysis combines the effects of four rules, making it difficult to disaggregate the Utility MACT's effect. What it did say was:

> The MACT Rule considered alone could drive Planning Reserve Margins of 8 regions/subregions below the NERC Reference Margin Levels standards and trigger the retirement of 2-15 GW ... of existing coal capacity by 2015. To comply, owners of the remaining capacity need to retrofit from 277 to 753 units with added environmentalcontrols. The "hard stop" 2015 compliance deadline proposed by the MACT Rule makes retrofit timing a significant issue and potentially problematic.[34]

In part, whether or not there is sufficient time to implement the rule without threatening electric system reliability will depend on the number of units that require retrofits. EPA is the only one of the three sources discussed herein that analyzed the actual proposal. Both EEI and NERC assumed requirements that appear to be substantially more stringent than what EPA proposed. If EPA is correct in its analysis, the number of retrofits appears to be within the range of what the industry has accomplished in the past as a result of earlier regulations. This point is discussed below in more detail, under "Train Wreck?"

New Source Performance Standards for Greenhouse Gas Emissions

On December 23, 2010, EPA released the text of a settlement agreement with 11 states, two municipalities, and three environmental groups, under which it agreed to propose New Source Performance Standards (NSPS) to address greenhouse gas emissions from power plants by July 26, 2011, and take final action on the proposal by May 26, 2012. (The agency recently announced

[32] NERC report, p. 50.

[33] For a detailed comparison of equipment cost, see EEI report, p. 33.

[34] NERC report, p. V.

that it will delay proposal until September 30, 2011, but it expects to retain the May 26, 2012 date for final action.) Electric generating units are the largest U.S. source of greenhouse gas (GHG) emissions, accounting for about one-third of total U.S. emissions. Coal-fired plants accounted for 81% of the electric power industry's total GHG emissions in 2009[35] and, thus, are expected to be the main focus of EPA'sNSPS rules.

New Source Performance Standards are emission limitations imposed on designated categories of major new (including substantially modified) stationary sources of air pollution. CAA Section 111 gives EPA authority to set NSPS for emissions of "air pollutants," a term that includes greenhouse gases.[36] A new source is subject to NSPS regardless of its location (i.e., the same standards apply to all new and modified major facilities anywhere in the United States). The statute provides authority for EPA to impose such standards directly in the case of new (or modified) sources (Section 111(b)), and through the states in the case of existing sources (Section 111(d)). The authority to impose performance standards on new and modified sources refers to any category of sources that the EPA Administrator judges "causes, or contributes significantly to, air pollution which may reasonably be anticipated to endanger public health or welfare" (Sec. 111(b)(1)(A))—language similar to the endangerment and cause-or-contribute findings EPA used to promulgate GHG emission standards for motor vehicles in 2010.

In establishing these standards, Section 111 gives EPA considerable flexibility with respect to the source categories regulated, the size of the sources regulated, and the particular gases regulated, along with the timing and phasing in of regulations. This flexibility extends to the stringency of the regulations with respect to costs and secondary effects, such as non-air-quality, health and environmental impacts, along with energy requirements. This flexibility is encompassed within the Administrator's authority to determine the control systems that have been "adequately demonstrated." Standards of performance developed by the states for existing sources under Section 111(d) can be similarly flexible.

Assuming EPA promulgates the greenhouse gas NSPS on schedule, how quickly such standards would be applied to existing sources is an open question. EPA must first propose and promulgate guidelines, following which the states would be given time to develop implementation plans.[37] Following approval of the plans, the act envisions case-by-case determinations of emission limits, in which the states may consider, among other factors, the remaining useful life of a source in setting an emission limit. Thus, it is likely to be several years before existing power plants are subject to emission limits for GHGs.

Since EPA has not yet proposed NSPS, the agency has not provided a Regulatory Impact Analysis or cost estimate for such a rule.[38] EEI, on the other hand, in six of the nine scenarios in its

[35] U.S. EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2009*, April 2011, Table 2-13, available at http://epa.gov/climatechange/emissions/usinventoryreport.html.

[36] In Massachusetts v. EPA (549 U.S. 497 (2007)), the Supreme Court held, in a 5-4 decision, that greenhouse gases are clearly air pollutants under the Clean Air Act's definition of that term.

[37] How much time the states would be given to submit plans is unclear. The statute says that the regulations shall establish a procedure "similar to that" provided for State Implementation Plans under Section 110, which generally give states three years to submit a plan, following which EPA reviews it to determine its adequacy.

[38] Agency guidance for state GHG permitting decisions, issued in November 2010, is perhaps the best example of what the agency might require: the guidance focuses on energy efficiency as the best available control technology, and states that both conversion to natural gas and carbon capture and sequestration can be eliminated from consideration. While cost is not estimated in the guidance, the requirements would not appear to be stringent. For a discussion of EPA's guidance, see CRS Report R41505, *EPA's BACT Guidance for Greenhouse Gases from Stationary Sources*, by Larry (continued...)

analysis, assumed there would be CO_2 regulations in place by 2017. In five of the scenarios, it estimatedthe cost of CO_2 regulation or legislation at $25 per ton of emissions in 2017, with price escalation of 5% annually thereafter. This assumption would impose a larger burden on coal-fired power plants than any of the other rules considered in EEI's report. In 2009, coal-fired electric power plants emitted 1,748 million tons of CO_2.[39] Assuming roughly the same level of emissions in 2017, EEI's $25/ton assumption would result in a cost of CO_2 regulation of $43.7 billion in 2017, with 5% increases each year thereafter. This cost, which appears to have been based on its analysis of legislation not enacted in the 111th Congress, dwarfs every other projected regulatory cost in the regulatory impact analyses that CRS examined. Inclusion of this requirement leads, in EEI's analysis, to an additional 23 GW of retired capacity in 2015 and 40 GW of incremental retirements in 2020, accounting for more than half of all retirements in the latter year.[40]

NERC, on the other hand, did not include CO_2 regulation in its study.

NAAQS Revisions

EPA is required in CAA Sections 108 and 109 to set National Ambient Air Quality Standards (NAAQS) for air pollutants that endanger public health ("primary" NAAQS) or welfare ("secondary" NAAQS) and that are emitted by numerous or diverse sources. NAAQS do not directly regulate emissions. Rather, the primary NAAQS identify pollutant concentrations in ambient air that must be attained to protect public health with an adequate margin of safety. Secondary NAAQS identify concentrations necessary to protect public welfare, a broad term that includes damage to crops, vegetation, property, building materials, and more.

In essence, NAAQS are standards that define what EPA considers to be clean air. Their importance stems from the long and complicated implementation process that is set in motion by their establishment. Once NAAQS have been set, EPA, using monitoring data and other information submitted by the states to identify areas that exceed the standards and must, therefore, reduce pollutant concentrations to achieve them. State and local governments then have three years to produce State Implementation Plans which outline the measures they will implement to reduce the pollution levels in these "nonattainment" areas. Nonattainment areas are given anywhere from three to 20 years to attain the standards, depending on the pollutant and the severity of the area's pollution problem.

EPA also acts to control many of the NAAQS pollutants wherever they are emitted through national standards for certain products that emit them (particularly mobile sources, such as automobiles) and emission standards for new stationary sources, such as power plants.

In the 1970s, EPA identified six pollutants or groups of pollutants for which it set NAAQS.[41] But that was not the end of the process. When it gave EPA the authority to establish NAAQS, Congress anticipated that the understanding of air pollution's effects on public health and welfare

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Parker and James E. McCarthy.

[39] U.S. EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2009,* April 2011, Table 2-13, available at http://epa.gov/climatechange/emissions/usinventoryreport.html.

[40] EEI report, p. v.

[41] The six pollutants are ozone, particulates, carbon monoxide, SO_2, NOx, and lead.

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would change with time, and it required that EPA review the standards at five-year intervals and revise them, as appropriate.

The agency is currently conducting the required reviews of these standards: it has already completed reviews for five of the six standards, but two of them have been remanded by the D.C. Circuit Court of Appeals for further agency action, and others are being challenged in court. The electric power industry and others are following this process closely, because more stringent standards could begin a process that would lead to more stringent emission standards.[42]

The three standards most likely to affect power plants are those for SO_2, ozone, and particulate matter (PM).

Sulfur Dioxide (SO_2)

On June 22, 2010, EPA revised the NAAQS for SO_2, focusing on short-term (1-hour) exposures. The prior standards (for 24-hour and annual concentrations), which were set in 1971, were revoked as part of the revision. Since 1971, EPA had conducted three reviews of the SO_2 standard without changing it. However, following the last of these reviews, in 1998, the D.C. Circuit Court of Appeals remanded the SO_2 standard to EPA, finding that the agency had failed adequately to explain its conclusion that no public health threat existed from short-term exposures to SO_2.[43] Twelve years later, EPA revised the standard to respond to the court's decision.

The new short-term standard is substantially more stringent than the previous standards: it replaces a 24-hour standard of 140 parts per billion (ppb) with a 1-hour maximum of 75 ppb. This means that there could be an increase in the number of SO_2 nonattainment areas (especially since there were *no* nonattainment areas under the old standards), with additional controls required on the sources of SO_2 emissions in any newly designated areas. Since electric generating units accounted for 60% of total U.S. emissions of SO_2 in 2009, additional controls on EGUs would be likely.

The timing and extent of any additional controls is uncertain, however, for several reasons. First, the monitoring network needed to determine attainment status is incomplete and is not primarily configured to monitor locations of maximum short-term SO_2 concentrations.[44] The agency says it will need 41 new monitoring sites to supplement the existing network in order to have a more complete data base. Since three years of data must be collected after a site's startup to determine attainment status, it may be as late as 2016 before some areas will have sufficient data to be classified. Even if the areas can be designated sooner based on modeling data, it would be at least 2015 before State Implementation Plans with specific control measures would be due, and actual compliance with control requirements would occur several years later.

Meanwhile, SO_2 emissions will be significantly reduced as a result of the CAIR, Cross-State, and Utility MACT rules described above. Thus, although EPA identified 59 counties that would have

[42] Five of the entries on EEI's "train wreck" chart (**Figure 1**) refer to NAAQS reviews.

[43] American Lung Association v. EPA, 134 F.3d 388 (D.C. Cir 1998).

[44] U.S. EPA, "Fact Sheet: Revisions to the Primary National Ambient Air Quality Standard Monitoring Network, and Data Reporting Requirements for Sulfur Dioxide," June 2, 2010, p. 3, at http://www.epa.gov/air/sulfurdioxide/pdfs/20100602fs.pdf.

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violated the new SO_2 NAAQS based on 2007-2009 data, it is not clear whether any of these counties will be in nonattainment by the time EPA designates the nonattainment areas.

In its Regulatory Impact Analysis of the SO_2 NAAQS, the agency estimated that attainment would require a reduction of 370,000 tons of SO_2 by 2020, about two-thirds of which would need to come from EGUs.[45] The agency estimated the annualized cost of these controls (for all sources, not just EGUs) at $1.5 billion. Benefits would range from $15 billion to $37 billion annually.[46]

These costs and benefits do not take account of CAIR, the Cross-State Rule, or the Utility MACT, however. (As may be recalled, the CAIR and Cross-State Rules will result in more than 6 million tons of SO_2 emission reductions by 2014.) The agency assumed for purposes of analysis that none of these rules was in effect, because none of them was in effect in 2005, the base year used for analytical purposes. As the agency's RIA states:

> The baseline for this analysis is complicated by the expected issuance of additional air quality regulations. The SO_2 NAAQS is only one of several regulatory programs that are likely to affect EGU emissions nationally in the next several years. We thus expect that EGUs will apply controls in the coming years in response to multiple rules. These include the maximum achievable control technology (MACT) rule for utility boilers, revisions to the Clean Air Interstate Rule, and reconsideration of the Clean Air Mercury Rule. Therefore controls and costs attributed solely to the SO_2 NAAQS in this analysis will likely be needed for compliance with other future rules as well.[47]

In short, compared to the Utility MACT and the Cross-State Rule, the SO_2 NAAQS has relatively little impact on coal-fired power plants in EPA's analysis, and the agency's analysis relied on assumptions that probably overstate the impact of the standard.

EEI included the SO_2 NAAQS on its "train wreck" timeline, but neither EEI nor NERC considered the standard in their analyses.

Ozone

On January 19, 2010, EPA proposed a revision of the NAAQS for ozone.[48] EPA currently expects to finalize this revision by the end of July 2011 (although it has already postponed the review's completion date three times). As noted above, NAAQS do not directly limit emissions, but they set in motion a process under which "nonattainment areas" are identified and states and EPA develop plans and regulations to reduce pollution in those areas.

Ozone is not directly emitted by coal-fired power plants (or most other sources). It forms in the atmosphere as the result of a chemical reaction between nitrogen oxides (NOx), volatile organic compounds (VOCs), and carbon monoxide (CO) in the presence of sunlight. Power plants emit

[45] U.S. EPA, Office of Air Quality Planning and Standards, *Final Regulatory Impact Analysis (RIA) for the SO2 National Ambient Air Quality Standards (NAAQS)*, June 2010, page ES-7, Table ES.2, at http://www.epa.gov/ttnecas1/regdata/RIAs/fso2ria100602full.pdf.

[46] Ibid., p. ES-9, Table ES.4.

[47] Ibid., p. ES-3.

[48] U.S. Environmental Protection Agency, "National Ambient Air Quality Standards for Ozone; Proposed Rule," 75 *Federal Register* 2938, January 19, 2010.

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one of these precursor emissions, NOx. Thus, the setting of a more stringent ozone standard might lead to tighter controls on their NOx emissions.

The ozone standard affects a large percentage of the population: as of September 2010, 119 million people (nearly 40% of the U.S. population) lived in areas classified "nonattainment" for the current ozone standard. The proposed revision would lower the primary (health-based) standard from 0.075 parts per million—75 parts per billion (ppb)—averaged over 8 hours to somewhere in the range of 70 to 60 ppb averaged over the same time.

EPA has identified at least 515 counties that would violate the proposed ozone NAAQS if the most recent three years of data available at the time of proposal were used to determine attainment (compared to 85 counties that violated the standard in effect at that time). The proposal would also, for the first time, set a separate standard for public welfare, the principal effect of which would be to call attention to the damage by ozone to forests and agricultural productivity.

As with other NAAQS, the standards, when finalized, would set in motion a long implementation process that has far-reaching impacts. The first step, designation of nonattainment areas, is expected to take place within a year of the new standards' promulgation; the areas so designated would then have 3 to 20 years to reach attainment.

EPA is prohibited by the statute from considering costs in setting NAAQS, but it does prepare cost and benefit estimates for information purposes. The agency estimated that the costs of implementing the revised ozone NAAQS (for all sources of ozone precursors) would range from $19 billion to $25 billion annually in 2020 if the standard chosen is 70 ppb, or $52 billion to $90 billion if the standard chosen is 60 ppb,[49] with benefits of roughly the same amount.

Although the ozone NAAQS revision is one of the most expensive EPA rules under development, it is unlikely to have major impacts on electric generating units. Fuel combustion by electric utilities accounted for 13% of NOx emissions nationally in 2009, and less than 1% of VOC and CO emissions. Thus, other sources account for most of the emissions and are likely to be the main focus of the emission controls necessary to reach attainment of the standard. Furthermore, to the extent that utility NOx emissions are targeted, it will likely be through the Cross-State Rule, or a successor to it, whose impacts were discussed above. The ozone NAAQS would primarily serve as a driver in the development of these other rules.

As with the SO_2 NAAQS, EEI included the ozone NAAQS on its "train wreck" diagram, but neither EEI nor NERC considered the standard in their analyses.

Particulate Matter

A third NAAQS whose revision could affect coal-fired power plants is that for particulate matter (PM). The PM NAAQS, which includes standards for both coarse and fine particulates (PM_{10} and $PM_{2.5}$, respectively), was last revised in October 2006. The D.C. Circuit Court of Appeals remanded the $PM_{2.5}$ standards to EPA in February 2009,[50] so EPA is both conducting the statutory

[49] U.S. EPA, "Fact Sheet: Supplement to the Regulatory Impact Analysis for Ozone," January 7, 2010, at http://www.epa.gov/air/ozonepollution/pdfs/fs 20100106ria.pdf.

[50] American Farm Bureau Fed'n v. EPA, 559 F.3d 512 (D.C. Cir. 2009).

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five-year review of the standard and responding to the D.C. Circuit decision. The agency expects to propose revised standards for both $PM_{2.5}$ and PM_{10} by summer 2011, with promulgation perhaps taking place in 2012.

EPA staff have recommended a strengthening of the PM NAAQS,[51] but at this time, there is no proposal to be evaluated. Fuel combustion by electric utilities is the source of 8.3% of $PM_{2.5}$ and 3.5% of PM_{10}.

As with the other NAAQS, EEI included the PM NAAQS on its "train wreck" diagram, but neither EEI nor NERC considered the standard in their analyses.

Revised Cooling Water Intake Rule

Power plants withdraw large volumes of water for production and, especially, to absorb heat from their industrial processes. Water withdrawals by electric generating plants, used primarily for cooling, are the largest water use category by sector in the United States—201 billion gallons per day (BGD) in 2005. Although water withdrawal is a necessity for these facilities, it also presents special problems for aquatic resources. Cooling water intake structures (CWIS) can cause two types of environmental harm. First, impingement occurs when fish, invertebrates, and other aquatic life are trapped on equipment on intake screens at the entrance to the CWIS. Second, entrainment occurs when small organisms pass through the intake screening system, travel through the cooling system pumps and tubes, and then are discharged back into the source water. Impingement and entrainment injure or kill large numbers of aquatic organisms at all life stages. Section 316(b) of the Clean Water Act (CWA) authorizes regulation of CWIS to protect such organisms from being harmed or killed.

Regulatory efforts by EPA to implement Section 316(b) have a complicated history over 35 years, including legal challenges at every step by industry groups and environmental advocates. Currently most new facilities are regulated under rules issued in 2001, while rules for existing facilities issued in 2004 were challenged and remanded to EPA for revisions. In response to the remand, in March 2011 EPA proposed national requirements expected to affect 559 existing electric generators; 483 are fossil-fuel facilities. The affected facilities comprise approximately 11% of the steam electric generating facilities and over 45% of the electric power sector capacity in the United States. Publication of the CWIS proposal in the *Federal Register* on April 20 triggered a 90-day public comment period that ends on July 19, 2011.[52] EPA is under a court-ordered schedule to issue a final CWIS rule by July 27, 2012.

Even before release, the proposed regulations were highly controversial among stakeholders and some Members of Congress who questioned whether a stringent and costly environmental mandate could jeopardize reliability of U.S. electricity supply. Many in industry feared, while

[51] On July 2, 2010, EPA released the *Second External Review Draft of its Policy Assessment for the Review of the Particulate Matter NAAQS*. The draft represented EPA staff's recommendations to the Administrator. It outlined options for revising both the fine and coarse particulate standard, both of which would make the standards more stringent. The draft is available at http://www.epa.gov/ttn/naaqs/standards/pm/s_pm_ 2007_pa.html.

[52] U.S. Environmental Protection Agency, "National Pollutant Discharge Elimination System—Cooling Water Intake Structures at Existing Facilities and Phase 1 Facilities," 76 *Federal Register* 22174-22228, April 20, 2011. For information, see CRS Report R41786, *Cooling Water Intake Structures: Summary of EPA's Proposed Rule*, by Claudia Copeland.

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environmental groups hoped, that EPA would require installation of technology called closed-cycle cooling that most effectively minimizes the environmental damage of CWIS, but also is the most costly technology option.

In its proposed rule, EPA evaluated four regulatory options expected to minimize the harm to aquatic species of CWIS at existing facilities, each with varying environmental benefits and costs.[53] The agency concluded that closed-cycle cooling reduces CWIS impacts to a greater extent than other technologies, but declined to mandate closed-cycle cooling universally and instead favored a less costly, more flexible regulatory option. EPA's recommended approach would essentially codify current CWIS permitting procedures for existing facilities, which are based on site-specific determinations and have been in place administratively for some time because of legal challenges to previous rules. The agency based the conclusion to not mandate closed-cycle cooling on four factors: additional energy needed by electricity and manufacturing facilities to operate cooling equipment, and threats to reliability of energy delivery (i.e., energy penalty); additional air pollutants that would be emitted because fossil-fueled facilities would need to burn more fuel as compensation for the energy penalty; land availability concerns in some locations; and limited remaining useful life of some facilities such that retrofit costs would not be justified. EPA estimates that more than 90 of the 559 affected electric generators already have the technology required to demonstrate compliance with the proposed rule.

Compliance with the rule, when promulgated in 2012, will be required as soon as possible. For individual facilities, specific compliance deadlines will be set when the facility next seeks to renew its existing CWA discharge permit; such permits are issued for five-year periods and then must be reissued by the permitting authority (state or EPA). Permitting agencies often allow facilities some time to come into compliance with new requirements. As proposed by EPA, for facilities already in compliance with the rule or needing to install technologies other than cooling towers, the compliance period is assumed to be a five-year period from 2013 to 2017. EPA expects that facilities required to install cooling towers for entrainment mortality control will require a longer period of time. Fossil-fuel electric power generating facilities would achieve compliance from 2018 to 2022.[54] EPA estimated that the annual costs of the proposed rule will be $319 million, while benefits will be $17.6 million annually.[55] EPA also estimated that a net nine generating units would be retired as a result of the rule.[56] EPA did not identify potential retirements by fuel source.

Industry groups generally view the March 2011 proposal favorably (at least in comparison with what had been anticipated), while environmental advocates are critical that the proposal does not mandate stricter technological options to provide greater protection of aquatic resources. States

[53] Three of the regulatory options considered by EPA would require all existing electric generators covered by the rule to use screens to prevent impingement of fish, but they differ with respect to requiring closed-cycle cooling towers to prevent entrainment. The fourth option would allow permitting authorities to establish impingement and entrainment controls on a case-by-case basis for small and medium EGUs and would require uniform controls for larger facilities. The agency's preferred option would require uniform impingement standards (i.e., screens) for all power plants and case-by-case determination of need for cooling towers for all facilities.

[54] EPA believes that permitting authorities would need to coordinate outages by multiple power generating facilities in a geographic area so as to minimize impacts on reliability of power generation. In these circumstances, EPA expects a facility could reasonably require as long as eight years to attain compliance.

[55] Costs and benefits are annualized over 50 years and discounted at a 3% rate.

[56] EPA concluded that 39 EGUs would be retired, but that 30 others would avoid closure because of EPA's recommendation of a rule that does not mandate cooling tower retrofits.

will be responsible for most permitting actions to implement the rule. Since many states are coping with constrained budgets, some of them favor a regulatory approach that requires them to make fewer case-by-case decisions, thus imposing less administrative cost.

Prior to release of the EPA proposal, industry assumed that the agency would propose a more stringent rule with a more rapid timeline for compliance. Both EEI and NERC assumed that EPA would mandate that existing power plants retrofit by installing closed-cycle cooling systems. EEI assumed that the CWIS rule would affect 314 GW of capacity and a total of 400 electric generating units, at a cost of $16 billion through 2020. EEI did not estimate or separate out how many plant retirements would result from the anticipated CWIS rule.

The NERC analysis assumed that mandatory cooling tower retrofits would be required by 2018, and on that basis, NERC concluded that the CWIS rule would be the most costly of the four EPA rules that it examined (although NERC did not estimate compliance costs for this rule), with the greatest likely impact on electricity capacity. NERC concluded that such a rule would lead to power plant retirements totaling 33 GW of capacity. However, NERC also concluded that only 2.5 GW of that total would be coal-fired power plants (representing 94 coal steam units). According to NERC, the largest impact of such a CWIS rule would be on older oil- and gas-fired units, with 253 units totaling 30 GW of capacity expected to be economically vulnerable and thus likely to be retired.[57]

Revised Steam Electric Effluent Guidelines

Under authority of CWA Section 304, EPA establishes national technology-based regulations, called effluent limitation guidelines (ELGs), to reduce pollutant discharges from industries directly to waters of the United States and indirectly to municipal wastewater treatment plants. EPA has issued ELGs for 56 industries that include many types of dischargers, such as manufacturing and service industries. These requirements are incorporated into discharge permits issued by EPA and states. The current steam electric power plant rules,[58] which were promulgated in 1982, apply to about 1,200 nuclear- and fossil-fueled steam electric power plants nationwide, 500 of which are coal-fired.

In a 2009 study,[59] EPA found that the current regulations do not adequately address the pollutants being discharged and have not kept pace with changes that have occurred in the electric power industry over the last three decades, specifically the increase of flue gas desulfurization (FGD) systems, or scrubbers, at coal-fired power plants to control air pollution. According to EPA, as of June 2008, 30% of coal-fired power plants were using FGD systems to control SO_2 emissions from the flue gas generated in the plants' boilers and prevent buildup of certain corrosive constituents such as chlorides, and by 2025, nearly 80% of coal-fired generating capacity is expected to employ FGD systems. While scrubbers dramatically reduce emissions of harmful pollutants into the air, some create a significant liquid waste stream (especially wet scrubbers). In addition, discharges from coal combustion waste (CCW) ash impoundments at steam electric power plants have a potential to degrade water quality. Concern about releases of CCW grew

[57] NERC report, pp. 14-15.

[58] 40 CFR § 423.10.

[59] U.S. Environmental Protection Agency, *Steam Electric Power Generating Point Source Category: Final Detailed Study Report*, EPA 821-R-09-008, October 2009.

following the collapse of ash impoundment dams at Tennessee Valley Authority (TVA) power plants, discussed further under "Coal Combustion Wastes," below. Pollutants of concern associated with FGD systems and CCW include a large number of metals (e.g., mercury, arsenic, chromium, and selenium), chloride, nitrogen compounds, and total dissolved and suspended solids. EPA believes that many current CWA permits for power plants do not fully address potential water quality impacts of these discharges through appropriate pollutant limits and monitoring and reporting requirements.

Under the CWA, EPA has a duty to review existing ELGs at least every five years and, if appropriate, revise them. EPA had been studying the effluent limitations for the steam electric power generating category since the mid-1990s and on several occasions indicated that a preliminary study of discharges from this category was necessary. In 2009, environmental groups sued EPA to compel the agency to commit to a schedule for issuing revised guidelines. Pursuant to a November 8, 2010 consent decree that it entered into with environmental litigants, EPA agreed to propose the revised power plant ELG by July 23, 2012, and to finalize the rule by January 31, 2014. The rulemaking will address wastewater discharges from CCW ash storage ponds and FGD air pollution controls, as well as other power plant waste streams.[60] As with the CWIS rule discussed above, compliance with specific regulations, which cannot be anticipated at this time, will occur over several years with full compliance likely not required before 2019 or 2020.

Until EPA proposes a regulation, the substance, cost, and impact of a rule are speculative. Still, even before EPA proposes a new ELG for power plants, the agency has launched an effort to scrutinize state-issued CWA discharge permits for power plants as an interim measure to address longstanding concerns that the permits need to be strengthened. In a June 2010 letter to environmental groups, EPA committed to reviewing at least 35 CWA permits for power plants before the end of 2012 and simultaneously provided EPA regional offices with interim guidance to assist state and EPA permitting authorities to establish appropriate requirements for power plant wastewater discharges.[61]

Since EPA has not proposed a revised steam electric power ELG rule, the agency has not provided a Regulatory Impact Analysis or cost estimate for such a rule. EEI included an ELG rule in the timeline shown in **Figure 1**, but did not analyze or project what a rule would look like, or what its impact might be. NERC did not include an ELG rule in its analysis.

Coal Combustion Waste[62]

Coal combustion waste (CCW) is inorganic material that remains after pulverized coal is burned for electricity production.[63] A tremendous amount of the material is generated each year—

[60] Separately, EPA also is considering regulation of coal ash disposal sites under Resource Conservation and Recovery Act, as discussed in this report under "Coal Combustion Waste."

[61] James A. Hanlon, Director, EPA Office of Wastewater Management, "National Pollutant Discharge Elimination System (NDES) Permitting of Wastewater Discharges from Flue Gas Desulfurization (FGD) and Coal Combustion Residuals (CCR) Impoundments at Steam Electric Power Plants," memorandum, June 7, 2010, on file with authors.

[62] This section of the report was written by Linda Luther, Analyst in EnvironmentalPolicy.

[63] In its June 2010 regulatory proposal, EPA refers to the material as coal combustion *residuals*. It is also commonly referred to as coal combustion *byproducts* or *materials*. How the material is referred to generally depends on the context in which it is being discussed. For example, coal combustion *waste* is generally destined for disposal, while coal combustion *byproducts* or *residuals* may be destined for some use such as a component in gypsum wallboard or (continued...)

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industry estimates that as much as 135 million tons were generated in 2009, making it one of the largest waste streams generated in the United States. Disposal of CCW onsite at individual power plants may involve decades-long accumulation of tons of dry ash (in a landfill) or wet ash slurry (in a surface impoundment) deposited at the site.

On December 22, 2008, national attention was turned to risks associated with managing such large volumes of waste when a breach in a surface impoundment pond at TVA'sKingston, TN, plant released 1.1 billion gallons of coal fly ash slurry that damaged or destroyed homes and property. Beyond the potential for a sudden, catastrophic release from a surface impoundment, a more common threat associated with CCW management is the leaching of contaminants likely present in the waste, primarily heavy metals, resulting in surface or groundwater contamination. This risk is particularly high at unlined surface impoundments which are likely in common use today.

The Kingston release also brought attention to how the waste is managed and regulated. CCW management is largely exempt from federal regulations and is regulated by individual states. State requirements generally apply to two broad categories of CCW management—its *disposal* in landfills, surface impoundment, or mines, and its *beneficial use* (e.g., as a component in concrete, cement, or gypsum wallboard, or as structural or embankment fill). Inconsistencies and deficiencies in state regulatory programs have been identified by EPA as one reason that national standards to regulate CCW are needed. More recently, EPA called into question the effectiveness of some state regulatory programs for protecting human health and the environment.

As discussed below, to establish a national standard necessary to address potential threats of improper management of CCW to human health and the environment, on June 21, 2010, EPA proposed two regulatory options.[64]

Regulatory Background

The evolution of CCW regulation began in 1978 when EPA first proposed hazardous waste management regulations under Subtitle C of the Resource Conservation and Recovery Act (RCRA).[65] However, in 1980, Congress amended the law to exclude CCW from regulation under Subtitle C, pending EPA'scompletion of a report to Congress and regulatory determination on whether hazardous waste regulations were warranted.[66] In response, EPA published regulatory determinations in 1993 and 2000 retaining that exemption, concluding on both occasions that CCW did not warrant regulation as hazardous waste. However, in the 2000 determination EPA stated that national regulations under Subtitle D (applicable to non-hazardous solid waste) were warranted for CCW disposal in landfills and surface impoundments for reasons including new

(...continued)

cement. Regardless of what it is called, these terms refer to the same substances. Since EPA's regulatory proposal primarily discusses issues associated with the materials' disposal, it is referred to here as coal combustion *waste* (CCW).

[64] U.S. EPA, "Hazardous and Solid Waste Management System; Identification and Listing of Special Wastes; Disposal of Coal Combustion Residuals From Electric Utilities," 75 *Federal Register* 35127-35264, June 21, 2010.

[65] RCRA actually amends earlier legislation, the Solid Waste Disposal Act of 1965, but the amendments were so comprehensive that the act is commonly referred to as RCRA rather than by its official title.

[66] This exclusion was specified in Solid Waste Disposal Act Amendments of 1980 (P.L. 96-482) at 42 U.S.C. 6921(b)(3)(A)(i). The provisions are commonly referred to as the "Bevill Amendment" or the "Bevill exclusion."

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data about potential risks to human health and the environment and concerns about the adequacy of state regulatory programs. EPA stated that it would revise its determination that regulation under Subtitle C was not needed if it found that a need for such regulation was warranted.

After accumulating new data regarding CCW management, in October 2009, EPA developed a draft regulatory proposal to list the material as hazardous waste under Subtitle C of RCRA. Under the draft proposal, EPA would establish land disposal and treatment standards for CCW. EPA cited several reasons for determining that regulation under Subtitle C was needed based on new data which showed that disposal in unlined landfills and surface impoundments presents substantial risks to human health and the environment from releases of toxic constituents, that a large amount of waste is still being disposed in units that lack necessary protections, and state programs have not been sufficiently improved to address gaps that EPA had previously identified.[67]

Current Regulatory Proposal

As a result of review by the Office of Management and Budget, EPA'sdraft proposal underwent substantial changes. The final proposal, published on June 21, 2010, stated that the determination to revise the regulatory determination had not yet been made. It proposed two regulatory options for consideration. Under the first option, EPA would draw on its existing authority to list a waste as hazardous and to regulate it. The second option would keep the Subtitle C exclusion in place, but would establish national criteria applicable to landfills and surface impoundments under RCRA's Subtitle D non-hazardous solid waste requirements. Under Subtitle D, EPA does not have the authority to implement or enforce its proposed requirements. Instead, EPA would rely on states or citizen suits to enforce the new standards. However, in support of the Subtitle D option, EPA cited industry's concern that labeling CCW as hazardous waste would stigmatize beneficial uses of the material and ultimately increase the amount that must be disposed.[68]

The public comment period for EPA'sproposal ended on November 19, 2010. It is unclear when, or if, EPA will ultimately promulgate a final rule. On March 3, 2011, EPA Administrator Lisa Jackson testified that she does not anticipate a final rule to be promulgated in 2011, due to the large number of public comments received.[69]

During several congressional hearings, some Members of Congress also have expressed concern over EPA'sultimate decision to regulate CCW. Their concerns about potential Subtitle C regulations relate primarily to the potential impacts those requirements may ultimately have on coal-producing states, state regulatory agencies, energy prices, and CCW recycling opportunities. On the other hand, concerns expressed by other Members regarding the Subtitle D option generally relate to concerns that human health and the environment would not be sufficiently protected given EPA'slack of authority to enforce Subtitle D requirements.

[67] For more information about EPA's regulatory proposal, see CRS Report R41341, *EPA's Proposal to Regulate Coal Combustion Waste Disposal: Issues for Congress*, by Linda Luther.

[68] Opponents of the Subtitle D option have argued the opposite point—that recycling may actually increase if disposal becomes more costly under the Subtitle C requirements.

[69] House Committee on Appropriations, Subcommittee on Interior, Environment, and Related Agencies, March 3, 2011, EPA budget hearing.

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EPA's Regulatory Impact Analysis (RIA) estimated potential costs and benefits associated with the 2010 regulatory proposal. The RIA estimated average annualized regulatory costs to be approximately $1.5 billion a year under the Subtitle C option and $587 million a year under the Subtitle D option. EPA also estimated annualized "regulatory benefits." Under the Subtitle C option, regulatory benefits would range widely depending on whether there would be increases in recycling due to added costs of disposal, or decreases in recycling due to possible "stigma" effects of regulating the material under Subtitle C.[70] EPA estimated that if a decrease in beneficial use were to occur, this could result in increased costs of $16.7 billion, while induced increases in recycling could result in a regulatory benefit of $7.4 billion a year. Under the Subtitle D option, the regulatory benefit is estimated to range from $85 million to $3 billion a year.[71]

The EEI report estimated that if the Subtitle C option were adopted, costs would be considerably higher than projected by EPA, based largely on two costs that were not considered by EPA—costs of retrofitting existing disposal units to meet new standards, and the costs of sending the waste to an offsite commercial hazardous waste disposal facility. With regard to the first cost, neither of EPA's regulatory options would require existing landfills to be retrofitted to meet new regulatory standards as long as they install groundwater monitoring systems and implement corrective action, as needed, while existing surface impoundments would be required to be retrofitted. However, based on its past experience with surface impoundment regulations, EPA assumed that facilities would choose to close rather than retrofit. EEI assumed that some portion would retrofit. With regard to the second cost, EEI assumes that under potential Subtitle C requirements, siting or zoning restrictions and state or local ordinances would affect a facility's decision to open a new CCW landfill. However, these factors are difficult to evaluate. Electric utilities currently operate CCW landfills on-site; no data have been presented that indicate that future landfills could not meet EPA's proposed location restrictions or design requirements or that additional restrictions would prohibit or limit the potential for on-site disposal. Further, according to industry statements, new CCW landfills are already built with liners and groundwater monitoring systems. Thus, there is little evidence to suggest that new Subtitle C standards would differ greatly from what has, up until now, been common industry practice.

Other Regulatory Actions Affecting Coal Power

EPA and other federal agencies (the Office of Surface Mining and Reclamation, in the Department of the Interior; and the U.S. Army Corps of Engineers) are developing a series of actions and regulatory proposals to reduce the harmful environmental and health impacts of surface coal mining, including a practice called mountaintop removal mining, in Appalachia. These actions would not affect electric power plants directly, and thus are not covered by EEI nor NERC in their studies. Nevertheless, numerous critics have included actions by EPA, the Corps of Engineers, and the Interior Department regarding mountaintop removal mining in Appalachia in what they term a "War on Coal." Some of these EPA-Corps-Interior actions are discussed in **Appendix A** to this report.

[70] Potential benefits to the Subtitle C option also included groundwater protection benefits (e.g., human cancer prevention benefits) and remediation or cleanup costs avoidance after groundwater contamination or surface impoundment breach.

[71] For more detail on cost estimates, see 75 *Federal Register* 35134 and 35211-35220, June 21, 2010.

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The Future for Coal-Fired Power

Virtually all the analyses agree that coal will continue to play a substantial role in powering electric generation for decades to come. EPA, for example, in the Utility MACT RIA, concluded that coal-fired generation will be roughly the same in 2015 as it was in 2008, despite the impact of the MACT and other rules.[72] By 2030, the agency projects that 43% of the nation's electricity will still be powered by coal.[73] (The current level is 45%.) EEI projected that coal will be responsible for 36% to 46% of electricity generation in 2020, depending on the scenario.

There *will* be retirements of coal-fired capacity, however, as all of the analyses conclude. The number of these retirements, and the role of EPA regulations in causing them, are matters of dispute. The most extreme scenario in EEI's analysis showed 76 GW of coal-fired capacity retirements by 2020 (a little less than 25% of current capacity) as a result of the regulations it analyzed. As noted in the discussion of the individual regulations, in many cases EEI's analysis assumed regulations far more stringent than EPA actually proposed.

The units that would retire are the least economic and/or those currently operating with minimal pollution controls. As noted in **Figure 5**, there are 110 GW of coal-fired plants (about one-third of all coal-fired capacity) that began operating between 1940 and 1969, and two-thirds of these plants do not have scrubbers. These are the prime candidates for retirement.

[72] Utility MACT RIA, p. 8-16; 2008 data are from U.S. DOE, Energy Information Administration, *Electric Power Annual 2009*, April 2011, Table 2.1, available at http://www.eia.gov/cneaf/electricity/epa/epa_sum.html.

[73] Utility MACT RIA, p. 8-16.

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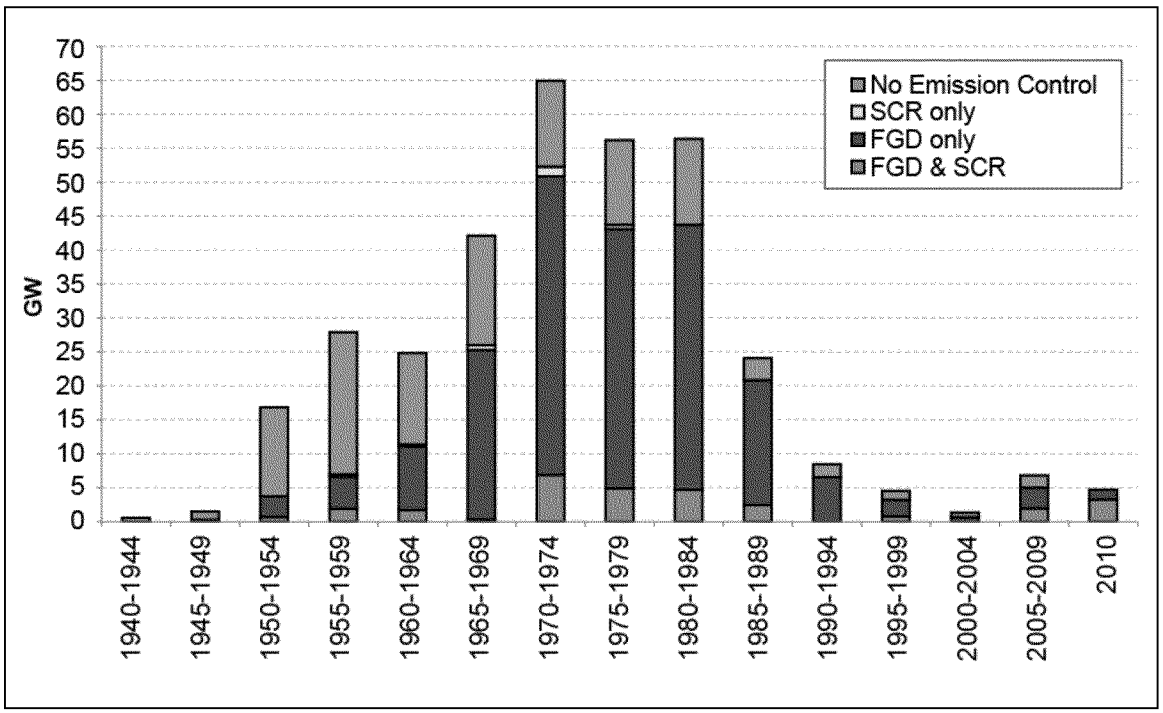
Figure 5. Coal Plants by Age and Emission Controls



Source: Sue Tierney, "EPA Proposed Utility Air Toxics Rule –Managing Compliance in Reliable Ways," Congressional Staff Briefing, May 9, 2011, p. 4.

In many cases, these older plants are not base-load plants, so their significance as a percentage of coal-fired generation is less than one might assume from adding up their nominal capacity. In a presentation to congressional staff, Sue Tierney, a former Assistant Secretary of Energy, presented data showing that the pre-1970 units operating without emission controls are in use only 41% of the time.[74]

EPA'smodeling confirmed that the plants likely to be retired are older, smaller, and less frequently used: the agency concludes, for example, that under the MACT rule the average unit to be retired will be 51 years old, with an average capacity of 109 Mw (versus 278 Mw for units that will continue operation), and has operated only 56% of the time.[75]

Some of these units will be replaced by new capacity, of which some will be coal-fired, but most replacements are likely to be natural gas combined cycle units. Even before the advent of the "train-wreck" rules, very few coal-fired plants were being built. As shown in **Figure 6**, since 1990, more than 80% of new capacity has been natural gas-fired. These plants are highly efficient; they are cost-competitive with coal; and they emit no SO_2, no mercury, and no other hazardous air pollutants. Without scrubber sludge to manage, they also do not need to meet effluent guidelines. Natural gas-fired power plants also have an advantage with regard to greenhouse gas (GHG) emissions: for the same amount of electric generation, they emit only half the GHGs of coal-fired units.

[74] Data obtained from Sue Tierney, "EPA Proposed Utility Air Toxics Rule –Managing Compliance in Reliable Ways," Congressional Staff Briefing, May 9, 2011, p. 4. Hereafter, "Tierney presentation." Additional calculation by CRS.

[75] Utility MACT RIA, p. 8-17.

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In the last two years, gas has enjoyed a price advantage, as well. As one analyst notes:

> Since most of America's utilities have the ability to employ natural gas fired power plants in lieu of coal fired power plants when natural gas is priced advantageously, utilities have been ramping up natural gas consumption and reducing their usage of coal. With the price of Central Appalachian (CAPP) coal currently trading at $73 per ton, up from $60 per ton for much of last year, a recent study by Credit Suisse (CS) indicates that natural gas prices would need to rise to approximately $6.30 per mcf [thousand cubic feet] before coal and natural gas trade at parity for electricity generation.[76]

Gas is currently trading at around $4.50 per mcf, with futures contracts through 2014 generally trading below $6.00.[77]

Train Wreck?

Is there a train wreck coming for coal-fired power? The answer depends on the individual facility. Older, smaller, less efficient units already face a train wreck. In 2010, 48 of them with a combined capacity of 12 GW were retired, according to one source.[78] Another source identifies 149 coal-fired units with a combined capacity of 19.7 GW whose retirement has been announced or implemented in the past few years.[79] In recent weeks, as utilities weigh the cost of retrofitting and operating their older units, more retirements have been announced.[80]

[76] Bill Powers, "Natural Gas vs. Oil and Coal," *Financial Sense*, February 1, 2011, at http://www.financialsense.com/contributors/bill-powers/natural-gas-vs-oil-and-coal.

[77] Commodity Futures Price Quotes for NYMEX Natural Gas, at http://futures.tradingcharts.com/marketquotes/NG.html.

[78] Sierra Club, "2010, Outlook Dimmed for Coal: Year End State of Coal Report," Press Release, December 22, 2010, at http://action.sierraclub.org/site/MessageViewer?em_id=192801.0.

[79] See Source Watch, "Coal Plant Retirements," at http://www.sourcewatch.org/index.php?title=Coal_plant_retirements#Table_1:_Age_of_U.S._Coal_Plants. Of the 149 units listed, all but 15 were built before 1973.

[80] American Electric Power announced in early June that it will retire 6 GW of coal-fired capacity, about one-fourth of the capacity of its coal-fired fleet, and will retrofit an additional gigawatt to burn natural gas. TVA, in April, announced that it will retire 18 coal-fired units, replacing them with low emission or zero-emission electricity sources, including renewable energy, natural gas, nuclear power, and energy efficiency.

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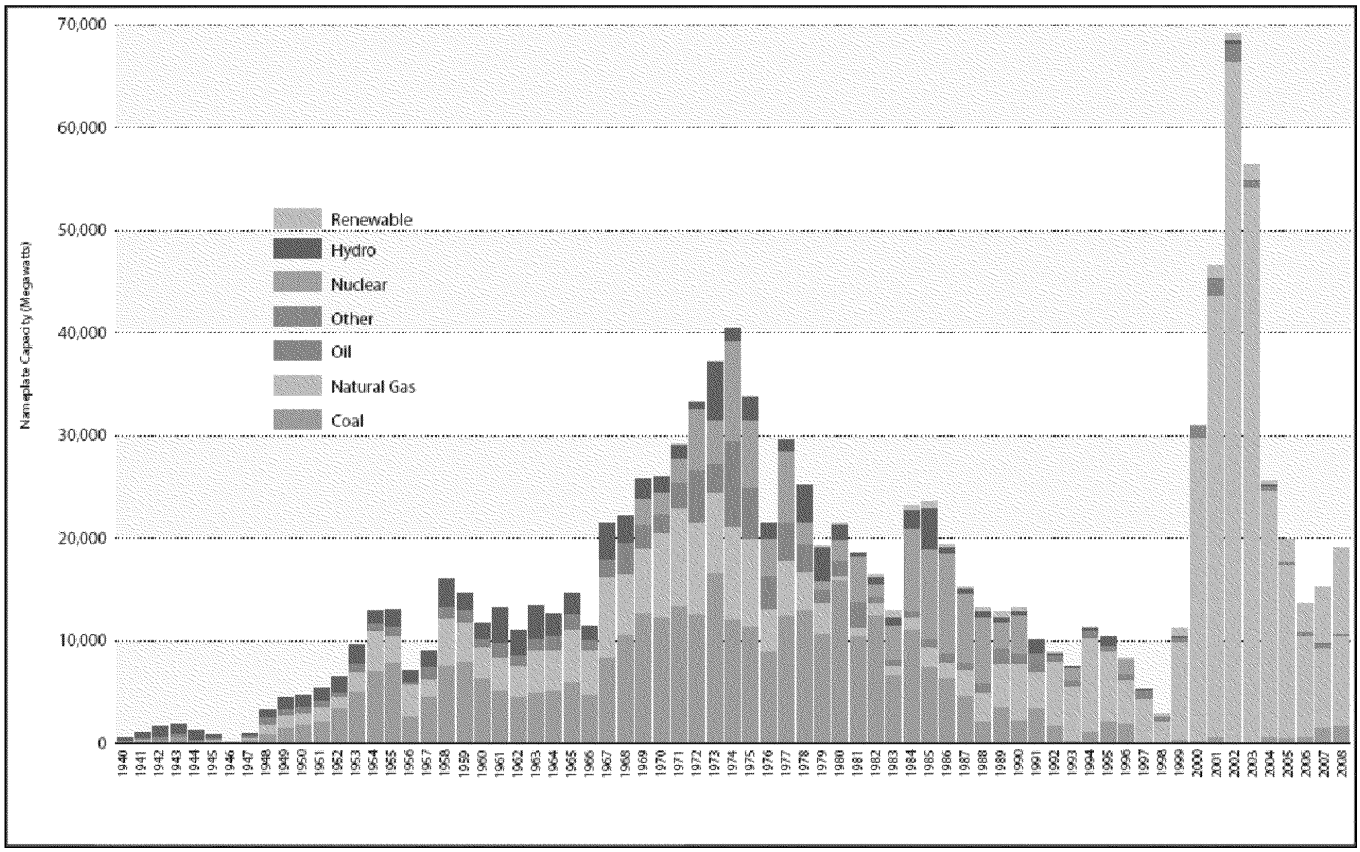
Figure 6. Power Plant Capacity, by Typeand YearIt Entered Service



Source: Sue Tierney, "EPA Proposed Utility Air Toxics Rule –Managing Compliance in Reliable Ways," Congressional Staff Briefing, May 9, 2011, p. 10. The chart is based on EIA Form 860 data. A similar chart produced by EIA itself can be found at http://www.eia.gov/todayinenergy/detail.cfm?id=183 0.

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But this does not mean that the newer (post-1970) coal-fired facilities that have invested in pollution controls over the years will be shuttered. Most of them already comply with many of the proposed rules, or if not, they can do so with modest modifications to their pollution control equipment. A train wreck for this group seems unlikely.

In between the two ends of the spectrum are facilities that are efficient enough or play a sufficiently vital role in meeting regional demand that the economics likely would justify their retrofit. For these facilities, the key questions are whether there will be sufficient time to act, and whether the reliability of the electric grid will be affected as they are taken off-line for modification.

Timing and Reliability Issues

It is difficult to generalize about the timing and system reliability issues. Several utilities state that they will have difficulty meeting the deadlines. In congressional testimony, April 15, 2011, Thomas A. Fanning, the Chairman, President, and Chief Executive Officer of The Southern Company, which provides electricity to 4.4 million customers in the Southeastern United States, stated:

> The reliability of the nation's electric generating system is at risk because of the number of new rules and regulations applicable to power plants. The stringency of these regulations, the lack of flexibility likely to be provided within these regulations, and, above all, the compliance schedules that will be required put reliability at risk. Accelerated plant retirements and shutdowns triggered by the Utility MACT rule will cause reserve capacity to plummet, increasing the likelihood and severity of service disruptions.[81]

In announcing the retirement of one-fourth of its coal-fired generation, June 9, 2011, American Electric Power's Chairman and CEO, Michael G. Morris, in a press release, stated:

> We support regulations that achieve long-term environmental benefits while protecting customers, the economy and the reliability of the electric grid, but the cumulative impacts of the EPA's current regulatory path have been vastly underestimated, particularly in Midwest states dependent on coal to fuel their economies. We have worked for months to develop a compliance plan that will mitigate the impact of these rules for our customers and preserve jobs, but because of the unrealistic compliance timelines in the EPA proposals, we will have to prematurely shut down nearly 25 percent of our current coal-fueled generating capacity, cut hundreds of good power plant jobs, and invest billions of dollars in capital to retire, retrofit and replace coal-fueled power plants.[82]

Others, however, cite historical experience and available indicators to argue that timing and system reliability will not be a problem. Michael Bradley, representing the Clean Energy Group, a coalition of electric power companies with over 200 GW of electric generating capacity, including 105 GW of fossil-fuel fired capacity, testified that:

[81] Testimony of Thomas A. Fanning, "Recent EPA Rulemakings Relating to Boilers, Cement Manufacturing Plants, and Utilities," Hearing, House Energy and Commerce Committee, Subcommittee on Energy and Power, April 15, 2011, p. 13.

[82] "AEP Shares Plan For Compliance With Proposed EPA Regulations," press release, June 9, 2011, at http://www.aep.com/environmental/news/?id= 1697.

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> The Utility Toxics Rule provides the business certainty the electric sector needs to move forward with capital investment decisions;
>
> While not perfect, the proposal is reasonable and consistent with the requirements of the Clean Air Act;
>
> The electric sector is well positioned to comply; and
>
> The Clean Air Act provides sufficient time to comply as well as the authority to accommodate special circumstances where additional time is necessary.[83]

The Institute of Clean Air Companies, which represents the pollution control industry, states that utilities installed 60 GW of scrubbers and 20 GW of selective catalytic reduction (SCR) between 2008 and 2010. (See **Figure 7**.) In the early 2000s, in response to the NOx SIP Call, the industry installed 96 GW of SCR in a five-year period while successfully maintaining system reliability. This was a "much more capital and manpower intensive effort" than the Utility MACT will be, according to David Foerter, the group's Executive Director.[84]

[83] Testimony of Michael Bradley, "Recent EPA Rulemakings Relating to Boilers, Cement Manufacturing Plants, and Utilities," Hearing, House Energy and Commerce Committee, Subcommittee on Energy and Power, April 15, 2011, p. 1

[84] David C. Foerter, Executive Director, Institute of Clean Air Companies, "EPA's Proposed Utility Air Toxics Rule," Presentation to Congressional Staff, May 9, 2011, p. 6.

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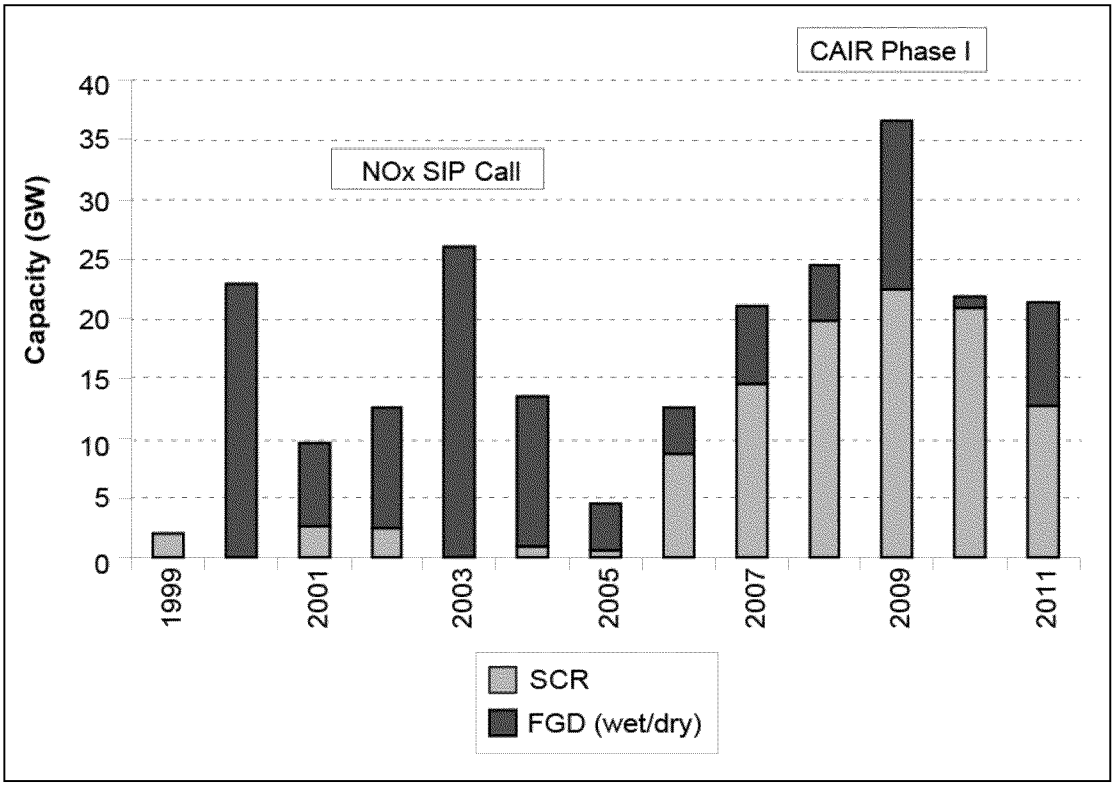
Figure 7. Cumulative SCR and Scrubber Installations, by Year



Source: David C. Foerter, Executive Director, Institute of Clean Air Companies, "EPA's Proposed Utility Air Toxics Rule," Presentation to Congressional Staff, May 9, 2011.

Notes: SCR = Selective Catalytic Reduction technology to reduce NOx emissions. FGD = Flue Gas Desulfurization, commonly referred to as a scrubber.

If necessary, as shown in **Figure 6**, the industry is capable of adding new generating capacity in a short time. From 2000-2003, electric companies added over 200 GW of new capacity, far more than any of the analyses suggest will be needed in the 2011-2017 timeframe.

A December 2010 analysis by FBR Capital Markets concluded that even the incremental retirement of 45 GW by 2014 (which appears to be more than EPA'srules will effect) would have little effect on electricity reserve margins:[85] "Summer reserve margins are currently 26% across the U.S. and are likely to decline only to 24% by 2014 in a draconian scenario in which 45 GW of generation is retired."[86] FBR offers the caveat that electricity reserve margins are a regional, not a national matter; but its analysis of eight NERC regions found reserve margins of 16.8% to 37.8% under its "draconian" 2014 scenario.[87]

Other studies suggest that proper planning can prevent a train wreck, even in worst-case scenarios. Much depends on whether individual utilities have already begun planning for the

[85] Only three of EEI's nine scenarios resulted in that many retirements, and all three assumed regulations far more stringent than EPA has proposed.

[86] FBR Capital Markets, *Coal Retirements in Perspective – Quantifying the EPA Rules*, December 13, 2010, p. 18.

[87] Ibid., p. 19. NERC considers 15% to be the necessary planning reserve margin. See NERC, "Reliability Indicators: Planning Reserve Margin," at http://www.nerc.com/page.php?cid=4%7C331%7C373.

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implementation of the rules, including lining up engineers to design modifications, and conducting preliminary discussions with permitting authorities and grid operators regarding the required steps. This point is stressed by analysts on all sides of the issue. For example, Sue Tierney, after reviewing several studies, states:

> The studies' results do not mean that there will be resources gaps; they make it clear that action needs to be taken soon
>
> - These studies serve as a "call to action" ...
> - Several are explicit in saying that they have identified resource gaps in order to signal that action is needed.[88]

NERC's study is one of those to which Tierney refers. NERC concluded that, "Regulators, system operators, and industry participants should employ available tools to ensure Planning Reserve Margins while forthcoming EPA regulations are implemented."[89] Perhaps more importantly, it stated: "NERC should further assess the implications of the EPA regulations as greater certainty or finalization emerges around industry obligations, technologies, timelines, and targets."[90] Given that the NERC study assumed far more stringent requirements than EPA proposed for both the Cooling Water Intake and Utility MACT rules, a NERC reassessment could be informative.

Price and Availability of Natural Gas

The EEI and NERC reports said that EPA rules would make coal-fired power more expensive so that utilities would retire additional coal-burning units (i.e., beyond those they already plan to retire) and replace them with alternative generation that emits fewer pollutants, leading to a drop in coal-fired generation and equal or greater increase for natural gas. From one perspective, the train wreck debate appears to be a coal-vs.-natural gas argument. The debate is not entirely that simple, however, because gas-burning power plants will be subject to some of the new rules, too. Some rules may affect coal-fired power plants disproportionately compared with other plants, such as the cooling water intake proposal, while others may affect power plants of all types.

The primary impacts of many of the rules discussed here will be on coal-fired plants more than 40 years old that have not, until now, installed state-of-the-art pollution controls. Many of these plants are inefficient and are being replaced by more efficient combined cycle natural gas plants.

In EEI's analysis (and perhaps in the others that use the Integrated Planning Model[91]), a key variable is the assumed price of natural gas. The price of gas in EEI's reference case rises somewhat compared to today's price of about $4.50 per MMBtu, but it remains below $6.00 per MMBtu every year from now until 2035.[92] This is inexpensive gas, by the standards of recent

[88] Tierney presentation, p. 9.

[89] NERC report, p. VII.

[90] Ibid.

[91] The Integrated Planning Model, developed by ICF Inc., is used by EPA, EEI, and others to model the impacts of environmental regulations on the electric power industry.

[92] Natural gas price projections are shown on page 58 of the EEI report.

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history, as much as one-third below the price in each of the years 2004-2008. The low prices apparently reflect recent reports that future supplies of gas are projected to be abundant.[93]

In the other scenarios modeled by EEI (i.e., the scenarios showing the impact of EPA'sexpected regulations), the gas price ranged from about $5.50 to $7.50 per MMBtu over the 25 years through 2035. The higher prices presumably are the result of increased demand as some EGUs switch from coal to gas as a compliance strategy. These prices would also be below 2004-2008 prices in most cases.[94]

What the model showed in most of EEI's scenarios, then, is that, because the price of gas was projected to remain low, coal-powered units would be retired or converted to natural gas as EPA imposes the regulatory requirements under consideration.

Two of EEI's scenarios, however, used different assumptions regarding gas prices: they artificially assumed that gas costs either $1.50 or $3.00 per MMBtu more than the model's supply curve showed. With more expensive gas, fewer coal-powered facilities would be retired: in the extreme ($3.00 more) case, 17 GW were retired, compared to 57-71 GW in the same case with lower-priced gas.[95]

What these scenarios tell us is that utilities will look at the impending regulations and decide what to do largely based on their assumptions regarding the cost of the alternatives—natural gas (where it's available) being the most often discussed, but others include conservation, wind, and other renewable resources. If they expect the price of gas to remain low or the cost of other alternatives to be competitive, their primary method of compliance likely will be to retire old coal plants and switch to gas or the alternatives. If they expect the price of gas or other alternatives to be high, they'll invest the money in retrofitting the coal plants to reduce their emissions.

As the NERC report stated:

> Unit retirement is assumed when the generic required cost of compliance with the proposed environmental regulation exceeds the cost of replacement power.... For the purpose of this assessment, replacement power costs were based on new natural gas generation capacity. If the unit's retrofit costs are less than the cost of replacement power, then the unit is marked to be upgraded and retrofitted to meet the requirements of the potential environmental regulation., i.e., it is not considered "economically vulnerable" for retirement.[96]

As utilities attempt to forecast the price of natural gas, their conclusions will be based in large part on assumptions as to whether gas will be available in sufficient quantities to meet the increased demands of electric power generation. Natural gas faces its own controversies, as domestic production increasingly relies on "unconventional" sources such as shale, from which gas is obtained by hydraulic fracturing. (For additional information on this practice, see CRS Report R41760, *Hydraulic Fracturing and Safe Drinking Water Act Issues*, by Mary Tiemann and Adam Vann.) Nevertheless, a 2009 NERC report stated:

[93] The comparison is to EIA data shown in **Figure 4** above.

[94] All the scenarios, including the Reference case, assume a brief price peak in 2015, with prices declining for the next 15-20 years thereafter.

[95] EEI report, Table 3.1.

[96] NERC report, p. 6.

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> Concerns regarding the availability and deliverability of natural gas have diminished during 2009 as North American production has begun to trend upward due to a shift toward unconventional gas production from shale, tight sands, and coal-bed methane reservoirs. In its latest biennial assessment, the Potential Gas Committee increased U.S. natural gas resources by nearly 45 percent to 1,836 TCF [trillion cubic feet], largely because of increases in unconventional gas across many geographic areas. Pipeline capacity has similarly increased, by 15 BCFD [billion cubic feet per day] in 2007 and 44 BCFD in 2008, with an increase of 35 BCFD expected in 2009. Storage capacity has also increased substantially.[97]

In short, the "train wreck" facing the coal-fired electric generating industry, to the extent that it exists, is being caused by cheap, abundant natural gas as much as by EPA regulations. As John Rowe, Chairman and CEO of Exelon Corporation, recently stated: "These regulations will not kill coal.... In fact, modeling done on the impacts of these rules shows that up to 50% of retirements are due to the current economics of the plant due to natural gas and coal prices."[98]

Legislation

Congress has shown a great deal of interest in the forthcoming EPA power plant rules and related Administration activities, with both proponents and opponents of EPA action circulating "Dear Colleague" letters and hearings held or scheduled by several House and Senate committees. Legislation to prevent or delay EPA action has passed the House, and more legislation is considered likely. Some recent proposals are broad in nature, targeting EPA generally or a lengthy list of specifics, while others focus more narrowly on individual rules or actions.

One such broad bill is H.R. 2401, the Transparency in Regulatory Analysis of Impacts on the Nation (TRAIN) Act of 2011. It would establish a panel of representatives of federal agencies to report to Congress by August 2012 on the cumulative economic impact of a number of listed clean air, clean water, and waste management EPA proposals and actions. A House subcommittee approved this bill on July 8. Similar legislation introduced in the Senate, S. 609, the Comprehensive Assessment of Regulations on the Economy Act of 2011, would direct the Department of Commerce to form a panel to review the cumulative energy and economic impacts of specific rules proposed or finalized by EPA or expected soon. Both bills would cover rules discussed in this report. Impetus for this type of legislation is the widely expressed concern that when EPA analyzes impacts of individual regulations, it does not consider costs imposed by multiple rules taking effect more or less simultaneously. Another bill, H.R. 1872 (the Employment Protection Act of 2011) would require EPA to consider the impact on employment levels and economic activity prior to issuing a regulation, policy statement, guidance, or other requirement, implementing any new or substantially altered program, or issuing or denying any clean water or other permit.

Even before the start of the 112th Congress, House Republican leaders signaled that House committees would scrutinize EPA'srulemaking decisions, including by withholding funding for

[97] NERC, *2009 Long-Term Reliability Assessment: 2009-2018*, October 2009, p. 4, available at http://www.nerc.com/files/2009_LTRA.pdf.

[98] John W. Rowe, "Energy Policy: Above All, Do No Harm," Remarks as Prepared, American Enterprise Institute, March 8, 2011, p. 7. Exelon is one of the largest electric and gas utility companies in the United States, serving 13 million people in Illinois and Pennsylvania.

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prospective rules and de-funding previously promulgated rules.[99] This was demonstrated when the House passed H.R. 1, a full-year continuing appropriations resolution for FY2011, in February. As passed by the House, the bill contained more than 20 provisions restricting or prohibiting the use of appropriated funds to implement various regulatory activities under the EPA'sjurisdiction—including many discussed in this report.[100] (On March 9, the Senate failed to approve the House-passed bill and subsequently also did not agree to a substitute text (S.Amdt. 49) that contained different funding levels and generally omitted the EPA regulatory provisions in the House-passed bill.) Final legislation that provided full-year appropriations for EPA (P.L. 112-10) did not include the restrictive provisions in the House-passed bill.

Several bills concerned with specific rules discussed in this report also have been introduced.

The House approved legislation to restrict EPA authority and to repeal a dozen EPA regulatory actions dealing with greenhouse gases (H.R. 910) on April 7. In the Senate, an amendment identical to H.R. 910 (S.Amdt. 183) failed on a vote of 50-50.

As discussed elsewhere in this report (**Appendix A**), EPA'sJanuary 2011 veto of a CWA permit for a West Virginia surface coal mining project has been very controversial, including in Congress, and raised questions about adequate coal supplies for power plants. In the 112th Congress, legislation has been introduced to remove EPA'sveto authority from the CWA (H.R. 517), and a number of other bills to modify or clarify this portion of the law also have been introduced (H.R. 457/S. 272, H.R. 468/S. 960, and H.R. 2018). A subcommittee of the House Transportation and Infrastructure Committee held hearings on these issues in May, and on June 22, the Committee approved H.R. 2018. Several provisions in this bill would limit EPA's authority to provide oversight of states' implementation of the CWA; it would allow the agency to veto a Section 404 permit only with concurrence of the state where the subject discharge originates.

Also in the 112th Congress, two bills have been proposed that would prohibit CCW from being regulated under Subtitle C of RCRA—H.R. 1391 (the Recycling Coal Combustion Residuals Accessibility Act of 2011, or the RCCRA Act) and H.R. 1405. On June 21, 2011, a House Energy and Commerce Committee subcommittee approved H.R. 1391.[101]

Beyond Congress, some state legislatures also have taken interest in EPA'sregulatory activity. In February, the American Legislative Exchange Council issued a report identifying a number of strategies that states could use to oppose EPA'sactions: adopting resolutions, conducting enhanced legislative review of state regulations, and enacting bills to assert state sovereignty.[102] Resolutions critical of EPA'sactions have been introduced in several state legislatures this year.

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[99] Honorable Jerry Lewis, letter to EPA Administrator Lisa P. Jackson, November 29. 2010, on file with authors.

[100] For information, see CRS Report R41698, *H.R. 1 Full-Year FY2011 Continuing Resolution: Overview of Environmental Protection Agency (EPA) Provisions*, by Robert Esworthy.

[101] For more information, go to the House Energy and Commerce Committee hearing web page, "Fossil Fuel Combustion Waste Regulation," http://republicans.energycommerce.house.gov/hearings/hearingdetail.aspx?NewsID=8474.

[102] American Legislative Exchange Council, "EPA's Regulatory Train Wreck, Strategies for State Legislators," February 2011, http://www.alec.org/AM/Template.cfm?Section=EPATrainWreck&Template=/CM/ContentDisplay.cfm&ContentID=15364. According to its website, the American Legislative Exchange Council is an organization of conservative state lawmakers.

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Concluding Thoughts About the "Train Wreck" Analyses

EEI, NERC, and other recent reports describe scenarios and potential impacts of EPA rules, including projected need for additional power plant capacity or potential reliability problems, that depend on a number of assumptions such as the stringency of the rules or expected tight compliance deadlines, many of which differ greatly from what EPA has actually proposed or promulgated. Also, because most of the reports try to look collectively at EPA rules, to the extent a proposed or promulgated rule differs from some of these assumptions, it can be difficult to separate out one rule's projected impacts from the report's overall conclusions about multiple rules.

Some of the reports project impacts on power plants and electricity supply nationwide, some project impacts on a regional basis. In reality, evaluating regulatory impacts, compliance costs, and possible retirement decisions depends on facility-specific considerations—micro, not macro. Utilities and states will be affected differently. Rules when actually proposed or issued may well differ enough that investment or retirement decisions look entirely different. Technology options available to a unit or plant depend on the specific rule, and compliance costs may be less than projected. Even some units with high assumed control costs, or others that look to be marginal economically, may install controls and continue to operate. Many utilities have already installed technology needed to comply with new rules; for them, costs will be minimal: EPA said that, with regard to the most expensive proposed rule, the Utility MACT, more than half of the coal-fired units fall in this category. The EEI and NERC reports did not account for the fact that plants' compliance costs may be less because of investments already made in pollution control equipment.

Frequently overlooked in analyses of EPA regulations are the benefits to public health and the environment that will occur, benefits that for the most part are difficult to monetize. EPA does estimate benefits of individual rules, while acknowledging that it is challenging to quantify benefits due to data limitations and uncertainties in approaches used to value benefits. The costs of the rules may be large, but, in most cases, the benefits are larger, especially estimated public health benefits. Neither the EEI nor the NERC report addresses benefits.

Although much of the current critical attention to EPA'sregulations has focused on rules affecting power plants, especially coal-fired power plants, the rules discussed here are only part of EPA's statutory mandate and regulatory agenda, and there are controversies about many of these other rules, as well, such as a MACT rule to control toxic air pollutants from commercial and industrial boilers and several Clean Water Act rules concerning water quality standards and permits.[103] Further, concerns about impacts of EPA rules have been raised by a range of individual companies and trade associations representing regulated entities beyond the electric utility sector, such as agriculture, chemical manufacturers, water utilities, and others.[104]

Several other conclusions bear repeating:

[103] For additional information, see CRS Report R41561, *EPA Regulations: Too Much, Too Little, or On Track?*, by James E. McCarthy and Claudia Copeland.

[104] Regarding agriculture's interest in EPA rules, see CRS Report R41622, *Environmental Regulation and Agriculture*, coordinated by Megan Stubbs.

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- The studies sponsored by industry groups (EEI and NERC) were written before EPA proposed most of the rules whose impacts they analyze, and they assumed that the rules would impose more stringent requirements than EPA proposed in many cases.
- Of the regulations so far proposed, the Utility MACT, which will set standards for power plant emissions of mercury and other hazardous air pollutants, appears to be the most expensive. EPA'sanalysis concluded that it will impose annual costs of $10 billion to $11 billion annually
- Other rules that industry expected to impose major costs now appear less likely to do so. The Cooling Water Intake rule, for example, proposes a less costly, more flexible regulatory option than EEI and NERC anticipated. Further, NERC believes that few coal-fired EGUs will be affected by this rule, which will have greater impact on older, oil-fired units. The Coal Combustion Waste Rule has been delayed, with no deadline for promulgation.
- For coal-fired plants, the primary impacts will be on units more than 40 years old that have not, until now, installed state-of-the art pollution controls. Many of these plants are inefficient, and are being replaced by more efficient combined cycle natural gas plants.
- Lower prices for natural gas and recent increases in its projected availability may reduce the impact of the proposed rules on electric utilities and consumers, although they may lead to more retirements of coal-fired units.
- There is a substantial amount of excess generation capacity at present, due in part to the recession and also due to the large number of natural gas combined cycle plants constructed in the last decade, muting reliability concerns.

Implementation

Finally, several other points regarding the timing of implementation of EPA rules are worth underlining:

- Many proposed and "pre-proposal" rules linger for years without being promulgated; thus, many of the EPA actions described here may not be finalized or take effect for some time. They may also be substantially altered before they become final (i.e., before sources of pollution actually are affected by control requirements), as a result of the proposal and public comment process, and/or judicial review.
- Although EPA generally announces a schedule under which it plans to propose and promulgate rules, experience suggests that proposal and promulgation may take longer than estimated, particularly in cases that do not have court-ordered deadlines.
- Even court-ordered dates for proposal or promulgation may change. It is not uncommon for EPA to request extensions of time, often due to the need to analyze extensive comments.
- Promulgation of standards is not the end of the road. Virtually all major EPA regulatory actions are subjected to court challenge, frequently delaying implementation for years. As noted earlier, many of the regulatory actions

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described here are the result of courts remanding and/or vacating rules promulgated by previous administrations.

- In many cases, EPA rules must be adopted by states to which the relevant program has been delegated. Moreover, many states require that the legislature review new regulations before the new rules would take effect.
- For many rules, actions by states may be more significant than what EPA does, because the CAA, CWA, and RCRA allow states to adopt more stringent requirements. For example, EPA'scooling water intake proposal does not mandate installation of costly closed-cycle cooling systems at all existing power plants. At the same time, an EPA rule does not preclude states from imposing such a mandate, as has occurred and is occurring in several locations (e.g., New York, California, Delaware, and New Jersey).
- Standards for stationary sources under the air, water, and solid waste laws are generally implemented through permits, which would be individually issued by state permitting authorities after the standards take effect. When finalized, a permit would generally include a compliance schedule, typically giving the permittee several years for installation of required control equipment. Existing sources generally will have several years following promulgation and effective dates of standards, therefore, to comply with any standards.

In short, the road to EPA regulation is rarely a straight path. There are numerous possible causes of delay. It would be unusual if the regulatory actions described here were all implemented on the anticipated schedule, and even if they were, existing facilities would often have several years before being required to comply. Unable to account for such factors, which will vary from case to case, timelines that show dates for proposal and promulgation of EPA standards effectively underestimate the complexities of the regulatory process and overstate the near-term impact of many of the regulatory actions.

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Appendix A. Regulatory Actions Affecting Mountaintop Removal Mining

EPA and other federal agencies (the Office of Surface Mining and Reclamation, in the Department of the Interior; and the U.S. Army Corps of Engineers) are developing a series of actions and regulatory proposals to reduce the harmful environmental and health impacts of surface coal mining, including a practice called mountaintop removal mining, in Appalachia. These actions would not affect electric power plants directly, and thus were not covered by EEI nor NERC in their studies. Thus, CRS did not include these regulations in the discussion of the "train wreck" issues in the body of this report. Nevertheless, numerous critics of EPA have included EPA, Corps of Engineers, and Interior Department actions in what they term a "War on Coal." The actions, announced in a June 2009 interagency Memorandum of Understanding, are intended to tighten regulation and strengthen environmental reviews of permit requirements under the CWA and the Surface Mining Control and Reclamation Act (SMCRA).

Also in June 2009, EPA and the Army Corps signed a specific agreement detailing criteria that will be used to coordinate and expedite review of pending CWA permit applications for surface coal mining operations in Appalachia. The agencies are conducting detailed reviews of 79 permit applications to evaluate the permits in order to limit environmental impacts of the proposed activities. This review is proceeding slowly. In June 2010, the Army Corps suspended the use of a particular CWA general permit for surface coal mining activities in Appalachia and proposed a rule to prohibit its use entirely; a finalized rule, expected in 2012, would apply more stringent CWA rules to these coal mining operations.[105]

In April 2010 EPA released an interim guidance memorandum that seeks to clarify the agency's tightened requirements for surface coal mining in Appalachia. The guidance will be applied as a framework for EPA's approval of all pending and future reviews of permits to dispose of coal mining waste and other types of Appalachian surface coal mining discharges that are authorized by the CWA. Among other items, the interim guidance sets strict numeric limits on conductivity levels in waters affected by mining activities. Conductivity is a measure of the level of salinity in water associated with discharges of selenium and total dissolved solids that are associated with coal mining wastes. Based on recent scientific literature, EPA has concluded that conductivity above certain levels in Appalachian streams presents a reasonable potential to harm stream biota.

Conductivity, and its use in assessing coal mining impacts on water quality, has become a focus of debate. According to EPA, the 2010 interim guidance is not intended to bring a complete halt to surface coal mining in Appalachia, but to force the industry to adopt practices that will minimize harmful impacts. Environmental groups support the guidance document and EPA's use of conductivity to assess water quality impacts, but industry groups have been highly critical, asserting that the science linking conductivity to water quality impairment is uncertain and that acceptable numeric levels are arbitrary. Lawsuits challenging the guidance have been brought by the States of Kentucky and West Virginia, as well as individual coal companies and trade associations. In January 2011, a federal judge who is hearing one of the challenges denied industry's request to block implementation of the guidance, but also denied the government's

[105] U.S. Department of the Army, Corps of Engineers, "Suspension of Nationwide Permit 21," 75 *Federal Register* 34711-34714, June 18, 2010.

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request to dismiss the case. EPA is working on revised guidance that incorporates public comments, scientific reviews, and experience of implementing the 2010 guidance. Final guidance had been expected by April 1, but its release has been delayed by interagency review.

In addition, in November 2009, the Department of the Interior's Office of Surface Mining (OSM) issued an Advance Notice of Proposed Rulemaking (ANPR) describing options to revise a SMCRA rule, called the stream buffer zone rule, which was promulgated in December 2008.[106] The Obama Administration identified the 2008 rule, which exempts so-called valley fills and other mining waste disposal activities from requirements to protect a 100-foot buffer zone around streams, for revision as part of the series of actions concerning surface coal mining in Appalachia. OSM identified a broad set of regulatory options that it is considering for revisions to the 2008 rule, ranging from formally reinstating the previous rule with small conforming changes, to requiring stricter buffer zone requirements for mountaintop mining operations on steep slopes. OSM officials have been working on developing a new rule, with the goal of releasing a proposal by early 2011, but none has yet emerged. In addition, EPA and OSM have pledged to strengthen oversight of state CWA and SMCRA permitting, regulation, and enforcement.

Finally, EPA has used CWA authority to veto a permit for a surface coal mining operation in West Virginia, after determining that the activity will have an unacceptable adverse effect on wildlife and fishery resources. EPA'sveto has been very controversial, in part because it involves the rare action of cancelling a permit previously issued by the Army Corps. Coal industry groups and those representing manufacturing and other sectors have been highly critical, many saying that to revoke an existing permit creates huge uncertainty about whether water quality permits would be rescinded in the future, producing a ripple effect beyond the coal industry. EPA argues that the veto, while highly unusual, is justified because the project involves unacceptable environmental damages.

Viewed broadly, the Administration's combined actions on surface coal mining displease both industry and environmental advocates. The additional scrutiny of permits, more stringent requirements, and EPA'sveto of a previously authorized project have angered the coal industry. At the same time, while environmental groups support the veto and related actions, many favor even tougher requirements.[107]

Critics assert that collectively the Administration'sactivities and initiatives concerning surface coal mining in Appalachia are needlessly delaying important projects, thus costing jobs and hurting the nation's energy security. While these actions do not directly affect power plants, they have the potential of doing so indirectly, if they effectively limit or restrict coal supplies. None of these actions are discussed in either the EEI or NERC analysis.

[106] U.S. Department of the Interior, Office of Surface Mining Reclamation and Enforcement, "Stream Buffer Zone and Related Rules; Advance notice of proposed rulemaking; notice of intent to prepare a supplemental environmental impact statement (SEIS)," 74 *Federal Register* 62664-62668, November 30, 2009.

[107] For additional information, see CRS Report RS21421, *Mountaintop Mining: Background on Current Controversies*, by Claudia Copeland.

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Appendix B. Bibliography of Analytic Reports

Growing interest in the impact of EPA regulation on fossil-fuel power plants, especially coal-fired plants, has generated a large number of analytic reports by policy and advocacy groups using varying assumptions and analytic approaches that reach varying conclusions. Many of these reports were issued prior to proposal or promulgation of a rule.

North American Electric Reliability Corporation, *2010 Special Reliability Scenario Assessment: Resource Adequacy Impacts of Potential U.S. Environmental Regulations*, October 2010, http://www/nerc.com/files/EPA_Scenario_Final_v2.pdf.

ICF International, *Potential Impacts of Environmental Regulation on the U.S. Generation Fleet*, Final Report, prepared for Edison Electric Institute, January 2011, http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Integrated_Resource_Plan/2011IRP/EEIModelingReportFinal-28January2011.pdf.

Metin Celebi, Frank Graves, Gunjan Bethla, et al., The Brattle Group, *Potential Coal Plant Retirements Under Emerging Environmental Regulations*, December 8, 2010, http://www.brattle.com/_documents/uploadlibrary/upload898.pdf.

National Economic Research Associations, *Proposed CATR + MACT,* prepared for American Coalition for Clean Coal Electricity, May 2011, http://www.americaspower.org/NERA_CATR_MACT_29.pdf.

Dan Eggers, Kevin Cole, Yang Y. Song, and LinLin Sun, Credit Suisse, *Impact of EPA Rules on Power Markets*, September 2010, http://epw.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=b42de70d-b814-4410-831d-34b180846a19. Also see Dan Eggers, Credit Suisse, *Implications of EPA Policy*, April 2011, http://www.fbcinc.com/EIA/presentations/Eggers_04.26.11.pdf.

Wood Mackenzie, "Long-term Viability of Many U.S. Coal Plants at Risk," September 10, 2010, http://www.woodmacresearch.com/cgi-bin/corp/portal/corp/corpPressDetail.jsp?oid=2178098.

FBR Capital Markets, *Coal Retirements in Perspective—Quantifying the Upcoming EPA Rules*, December 13, 2010, http://jlcny.org/site/attachments/article/388/coal1.pdf.

Hugh Wynne, Francois D. Broquin, and Saurabh Singh, Bernstein Research, *Black Days Ahead for Coal: Implications of EPA Air Emissions Regulations for Energy & Power Markets*, July 21, 2010, http://grist.s3.amazonaws.com/eparegs/Bernstein%20-%20black%20days%20ahead%20for%20coal%20-%2007%2021%2010.pdf.

There also have been a number of recent analytic rebuttals to these reports:

Michael J. Bradley, Susan F. Tierney, Christopher E. Van Atten, et al., *Ensuring a Clean, Modern Electric Generating Fleet while Maintaining Electric System Reliability*, August 2010, http://www.mjbradley.com/documents/MJBAandAnalysisGroupReliabilityReportAugust2010.pdf and *Summer 2011 Update*, June 2011, http://www.mjbradley.com/documents/MJBAReliability Report Update June 7 2011.pdf.

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University of Massachusetts Political Economy Research Institute, James Heintz, Heidi Garrett-Peltier, Ben Zipperrer, New Jobs – Cleaner Air, Employment Effects Under Planned Changes to the EPA'sAir Pollution Rules, February 2011, http://www.ceres.org/resources/reports/new-jobs-cleaner-air.

Susan F. Tierney and Charles Cicchetti, *The Results in Context: A Peer Review of EEI's "Potential Impacts of Environmental Regulation on the U.S. Generation Fleet*," Summary Report, May 2011, http://www.supportcleanair.com/resources/studies/file/Tierney-and-Cicchetti-EEI-Peer-Review-Summary-May-2011.pdf.

World Resources Institute, *Response to EEI's Timeline of Environmental Regulations*, November 2010, http://pdf.wri.org/factsheets/factsheet_response_to_eei_timeline.pdf.

Josh Bivens, Economic Policy Institute, *A Lifesaver, Not a Job Killer, EPA'sproposed "air toxics rule" is no threat to job growth*, EPI Briefing Paper, June 14, 2011, http://w3.epi-data.org/temp2011/BriefingPaper312 (2).pdf.

Jennifer Macedonia, Joe Kruger, Lourdes Long, and Meghan McGuinness, Bipartisan Policy Center, *Environmental Regulation and Electric System Reliability*, June 13, 2011, http://www.bipartisanpolicy.org/sites/default/files/BPC%20Electric%20System%20Reliability.pdf

Daniel J. Weiss, Valeri Vasquez, and Stewart Boss, "Mercury Falling, Many Power Plants Already Have Equipment to Slash Mercury, Toxic Contamination," June 21, 2011, http://www.americanprogress.org/issues/2011/06/mercury_falling.html.

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January 28, 2010
DRAFT

EEI Analysis of EPA Power Sector Regulations – For Use in Communications Materials
(This assessment is particularly focused on issues related to the EEI analysis of air regulations)

Context:

- EEI has completed an updated analysis of upcoming EPA power sector regulations and will transmit a summary report to the Administrator in the next few days. EEI has analyzed policies that cover air emissions, coal combustion residues, cooling water intake structures, and greenhouse gases.
- The report is intended to inform EEI member utilities on the potential effects of forthcoming EPA power sector regulations, and the analysis includes a broad array of potential scenarios.
- Over the past few months, EEI has reached out to EPA technical staff to solicit informal feedback on the report, and EEI deserves credit for engaging EPA early in the process and refining some aspects of the report based on EPA comments.
- EEI relies upon many of EPA's power sector assumptions, lending support for the Agency's analytical approach to assessing the impacts of policy for the industry.
- The analysis presents an array of potential regulatory scenarios that are very speculative in nature, since several of the rules analyzed have yet to be proposed.
- The power sector currently consists of over 1,000 GW of total installed capacity, of which roughly 320 GW is coal-fired capacity.

High-Level EPA Response:

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Ex. 5 - Deliberative

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From: CN=Lorie Schmidt/OU=DC/O=USEPA/C=US
Sent: Fri 8/19/2011 5:50:26 PM
Subject: Fw: Last Week's CRS report on upcoming coal plant regs
CRS-EPA.pdf

Thought you might be interested in CRS Report if you haven't seen it already.

My apologies if you already have it.

It's unclear to me whether it's leaked . . .

----- Forwarded by Lorie Schmidt/DC/USEPA/US on 08/19/2011 01:46 PM -----

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Date: 08/19/2011 01:21 PM
Subject: Last Week's CRS report on upcoming coal plant regs

Someone leaked last weeks Congressional Research Service report on coal power regs to the Hill.

Kevin

FOIA 2014-009508 Interim 5

EPA'sRegulation of Coal-Fired Power: Is a "Train Wreck" Coming?

James E. McCarthy
Specialist in Environmental Policy

Claudia Copeland
Specialist in Resources and Environmental Policy

August 8, 2011

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CRS Report for Congress
Prepared for Members and Committees of Congress

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Summary

Given the central role of electric power in the nation's economy, and the importance of coal in power production, concerns have been raised recently about the cost and potential impact of regulations under development at the Environmental Protection Agency (EPA) that would impose new requirements on coal-fired power plants. Six of the rules, which have drawn much of the recent attention, are Clean Air Act regulations. Two others are Clean Water Act rules, and one is a Resource Conservation and Recovery Act rule. The majority are expected to be promulgated over the next 18 months. All together, these rules have been characterized by critics as a regulatory "train wreck" that would impose excessive costs and lead to plant retirements that could threaten the adequacy of electricity capacity (i.e., reliability of supply) across the country, especially from now through 2017.

Although some question why EPA is undertaking so many regulatory actions in such a short time-frame, supporters of the regulations assert that it is decades of regulatory delays and court decisions that have led to this point, resulting in part from special consideration given electric utilities by Congress under several statutes. Further, several of the current regulatory developments have been under consideration for a decade or longer, or are being reevaluated after an earlier action was vacated or remanded to EPA by the courts. The regulations are supported by proponents and EPA as having substantial benefits for public health and the environment.

Recent reports by industry trade associations and others have discussed potential harm of EPA's prospective regulations to U.S. electricity generating capacity, with emphasis on coal-fired generation. One of these reports, by the Edison Electric Institute, which represents investor-owned utilities, has attracted considerable attention by depicting a timeline in which multiple rules would take effect more or less simultaneously over the next five years. Congress has shown significant interest in these issues, and bills have been introduced that would de-fund or restrict EPA's ability to develop rules, and which would legislate new regulatory analytic requirements. This report describes nine rules in seven categories that are at the core of recent critical analyses, with background on the rule and its requirements and, where possible, a discussion of the rule's potential costs and benefits.

The EEI and other analyses discussed here generally predate EPA's actual proposals and reflect assumptions about stringency and timing (especially for implementation) that differ significantly from what EPA actually may propose or has promulgated. Some of the rules are expected to be expensive; costs of others are likely to be moderate or limited, or they are unknown at this point because a rule has not yet been proposed. Rules when actually proposed or issued may well differ enough that a plant operator's decision about investing in pollution controls or facility retirement will look entirely different from what these analyses project. Further, promulgation of standards is not the end of the road: court challenges are likely, potentially delaying implementation for years, and even when final, EPA rules must be adopted by states and implemented over time through state-issued permits.

The primary impacts of many of the rules will largely be on coal-fired plants more than 40 years old that have not, until now, installed state-of-the-art pollution controls. Many of these plants are inefficient and are being replaced by more efficient combined cycle natural gas plants, a development likely to be encouraged if the price of competing fuel—natural gas—continues to be low, almost regardless of EPA rules.

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Introduction

Given the central role of electric power in the nation's economy, and the importance of coal in power production, concerns have been raised about the cost and potential impact of numerous regulatory actions that would impose new requirements on coal-fired power plants. In the summer of 2010, for example, the Edison Electric Institute (EEI), which represents the nation's investor-owned electric utilities, prepared a chart, "Possible Timeline for Environmental Regulatory Requirements for the Electric Utility Industry," which is reproduced here as **Figure 1**. Using color-coded categories, the chart identified rules under development at the U.S. Environmental Protection Agency (EPA) and depicted a schedule for development and implementation of the rules between 2008 and 2017.

The rules identified by EEI were:

- the Cross-State Air Pollution Rule, and its predecessor, the Clean Air Interstate Rule (identified as "CAIR/Transport" on the timeline), which would establish cap-and-trade programs for utility emissions of sulfur dioxide and nitrogen oxides;
- Maximum Achievable Control Technology emission standards for mercury and other hazardous air pollutants, a rule generally referred to as the "Utility MACT" ("Hg/HAPS" on the timeline);
- National Ambient Air Quality Standards (NAAQS) for ozone, sulfur dioxide, nitrogen dioxide, and particulate matter ("Ozone," "SOx/NOx," and "PM/$PM_{2.5}$" on the timeline);
- regulation of greenhouse gas emissions ("CO_2" on the timeline);
- cooling water intake regulations ("316(b)" on the timeline);
- clean water effluent guidelines (identified under "Water" on the timeline); and
- coal combustion waste management rules ("Ash" or "CCBs Management").

EEI subsequently produced a report, *Potential Impacts of Environmental Regulation on the U.S. Generation Fleet*, which concluded that new EPA regulations would cause the unplanned retirement of 17 to 59 gigawatts (GW) of coal-fired electric capacity (5.4% to 18.8% of the current coal-fired total of about 315 GW) by 2015, and would require incremental capital expenditures of $85 billion to $129 billion.[1]

[1] ICF International, *Potential Impacts of Environmental Regulation on the U.S. Generation Fleet*, Final Report, prepared for the Edison Electric Institute, January 2011, available at http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Integrated_Resource_Plan/2011IRP/EEIModelingReportFinal-28January2011.pdf. Hereinafter referred to as the "EEI report."

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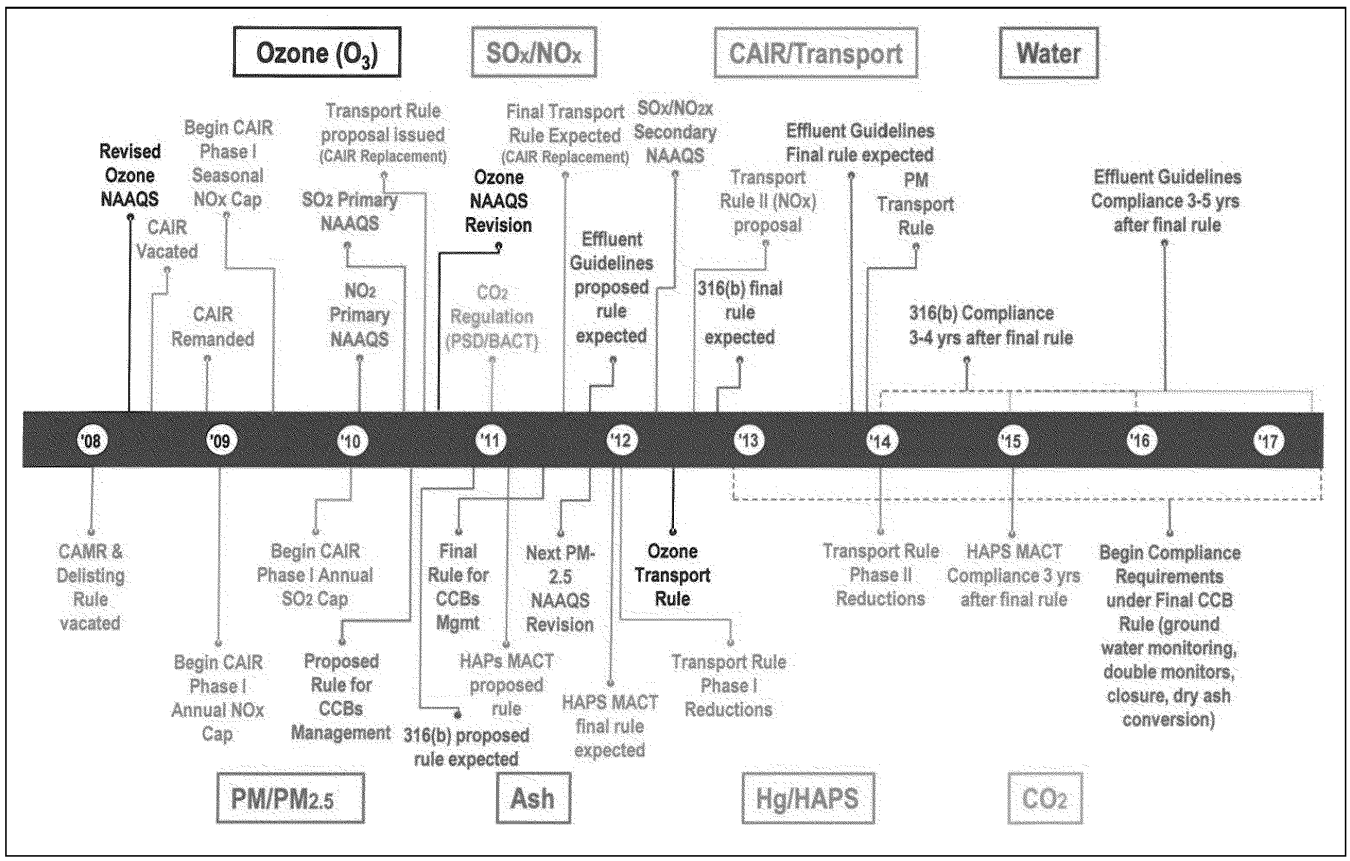
Figure 1. EEI's Timeline for Environment Requirements for the Electric Utility Industry



Source: Edison Electric Institute, http://www.eei.org/whatwedo/PublicPolicyAdvocacy/TFB%20Documents/100525SheaCongressCoalImpacts.pdf (Figure 7).

EEI is not the only group to have focused on EPA'sprospective regulations. The American Legislative Exchange Council (ALEC) picked up EEI's chart, added to it the separate EPA rules that will affect industrial and commercial boilers, and labeled it "EPA'sRegulatory Train Wreck." The National Mining Association also refers to "EPA'sRegulatory Train Wreck" in materials that it distributes, and the North American Electric Reliability Corporation (NERC), in an October 2010 Special Reliability Assessment, concluded that implementation of four EPA rules could result in a loss of up to 19% of fossil-fuel-fired steam capacity in the United States by 2018, with the potential for "significantly deteriorating future … system reliability."[2] In addition to these, a large number of other analyses have been prepared by other policy and research groups; some are similarly critical of EPA'srules, while others counter or rebut the criticisms. Many of these reports are identified below in **Appendix B**.

The "train wreck" charts and related studies have been widely circulated on Capitol Hill, where they have stimulated concern. Several bills aimed at reducing the regulatory burden or requiring additional analyses of the combined rules' impacts have been introduced, as have proposals to modify or delay implementation of specific EPA rules. As discussed below in "Legislation," as of August 2011, three of these bills had passed the House.

Opponents of these bills maintain that regulation of the affected plants is overdue. Coal-fired power plants are major sources of pollution; many are decades old; and regulation of their emissions, effluent, and waste has lagged that of other industries.

Coal's Place in Electric Power Production

Coal fueled 44.6% of the nation's electric power in 2009. This was a decline from 52% in 2000, but coal is still the electric power industry's dominant fuel source (as shown in **Figure 2**).

Many coal-fired electric generating units, along with most nuclear and hydroelectric plants, provide what is called "base-load" power. Many of the plants run 24 hours a day and provide the relatively cheap power that is the foundation of electric service. (Other plants, known as peaking plants, are brought into service at times of peak demand. Peaking plants tend to have higher operating costs, but since they operate for short periods of time, the higher cost is of less concern.)

Low Cost

Coal-fired power has been cheap for multiple reasons. The average coal-fired power plant is more than 40 years old and its capital cost fully amortized, whereas many natural gas plants (the second largest source, producing about 23% of the nation's electricity) have been built in the last 10 years. Coal itself (i.e., the fuel) is abundant and cheap: as shown in **Figure 3**, its price—expressed in dollars for the same energy content, i.e., dollars per million Btu—has sometimes been less than

[2] North American Electric Reliability Corporation, *2010 Special Reliability Scenario Assessment: Resource Adequacy Impacts of Potential U.S. Environmental Regulations*, October 2010, pp. I and IV, http://www.nerc.com/files/EPA_Scenario_Final.pdf. Hereinafter referred to as the "NERC report." NERC is an independent organization, founded by the electric utility industry, that conducts periodic, independent assessments of the reliability and adequacy of the bulk power system in North America.

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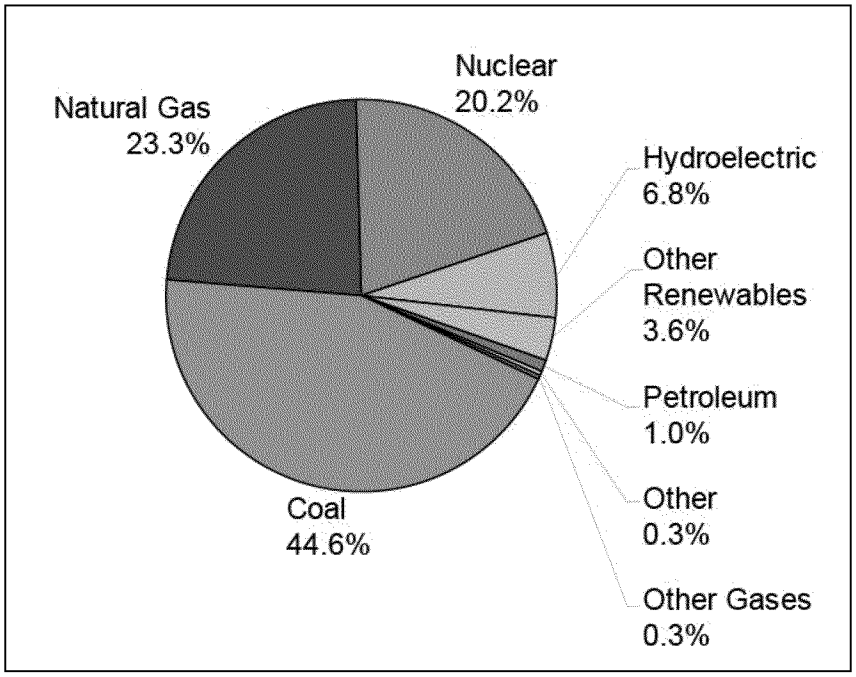
one-fourth the cost of natural gas, its main competitor. Averaged over a 12-year period, coal cost less than one-third as much as gas.

Figure 2. U.S. Electric Power,2009, by Fuel Type



Source: U.S. Energy Information Administration, *Electric Power Annual, 2009*, April 2011, Table 2.1.

Of course, other factors also affect the price of power, including the efficiency with which the plant converts fuel into electric power, maintenance costs, and the cost of operating the unit—which, in the case of coal must include costs for removal and management of ash. But, in general, these factors did not outweigh coal's basic cost advantage until the advent of natural gas combined cycle technology in the 1990s.

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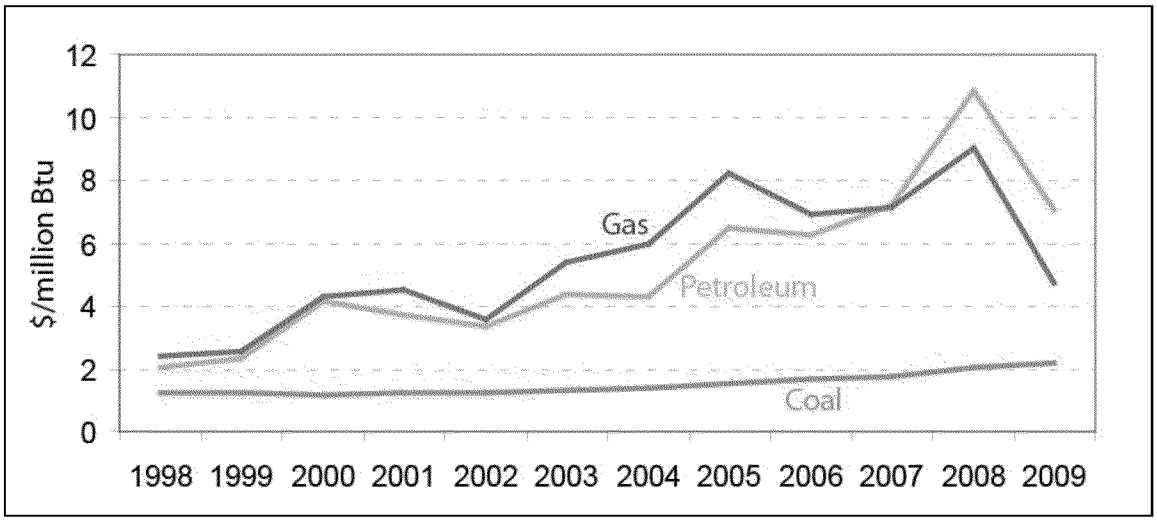
Figure 3. Average Cost of Fossil Fuels for the Electric Power Industry, 1998 through 2009

($/million Btu)



Source: U.S. EIA, Electric Power Annual 2009, April 2011, Table 3.5.

Clean Air Act Exceptions

Besides the age of the plants and the cost of the fuel, a third factor that has resulted in lower cost is that many of the coal-fired plants, particularly the older ones, have been allowed to operate with little in the way of pollution control equipment. Coal is an inherently "dirty" fuel. Burning it produces sulfur dioxide (SO_2), nitrogen oxides (NOx), particulates, mercury, acid gases, and other pollutants, in greater abundance than other fossil fuels. As shown in **Figure 4**, coal-fired power is *a* major or *the* major source of the air emissions of many of these pollutants.

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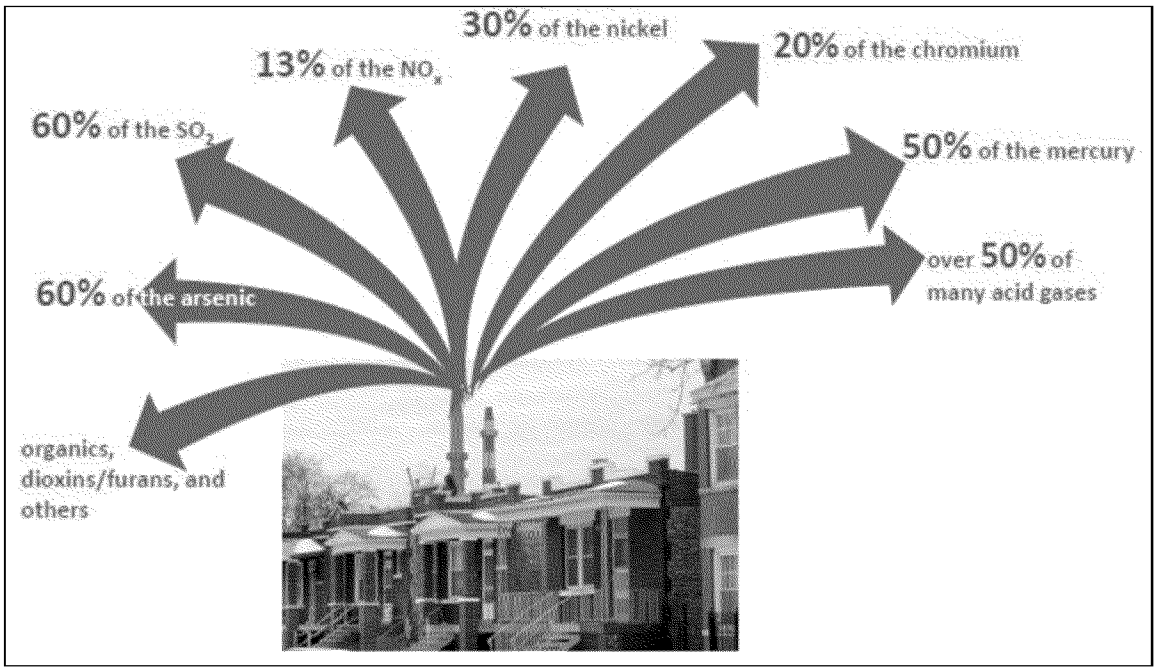
Figure 4. Emissions from Fossil-Fueled Power Plants as a Percent of Total U.S. Air Emissions



Source: U.S. EPA, "Reducing Toxic Pollution from Power Plants," March 16, 2011, p. 6.

Note: The figure includes emissions from oil-fired units as well as coal-fired, but oil-fired units account for only 1% of U.S. electric generation. Air emissions are not necessarily the major source of exposure for each of these pollutants.

Despite the industry's emissions, the structure of the Clean Air Act has allowed many of the older coal plants to operate with minimal controls. The statute's focus is on new sources of pollution (including major modifications of existing plants). Under Sections 165 and 169 of the act, new plants and major modifications are required to install the Best Available Control Technology (BACT) in order to obtain an operating permit. Other plants (so-called "grandfathered plants") are not required to have best available controls, unless subject to state or local requirements needed to address local air quality. The majority of the grandfathered plants are coal-fired.

In addition, the act's major requirements for existing power plants, the acid rain program and the NOx control program (generally known as the "NOx SIP call"), have both been cap-and-trade programs. These allowed companies to decide how they wanted to meet system-wide emission caps: by switching to lower sulfur fuels, by installing the best control equipment on a few plants, by operating their dirtiest plants less frequently, or by purchasing allowances from facilities that had over-complied. Since controls weren't required on each individual plant, many of the older plants could keep running without them.[3]

[3] Power plant operations also can affect water quality in several ways, and EPA is developing regulations to strengthen requirements for both water intake and water effluent. These regulations affect a broader range of power plants, however, including natural gas and nuclear, as well as coal-fired.

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The "Train Wreck" Rules

General Observations

Burning coal to generate electricity can affect the environment in a number of ways, producing air pollution, water pollution, and solid waste residuals. As reflected in the EEI timeline and other analyses, EPA'sregulatory activities touch on all of these, although much of the recent critical attention has focused on air pollution.

EEI's chart contains 32 entries covering a 10-year period, 2008-2017. Not all of these entries represent actions by the Obama Administration's EPA. Of the first seven, for example, three are court decisions vacating and remanding Bush Administration EPA rules, and the other four are rules that were promulgated during the Bush Administration with implementation scheduled for 2009 or 2010. Because the Bush Administration's Clean Air Interstate Rule (CAIR) was the subject of two court decisions and was designed to be implemented in phases, it gets numerous entries: three entries for implementation (for its seasonal NOx cap), its annual NOx cap, and its SO_2 cap) and two for the court decisions that vacated and remanded it.

CAIR and its replacement rules are the extreme example of repetition on the "train wreck" charts, accounting for 10 of the 32 total entries, but most of the other rules on the chart have at least three entries—for proposal, promulgation, and implementation. Only implementation imposes an actual burden on the regulated community. Thus, the chart tends to exaggerate the regulatory burden through repetition.

The timeline also treats as imminent the promulgation of rules that may not be so. For example, the coal combustion waste rule, which has been the object of some concern, was authorized in the Solid Waste Disposal Act Amendments of 1980. The legislation required that EPA conduct a study of whether such waste should be considered hazardous waste and report to Congress before taking regulatory action. EPA has conducted numerous studies over the three decades since then and proposed to regulate the management of the waste in June 2010. Since then, however, the agency has stated that it does not anticipate promulgating a final rule in 2011, leaving uncertain when a rule will be promulgated. The EEI timeline assumed promulgation in 2011 with compliance five years later.

Nevertheless, it is safe to say that several major rules under development at EPA are due to be promulgated within the next 18 months and will affect coal-fired power plants, as shown in **Table 1**. Some of them are expected to be expensive; the costs of others are likely to be moderate or limited, or they are unknown at this point because a rule has not yet been proposed.

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Table 1. Timing of EPA Rules and Impacts on Coal-Fired Utilities

Rule or Standard	Final Rule	EPA Estimate of Costs/Impacts[a]
Cross-State Air Pollution Rule	Finalized July 6, 2011	$2.4 billion/year[b]
Utility MACT Rule	Expected November 16, 2011	$10-$11 billion/year
National Ambient Air Quality Standard (NAAQS) for sulfur dioxide	Promulgated June 22, 2010	$1.5 billion/year for all sources, but limited impact on electric generating units (EGUs)[a]
NAAQS for ozone	Expected July 2011	$19-$25 billion/year for all sources but limited impact on EGUs[a]
NAAQS for particulate matter	Not yet proposed; expected in 2012	Unknown
New Source Performance Standards for Greenhouse Gases	Not yet proposed; expected May 26, 2012	Unknown
Cooling Water Intake Structure Rule	Expected July 27, 2012	$319 million/year
Clean Water Effluent Limitation Guidelines Rule	Not yet proposed; expected January 31, 2014	Unknown
Coal Combustion Waste Rule	Expected 2012 or later	$587 million-$1.5 billion/year

Source: Compiled by CRS.

a. Costs as estimated by EPA. See text for discussion of costs and impacts of specific rules.

b. Of the $2.4 billion annual cost, $1.6 billion is attributed to the Clean Air Interstate Rule (CAIR), a 2005 rule that the Cross-State Rule is replacing.

This report will discuss each of the rules identified on EEI's timeline individually; but before discussing individual rules, a few general statements are in order.

First, most of these rules have been a long time in the making. As noted, the coal combustion waste rule is the result of legislation passed in 1980; another rule, the utility air toxics rule (or "Utility MACT"), which appears to be the most costly of the rules thus far proposed, is required by the Clean Air Act Amendments of 1990. Some may question why EPA is undertaking so many regulatory actions at once, but it is the decades of regulatory inaction that led to this point that strike other observers.

The inaction stemmed in large part from special consideration given electric utilities by Congress: both the Clean Air Act and the Solid Waste Disposal Act required special studies and reports to Congress before EPA could set standards for certain pollutants emitted or wastes disposed by electric utilities. Meanwhile, other industries that emitted the same pollutants or similar wastes (e.g., municipal solid waste incinerators and medical waste incinerators, and any industry generating hazardous waste) have been subject to more stringent emission controls or waste management standards for a decade or more.

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Second, as we have noted in an earlier report on EPA regulations,[4] both the legislative authority for these rules and, in most cases, the development of the rules themselves predate the current Administration. With the exception of greenhouse gas emission rules, all of the rules discussed below began development under the Bush Administration or earlier, including several that were promulgated under that Administration and subsequently were vacated or remanded to EPA by the courts. The Cross-State Air Pollution Rule, the Utility MACT rule, and the Cooling Water Intake rule, for example, fit that description. Other EPA actions, such as the Obama Administration's reconsideration of the ozone National Ambient Air Quality Standard, have actually delayed for several years implementation of Bush Administration rules that would have strengthened existing standards. Each of these actions is described in more detail below.

Third, one criticism highlighted by the EEI and others of EPA'spending and upcoming rules is the impact of multiple requirements. The critics point out that, although EPA conducts detailed economic impact analyses of individual rules, the CAA and other federal environmental laws do not provide a mechanism or require that the agency analyze cumulative impacts, including jobs. Viewed separately, they argue, a particular rule may have limited economic impact, while the second, third, or fourth rule that takes effect more or less simultaneously may drive the power plant operator to decide to retire a given facility. As discussed in this report, such decisions are highly case-specific, involving unique considerations and potentially mitigating factors.

The following sections of this report describe seven rules or categories of rules that are the core of the "train wreck" debate, with background on the rule, information on its requirements (for those rules that have been proposed or promulgated), and where possible, a discussion of the rule's potential costs and benefits. We also examine two of the studies—those of the electric industry's trade association (EEI) and the North American Electric Reliability Corporation—that have attempted to estimate their cumulative economic impacts.

Cross-State Air Pollution (Clean Air Transport) Rule

The Cross-State Air Pollution Rule (hereinafter, the "Cross-State Rule") replaces EPA'smajor clean air initiative under the Bush Administration, the Clean Air Interstate Rule (CAIR). CAIR was promulgated in 2005, but was vacated and remanded to the agency by the D.C. Circuit Court of Appeals in 2008.[5] On appeal, the court left the rule in place until such time as EPA promulgated a replacement. The agency proposed the replacement August 2, 2010,[6] and it finalized the rule July 6, 2011.[7]

[4] CRS Report R41561, *EPA Regulations: Too Much, Too Little, or On Track?*, by James E. McCarthy and Claudia Copeland.

[5] The promulgated rule was published at 70 *Federal Register* 25162, May 12, 2005. The court decision was North Carolina v. EPA, 531 F.3d 896 (D.C. Cir. 2008).

[6] U.S. Environmental Protection Agency, "Federal Implementation Plans To Reduce Interstate Transport of Fine Particulate Matter and Ozone; Proposed Rule," 75 *Federal Register* 45210, August 2, 2010.

[7] The final rule has not appeared in the *Federal Register* as of this writing, but a pre-publication copy as well as explanatory and background material can be found on EPA's website at http://www.epa.gov/crossstaterule/actions.html. When proposed in August 2010, the Cross-State Rule was referred to as the Clean Air Transport Rule. The name change to "Cross-State Rule" occurred late in the development of the final rule. As a result, many of the explanatory materials, including the final Regulatory Impact Analysis, refer to the "Transport Rule."

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Both CAIR and its replacement, the Cross-State Rule, are designed to control emissions of air pollution that cause air quality problems in downwind states. The original, Bush-era rule did so by establishing region-wide cap-and-trade programs[8] for SO_2 and NOx emissions from coal-fired electric power plants in 28 Eastern states, at an estimated annual compliance cost of $3.6 billion in 2015.[9] CAIR covered only the eastern half of the country, but since most of the coal-fired generation capacity lacking emission controls is located there, EPA projected that nationwide emissions of SO_2 would decline 53% and NOx emissions 56% by 2015, as compared to nationwide emissions from electric generating units (EGUs) in 2001.

The replacement rule, finalized July 6, 2011, is a modified cap-and-trade rule. It would allow unlimited trading of allowances within individual states; interstate trading would be allowed so long as a state remained within 18%-21% of its emissions caps. Limiting interstate trading would address the D.C. Circuit's ruling, which found CAIR's interstate allowance trading program unlawful.

The rule applies to 28 states (adding Oklahoma, Kansas, and Nebraska to the 28 covered by CAIR, but removing Connecticut, Delaware, and Massachusetts from the CAIR group). Its annual compliance cost is estimated at $3.0 billion in 2012 and $2.4 billion in 2014.[10]

The Cross-State Rule would leave the CAIR Phase 1 (2009-2010) caps in place and would set new limits replacing CAIR's second phase in 2012 and 2014, up to three years earlier than CAIR would have done. The 2012 and 2014 requirements place particular emphasis on SO_2—emissions of which would decline to 2.4 million tons in the covered states (73% below 2005 levels) in 2014.

To insure that the Cross-State Rule is implemented quickly, EPA is promulgating a Federal Implementation Plan (FIP) for each of the states: the FIP specifies emission budgets for each state based on controlling emissions from electric power plants. States may develop their own State Implementation Plans and may choose to control other types of sources if they wish, but the federal plan will take effect until the state acts to replace it.

The CAIR Phase 1 rules already appear to be having substantial effects. In August 2010, EPA reported that emissions of SO_2 had declined sharply in both 2008 and 2009: in the latter year, emissions from fossil-fueled power plants in the lower 48 states (at 5.7 million tons) were 44% below 2005 levels. NOx emissions from the same sources declined to 1.8 million tons in 2009, a

[8] A cap-and-trade system sets a declining national cap on emissions and allocates emission allowances that can be bought and sold on open markets.

[9] 70 *Federal Register* 25306, May 12, 2005.

[10] These cost estimates include $1.6 billion in annualized costs already incurred to comply with Phase 1 of CAIR. EPA estimates the additional cost of the Cross-State Rule at $1.4 billion in 2012 and $0.8 billion in 2014. The 2014 cost of compliance with the Cross-State is less than that estimated for 2012 or for final implementation of CAIR in 2015 because the Regulatory Impact Analyses for the two rules use different base years for comparison. As the agency's RIA for the Cross-State Rule notes, "The base case in this RIA assumes that CAIR is not in effect, but does take into account emissions reductions associated with the implementation of all federal rules, state rules and statutes, and other binding, enforceable commitments finalized by December 1, 2010, that are applicable (sic) the power industry and which govern the installation and operation of SO_2 and NOx emissions controls in the timeframe covered in the analysis." Thus, the base with which control requirements are compared already accounts for some reductions realized since the original CAIR rule was promulgated. See U.S. EPA, Office of Air and Radiation, *Regulatory Impact Analysis (RIA) for the final Transport Rule*, June 2011, p. 244, at http://www.epa.gov/crossstaterule/pdfs/FinalRIA.pdf. Hereafter, "Cross-State Rule RIA."

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decline of 45% compared to 2005.[11] The reductions occurred well in advance of CAIR's compliance dates: in fact, for both SO_2 and NOx, the affected units had achieved about 80% of the required 2015 reductions six years ahead of that deadline. Further reductions of both SO_2 and NOx can be expected as Phase 1 takes effect. The Cross-State Rule would build on these reductions.

As noted earlier, EPA estimated that compliance with the rule will cost the power sector $2.4 billion annually when fully effective. It expects the benefits to be 50 to almost 120 times as great—an estimated $120 billion to $280 billion annually. The most important benefit would be 13,000 to 34,000 fewer premature deaths annually. Avoided deaths and other benefits would occur throughout the East, Midwest, and South, according to EPA, with Ohio and Pennsylvania benefitting the most.[12]

Both EEI and NERC included the Cross-State Rule in their analyses, and their estimates of the rule's cost and the impact on coal-fired power do not appear to differ greatly from those of EPA, particularly in the "train wreck" years, from now until 2017. NERC, for example, concluded that the Cross-State Rule as proposed (then referred to as the "Transport Rule") would lead to 2.9 GW of deratings[13] or retirements by 2015.[14] This would represent less than 1% of coal-fired capacity, and less than 0.3% of all EGU capacity. EPA, by comparison, projects that 4.8 GW of coal-fired capacity would be uneconomic to maintain as a result of the rule.[15]

EEI's analysis stated that it used EPA'sIntegrated Planning Model assumptions with "no additional controls for SO_2-specific compliance" and with EPA'spreferred option for NOx compliance through 2017. With the same assumptions and the same model, EEI's projected compliance costs should not differ from those of EPA.

For the years after 2017, however, EEI's analysis did differ from that of EPA: it assumed that selective catalytic reduction (SCR) would be required on all units to reduce NOx emissions. This *would* impose additional cost, since about 54% of coal-fired capacity will not have installed SCR to comply with the Cross-State Rule's 2014 requirements, according to EPA.[16] These costs are speculative: to date, EPA has not proposed additional post-2014 requirements, and, as a result, the agency has not estimated costs of compliance or a schedule for implementation of any future pollution transport regulations.[17]

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[11] Data are from EPA's "2009 Acid Rain Program Emission and Compliance Data Report," August 11, 2010, at http://www.epa.gov/airmarkets/progress/ARP09.html. Some of the emission reduction was the result of the recession, which resulted in a decline in electric power generation of 5% from 2007 to 2009. Coal use for electricity generation declined even more (11% from 2007 to 2009).

[12] U.S. EPA, Office of Air and Radiation, "Final Air Pollution Cross-State Air Pollution Rule," Overview Presentation, undated, pp. 12-14, at http://www.epa.gov/crossstaterule/pdfs/CSAPRPresentation.pdf.

[13] "Derating," in these analyses, refers to the loss of available capacity because of the power needed to operate the pollution control equipment.

[14] NERC report, p. 20.

[15] Cross-State Rule RIA, p. 262.

[16] Cross-State Rule RIA, p. 259.

[17] Given the need to meet the more stringent ambient air quality standard (NAAQS) requirements, especially those for ozone and PM (described below), which EPA is expected to propose or promulgate this year, the agency stated its intention to propose a further set of requirements addressing interstate transport of air pollution in 2011. (These potential further rules appear on EEI's chart as "Transport Rule II (NOx) Proposal" and "PM Transport Rule.")

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To summarize, CAIR and its replacement, the Cross-State Air Pollution Rule, would impose annual costs in the $2 billion to $3 billion range on previously uncontrolled coal-fired electric generating units. Although these are significant costs, the industry has already complied with Phase 1, which was the most ambitious of the rules' requirements. Prompted by the ability to generate tradable allowances, the industry complied well ahead of schedule. The final version of the Cross-State Rule allows additional allowance trading as compared to the proposed rule, giving EGUs additional flexibility in determining how to comply and lowering compliance costs.

Mercury and Air Toxics Standards/Utility MACT

In 2005, EPA promulgated regulations establishing a cap-and-trade system to limit emissions of mercury from coal-fired power plants. Coal-fired electric generating units (EGUs) account for about half of U.S. mercury emissions. Mercury is a potent neurotoxin that can harm health (principally delayed development, neurological defects, and lower IQ in fetuses and children) at very low concentrations.[18]

The mercury cap-and-trade rules promulgated in 2005 were a change in policy by EPA. All previous sources of mercury subject to emission standards had been required to meet plant-specific Maximum Achievable Control Technology (MACT) standards under CAA Section 112.[19] Section 112 sets out very detailed requirements for MACT standards, including a list of the pollutants that need to be controlled (not just mercury, but any of 187 hazardous air pollutants, or HAPs) and the level of control that the standards must achieve. The 2005 cap-and-trade rules addressed only mercury, and would have allowed many power plants to avoid control provided they obtained allowances from others who achieved lower pollution levels than required, or reduced emissions sooner than required. The ability of plants to avoid emission control by purchasing allowances could lead to the continuation of "hot spots," areas where mercury concentrations in waterbodies are greater than elsewhere.

By contrast, the statute requires MACT standards applicable at each existing plant to be no less stringent than the average emission limitation achieved by the best performing 12% of existing sources in the industry subcategory.[20] These statutory requirements are referred to as the "MACT floor," because the agency is not allowed to set less stringent standards, nor may it take economic factors into account in determining what the floor will be.

Whether the agency could substitute cap-and-trade rules for the MACT requirements was challenged by the State of New Jersey and others, and, in a 3-0 decision, the D.C. Circuit Court of Appeals vacated the cap-and-trade rules in 2008.[21] The court found that, under Section 112,

[18] The principal route of exposure to mercury is through consumption of fish. Mercury enters water bodies, often through air emissions, and is taken up through the food chain, ultimately affecting humans as a result of fish consumption. All 50 states have issued fish consumption advisories due to mercury pollution, covering 16.8 million acres of lakes, 1.25 million river miles, and the coastal waters of 20 entire states. For a more detailed discussion of mercury's health effects, see CRS Report RL32420, *Mercury in the Environment: Sources and Health Risks*, by Linda-Jo Schierow. For EPA's "2008 Biennial National Listing of Fish Advisories," September 2009, see http://water.epa.gov/scitech/swguidance/fishshellfish/fishadvisories/upload/2009_09_16_fish_advisories_tech2008.pdf.

[19] EPA identified 174 industrial categories to be regulated under the MACT provisions. Standards have been promulgated for almost all these categories except EGUs.

[20] For new sources, the standards are to be based on the emission control achieved by the best controlled similar source.

[21] New Jersey v. EPA, 517 F.3d 574 (D.C. Cir. 2008).

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unless EPA "delisted" the category of sources, it had to require that each plant in the category meet MACT standards. Under the statute, delisting would have required a finding that no EGU's emissions exceeded a level adequate to protect public health with an ample margin of safety, and that no adverse environmental effect would result from any source.

Rather than appeal the court's ruling to the Supreme Court or attempt to delist the category, EPA proposed what is referred to as the "Utility MACT," March 16, 2011.[22] The proposal appeared in the *Federal Register* May 3, beginning a public comment period that runs through August 4. Under a consent agreement, the final MACT standards are to be promulgated by November 16, 2011.

The Proposed Rule

As proposed, the Utility MACT would require coal-fired power plants to achieve a 91% reduction from uncontrolled emissions of mercury, nine other toxic metals, and three acid gases, all of which were listed by Congress as hazardous air pollutants in the 1990 Clean Air Act Amendments. Power plants are the largest emitters of many of these pollutants, accounting for about 50% of the nation's mercury emissions, 62% of arsenic emissions, and 82% of hydrochloric acid emissions, for example.[23] The Utility MACT would also reduce emissions of fine particulates ($PM_{2.5}$), which, although not categorized as hazardous air pollutants, are estimated to cause thousands of premature deaths annually.

In proposing the standards, EPA noted that while the requirements are stringent for those facilities lacking controls, 56% of existing coal-fired power plants already are in compliance. Thus, the standards are expected to level the playing field, bringing older, poorly controlled plants up to the standards being achieved by a majority of the existing units. In this respect, the proposed standards reflect the statute's requirement that existing sources of HAPs should meet standards based on the current emissions of the best performing similar sources.

The agency also concluded that some plants, representing less than 10 GW of coal-fired capacity, will be retired by 2015, rather than invest in control technologies. In all, it said, coal-fired generation will decline about 2% compared to estimated generation in the absence of the rule.[24]

Costs, Benefits, and Control Technology

EPA projected the annualized cost of compliance with the proposed rule at $10.9 billion in 2015, and remaining at $10 billion - 11 billion annually through 2030.[25] The average consumer would see an increase of $3-$4 per month in the cost of electricity due to the rule, according to the agency.[26] These costs will go largely to the installation of scrubbers and fabric filters. As a result

[22] For a link to the proposed rule as well as explanatory material, see U.S. EPA, "Reducing Toxic Air Emissions from Power Plants," at http://www.epa.gov/airquality/powerplanttoxics/actions.html.

[23] See U.S. EPA, "Emissions Overview: Hazardous Air Pollutants in Support of the Proposed Toxics Rule," Memorandum from Madeleine Strum, Emission Inventory and Analysis Group, to Marc Houyoux, Group Leader, Emission Inventory and Analysis Group, March 15, 2011, Tables 3 and 4.

[24] U.S. EPA, *Regulatory Impact Analysis of the Proposed Toxics Rule: Final Report*, March 2011, p. 8-17 at http://www.epa.gov/ttn/ecas/regdata/RIAs/ToxicsRuleRIA.pdf. Hereafter, "Utility MACT RIA."

[25] Utility MACT RIA, p. 8-12.

[26] U.S. EPA, "Power Plant Mercury and Air Toxics Standards: Overview of Proposed Rule and Impacts," p. 3, at (continued...)

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of the rule, 26 GW of coal-fired units, about 9% of total coal-fired capacity, are expected to install scrubbers. (EPA estimated that by the time the rule requires compliance, 203 GW will already have installed scrubbers anyway, as a result of other regulations.)[27]

More than half of the coal-fired EGU capacity (166 GW) are expected to add fabric filters because of the rule, while 77 GW would have them whether or not there were a rule. In most cases, the fabric filters will be coupled with activated carbon injection or dry sorbent injection.[28] Mercury and other HAPs become attached to the carbon or sorbent after it is injected into the flue gas, and the fabric filter collects the particles, removing them from the plant's emissions. EPA estimates that 62 GW of coal-fired capacity (about one-fifth of the U.S. total) would have either activated carbon or dry sorbent injection in 2015 without the rule. The rule adds another 149 GW of carbon/sorbent installations.

This is not complicated or new technology. Other types of facilities (notably solid waste incinerators) have used this technology for the past 15 years to reduce their mercury and other HAP emissions by 95% or more. As a result of state-level pollution control regulations, a growing percentage of coal-fired power plants do the same.

The benefits of the rule are estimated by EPA at $59 billion to $140 billion annually—5 to 13 times as great as the costs—due primarily to the avoidance of 6,800 to 17,000 premature deaths each year.[29] Other benefits, only some of which were given dollar values, include the annual avoidance of 11,000 nonfatal heart attacks, 120,000 cases of aggravated asthma, and developmental effects on children, including effects on IQ, learning, and memory.[30]

Of the proposed EPA rules, the Utility MACT is probably the most costly and most likely to affect older coal-fired plants that have not yet installed current pollution control technology. EPA's proposal does allow averaging of emissions from multiple units at a single location, which may allow some older units that are operated infrequently to remain in service, but the absence of broader allowance trading provisions in the law and the stringency of the emission requirements mean that most units will not be able to escape regulation.

EEI's and NERC's Analyses of the Utility MACT Rule

In its report, which was written before EPA's Utility MACT proposal, EEI concluded that, "All coal units [would be] required to install a scrubber (wet or dry), activated carbon injection (ACI) and a baghouse/fabric filter" for compliance with the MACT.[31] This goes well beyond what EPA proposed. Compared to EPA's projections, it concluded that five times as much scrubber capacity, nearly three times as much ACI, and about one and one-half times as much baghouse capacity

(...continued)

http://www.epa.gov/airquality/powerplanttoxics/pdfs/overviewfactsheet.pdf.

[27] U.S. EPA, "Reducing Toxic Pollution from Power Plants: EPA's Proposed Mercury and Air Toxics Standards," Overview Presentation, March 16, 2010, p. 15, http://www.epa.gov/airquality/powerplanttoxics/pdfs/presentation.pdf.

[28] Ibid.

[29] Ibid., p. 13.

[30] U.S. EPA, "Fact Sheet: Proposed Mercury and Air Toxics Standards," March 2011, p. 3, at http://www.epa.gov/airquality/powerplanttoxics/pdfs/proposalfactsheet.pdf. For additional information, see Utility MACT RIA, pp. 1-2 to 1-10, and Chapter 5.

[31] EEI report, p. 43.

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would need to be added, making the rule substantially more costly and far more difficult to comply with in the limited time provided by the statute.

NERC's report, which was also written before EPA proposed the Utility MACT, also assumed that vastly more pollution control equipment would need to be added to coal-fired plants than EPA believes will be necessary. The NERC analysis assumed wet scrubbers would be added to all coal-fired plants that don't already have them, that selective catalytic reduction (SCR) will be added to all bituminous coal-powered facilities, and that activated carbon injection and baghouses would be added at all facilities burning other types of coal.[32] These assumptions are similar to EEI's except that by assuming wet scrubbers (instead of EPA'sgeneral assumption that dry scrubbers will suffice) and by assuming SCR at bituminous facilities, the cost impacts would most likely be even greater than the costs in EEI's assessment.[33] NERC concluded that 8.4 GW to 17.6 GW of capacity would be retired or derated as a result of the MACT rule. If fewer units need controls and less expensive pollution control equipment is needed on those that do, the retirements and deratings would be fewer.

Following promulgation of these standards, existing power plants will have three years, with a possible one-year extension, to meet the standards. (The three-to-four-year timeframe is mandated by the statute.) Many in industry argue that three or four years is not enough time to complete the required pollution control equipment installation, and as a result that the reliability of the nation's electric power supply could be affected by the rule. NERC did not say this directly, in part because its analysis combines the effects of four rules, making it difficult to disaggregate the Utility MACT's effect. What it did say was:

> The MACT Rule considered alone could drive Planning Reserve Margins of 8 regions/subregions below the NERC Reference Margin Levels standards and trigger the retirement of 2-15 GW ... of existing coal capacity by 2015. To comply, owners of the remaining capacity need to retrofit from 277 to 753 units with added environmentalcontrols. The "hard stop" 2015 compliance deadline proposed by the MACT Rule makes retrofit timing a significant issue and potentially problematic.[34]

In part, whether or not there is sufficient time to implement the rule without threatening electric system reliability will depend on the number of units that require retrofits. EPA is the only one of the three sources discussed herein that analyzed the actual proposal. Both EEI and NERC assumed requirements that appear to be substantially more stringent than what EPA proposed. If EPA is correct in its analysis, the number of retrofits appears to be within the range of what the industry has accomplished in the past as a result of earlier regulations. This point is discussed below in more detail, under "Train Wreck?"

New Source Performance Standards for Greenhouse Gas Emissions

On December 23, 2010, EPA released the text of a settlement agreement with 11 states, two municipalities, and three environmental groups, under which it agreed to propose New Source Performance Standards (NSPS) to address greenhouse gas emissions from power plants by July 26, 2011, and take final action on the proposal by May 26, 2012. (The agency recently announced

[32] NERC report, p. 50.

[33] For a detailed comparison of equipment cost, see EEI report, p. 33.

[34] NERC report, p. V.

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that it will delay proposal until September 30, 2011, but it expects to retain the May 26, 2012 date for final action.) Electric generating units are the largest U.S. source of greenhouse gas (GHG) emissions, accounting for about one-third of total U.S. emissions. Coal-fired plants accounted for 81% of the electric power industry's total GHG emissions in 2009[35] and, thus, are expected to be the main focus of EPA'sNSPS rules.

New Source Performance Standards are emission limitations imposed on designated categories of major new (including substantially modified) stationary sources of air pollution. CAA Section 111 gives EPA authority to set NSPS for emissions of "air pollutants," a term that includes greenhouse gases.[36] A new source is subject to NSPS regardless of its location (i.e., the same standards apply to all new and modified major facilities anywhere in the United States). The statute provides authority for EPA to impose such standards directly in the case of new (or modified) sources (Section 111(b)), and through the states in the case of existing sources (Section 111(d)). The authority to impose performance standards on new and modified sources refers to any category of sources that the EPA Administrator judges "causes, or contributes significantly to, air pollution which may reasonably be anticipated to endanger public health or welfare" (Sec. 111(b)(1)(A))—language similar to the endangerment and cause-or-contribute findings EPA used to promulgate GHG emission standards for motor vehicles in 2010.

In establishing these standards, Section 111 gives EPA considerable flexibility with respect to the source categories regulated, the size of the sources regulated, and the particular gases regulated, along with the timing and phasing in of regulations. This flexibility extends to the stringency of the regulations with respect to costs and secondary effects, such as non-air-quality, health and environmental impacts, along with energy requirements. This flexibility is encompassed within the Administrator's authority to determine the control systems that have been "adequately demonstrated." Standards of performance developed by the states for existing sources under Section 111(d) can be similarly flexible.

Assuming EPA promulgates the greenhouse gas NSPS on schedule, how quickly such standards would be applied to existing sources is an open question. EPA must first propose and promulgate guidelines, following which the states would be given time to develop implementation plans.[37] Following approval of the plans, the act envisions case-by-case determinations of emission limits, in which the states may consider, among other factors, the remaining useful life of a source in setting an emission limit. Thus, it is likely to be several years before existing power plants are subject to emission limits for GHGs.

Since EPA has not yet proposed NSPS, the agency has not provided a Regulatory Impact Analysis or cost estimate for such a rule.[38] EEI, on the other hand, in six of the nine scenarios in its

[35] U.S. EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2009*, April 2011, Table 2-13, available at http://epa.gov/climatechange/emissions/usinventoryreport.html.

[36] In Massachusetts v. EPA (549 U.S. 497 (2007)), the Supreme Court held, in a 5-4 decision, that greenhouse gases are clearly air pollutants under the Clean Air Act's definition of that term.

[37] How much time the states would be given to submit plans is unclear. The statute says that the regulations shall establish a procedure "similar to that" provided for State Implementation Plans under Section 110, which generally give states three years to submit a plan, following which EPA reviews it to determine its adequacy.

[38] Agency guidance for state GHG permitting decisions, issued in November 2010, is perhaps the best example of what the agency might require: the guidance focuses on energy efficiency as the best available control technology, and states that both conversion to natural gas and carbon capture and sequestration can be eliminated from consideration. While cost is not estimated in the guidance, the requirements would not appear to be stringent. For a discussion of EPA's guidance, see CRS Report R41505, *EPA's BACT Guidance for Greenhouse Gases from Stationary Sources*, by Larry (continued...)

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analysis, assumed there would be CO_2 regulations in place by 2017. In five of the scenarios, it estimated the cost of CO_2 regulation or legislation at $25 per ton of emissions in 2017, with price escalation of 5% annually thereafter. This assumption would impose a larger burden on coal-fired power plants than any of the other rules considered in EEI's report. In 2009, coal-fired electric power plants emitted 1,748 million tons of CO_2.[39] Assuming roughly the same level of emissions in 2017, EEI's $25/ton assumption would result in a cost of CO_2 regulation of $43.7 billion in 2017, with 5% increases each year thereafter. This cost, which appears to have been based on its analysis of legislation not enacted in the 111th Congress, dwarfs every other projected regulatory cost in the regulatory impact analyses that CRS examined. Inclusion of this requirement leads, in EEI's analysis, to an additional 23 GW of retired capacity in 2015 and 40 GW of incremental retirements in 2020, accounting for more than half of all retirements in the latter year.[40]

NERC, on the other hand, did not include CO_2 regulation in its study.

NAAQS Revisions

EPA is required in CAA Sections 108 and 109 to set National Ambient Air Quality Standards (NAAQS) for air pollutants that endanger public health ("primary" NAAQS) or welfare ("secondary" NAAQS) and that are emitted by numerous or diverse sources. NAAQS do not directly regulate emissions. Rather, the primary NAAQS identify pollutant concentrations in ambient air that must be attained to protect public health with an adequate margin of safety. Secondary NAAQS identify concentrations necessary to protect public welfare, a broad term that includes damage to crops, vegetation, property, building materials, and more.

In essence, NAAQS are standards that define what EPA considers to be clean air. Their importance stems from the long and complicated implementation process that is set in motion by their establishment. Once NAAQS have been set, EPA, using monitoring data and other information submitted by the states to identify areas that exceed the standards and must, therefore, reduce pollutant concentrations to achieve them. State and local governments then have three years to produce State Implementation Plans which outline the measures they will implement to reduce the pollution levels in these "nonattainment" areas. Nonattainment areas are given anywhere from three to 20 years to attain the standards, depending on the pollutant and the severity of the area's pollution problem.

EPA also acts to control many of the NAAQS pollutants wherever they are emitted through national standards for certain products that emit them (particularly mobile sources, such as automobiles) and emission standards for new stationary sources, such as power plants.

In the 1970s, EPA identified six pollutants or groups of pollutants for which it set NAAQS.[41] But that was not the end of the process. When it gave EPA the authority to establish NAAQS, Congress anticipated that the understanding of air pollution's effects on public health and welfare

(...continued)

Parker and James E. McCarthy.

[39] U.S. EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2009*, April 2011, Table 2-13, available at http://epa.gov/climatechange/emissions/usinventoryreport.html.

[40] EEI report, p. v.

[41] The six pollutants are ozone, particulates, carbon monoxide, SO_2, NOx, and lead.

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would change with time, and it required that EPA review the standards at five-year intervals and revise them, as appropriate.

The agency is currently conducting the required reviews of these standards: it has already completed reviews for five of the six standards, but two of them have been remanded by the D.C. Circuit Court of Appeals for further agency action, and others are being challenged in court. The electric power industry and others are following this process closely, because more stringent standards could begin a process that would lead to more stringent emission standards.[42]

The three standards most likely to affect power plants are those for SO_2, ozone, and particulate matter (PM).

Sulfur Dioxide (SO_2)

On June 22, 2010, EPA revised the NAAQS for SO_2, focusing on short-term (1-hour) exposures. The prior standards (for 24-hour and annual concentrations), which were set in 1971, were revoked as part of the revision. Since 1971, EPA had conducted three reviews of the SO_2 standard without changing it. However, following the last of these reviews, in 1998, the D.C. Circuit Court of Appeals remanded the SO_2 standard to EPA, finding that the agency had failed adequately to explain its conclusion that no public health threat existed from short-term exposures to SO_2.[43] Twelve years later, EPA revised the standard to respond to the court's decision.

The new short-term standard is substantially more stringent than the previous standards: it replaces a 24-hour standard of 140 parts per billion (ppb) with a 1-hour maximum of 75 ppb. This means that there could be an increase in the number of SO_2 nonattainment areas (especially since there were *no* nonattainment areas under the old standards), with additional controls required on the sources of SO_2 emissions in any newly designated areas. Since electric generating units accounted for 60% of total U.S. emissions of SO_2 in 2009, additional controls on EGUs would be likely.

The timing and extent of any additional controls is uncertain, however, for several reasons. First, the monitoring network needed to determine attainment status is incomplete and is not primarily configured to monitor locations of maximum short-term SO_2 concentrations.[44] The agency says it will need 41 new monitoring sites to supplement the existing network in order to have a more complete data base. Since three years of data must be collected after a site's startup to determine attainment status, it may be as late as 2016 before some areas will have sufficient data to be classified. Even if the areas can be designated sooner based on modeling data, it would be at least 2015 before State Implementation Plans with specific control measures would be due, and actual compliance with control requirements would occur several years later.

Meanwhile, SO_2 emissions will be significantly reduced as a result of the CAIR, Cross-State, and Utility MACT rules described above. Thus, although EPA identified 59 counties that would have

[42] Five of the entries on EEI's "train wreck" chart (**Figure 1**) refer to NAAQS reviews.

[43] American Lung Association v. EPA, 134 F.3d 388 (D.C. Cir 1998).

[44] U.S. EPA, "Fact Sheet: Revisions to the Primary National Ambient Air Quality Standard Monitoring Network, and Data Reporting Requirements for Sulfur Dioxide," June 2, 2010, p. 3, at http://www.epa.gov/air/sulfurdioxide/pdfs/20100602fs.pdf.

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violated the new SO_2 NAAQS based on 2007-2009 data, it is not clear whether any of these counties will be in nonattainment by the time EPA designates the nonattainment areas.

In its Regulatory Impact Analysis of the SO_2 NAAQS, the agency estimated that attainment would require a reduction of 370,000 tons of SO_2 by 2020, about two-thirds of which would need to come from EGUs.[45] The agency estimated the annualized cost of these controls (for all sources, not just EGUs) at $1.5 billion. Benefits would range from $15 billion to $37 billion annually.[46]

These costs and benefits do not take account of CAIR, the Cross-State Rule, or the Utility MACT, however. (As may be recalled, the CAIR and Cross-State Rules will result in more than 6 million tons of SO_2 emission reductions by 2014.) The agency assumed for purposes of analysis that none of these rules was in effect, because none of them was in effect in 2005, the base year used for analytical purposes. As the agency's RIA states:

> The baseline for this analysis is complicated by the expected issuance of additional air quality regulations. The SO_2 NAAQS is only one of several regulatory programs that are likely to affect EGU emissions nationally in the next several years. We thus expect that EGUs will apply controls in the coming years in response to multiple rules. These include the maximum achievable control technology (MACT) rule for utility boilers, revisions to the Clean Air Interstate Rule, and reconsideration of the Clean Air Mercury Rule. Therefore controls and costs attributed solely to the SO_2 NAAQS in this analysis will likely be needed for compliance with other future rules as well.[47]

In short, compared to the Utility MACT and the Cross-State Rule, the SO_2 NAAQS has relatively little impact on coal-fired power plants in EPA'sanalysis, and the agency's analysis relied on assumptions that probably overstate the impact of the standard.

EEI included the SO_2 NAAQS on its "train wreck" timeline, but neither EEI nor NERC considered the standard in their analyses.

Ozone

On January 19, 2010, EPA proposed a revision of the NAAQS for ozone.[48] EPA currently expects to finalize this revision by the end of July 2011 (although it has already postponed the review's completion date three times). As noted above, NAAQS do not directly limit emissions, but they set in motion a process under which "nonattainment areas" are identified and states and EPA develop plans and regulations to reduce pollution in those areas.

Ozone is not directly emitted by coal-fired power plants (or most other sources). It forms in the atmosphere as the result of a chemical reaction between nitrogen oxides (NOx), volatile organic compounds (VOCs), and carbon monoxide (CO) in the presence of sunlight. Power plants emit

[45] U.S. EPA, Office of Air Quality Planning and Standards, *Final Regulatory Impact Analysis (RIA) for the SO2 National Ambient Air Quality Standards (NAAQS)*, June 2010, page ES-7, Table ES.2, at http://www.epa.gov/ttnecas1/regdata/RIAs/fso2ria100602full.pdf.

[46] Ibid., p. ES-9, Table ES.4.

[47] Ibid., p. ES-3.

[48] U.S. Environmental Protection Agency, "National Ambient Air Quality Standards for Ozone; Proposed Rule," 75 *Federal Register* 2938, January 19, 2010.

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one of these precursor emissions, NOx. Thus, the setting of a more stringent ozone standard might lead to tighter controls on their NOx emissions.

The ozone standard affects a large percentage of the population: as of September 2010, 119 million people (nearly 40% of the U.S. population) lived in areas classified "nonattainment" for the current ozone standard. The proposed revision would lower the primary (health-based) standard from 0.075 parts per million—75 parts per billion (ppb)—averaged over 8 hours to somewhere in the range of 70 to 60 ppb averaged over the same time.

EPA has identified at least 515 counties that would violate the proposed ozone NAAQS if the most recent three years of data available at the time of proposal were used to determine attainment (compared to 85 counties that violated the standard in effect at that time). The proposal would also, for the first time, set a separate standard for public welfare, the principal effect of which would be to call attention to the damage by ozone to forests and agricultural productivity.

As with other NAAQS, the standards, when finalized, would set in motion a long implementation process that has far-reaching impacts. The first step, designation of nonattainment areas, is expected to take place within a year of the new standards' promulgation; the areas so designated would then have 3 to 20 years to reach attainment.

EPA is prohibited by the statute from considering costs in setting NAAQS, but it does prepare cost and benefit estimates for information purposes. The agency estimated that the costs of implementing the revised ozone NAAQS (for all sources of ozone precursors) would range from $19 billion to $25 billion annually in 2020 if the standard chosen is 70 ppb, or $52 billion to $90 billion if the standard chosen is 60 ppb,[49] with benefits of roughly the same amount.

Although the ozone NAAQS revision is one of the most expensive EPA rules under development, it is unlikely to have major impacts on electric generating units. Fuel combustion by electric utilities accounted for 13% of NOx emissions nationally in 2009, and less than 1% of VOC and CO emissions. Thus, other sources account for most of the emissions and are likely to be the main focus of the emission controls necessary to reach attainment of the standard. Furthermore, to the extent that utility NOx emissions are targeted, it will likely be through the Cross-State Rule, or a successor to it, whose impacts were discussed above. The ozone NAAQS would primarily serve as a driver in the development of these other rules.

As with the SO_2 NAAQS, EEI included the ozone NAAQS on its "train wreck" diagram, but neither EEI nor NERC considered the standard in their analyses.

Particulate Matter

A third NAAQS whose revision could affect coal-fired power plants is that for particulate matter (PM). The PM NAAQS, which includes standards for both coarse and fine particulates (PM_{10} and $PM_{2.5}$, respectively), was last revised in October 2006. The D.C. Circuit Court of Appeals remanded the $PM_{2.5}$ standards to EPA in February 2009,[50] so EPA is both conducting the statutory

[49] U.S. EPA, "Fact Sheet: Supplement to the Regulatory Impact Analysis for Ozone," January 7, 2010, at http://www.epa.gov/air/ozonepollution/pdfs/fs20100106ria.pdf.

[50] American Farm Bureau Fed'n v. EPA, 559 F.3d 512 (D.C. Cir. 2009).

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five-year review of the standard and responding to the D.C. Circuit decision. The agency expects to propose revised standards for both $PM_{2.5}$ and PM_{10} by summer 2011, with promulgation perhaps taking place in 2012.

EPA staff have recommended a strengthening of the PM NAAQS,[51] but at this time, there is no proposal to be evaluated. Fuel combustion by electric utilities is the source of 8.3% of $PM_{2.5}$ and 3.5% of PM_{10}.

As with the other NAAQS, EEI included the PM NAAQS on its "train wreck" diagram, but neither EEI nor NERC considered the standard in their analyses.

Revised Cooling Water Intake Rule

Power plants withdraw large volumes of water for production and, especially, to absorb heat from their industrial processes. Water withdrawals by electric generating plants, used primarily for cooling, are the largest water use category by sector in the United States—201 billion gallons per day (BGD) in 2005. Although water withdrawal is a necessity for these facilities, it also presents special problems for aquatic resources. Cooling water intake structures (CWIS) can cause two types of environmental harm. First, impingement occurs when fish, invertebrates, and other aquatic life are trapped on equipment on intake screens at the entrance to the CWIS. Second, entrainment occurs when small organisms pass through the intake screening system, travel through the cooling system pumps and tubes, and then are discharged back into the source water. Impingement and entrainment injure or kill large numbers of aquatic organisms at all life stages. Section 316(b) of the Clean Water Act (CWA) authorizes regulation of CWIS to protect such organisms from being harmed or killed.

Regulatory efforts by EPA to implement Section 316(b) have a complicated history over 35 years, including legal challenges at every step by industry groups and environmental advocates. Currently most new facilities are regulated under rules issued in 2001, while rules for existing facilities issued in 2004 were challenged and remanded to EPA for revisions. In response to the remand, in March 2011 EPA proposed national requirements expected to affect 559 existing electric generators; 483 are fossil-fuel facilities. The affected facilities comprise approximately 11% of the steam electric generating facilities and over 45% of the electric power sector capacity in the United States. Publication of the CWIS proposal in the *Federal Register* on April 20 triggered a 90-day public comment period that ends on August 18, 2011.[52] EPA is under a court-ordered schedule to issue a final CWIS rule by July 27, 2012.

Even before release, the proposed regulations were highly controversial among stakeholders and some Members of Congress who questioned whether a stringent and costly environmental mandate could jeopardize reliability of U.S. electricity supply. Many in industry feared, while

[51] On July 2, 2010, EPA released the *Second External Review Draft of its Policy Assessment for the Review of the Particulate Matter NAAQS*. The draft represented EPA staff's recommendations to the Administrator. It outlined options for revising both the fine and coarse particulate standard, both of which would make the standards more stringent. The draft is available at http://www.epa.gov/ttn/naaqs/standards/pm/s_pm_2007_pa.html.

[52] U.S. Environmental Protection Agency, "National Pollutant Discharge Elimination System—Cooling Water Intake Structures at Existing Facilities and Phase 1 Facilities," 76 *Federal Register* 22174-22228, April 20, 2011. On July 20, EPA published a notice providing for 30 additional days of public comment beyond the time originally scheduled, to August 18, 2011. For information, see CRS Report R41786, *Cooling Water Intake Structures: Summary of EPA's Proposed Rule*, by Claudia Copeland.

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environmental groups hoped, that EPA would require installation of technology called closed-cycle cooling that most effectively minimizes the environmental damage of CWIS, but also is the most costly technology option.

In its proposed rule, EPA evaluated four regulatory options expected to minimize the harm to aquatic species of CWIS at existing facilities, each with varying environmental benefits and costs.[53] The agency concluded that closed-cycle cooling reduces CWIS impacts to a greater extent than other technologies, but declined to mandate closed-cycle cooling universally and instead favored a less costly, more flexible regulatory option. EPA'srecommended approach would essentially codify current CWIS permitting procedures for existing facilities, which are based on site-specific determinations and have been in place administratively for some time because of legal challenges to previous rules. The agency based the conclusion to not mandate closed-cycle cooling on four factors: additional energy needed by electricity and manufacturing facilities to operate cooling equipment, and threats to reliability of energy delivery (i.e., energy penalty); additional air pollutants that would be emitted because fossil-fueled facilities would need to burn more fuel as compensation for the energy penalty; land availability concerns in some locations; and limited remaining useful life of some facilities such that retrofit costs would not be justified. EPA estimates that more than 90 of the 559 affected electric generators already have the technology required to demonstrate compliance with the proposed rule.

Compliance with the rule, when promulgated in 2012, will be required as soon as possible. For individual facilities, specific compliance deadlines will be set when the facility next seeks to renew its existing CWA discharge permit; such permits are issued for five-year periods and then must be reissued by the permitting authority (state or EPA). Permitting agencies often allow facilities some time to come into compliance with new requirements. As proposed by EPA, for facilities already in compliance with the rule or needing to install technologies other than cooling towers, the compliance period is assumed to be a five-year period from 2013 to 2017. EPA expects that facilities required to install cooling towers for entrainment mortality control will require a longer period of time. Fossil-fuel electric power generating facilities would achieve compliance from 2018 to 2022.[54] EPA estimated that the annual costs of the proposed rule will be $319 million, while benefits will be $17.6 million annually.[55] EPA also estimated that a net nine generating units would be retired as a result of the rule.[56] EPA did not identify potential retirements by fuel source.

Industry groups generally view the March 2011 proposal favorably (at least in comparison with what had been anticipated), although they favor still more flexibility, while environmental advocates are critical that the proposal does not mandate stricter technological options to provide

[53] Three of the regulatory options considered by EPA would require all existing electric generators covered by the rule to use screens to prevent impingement of fish, but they differ with respect to requiring closed-cycle cooling towers to prevent entrainment. The fourth option would allow permitting authorities to establish impingement and entrainment controls on a case-by-case basis for small and medium EGUs and would require uniform controls for larger facilities. The agency's preferred option would require uniform impingement standards (i.e., screens) for all power plants and case-by-case determination of need for cooling towers for all facilities.

[54] EPA believes that permitting authorities would need to coordinate outages by multiple power generating facilities in a geographic area so as to minimize impacts on reliability of power generation. In these circumstances, EPA expects a facility could reasonably require as long as eight years to attain compliance.

[55] Costs and benefits are annualized over 50 years and discounted at a 3% rate.

[56] EPA concluded that 39 EGUs would be retired, but that 30 others would avoid closure because of EPA's recommendation of a rule that does not mandate cooling tower retrofits.

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greater protection of aquatic resources. States will be responsible for most permitting actions to implement the rule. Since many states are coping with constrained budgets, some of them favor a regulatory approach that requires them to make fewer case-by-case decisions, thus imposing less administrative cost.

Prior to release of the EPA proposal, industry assumed that the agency would propose a more stringent rule with a more rapid timeline for compliance. Both EEI and NERC assumed that EPA would mandate that existing power plants retrofit by installing closed-cycle cooling systems. EEI assumed that the CWIS rule would affect 314 GW of capacity and a total of 400 electric generating units, at a cost of $16 billion through 2020. EEI did not estimate or separate out how many plant retirements would result from the anticipated CWIS rule.

The NERC analysis assumed that mandatory cooling tower retrofits would be required by 2018, and on that basis, NERC concluded that the CWIS rule would be the most costly of the four EPA rules that it examined (although NERC did not estimate compliance costs for this rule), with the greatest likely impact on electricity capacity. NERC concluded that such a rule would lead to power plant retirements totaling 33 GW of capacity. However, NERC also concluded that only 2.5 GW of that total would be coal-fired power plants (representing 94 coal steam units). According to NERC, the largest impact of such a CWIS rule would be on older oil- and gas-fired units, with 253 units totaling 30 GW of capacity expected to be economically vulnerable and thus likely to be retired.[57]

Revised Steam Electric Effluent Guidelines

Under authority of CWA Section 304, EPA establishes national technology-based regulations, called effluent limitation guidelines (ELGs), to reduce pollutant discharges from industries directly to waters of the United States and indirectly to municipal wastewater treatment plants. EPA has issued ELGs for 56 industries that include many types of dischargers, such as manufacturing and service industries. These requirements are incorporated into discharge permits issued by EPA and states. The current steam electric power plant rules,[58] which were promulgated in 1982, apply to about 1,200 nuclear- and fossil-fueled steam electric power plants nationwide, 500 of which are coal-fired.

In a 2009 study,[59] EPA found that the current regulations do not adequately address the pollutants being discharged and have not kept pace with changes that have occurred in the electric power industry over the last three decades, specifically the increase of flue gas desulfurization (FGD) systems, or scrubbers, at coal-fired power plants to control air pollution. According to EPA, as of June 2008, 30% of coal-fired power plants were using FGD systems to control SO_2 emissions from the flue gas generated in the plants' boilers and prevent buildup of certain corrosive constituents such as chlorides, and by 2025, nearly 80% of coal-fired generating capacity is expected to employ FGD systems. While scrubbers dramatically reduce emissions of harmful pollutants into the air, some create a significant liquid waste stream (especially wet scrubbers). In addition, discharges from coal combustion waste (CCW) ash impoundments at steam electric

[57] NERC report, pp. 14-15.

[58] 40 CFR § 423.10.

[59] U.S. Environmental Protection Agency, *Steam Electric Power Generating Point Source Category: Final Detailed Study Report*, EPA 821-R-09-008, October 2009.

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power plants have a potential to degrade water quality. Concern about releases of CCW grew following the collapse of ash impoundment dams at Tennessee Valley Authority (TVA) power plants, discussed further under "Coal Combustion Wastes," below. Pollutants of concern associated with FGD systems and CCW include a large number of metals (e.g., mercury, arsenic, chromium, and selenium), chloride, nitrogen compounds, and total dissolved and suspended solids. EPA believes that many current CWA permits for power plants do not fully address potential water quality impacts of these discharges through appropriate pollutant limits and monitoring and reporting requirements.

Under the CWA, EPA has a duty to review existing ELGs at least every five years and, if appropriate, revise them. EPA had been studying the effluent limitations for the steam electric power generating category since the mid-1990s and on several occasions indicated that a preliminary study of discharges from this category was necessary. In 2009, environmental groups sued EPA to compel the agency to commit to a schedule for issuing revised guidelines. Pursuant to a November 8, 2010 consent decree that it entered into with environmental litigants, EPA agreed to propose the revised power plant ELG by July 23, 2012, and to finalize the rule by January 31, 2014. The rulemaking will address wastewater discharges from CCW ash storage ponds and FGD air pollution controls, as well as other power plant waste streams.[60] As with the CWIS rule discussed above, compliance with specific regulations, which cannot be anticipated at this time, will occur over several years with full compliance likely not required before 2019 or 2020.

Until EPA proposes a regulation, the substance, cost, and impact of a rule are speculative. Still, even before EPA proposes a new ELG for power plants, the agency has launched an effort to scrutinize state-issued CWA discharge permits for power plants as an interim measure to address longstanding concerns that the permits need to be strengthened. In a June 2010 letter to environmental groups, EPA committed to reviewing at least 35 CWA permits for power plants before the end of 2012 and simultaneously provided EPA regional offices with interim guidance to assist state and EPA permitting authorities to establish appropriate requirements for power plant wastewater discharges.[61]

Since EPA has not proposed a revised steam electric power ELG rule, the agency has not provided a Regulatory Impact Analysis or cost estimate for such a rule. EEI included an ELG rule in the timeline shown in **Figure 1**, but did not analyze or project what a rule would look like, or what its impact might be. NERC did not include an ELG rule in its analysis.

Coal Combustion Waste[62]

Coal combustion waste (CCW) is inorganic material that remains after pulverized coal is burned for electricity production.[63] A tremendous amount of the material is generated each year—

[60] Separately, EPA also is considering regulation of coal ash disposal sites under Resource Conservation and Recovery Act, as discussed in this report under "Coal Combustion Waste."

[61] James A. Hanlon, Director, EPA Office of Wastewater Management, "National Pollutant Discharge Elimination System (NDES) Permitting of Wastewater Discharges from Flue Gas Desulfurization (FGD) and Coal Combustion Residuals (CCR) Impoundments at Steam Electric Power Plants," memorandum, June 7, 2010, on file with authors.

[62] This section of the report was written by Linda Luther, Analyst in Environmental Policy.

[63] In its June 2010 regulatory proposal, EPA refers to the material as coal combustion *residuals*. It is also commonly referred to as coal combustion *byproducts* or *materials*. How the material is referred to generally depends on the (continued...)

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industry estimates that as much as 135 million tons were generated in 2009, making it one of the largest waste streams generated in the United States. Disposal of CCW onsite at individual power plants may involve decades-long accumulation of tons of dry ash (in a landfill) or wet ash slurry (in a surface impoundment) deposited at the site.

On December 22, 2008, national attention was turned to risks associated with managing such large volumes of waste when a breach in a surface impoundment pond at TVA'sKingston, TN, plant released 1.1 billion gallons of coal fly ash slurry that damaged or destroyed homes and property. Beyond the potential for a sudden, catastrophic release from a surface impoundment, a more common threat associated with CCW management is the leaching of contaminants likely present in the waste, primarily heavy metals, resulting in surface or groundwater contamination. This risk is particularly high at unlined surface impoundments which are likely in common use today.

The Kingston release also brought attention to how the waste is managed and regulated. CCW management is largely exempt from federal regulations and is regulated by individual states. State requirements generally apply to two broad categories of CCW management—its *disposal* in landfills, surface impoundment, or mines, and its *beneficial use* (e.g., as a component in concrete, cement, or gypsum wallboard, or as structural or embankment fill). Inconsistencies and deficiencies in state regulatory programs have been identified by EPA as one reason that national standards to regulate CCW are needed. More recently, EPA called into question the effectiveness of some state regulatory programs for protecting human health and the environment.

As discussed below, to establish a national standard necessary to address potential threats of improper management of CCW to human health and the environment, on June 21, 2010, EPA proposed two regulatory options.[64]

Regulatory Background

The evolution of CCW regulation began in 1978 when EPA first proposed hazardous waste management regulations under Subtitle C of the Resource Conservation and Recovery Act (RCRA).[65] However, in 1980, Congress amended the law to exclude CCW from regulation under Subtitle C, pending EPA'scompletion of a report to Congress and regulatory determination on whether hazardous waste regulations were warranted.[66] In response, EPA published regulatory determinations in 1993 and 2000 retaining that exemption, concluding on both occasions that CCW did not warrant regulation as hazardous waste. However, in the 2000 determination EPA stated that national regulations under Subtitle D (applicable to non-hazardous solid waste) were

(...continued)

context in which it is being discussed. For example, coal combustion *waste* is generally destined for disposal, while coal combustion *byproducts* or *residuals* may be destined for some use such as a component in gypsum wallboard or cement. Regardless of what it is called, these terms refer to the same substances. Since EPA's regulatory proposal primarily discusses issues associated with the materials' disposal, it is referred to here as coal combustion *waste* (CCW).

[64] U.S. EPA, "Hazardous and Solid Waste Management System; Identification and Listing of Special Wastes; Disposal of Coal Combustion Residuals From Electric Utilities," 75 *Federal Register* 35127-35264, June 21, 2010.

[65] RCRA actually amends earlier legislation, the Solid Waste Disposal Act of 1965, but the amendments were so comprehensive that the act is commonly referred to as RCRA rather than by its official title.

[66] This exclusion was specified in Solid Waste Disposal Act Amendments of 1980 (P.L. 96-482) at 42 U.S.C. 6921(b)(3)(A)(i). The provisions are commonly referred to as the "Bevill Amendment" or the "Bevill exclusion."

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warranted for CCW disposal in landfills and surface impoundments for reasons including new data about potential risks to human health and the environment and concerns about the adequacy of state regulatory programs. EPA stated that it would revise its determination that regulation under Subtitle C was not needed if it found that a need for such regulation was warranted.

After accumulating new data regarding CCW management, in October 2009, EPA developed a draft regulatory proposal to list the material as hazardous waste under Subtitle C of RCRA. Under the draft proposal, EPA would establish land disposal and treatment standards for CCW. EPA cited several reasons for determining that regulation under Subtitle C was needed based on new data which showed that disposal in unlined landfills and surface impoundments presents substantial risks to human health and the environment from releases of toxic constituents, that a large amount of waste is still being disposed in units that lack necessary protections, and state programs have not been sufficiently improved to address gaps that EPA had previously identified.[67]

Current Regulatory Proposal

As a result of review by the Office of Management and Budget, EPA'sdraft proposal underwent substantial changes. The final proposal, published on June 21, 2010, stated that the determination to revise the regulatory determination had not yet been made. It proposed two regulatory options for consideration. Under the first option, EPA would draw on its existing authority to list a waste as hazardous and to regulate it. The second option would keep the Subtitle C exclusion in place, but would establish national criteria applicable to landfills and surface impoundments under RCRA's Subtitle D non-hazardous solid waste requirements. Under Subtitle D, EPA does not have the authority to implement or enforce its proposed requirements. Instead, EPA would rely on states or citizen suits to enforce the new standards. However, in support of the Subtitle D option, EPA cited industry's concern that labeling CCW as hazardous waste would stigmatize beneficial uses of the material and ultimately increase the amount that must be disposed.[68]

The public comment period for EPA'sproposal ended on November 19, 2010. It is unclear when, or if, EPA will ultimately promulgate a final rule. On March 3, 2011, EPA Administrator Lisa Jackson testified that she does not anticipate a final rule to be promulgated in 2011, due to the large number of public comments received.[69]

During several congressional hearings, some Members of Congress also have expressed concern over EPA'sultimate decision to regulate CCW. Their concerns about potential Subtitle C regulations relate primarily to the potential impacts those requirements may ultimately have on coal-producing states, state regulatory agencies, energy prices, and CCW recycling opportunities. On the other hand, concerns expressed by other Members regarding the Subtitle D option generally relate to concerns that human health and the environment would not be sufficiently protected given EPA'slack of authority to enforce Subtitle D requirements.

[67] For more information about EPA's regulatory proposal, see CRS Report R41341, *EPA's Proposal to Regulate Coal Combustion Waste Disposal: Issues for Congress*, by Linda Luther.

[68] Opponents of the Subtitle D option have argued the opposite point—that recycling may actually increase if disposal becomes more costly under the Subtitle C requirements.

[69] House Committee on Appropriations, Subcommittee on Interior, Environment, and Related Agencies, March 3, 2011, EPA budget hearing.

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EPA's Regulatory Impact Analysis (RIA) estimated potential costs and benefits associated with the 2010 regulatory proposal. The RIA estimated average annualized regulatory costs to be approximately $1.5 billion a year under the Subtitle C option and $587 million a year under the Subtitle D option. EPA also estimated annualized "regulatory benefits." Under the Subtitle C option, regulatory benefits would range widely depending on whether there would be increases in recycling due to added costs of disposal, or decreases in recycling due to possible "stigma" effects of regulating the material under Subtitle C.[70] EPA estimated that if a decrease in beneficial use were to occur, this could result in increased costs of $16.7 billion, while induced increases in recycling could result in a regulatory benefit of $7.4 billion a year. Under the Subtitle D option, the regulatory benefit is estimated to range from $85 million to $3 billion a year.[71]

The EEI report estimated that if the Subtitle C option were adopted, costs would be considerably higher than projected by EPA, based largely on two costs that were not considered by EPA—costs of retrofitting existing disposal units to meet new standards, and the costs of sending the waste to an offsite commercial hazardous waste disposal facility. With regard to the first cost, neither of EPA's regulatory options would require existing landfills to be retrofitted to meet new regulatory standards as long as they install groundwater monitoring systems and implement corrective action, as needed, while existing surface impoundments would be required to be retrofitted. However, based on its past experience with surface impoundment regulations, EPA assumed that facilities would choose to close rather than retrofit. EEI assumed that some portion would retrofit. With regard to the second cost, EEI assumes that under potential Subtitle C requirements, siting or zoning restrictions and state or local ordinances would affect a facility's decision to open a new CCW landfill. However, these factors are difficult to evaluate. Electric utilities currently operate CCW landfills on-site; no data have been presented that indicate that future landfills could not meet EPA's proposed location restrictions or design requirements or that additional restrictions would prohibit or limit the potential for on-site disposal. Further, according to industry statements, new CCW landfills are already built with liners and groundwater monitoring systems. Thus, there is little evidence to suggest that new Subtitle C standards would differ greatly from what has, up until now, been common industry practice.

Other Regulatory Actions Affecting Coal Power

EPA and other federal agencies (the Office of Surface Mining and Reclamation, in the Department of the Interior; and the U.S. Army Corps of Engineers) are developing a series of actions and regulatory proposals to reduce the harmful environmental and health impacts of surface coal mining, including a practice called mountaintop removal mining, in Appalachia. These actions would not affect electric power plants directly, and thus are not covered by EEI nor NERC in their studies. Nevertheless, numerous critics have included actions by EPA, the Corps of Engineers, and the Interior Department regarding mountaintop removal mining in Appalachia in what they term a "War on Coal." Some of these EPA-Corps-Interior actions are discussed in **Appendix A** to this report.

[70] Potential benefits to the Subtitle C option also included groundwater protection benefits (e.g., human cancer prevention benefits) and remediation or cleanup costs avoidance after groundwater contamination or surface impoundment breach.

[71] For more detail on cost estimates, see 75 *Federal Register* 35134 and 35211-35220, June 21, 2010.

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The Future for Coal-Fired Power

Virtually all the analyses agree that coal will continue to play a substantial role in powering electric generation for decades to come. EPA, for example, in the Utility MACT RIA, concluded that coal-fired generation will be roughly the same in 2015 as it was in 2008, despite the impact of the MACT and other rules.[72] By 2030, the agency projects that 43% of the nation's electricity will still be powered by coal.[73] (The current level is 45%.) EEI projected that coal will be responsible for 36% to 46% of electricity generation in 2020, depending on the scenario.

There *will* be retirements of coal-fired capacity, however, as all of the analyses conclude. The number of these retirements, and the role of EPA regulations in causing them, are matters of dispute. The most extreme scenario in EEI's analysis showed 76 GW of coal-fired capacity retirements by 2020 (a little less than 25% of current capacity) as a result of the regulations it analyzed. As noted in the discussion of the individual regulations, in many cases EEI's analysis assumed regulations far more stringent than EPA actually proposed.

The units that would retire are the least economic and/or those currently operating with minimal pollution controls. As noted in **Figure 5**, there are 110 GW of coal-fired plants (about one-third of all coal-fired capacity) that began operating between 1940 and 1969, and two-thirds of these plants do not have scrubbers. These are the prime candidates for retirement.

[72] Utility MACT RIA, p. 8-16; 2008 data are from U.S. DOE, Energy Information Administration, *Electric Power Annual 2009*, April 2011, Table 2.1, available at http://www.eia.gov/cneaf/electricity/epa/epa_sum.html.

[73] Utility MACT RIA, p. 8-16.

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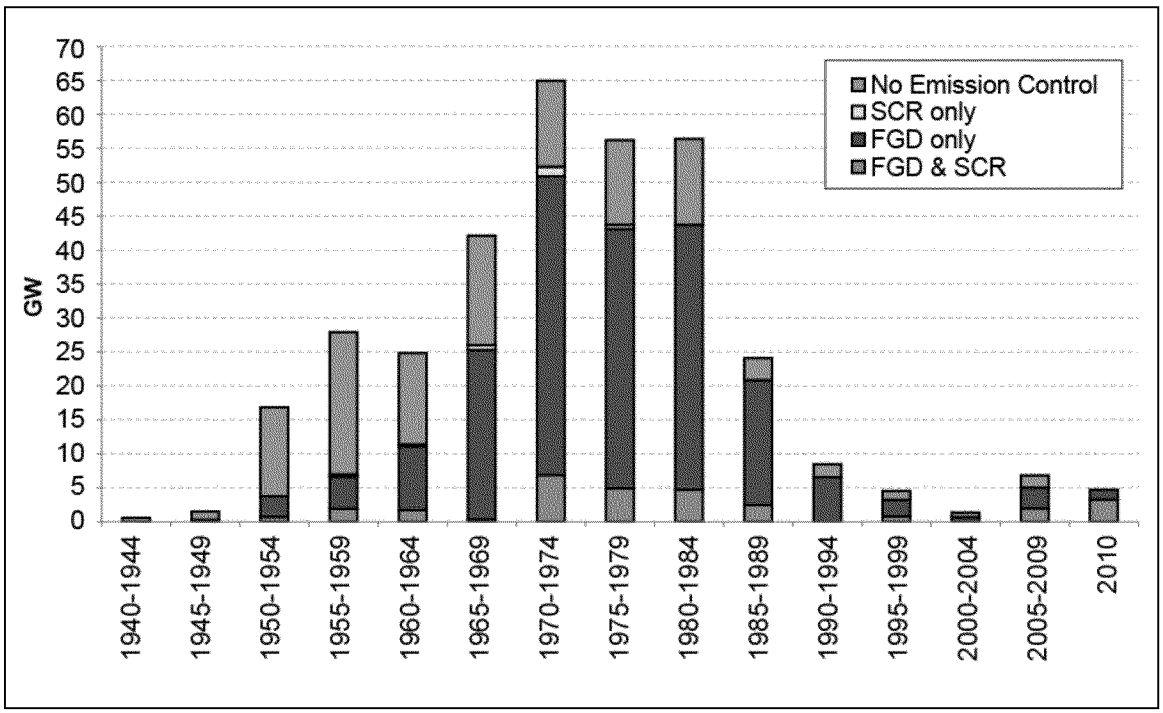
Figure 5. Coal Plants by Age and Emission Controls



Source: Sue Tierney, "EPA Proposed Utility Air Toxics Rule –Managing Compliance in Reliable Ways," Congressional Staff Briefing, May 9, 2011, p. 4.

In many cases, these older plants are not base-load plants, so their significance as a percentage of coal-fired generation is less than one might assume from adding up their nominal capacity. In a presentation to congressional staff, Sue Tierney, a former Assistant Secretary of Energy, presented data showing that the pre-1970 units operating without emission controls are in use only 41% of the time.[74]

EPA'smodeling confirmed that the plants likely to be retired are older, smaller, and less frequently used: the agency concludes, for example, that under the MACT rule the average unit to be retired will be 51 years old, with an average capacity of 109 Mw (versus 278 Mw for units that will continue operation), and has operated only 56% of the time.[75]

Some of these units will be replaced by new capacity, of which some will be coal-fired, but most replacements are likely to be natural gas combined cycle units. Even before the advent of the "train-wreck" rules, very few coal-fired plants were being built. As shown in **Figure 6**, since 1990, more than 80% of new capacity has been natural gas-fired. These plants are highly efficient; they are cost-competitive with coal; and they emit no SO_2, no mercury, and no other hazardous air pollutants. Without scrubber sludge to manage, they also do not need to meet effluent guidelines. Natural gas-fired power plants also have an advantage with regard to greenhouse gas (GHG) emissions: for the same amount of electric generation, they emit only half the GHGs of coal-fired units.

[74] Data obtained from Sue Tierney, "EPA Proposed Utility Air Toxics Rule –Managing Compliance in Reliable Ways," Congressional Staff Briefing, May 9, 2011, p. 4. Hereafter, "Tierney presentation." Additional calculation by CRS.

[75] Utility MACT RIA, p. 8-17.

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In the last two years, gas has enjoyed a price advantage, as well. As one analyst notes:

> Since most of America's utilities have the ability to employ natural gas fired power plants in lieu of coal fired power plants when natural gas is priced advantageously, utilities have been ramping up natural gas consumption and reducing their usage of coal. With the price of Central Appalachian (CAPP) coal currently trading at $73 per ton, up from $60 per ton for much of last year, a recent study by Credit Suisse (CS) indicates that natural gas prices would need to rise to approximately $6.30 per mcf [thousand cubic feet] before coal and natural gas trade at parity for electricity generation.[76]

Gas is currently trading at around $4.50 per mcf, with futures contracts through 2014 generally trading below $6.00.[77]

Train Wreck?

Is there a train wreck coming for coal-fired power? The answer depends on the individual facility. Older, smaller, less efficient units already face a train wreck. In 2010, 48 of them with a combined capacity of 12 GW were retired, according to one source.[78] Another source identifies 149 coal-fired units with a combined capacity of 19.7 GW whose retirement has been announced or implemented in the past few years.[79] In recent weeks, as utilities weigh the cost of retrofitting and operating their older units, more retirements have been announced.[80]

[76] Bill Powers, "Natural Gas vs. Oil and Coal," *Financial Sense*, February 1, 2011, at http://www.financialsense.com/contributors/bill-powers/natural-gas-vs-oil-and-coal.

[77] Commodity Futures Price Quotes for NYMEX Natural Gas, at http://futures.tradingcharts.com/marketquotes/NG.html.

[78] Sierra Club, "2010, Outlook Dimmed for Coal: Year End State of Coal Report," Press Release, December 22, 2010, at http://action.sierraclub.org/site/MessageViewer?em_id=192801.0.

[79] See Source Watch, "Coal Plant Retirements," at http://www.sourcewatch.org/index.php?title=Coal_plant_retirements#Table_1:_Age_of_U.S._Coal_Plants. Of the 149 units listed, all but 15 were built before 1973.

[80] American Electric Power announced in early June that it will retire 6 GW of coal-fired capacity, about one-fourth of the capacity of its coal-fired fleet, and will retrofit an additional gigawatt to burn natural gas. TVA, in April, announced that it will retire 18 coal-fired units, replacing them with low emission or zero-emission electricity sources, including renewable energy, natural gas, nuclear power, and energy efficiency.

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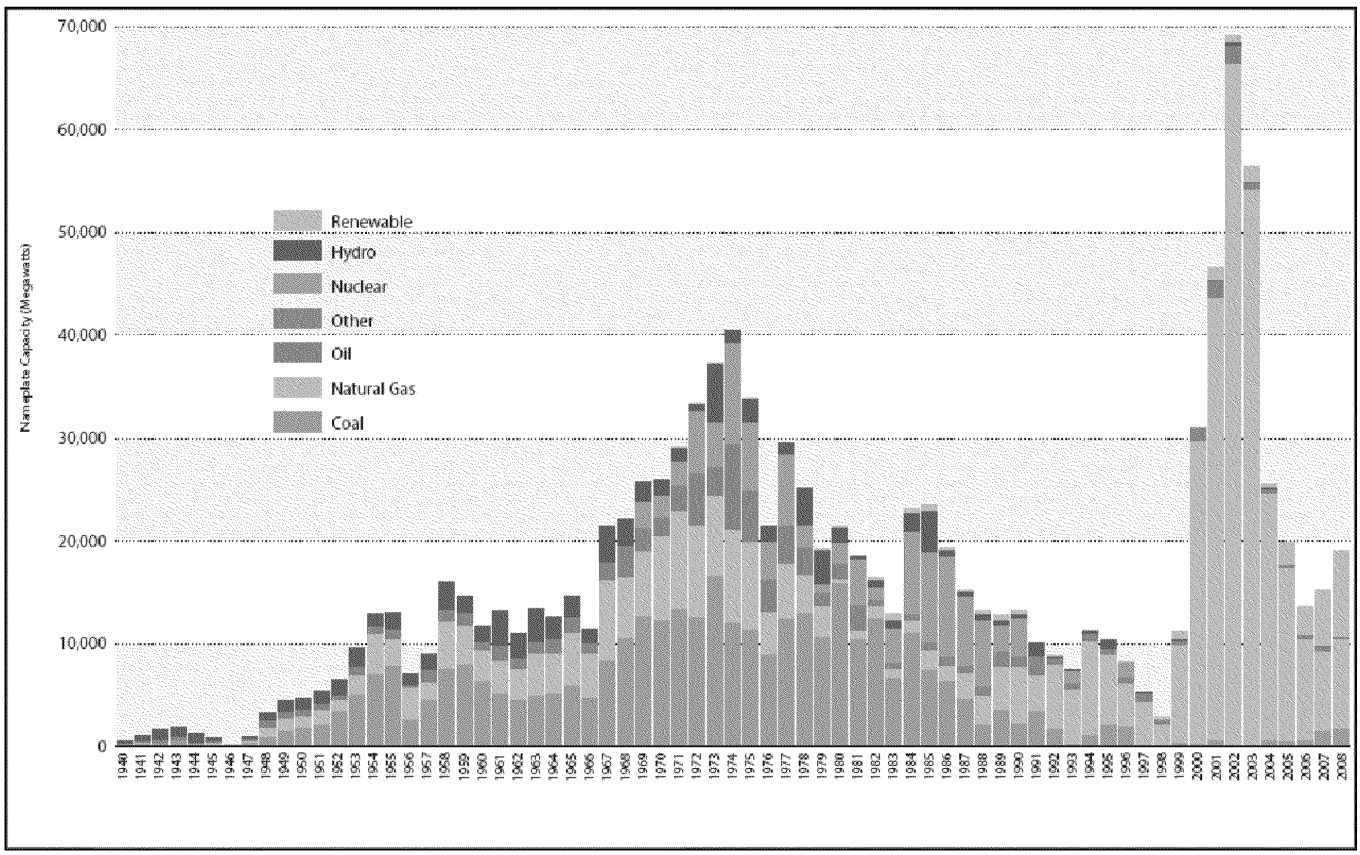
Figure 6. Power Plant Capacity, by Typeand YearIt Entered Service



Source: Sue Tierney, "EPA Proposed Utility Air Toxics Rule –Managing Compliance in Reliable Ways," Congressional Staff Briefing, May 9, 2011, p. 10. The chart is based on EIA Form 860 data. A similar chart produced by EIA itself can be found at http://www.eia.gov/todayinenergy/detail.cfm?id=1830.

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But this does not mean that the newer (post-1970) coal-fired facilities that have invested in pollution controls over the years will be shuttered. Most of them already comply with many of the proposed rules, or if not, they can do so with modest modifications to their pollution control equipment. A train wreck for this group seems unlikely.

In between the two ends of the spectrum are facilities that are efficient enough or play a sufficiently vital role in meeting regional demand that the economics likely would justify their retrofit. For these facilities, the key questions are whether there will be sufficient time to act, and whether the reliability of the electric grid will be affected as they are taken off-line for modification.

Timing and Reliability Issues

It is difficult to generalize about the timing and system reliability issues. Several utilities state that they will have difficulty meeting the deadlines. In congressional testimony, April 15, 2011, Thomas A. Fanning, the Chairman, President, and Chief Executive Officer of The Southern Company, which provides electricity to 4.4 million customers in the Southeastern United States, stated:

> The reliability of the nation's electric generating system is at risk because of the number of new rules and regulations applicable to power plants. The stringency of these regulations, the lack of flexibility likely to be provided within these regulations, and, above all, the compliance schedules that will be required put reliability at risk. Accelerated plant retirements and shutdowns triggered by the Utility MACT rule will cause reserve capacity to plummet, increasing the likelihood and severity of service disruptions.[81]

In announcing the retirement of one-fourth of its coal-fired generation, June 9, 2011, American Electric Power's Chairman and CEO, Michael G. Morris, in a press release, stated:

> We support regulations that achieve long-term environmental benefits while protecting customers, the economy and the reliability of the electric grid, but the cumulative impacts of the EPA's current regulatory path have been vastly underestimated, particularly in Midwest states dependent on coal to fuel their economies. We have worked for months to develop a compliance plan that will mitigate the impact of these rules for our customers and preserve jobs, but because of the unrealistic compliance timelines in the EPA proposals, we will have to prematurely shut down nearly 25 percent of our current coal-fueled generating capacity, cut hundreds of good power plant jobs, and invest billions of dollars in capital to retire, retrofit and replace coal-fueled power plants.[82]

Others, however, cite historical experience and available indicators to argue that timing and system reliability will not be a problem. Michael Bradley, representing the Clean Energy Group, a coalition of electric power companies with over 200 GW of electric generating capacity, including 105 GW of fossil-fuel fired capacity, testified that:

[81] Testimony of Thomas A. Fanning, "Recent EPA Rulemakings Relating to Boilers, Cement Manufacturing Plants, and Utilities," Hearing, House Energy and Commerce Committee, Subcommittee on Energy and Power, April 15, 2011, p. 13.

[82] "AEP Shares Plan For Compliance With Proposed EPA Regulations," press release, June 9, 2011, at http://www.aep.com/environmental/news/?id=1697.

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> The Utility Toxics Rule provides the business certainty the electric sector needs to move forward with capital investment decisions;
>
> • While not perfect, the proposal is reasonable and consistent with the requirements of the Clean Air Act;
>
> • The electric sector is well positioned to comply; and
>
> • The Clean Air Act provides sufficient time to comply as well as the authority to accommodate special circumstances where additional time is necessary.[83]

The Institute of Clean Air Companies, which represents the pollution control industry, states that utilities installed 60 GW of scrubbers and 20 GW of selective catalytic reduction (SCR) between 2008 and 2010. (See **Figure 7**.) In the early 2000s, in response to the NOx SIP Call, the industry installed 96 GW of SCR in a five-year period while successfully maintaining system reliability. This was a "much more capital and manpower intensive effort" than the Utility MACT will be, according to David Foerter, the group's Executive Director.[84]

[83] Testimony of Michael Bradley, "Recent EPA Rulemakings Relating to Boilers, Cement Manufacturing Plants, and Utilities," Hearing, House Energy and Commerce Committee, Subcommittee on Energy and Power, April 15, 2011, p. 1

[84] David C. Foerter, Executive Director, Institute of Clean Air Companies, "EPA's Proposed Utility Air Toxics Rule," Presentation to Congressional Staff, May 9, 2011, p. 6.

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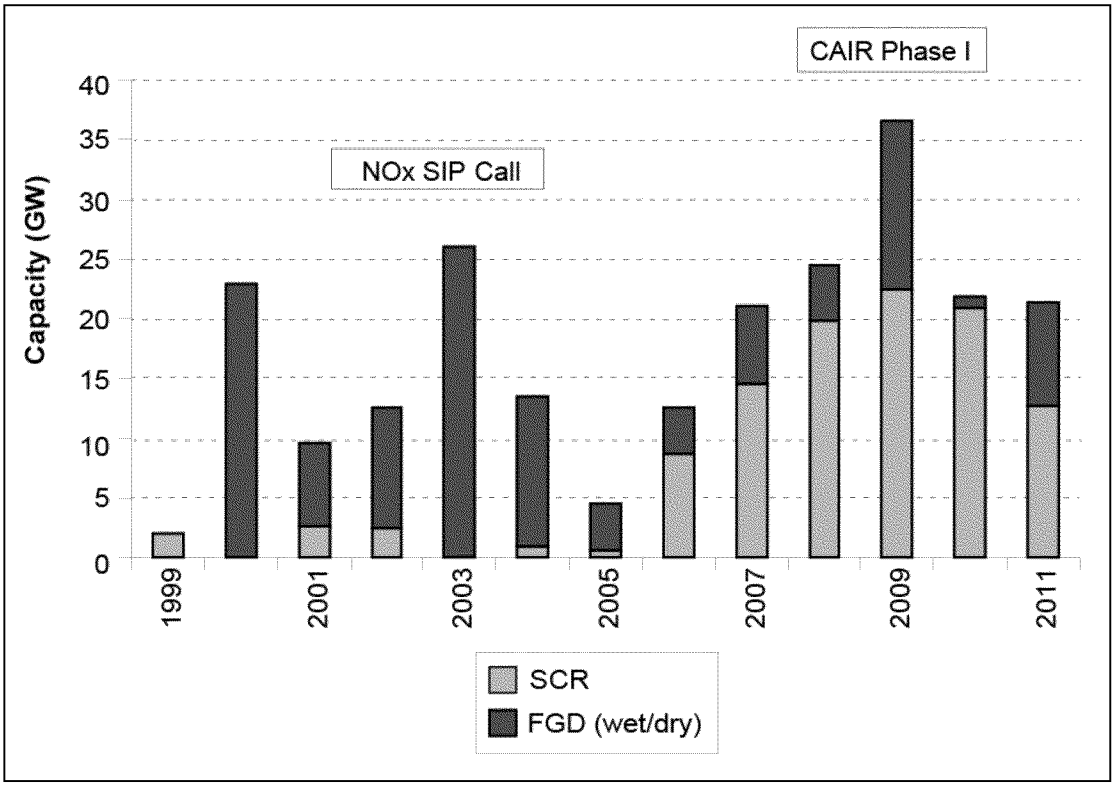
Figure 7. Cumulative SCR and Scrubber Installations, by Year



Source: David C. Foerter, Executive Director, Institute of Clean Air Companies, "EPA's Proposed Utility Air Toxics Rule," Presentation to Congressional Staff, May 9, 2011.

Notes: SCR = Selective Catalytic Reduction technology to reduce NOx emissions. FGD = Flue Gas Desulfurization, commonly referred to as a scrubber.

If necessary, as shown in **Figure 6**, the industry is capable of adding new generating capacity in a short time. From 2000-2003, electric companies added over 200 GW of new capacity, far more than any of the analyses suggest will be needed in the 2011-2017 timeframe.

A December 2010 analysis by FBR Capital Markets concluded that even the incremental retirement of 45 GW by 2014 (which appears to be more than EPA'srules will effect) would have little effect on electricity reserve margins:[85] "Summer reserve margins are currently 26% across the U.S. and are likely to decline only to 24% by 2014 in a draconian scenario in which 45 GW of generation is retired."[86] FBR offers the caveat that electricity reserve margins are a regional, not a national matter; but its analysis of eight NERC regions found reserve margins of 16.8% to 37.8% under its "draconian" 2014 scenario.[87]

Other studies suggest that proper planning can prevent a train wreck, even in worst-case scenarios. Much depends on whether individual utilities have already begun planning for the

[85] Only three of EEI's nine scenarios resulted in that many retirements, and all three assumed regulations far more stringent than EPA has proposed.

[86] FBR Capital Markets, *Coal Retirements in Perspective – Quantifying the EPA Rules*, December 13, 2010, p. 18.

[87] Ibid., p. 19. NERC considers 15% to be the necessary planning reserve margin. See NERC, "Reliability Indicators: Planning Reserve Margin," at http://www.nerc.com/page.php?cid=4%7C331%7C373.

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implementation of the rules, including lining up engineers to design modifications, and conducting preliminary discussions with permitting authorities and grid operators regarding the required steps. This point is stressed by analysts on all sides of the issue. For example, Sue Tierney, after reviewing several studies, states:

> The studies' results do not mean that there will be resources gaps; they make it clear that action needs to be taken soon
>
> - These studies serve as a "call to action" ...
> - Several are explicit in saying that they have identified resource gaps in order to signal that action is needed.[88]

NERC's study is one of those to which Tierney refers. NERC concluded that, "Regulators, system operators, and industry participants should employ available tools to ensure Planning Reserve Margins while forthcoming EPA regulations are implemented."[89] Perhaps more importantly, it stated: "NERC should further assess the implications of the EPA regulations as greater certainty or finalization emerges around industry obligations, technologies, timelines, and targets."[90] Given that the NERC study assumed far more stringent requirements than EPA proposed for both the Cooling Water Intake and Utility MACT rules, a NERC reassessment could be informative.

On August 1, 2011, in response to a letter from Senator Lisa Murkowski, the Federal Energy Regulatory Commission (FERC) weighed in on the debate over reliability. FERC stated that its "... preliminary assessment showed 40 GW of coal-fired generating capacity 'likely' to retire, with another 41"GW 'very likely' to retire ...."[91] FERC did not reach conclusions as to whether such retirements would cause reliability problems, and it went to some lengths to stress the limitations of its analysis. Of particular note, despite the August 1 date, FERC's analysis was not based on information available at that time. It assumed that once-through cooling water systems would have to be replaced with closed-loop systems,[92] for example, which is not what EPA had proposed in March 2011. The analysis also did not take into account EPA'sJuly finalization of the Cross-State Air Pollution Rule, which, in comparison to the earlier (proposed) version of the rule, provided additional flexibility for compliance. The Chairman's letter concluded: "... this informal assessment offered only a preliminary look at how coal-fired generating units could be impacted by EPA rules, and is inadequate to use as a basis for decision-making, given that it used information and assumptions that have changed."[93]

Price and Availability of Natural Gas

The EEI and NERC reports said that EPA rules would make coal-fired power more expensive so that utilities would retire additional coal-burning units (i.e., beyond those they already plan to retire) and replace them with alternative generation that emits fewer pollutants, leading to a drop

[88] Tierney presentation, p. 9.

[89] NERC report, p. VII.

[90] Ibid.

[91] "FERC Response to Senator Murkowski, Proposed EPA Rule," Attachment to letter of Jon Wellinghoff, FERC Chairman, et al., to Hon. Lisa Murkowski, August 1, 2011, p. 5.

[92] Ibid., p. 2.

[93] Ibid., cover letter, p. 1.

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in coal-fired generation and equal or greater increase for natural gas. From one perspective, the train wreck debate appears to be a coal-vs.-natural gas argument. The debate is not entirely that simple, however, because gas-burning power plants will be subject to some of the new rules, too. Some rules may affect coal-fired power plants disproportionately compared with other plants, while other rules, such as the cooling water intake proposal, may affect non-coal-fired power plants to a greater extent.

The primary impacts of many of the rules discussed here will be on coal-fired plants more than 40 years old that have not, until now, installed state-of-the-art pollution controls. Many of these plants are inefficient and are being replaced by more efficient combined cycle natural gas plants.

In EEI's analysis (and perhaps in the others that use the Integrated Planning Model[94]), a key variable is the assumed price of natural gas. The price of gas in EEI's reference case rises somewhat compared to today's price of about $4.50 per MMBtu, but it remains below $6.00 per MMBtu every year from now until 2035.[95] This is inexpensive gas, by the standards of recent history, as much as one-third below the price in each of the years 2004-2008. The low prices apparently reflect recent reports that future supplies of gas are projected to be abundant.[96]

In the other scenarios modeled by EEI (i.e., the scenarios showing the impact of EPA'sexpected regulations), the gas price ranged from about $5.50 to $7.50 per MMBtu over the 25 years through 2035. The higher prices presumably are the result of increased demand as some EGUs switch from coal to gas as a compliance strategy. These prices would also be below 2004-2008 prices in most cases.[97]

What the model showed in most of EEI's scenarios, then, is that, because the price of gas was projected to remain low, coal-powered units would be retired or converted to natural gas as EPA imposes the regulatory requirements under consideration.

Two of EEI's scenarios, however, used different assumptions regarding gas prices: they artificially assumed that gas costs either $1.50 or $3.00 per MMBtu more than the model's supply curve showed. With more expensive gas, fewer coal-powered facilities would be retired: in the extreme ($3.00 more) case, 17 GW were retired, compared to 57-71 GW in the same case with lower-priced gas.[98]

What these scenarios tell us is that utilities will look at the impending regulations and decide what to do largely based on their assumptions regarding the cost of the alternatives—natural gas (where it's available) being the most often discussed, but others include conservation, wind, and other renewable resources. If they expect the price of gas to remain low or the cost of other alternatives to be competitive, their primary method of compliance likely will be to retire old coal plants and switch to gas or the alternatives. If they expect the price of gas or other alternatives to be high, they'll invest the money in retrofitting the coal plants to reduce their emissions.

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[94] The Integrated Planning Model, developed by ICF Inc., is used by EPA, EEI, and others to model the impacts of environmental regulations on the electric power industry.

[95] Natural gas price projections are shown on page 58 of the EEI report.

[96] The comparison is to EIA data shown in **Figure 4** above.

[97] All the scenarios, including the Reference case, assume a brief price peak in 2015, with prices declining for the next 15-20 years thereafter.

[98] EEI report, Table 3.1.

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As the NERC report stated:

> Unit retirement is assumed when the generic required cost of compliance with the proposed environmental regulation exceeds the cost of replacement power.... For the purpose of this assessment, replacement power costs were based on new natural gas generation capacity. If the unit's retrofit costs are less than the cost of replacement power, then the unit is marked to be upgraded and retrofitted to meet the requirements of the potential environmental regulation., i.e., it is not considered "economically vulnerable" for retirement.[99]

As utilities attempt to forecast the price of natural gas, their conclusions will be based in large part on assumptions as to whether gas will be available in sufficient quantities to meet the increased demands of electric power generation. Natural gas faces its own controversies, as domestic production increasingly relies on "unconventional" sources such as shale, from which gas is obtained by hydraulic fracturing. (For additional information on this practice, see CRS Report R41760, *Hydraulic Fracturing and Safe Drinking Water Act Issues*, by Mary Tiemann and Adam Vann.) Nevertheless, a 2009 NERC report stated:

> Concerns regarding the availability and deliverability of natural gas have diminished during 2009 as North American production has begun to trend upward due to a shift toward unconventional gas production from shale, tight sands, and coal-bed methane reservoirs. In its latest biennial assessment, the Potential Gas Committee increased U.S. natural gas resources by nearly 45 percent to 1,836 TCF [trillion cubic feet], largely because of increases in unconventional gas across many geographic areas. Pipeline capacity has similarly increased, by 15 BCFD [billion cubic feet per day] in 2007 and 44 BCFD in 2008, with an increase of 35 BCFD expected in 2009. Storage capacity has also increased substantially.[100]

In short, the "train wreck" facing the coal-fired electric generating industry, to the extent that it exists, is being caused by cheap, abundant natural gas as much as by EPA regulations. As John Rowe, Chairman and CEO of Exelon Corporation, recently stated: "These regulations will not kill coal.... In fact, modeling done on the impacts of these rules shows that up to 50% of retirements are due to the current economics of the plant due to natural gas and coal prices."[101]

Legislation

Congress has shown a great deal of interest in the forthcoming EPA power plant rules and related Administration activities, with both proponents and opponents of EPA action circulating "Dear Colleague" letters and hearings held or scheduled by several House and Senate committees. Legislation to prevent or delay EPA action has passed the House, and more legislation is considered likely. Some recent proposals are broad in nature, targeting EPA generally or a lengthy list of specifics, while others focus more narrowly on individual rules or actions.

[99] NERC report, p. 6.

[100] NERC, *2009 Long-Term Reliability Assessment: 2009-2018*, October 2009, p. 4, available at http://www.nerc.com/files/2009_LTRA.pdf.

[101] John W. Rowe, "Energy Policy: Above All, Do No Harm," Remarks as Prepared, American Enterprise Institute, March 8, 2011, p. 7. Exelon is one of the largest electric and gas utility companies in the United States, serving 13 million people in Illinois and Pennsylvania.

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One such broad bill is H.R. 2401, the Transparency in Regulatory Analysis of Impacts on the Nation (TRAIN) Act of 2011. It would establish a panel of representatives of federal agencies to report to Congress by August 2012 on the cumulative economic impact of a number of listed EPA rules, guidelines, and actions concerning clean air and waste management. The House Energy and Commerce Committee approved this bill on July 13. Similar legislation introduced in the Senate, S. 609, the Comprehensive Assessment of Regulations on the Economy Act of 2011, would direct the Department of Commerce to form a panel to review the cumulative energy and economic impacts of specific rules proposed or finalized by EPA or expected soon. Both bills would cover rules discussed in this report. Impetus for this type of legislation is the widely expressed concern that when EPA analyzes impacts of individual regulations, it does not consider costs imposed by multiple rules taking effect more or less simultaneously. Another bill, H.R. 1872 (the Employment Protection Act of 2011) would require EPA to consider the impact on employment levels and economic activity prior to issuing a regulation, policy statement, guidance, or other requirement, implementing any new or substantially altered program, or issuing or denying any clean water or other permit. Companion Senate legislation is S. 1292.

Even before the start of the 112th Congress, House Republican leaders signaled that House committees would scrutinize EPA'srulemaking decisions, including by withholding funding for prospective rules and de-funding previously promulgated rules.[102] This was demonstrated when the House passed H.R. 1, a full-year continuing appropriations resolution for FY2011, in February. As passed by the House, the bill contained more than 20 provisions restricting or prohibiting the use of appropriated funds to implement various regulatory activities under the EPA'sjurisdiction—including many discussed in this report.[103] (On March 9, the Senate failed to approve the House-passed bill and subsequently also did not agree to a substitute text (S.Amdt. 49) that contained different funding levels and generally omitted the EPA regulatory provisions in the House-passed bill.) Final legislation that provided full-year appropriations for EPA (P.L. 112-10) did not include the restrictive provisions in the House-passed bill. Subsequently, many of these same provisions were included as general provisions in legislation providing FY2012 appropriations for EPA (H.R. 2584), which the House considered in July but took no final action on before Congress recessed in early August. As reported by the House Appropriations Committee, H.R. 2584 contains policy provisions that would, for example, prohibit EPA from spending appropriating funds to propose or promulgate rules for greenhouse gas emissions from stationary sources; to modify the PM NAAQS; to finalize or implement the cooling water intake rule; or to propose or implement a coal combustion ash rule. The bill also includes a provision similar to H.R. 2401, described above.

Several bills concerned with specific rules discussed in this report also have been introduced.

The House approved legislation to restrict EPA authority and to repeal a dozen EPA regulatory actions dealing with greenhouse gases (H.R. 910) on April 7. In the Senate, an amendment identical to H.R. 910 (S.Amdt. 183) failed on a vote of 50-50.

As discussed elsewhere in this report (**Appendix A**), EPA'sJanuary 2011 veto of a CWA permit for a West Virginia surface coal mining project has been very controversial, including in Congress, and raised questions about adequate coal supplies for power plants. In the 112th

[102] Honorable Jerry Lewis, letter to EPA Administrator Lisa P. Jackson, November 29. 2010, on file with authors.

[103] For information, see CRS Report R41698, *H.R. 1 Full-Year FY2011 Continuing Resolution: Overview of Environmental Protection Agency (EPA) Provisions*, by Robert Esworthy.

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Congress, legislation has been introduced to remove EPA'sveto authority from the CWA (H.R. 517), and a number of other bills to modify or clarify this portion of the law also have been introduced (H.R. 457/S. 272, H.R. 468/S. 960, and H.R. 2018). A subcommittee of the House Transportation and Infrastructure Committee held hearings on these issues in May, and on July 13, the House passed H.R. 2018. Several provisions in this bill would limit EPA'sauthority to provide oversight of states' implementation of the CWA; it would allow the agency to veto a Section 404 permit only with concurrence of the state where the subject discharge originates. As passed, the bill also includes a provisions similar to H.R. 1872, described above; it would require EPA to consider economic impacts before promulgating any clean water rule, or issuing or denying a clean water permit.

Also in the 112th Congress, two bills have been proposed that would prohibit CCW from being regulated under Subtitle C of RCRA—H.R. 1391 (the Recycling Coal Combustion Residuals Accessibility Act of 2011, or the RCCRA Act) and H.R. 1405. On June 21, 2011, a House Energy and Commerce Committee subcommittee approved H.R. 1391.[104]

Beyond Congress, some state legislatures also have taken interest in EPA'sregulatory activity. In February, the American Legislative Exchange Council issued a report identifying a number of strategies that states could use to oppose EPA'sactions: adopting resolutions, conducting enhanced legislative review of state regulations, and enacting bills to assert state sovereignty.[105] Resolutions critical of EPA'sactions have been introduced in several state legislatures this year.

Concluding Thoughts About the "Train Wreck" Analyses

EEI, NERC, and other recent reports describe scenarios and potential impacts of EPA rules, including projected need for additional power plant capacity or potential reliability problems, that depend on a number of assumptions such as the stringency of the rules or expected tight compliance deadlines, many of which differ greatly from what EPA has actually proposed or promulgated. Also, because most of the reports try to look collectively at EPA rules, to the extent a proposed or promulgated rule differs from some of these assumptions, it can be difficult to separate out one rule's projected impacts from the report's overall conclusions about multiple rules.

Some of the reports project impacts on power plants and electricity supply nationwide, some project impacts on a regional basis. In reality, evaluating regulatory impacts, compliance costs, and possible retirement decisions depends on facility-specific considerations—micro, not macro. Utilities and states will be affected differently. Rules when actually proposed or issued may well differ enough that investment or retirement decisions look entirely different. Technology options available to a unit or plant depend on the specific rule, and compliance costs may be less than

[104] For more information, go to the House Energy and Commerce Committee hearing web page, "Fossil Fuel Combustion Waste Regulation," http://republicans.energycommerce.house.gov/hearings/hearingdetail.aspx?NewsID=8474.

[105] American Legislative Exchange Council, "EPA's Regulatory Train Wreck, Strategies for State Legislators," February 2011, http://www.alec.org/AM/Template.cfm?Section=EPATrainWreck&Template=/CM/ContentDisplay.cfm&ContentID=15364. According to its website, the American Legislative Exchange Council is an organization of conservative state lawmakers.

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projected. Even some units with high assumed control costs, or others that look to be marginal economically, may install controls and continue to operate. Many utilities have already installed technology needed to comply with new rules; for them, costs will be minimal: EPA said that, with regard to the most expensive proposed rule, the Utility MACT, more than half of the coal-fired units fall in this category. The EEI and NERC reports did not account for the fact that plants' compliance costs may be less because of investments already made in pollution control equipment.

Frequently overlooked in analyses of EPA regulations are the benefits to public health and the environment that will occur, benefits that for the most part are difficult to monetize. EPA does estimate benefits of individual rules, while acknowledging that it is challenging to quantify benefits due to data limitations and uncertainties in approaches used to value benefits. The costs of the rules may be large, but, in most cases, the benefits are larger, especially estimated public health benefits. Neither the EEI nor the NERC report addresses benefits.

Although much of the current critical attention to EPA'sregulations has focused on rules affecting power plants, especially coal-fired power plants, the rules discussed here are only part of EPA's statutory mandate and regulatory agenda, and there are controversies about many of these other rules, as well, such as a MACT rule to control toxic air pollutants from commercial and industrial boilers and several Clean Water Act rules concerning water quality standards and permits.[106] Further, concerns about impacts of EPA rules have been raised by a range of individual companies and trade associations representing regulated entities beyond the electric utility sector, such as agriculture, chemical manufacturers, water utilities, and others.[107]

Several other conclusions bear repeating:

- The studies sponsored by industry groups (EEI and NERC) were written before EPA proposed most of the rules whose impacts they analyze, and they assumed that the rules would impose more stringent requirements than EPA proposed in many cases.
- Of the regulations so far proposed, the Utility MACT, which will set standards for power plant emissions of mercury and other hazardous air pollutants, appears to be the most expensive. EPA'sanalysis concluded that it will impose annual costs of $10 billion to $11 billion annually
- Other rules that industry expected to impose major costs now appear less likely to do so. The Cooling Water Intake rule, for example, proposes a less costly, more flexible regulatory option than EEI and NERC anticipated. Further, NERC believes that few coal-fired EGUs will be affected by this rule, which will have greater impact on older, oil-fired units. The Coal Combustion Waste Rule has been delayed, with no deadline for promulgation.
- For coal-fired plants, the primary impacts will be on units more than 40 years old that have not, until now, installed state-of-the art pollution controls. Many of

[106] For additional information, see CRS Report R41561, *EPA Regulations: Too Much, Too Little, or On Track?*, by James E. McCarthy and Claudia Copeland.

[107] Regarding agriculture's interest in EPA rules, see CRS Report R41622, *Environmental Regulation and Agriculture*, coordinated by Megan Stubbs.

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these plants are inefficient, and are being replaced by more efficient combined cycle natural gas plants.

- Lower prices for natural gas and recent increases in its projected availability may reduce the impact of the proposed rules on electric utilities and consumers, although they may lead to more retirements of coal-fired units.
- There is a substantial amount of excess generation capacity at present, due in part to the recession and also due to the large number of natural gas combined cycle plants constructed in the last decade, muting reliability concerns.

Implementation

Finally, several other points regarding the timing of implementation of EPA rules are worth underlining:

- Many proposed and "pre-proposal" rules linger for years without being promulgated; thus, many of the EPA actions described here may not be finalized or take effect for some time. They may also be substantially altered before they become final (i.e., before sources of pollution actually are affected by control requirements), as a result of the proposal and public comment process, and/or judicial review.
- Although EPA generally announces a schedule under which it plans to propose and promulgate rules, experience suggests that proposal and promulgation may take longer than estimated, particularly in cases that do not have court-ordered deadlines.
- Even court-ordered dates for proposal or promulgation may change. It is not uncommon for EPA to request extensions of time, often due to the need to analyze extensive comments.
- Promulgation of standards is not the end of the road. Virtually all major EPA regulatory actions are subjected to court challenge, frequently delaying implementation for years. As noted earlier, many of the regulatory actions described here are the result of courts remanding and/or vacating rules promulgated by previous administrations.
- In many cases, EPA rules must be adopted by states to which the relevant program has been delegated. Moreover, many states require that the legislature review new regulations before the new rules would take effect.
- For many rules, actions by states may be more significant than what EPA does, because the CAA, CWA, and RCRA allow states to adopt more stringent requirements. For example, EPA's cooling water intake proposal does not mandate installation of costly closed-cycle cooling systems at all existing power plants. At the same time, an EPA rule does not preclude states from imposing such a mandate, as has occurred and is occurring in several locations (e.g., New York, California, Delaware, and New Jersey).
- Standards for stationary sources under the air, water, and solid waste laws are generally implemented through permits, which would be individually issued by state permitting authorities after the standards take effect. When finalized, a permit would generally include a compliance schedule, typically giving the

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> permittee several years for installation of required control equipment. Existing sources generally will have several years following promulgation and effective dates of standards, therefore, to comply with any standards.

In short, the road to EPA regulation is rarely a straight path. There are numerous possible causes of delay. It would be unusual if the regulatory actions described here were all implemented on the anticipated schedule, and even if they were, existing facilities would often have several years before being required to comply. Unable to account for such factors, which will vary from case to case, timelines that show dates for proposal and promulgation of EPA standards effectively underestimate the complexities of the regulatory process and overstate the near-term impact of many of the regulatory actions.

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Appendix A. Regulatory Actions Affecting Mountaintop Removal Mining

EPA and other federal agencies (the Office of Surface Mining and Reclamation, in the Department of the Interior; and the U.S. Army Corps of Engineers) are developing a series of actions and regulatory proposals to reduce the harmful environmental and health impacts of surface coal mining, including a practice called mountaintop removal mining, in Appalachia. These actions would not affect electric power plants directly, and thus were not covered by EEI nor NERC in their studies. Thus, CRS did not include these regulations in the discussion of the "train wreck" issues in the body of this report. Nevertheless, numerous critics of EPA have included EPA, Corps of Engineers, and Interior Department actions in what they term a "War on Coal." The actions, announced in a June 2009 interagency Memorandum of Understanding, are intended to tighten regulation and strengthen environmental reviews of permit requirements under the CWA and the Surface Mining Control and Reclamation Act (SMCRA).

Also in June 2009, EPA and the Army Corps signed a specific agreement detailing criteria that will be used to coordinate and expedite review of pending CWA permit applications for surface coal mining operations in Appalachia. The agencies are conducting detailed reviews of 79 permit applications to evaluate the permits in order to limit environmental impacts of the proposed activities. This review is proceeding slowly. In June 2010, the Army Corps suspended the use of a particular CWA general permit for surface coal mining activities in Appalachia and proposed a rule to prohibit its use entirely; a finalized rule, expected in 2012, would apply more stringent CWA rules to these coal mining operations.[108]

In April 2010 EPA released an interim guidance memorandum that seeks to clarify the agency's tightened requirements for surface coal mining in Appalachia. The guidance will be applied as a framework for EPA'sapproval of all pending and future reviews of permits to dispose of coal mining waste and other types of Appalachian surface coal mining discharges that are authorized by the CWA. Among other items, the interim guidance sets strict numeric limits on conductivity levels in waters affected by mining activities. Conductivity is a measure of the level of salinity in water associated with discharges of selenium and total dissolved solids that are associated with coal mining wastes. Based on recent scientific literature, EPA has concluded that conductivity above certain levels in Appalachian streams presents a reasonable potential to harm stream biota.

Conductivity, and its use in assessing coal mining impacts on water quality, has become a focus of debate. According to EPA, the 2010 interim guidance is not intended to bring a complete halt to surface coal mining in Appalachia, but to force the industry to adopt practices that will minimize harmful impacts. Environmental groups support the guidance document and EPA'suse of conductivity to assess water quality impacts, but industry groups have been highly critical, asserting that the science linking conductivity to water quality impairment is uncertain and that acceptable numeric levels are arbitrary. Lawsuits challenging the guidance have been brought by the States of Kentucky and West Virginia, as well as individual coal companies and trade associations. In January 2011, a federal judge who is hearing one of the challenges denied industry's request to block implementation of the guidance, but also denied the government's

[108] U.S. Department of the Army, Corps of Engineers, "Suspension of Nationwide Permit 21," 75 *Federal Register* 34711-34714, June 18, 2010.

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request to dismiss the case. EPA is working on revised guidance that incorporates public comments, scientific reviews, and experience of implementing the 2010 guidance. Final guidance had been expected by April 1, but its release has been delayed by interagency review.

In addition, in November 2009, the Department of the Interior's Office of Surface Mining (OSM) issued an Advance Notice of Proposed Rulemaking (ANPR) describing options to revise a SMCRA rule, called the stream buffer zone rule, which was promulgated in December 2008.[109] The Obama Administration identified the 2008 rule, which exempts so-called valley fills and other mining waste disposal activities from requirements to protect a 100-foot buffer zone around streams, for revision as part of the series of actions concerning surface coal mining in Appalachia. OSM identified a broad set of regulatory options that it is considering for revisions to the 2008 rule, ranging from formally reinstating the previous rule with small conforming changes, to requiring stricter buffer zone requirements for mountaintop mining operations on steep slopes. OSM officials have been working on developing a new rule, with the goal of releasing a proposal by early 2011, but none has yet emerged. In addition, EPA and OSM have pledged to strengthen oversight of state CWA and SMCRA permitting, regulation, and enforcement.

Finally, EPA has used CWA authority to veto a permit for a surface coal mining operation in West Virginia, after determining that the activity will have an unacceptable adverse effect on wildlife and fishery resources. EPA's veto has been very controversial, in part because it involves the rare action of cancelling a permit previously issued by the Army Corps. Coal industry groups and those representing manufacturing and other sectors have been highly critical, many saying that to revoke an existing permit creates huge uncertainty about whether water quality permits would be rescinded in the future, producing a ripple effect beyond the coal industry. EPA argues that the veto, while highly unusual, is justified because the project involves unacceptable environmental damages.

Viewed broadly, the Administration's combined actions on surface coal mining displease both industry and environmental advocates. The additional scrutiny of permits, more stringent requirements, and EPA's veto of a previously authorized project have angered the coal industry. At the same time, while environmental groups support the veto and related actions, many favor even tougher requirements.[110]

Critics assert that collectively the Administration's activities and initiatives concerning surface coal mining in Appalachia are needlessly delaying important projects, thus costing jobs and hurting the nation's energy security. While these actions do not directly affect power plants, they have the potential of doing so indirectly, if they effectively limit or restrict coal supplies. None of these actions are discussed in either the EEI or NERC analysis.

[109] U.S. Department of the Interior, Office of Surface Mining Reclamation and Enforcement, "Stream Buffer Zone and Related Rules; Advance notice of proposed rulemaking; notice of intent to prepare a supplemental environmental impact statement (SEIS)," 74 *Federal Register* 62664-62668, November 30, 2009.

[110] For additional information, see CRS Report RS21421, *Mountaintop Mining: Background on Current Controversies*, by Claudia Copeland.

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Appendix B. Bibliography of Analytic Reports

Growing interest in the impact of EPA regulation on fossil-fuel power plants, especially coal-fired plants, has generated a large number of analytic reports by policy and advocacy groups using varying assumptions and analytic approaches that reach varying conclusions. Many of these reports were issued prior to proposal or promulgation of a rule.

North American Electric Reliability Corporation, *2010 Special Reliability Scenario Assessment: Resource Adequacy Impacts of Potential U.S. Environmental Regulations*, October 2010, http://www/nerc.com/files/EPA_Scenario_Final_v2.pdf.

ICF International, *Potential Impacts of Environmental Regulation on the U.S. Generation Fleet*, Final Report, prepared for Edison Electric Institute, January 2011, http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Integrated_Resource_Plan/2011IRP/EEIModelingReportFinal-28January2011.pdf.

Metin Celebi, Frank Graves, Gunjan Bethla, et al., The Brattle Group, *Potential Coal Plant Retirements Under Emerging Environmental Regulations*, December 8, 2010, http://www.brattle.com/_documents/uploadlibrary/upload898.pdf.

National Economic Research Associations, *Proposed CATR + MACT,* prepared for American Coalition for Clean Coal Electricity, May 2011, http://www.americaspower.org/NERA_CATR_MACT_29.pdf.

Dan Eggers, Kevin Cole, Yang Y. Song, and LinLin Sun, Credit Suisse, *Impact of EPA Rules on Power Markets*, September 2010, http://epw.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=b42de70d-b814-4410-831d-34b180846a19. Also see Dan Eggers, Credit Suisse, *Implications of EPA Policy*, April 2011, http://www.fbcinc.com/EIA/presentations/Eggers_04.26.11.pdf.

Wood Mackenzie, "Long-term Viability of Many U.S. Coal Plants at Risk," September 10, 2010, http://www.woodmacresearch.com/cgi-bin/corp/portal/corp/corpPressDetail.jsp?oid=2178098.

FBR Capital Markets, *Coal Retirements in Perspective—Quantifying the Upcoming EPA Rules*, December 13, 2010, http://jlcny.org/site/attachments/article/388/coal1.pdf.

Hugh Wynne, Francois D. Broquin, and Saurabh Singh, Bernstein Research, *Black Days Ahead for Coal: Implications of EPA Air Emissions Regulations for Energy & Power Markets*, July 21, 2010, http://grist.s3.amazonaws.com/eparegs/Bernstein%20-%20black%20days%20ahead%20for%20coal%20-%2007%2021%2010.pdf.

There also have been a number of recent analytic rebuttals to these reports:

Michael J. Bradley, Susan F. Tierney, Christopher E. Van Atten, et al., *Ensuring a Clean, Modern Electric Generating Fleet while Maintaining Electric System Reliability*, August 2010, http://www.mjbradley.com/documents/MJBAandAnalysisGroupReliabilityReportAugust2010.pdf and *Summer 2011 Update*, June 2011, http://www.mjbradley.com/documents/MJBAReliability Report Update June 7 2011.pdf.

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University of Massachusetts Political Economy Research Institute, James Heintz, Heidi Garrett-Peltier, Ben Zipperrer, New Jobs – Cleaner Air, Employment Effects Under Planned Changes to the EPA'sAir Pollution Rules, February 2011, http://www.ceres.org/resources/reports/new-jobs-cleaner-air.

Susan F. Tierney and Charles Cicchetti, *The Results in Context: A Peer Review of EEI's "Potential Impacts of Environmental Regulation on the U.S. Generation Fleet*," Summary Report, May 2011, http://www.supportcleanair.com/resources/studies/file/Tierney-and-Cicchetti-EEI-Peer-Review-Summary-May-2011.pdf.

World Resources Institute, *Response to EEI's Timeline of Environmental Regulations*, November 2010, http://pdf.wri.org/factsheets/factsheet_response_to_eei_timeline.pdf.

Josh Bivens, Economic Policy Institute, *A Lifesaver, Not a Job Killer, EPA'sproposed "air toxics rule" is no threat to job growth*, EPI Briefing Paper, June 14, 2011, http://w3.epi-data.org/temp2011/BriefingPaper312 (2).pdf.

Jennifer Macedonia, Joe Kruger, Lourdes Long, and Meghan McGuinness, Bipartisan Policy Center, *Environmental Regulation and Electric System Reliability*, June 13, 2011, http://www.bipartisanpolicy.org/sites/default/files/BPC%20Electric%20System%20Reliability.pdf

Daniel J. Weiss, Valeri Vasquez, and Stewart Boss, "Mercury Falling, Many Power Plants Already Have Equipment to Slash Mercury, Toxic Contamination," June 21, 2011, http://www.americanprogress.org/issues/2011/06/mercury_falling.html.

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From: CN=Alex Barron/OU=DC/O=USEPA/C=US
Sent: Fri 10/7/2011 6:27:54 PM
Subject: Fw: slides
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Close hold.

----- Forwarded by Alex Barron/DC/USEPA/US on 10/07/2011 02:04 PM -----

From: "Mignone, Bryan" <Bryan.Mignone@hq.doe.gov>
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Date: 10/07/2011 01:57 PM
Subject: slides

Here are the slides from today. Please share with other colleagues who attended.

Feel free to be in touch with any questions.

Best,
Bryan