UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Proposed Oil and Natural Gas Sector: Emission Standards for New, Reconstructed and Modified Sources Reconsideration	)))))))	**Docket No. EPA-HQ-OAR-2017-0483** *Via email* *February 21, 2019*

Supplemental Comments on Proposed Rule: Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources Reconsideration

We submit supplemental comments on behalf of Environmental Defense Fund, Chesapeake Bay Foundation, Clean Air Council, Clean Air Task Force, Earthjustice, Earthworks, Environmental Integrity Project, National Parks Conservation Association, Natural Resources Defense Council, and Sierra Club (together, "Environmental Commenters") on the proposed rule entitled "Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources Reconsideration," 83 Fed. Reg. 52,056 ("Reconsideration Proposal" or "Proposal"). After reviewing the comments submitted by other commenters, we reiterate our position that the evidence indicates that there is no justification for weakening the current standards, *Oil and Natural Gas Emission Standards for New, Reconstructed, and Modified Sources*, 81 Fed. Reg. 35,824 (June 3, 2016) (codified at 40 C.F.R. pt., 60, subpt. OOOOa) ("NSPS" or "2016 Rule"), in any respect.[1]

First, Environmental Commenters urge the Environmental Protection Agency ("EPA") to make available for public comment all information "of central relevance to the rulemaking,"[2] as required by the Clean Air Act, including all data and analyses EPA may reply upon in a final rulemaking, and including information submitted by oil and gas industry commenters during the comment period.[3] Second, the new data and analyses submitted by industry groups cannot support EPA's proposed weakening of the fugitive emissions standards. Finally, information that has become available since the close of the public comment demonstrates that the current standards (or even more protective requirements) constitute the best system of emission reductions for affected sources.

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[1] Environmental Defense Fund, *et al.*, Docket ID No. EPA-HQ-OAR-2017-0483-2041 ("Joint Environmental Comments").
[2] 42 U.S.C. § 7607(d)(4)(B)(i).
[3] Environmental Commenters submit these supplemental comments out of an abundance of caution that EPA may rely on faulty evidence submitted by other commenters without giving the public the required opportunity to comment on that evidence. Irrespective of these comments, should EPA seek to rely on evidence submitted by other commenters in a final rule, EPA must open a new comment period to allow *all* members of the public to review and comment on that evidence.

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I. EPA must make all data and analysis on which it seeks to rely available for public comment through a reopening of the public comment period.

As detailed extensively in Environmental Commenters' prior comments on the Reconsideration Proposal, EPA's proposal was not based on or supported by factual data. Instead, the Reconsideration Proposal served as a proxy information collection request (ICR), where the agency sought information to support its proposed substantive amendments. The Clean Air Act both prohibits a proposed rule that lacks the "factual data on which the proposed rule is based" and "the methodology used in obtaining the data and in analyzing the data," 42 U.S.C. § 7607(d)(3), and separately mandates a specific tool to use to solicit supporting factual data through an ICR, *see id.* § 7414. EPA's failure to provide the supporting factual data underlying its proposed action deprives Environmental Commenters and other interested parties of their ability to meaningfully comment and violates the Clean Air Act. Moreover, EPA cannot rely upon data submitted during the comment period, including any of the data Environmental Commenters address in these comments, to comply with the agency's duty to provide the factual data that serves as the basis of a proposal, for the same reasons explained by Environmental Commenters in their initial comments. *See* Joint Environmental Comments at 55-60.

Should EPA decide to proceed with this rulemaking, to remedy its failure, EPA must re-propose the Reconsideration Proposal and provide all interested parties an opportunity to comment on any and all factual data that EPA relies upon to support its proposed revisions to 40 C.F.R. Part 60, subpart OOOOa. *See, e.g., American Med. Ass'n v. Reno*, 57 F.3d 1129, 1132-33 (D.C. Cir. 1995); *Connecticut Light & Power Co. v. NRC*, 673 F.2d 525, 530-31 (D.C. Cir. 1982) ("An agency commits serious procedural error when it fails to reveal portions of the technical basis for a proposed rule in time to allow for meaningful commentary."); *Kennecott Corp. v. EPA*, 684 F.2d 1007, 1019-20 (D.C. Cir. 1982) (setting aside regulation where agency had not provided underlying factual data in proposed rule); *Daimler Trucks N. Am. LLC v. EPA*, 737 F.3d 95, 97 (D.C. Cir. 2013) (setting aside EPA rule for failure to provide adequate notice and comment); *Sierra Club v. Costle*, 657 F.2d 298, 398 (D.C. Cir. 1981) ("If, however, documents of central importance upon which EPA intended to rely had been entered on the docket too late for any meaningful public comment prior to promulgation, then both the structure and spirit of section 307 would have been violated.").

II. The new data and analysis submitted by industry groups cannot support EPA's proposed weakening of the fugitive emissions standards.

In comments on the Reconsideration Proposal, operators and industry trade associations submitted information that they claim supports EPA's proposed weakening of fugitive emissions requirements. As we set forth above (and in our comments on the proposal) EPA may not rely on this data absent a re-proposal that provides a full opportunity for public comment, consistent with the requirements of section 307. In any event, none of the new data or analysis presented by industry, nor its arguments supporting the consideration of data the agency had previously found unreliable, provide a legally-defensible rationale for weakening the current fugitive emissions requirements in the NSPS. Environmental Commenters address industry information regarding the reduction in monitoring frequency at well sites, low-production well site issues,

reduction in monitoring frequency at compressor stations, and state equivalency determinations in more detail below.[4] While we offer a number of specific critiques here, as a general matter, the industry data is insufficiently transparent and the industry analysis is insufficiently rigorous to allow us to meaningfully comment on all of the ways in which EPA reliance on that data and analysis would problematic.

a. Reduction in Monitoring Frequency at Well Sites.

Several industry commenters, including the American Petroleum Institute[5] and Chevron,[6] present data with their comments that they claim supports EPA's proposed reduction in fugitive emissions monitoring frequency at well sites. These comments include data purportedly showing that the number and/or percentage of components found leaking during inspections is lower than previously estimated by EPA and that the agency has thus overestimated both baseline fugitive emissions and the environmental benefits of the NSPS's semiannual monitoring requirement for these sources. *See* API Comments at 1-5, Attachments A, B; Chevron Comments at 2-3, Appendix A. However, the analysis in these industry comments suffers from several fundamental flaws—in particular, industry commenters do not provide any information on actual measured emissions, fail to account for empirical evidence indicating that the number or percentage of leaking components is not correlated with total site-level emissions, and disregard the fact that overall site-level fugitive emissions are, in fact, much *higher* than initially estimated by EPA.

Fundamentally, by presenting data on the number of leaks and claiming that a lower number of leaks shows that emissions are less than estimated by EPA, both API and Chevron ignore a key issue—the number or percentage of leaking components found during surveys are *not correlated* with *total site-level emissions*. *See* Joint Environmental Comments at 82-84. As discussed in detail in the Joint Environmental Comments, empirical evidence disproves a correlation between the percentage of leaking components and overall emissions, because a single large leak can have much higher emissions than the aggregate of numerous smaller leaks. This evidence critically undermines API's and Chevron's claims that lower leak rates correspond to lower emissions.

For example, Chevron claims that in its California business unit for which it presents Method 21 monitoring data, emissions are 93% lower than estimated by EPA. Chevron Comments at 2. But Chevron explains that this alleged disparity in emissions "is driven primarily by a leak occurrence rate of 0.04%, which is below the implicit leak rate of 0.81% using EPA's emissions factors and the distribution of components in our Method 21 program." *Id.* In addition to concerns regarding extrapolating conclusions from this leak data for a small subset of wells in

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[4] As stressed in Section I, *supra*, and in the Joint Environmental Comments, to the extent EPA wishes to rely on these industry data, it must re-propose the rule and allow the public to comment on that data. The fact that a limited subset of commenters out of an abundance of caution provide some responses to that new data and argument here does not absolve EPA of its statutory responsibility with respect to all commenters.

[5] American Petroleum Institute, Docket ID No. EPA-HQ-OAR-2017-0483-0801 ("API Comments").

[6] Chevron U.S.A. Inc., Docket ID No. EPA-HQ-OAR-2017-0483-0754 ("Chevron Comments").

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a specific region to wells across the United States, Chevron's approach to calculating overall emissions ignores the overwhelming factual evidence demonstrating that emissions from leaks follow a skewed, highly-heterogeneous distribution, with a relatively few number of sources accounting for a large portion of emissions. As Environmental Commenters have previously explained:

> We empirically examined the relationship between the number of leaking components and site level methane emissions, using data from the City of Fort Worth Study Air Quality Study, which includes both component level emissions information and site-level data. Figure [1] compares site-level emissions to the percentage of leaking components and demonstrates that there is no correlation between site-level emissions and the percent of leaking components—indeed, the individual sites with the highest emissions had fairly low percentages of leaking components. Similarly, Figure [2] shows data from *Allen et al* 2013, which likewise indicates there is no statistical relationship between the number of leaking components at a site and total site-level emissions ($R^2 = 0.07$). Given that there is no relationship between the percentage of leaking components and site level emissions, as EPA implicitly recognized when it declined to include the percentage of leaking components as a factor for determining emissions and emissions reductions in its analysis, EPA cannot reasonably rely on uncertainties over either the initial percentage of leaking components, or changes in the percentage of leaking components over time, to conclude that EPA had overestimated potential reductions due to LDAR.

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Figure [1]: Site Methane Emissions (lb per year) Versus Percent Leaking Components

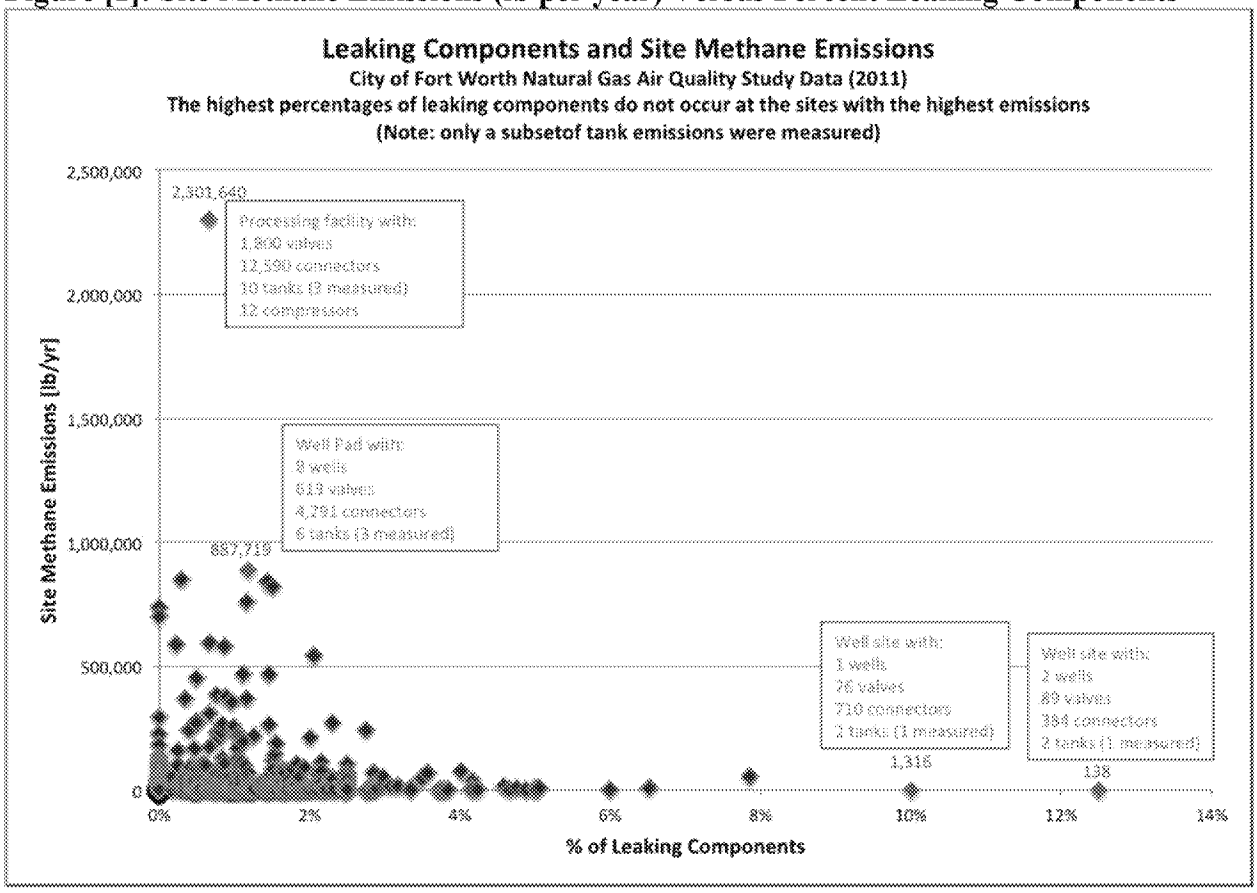
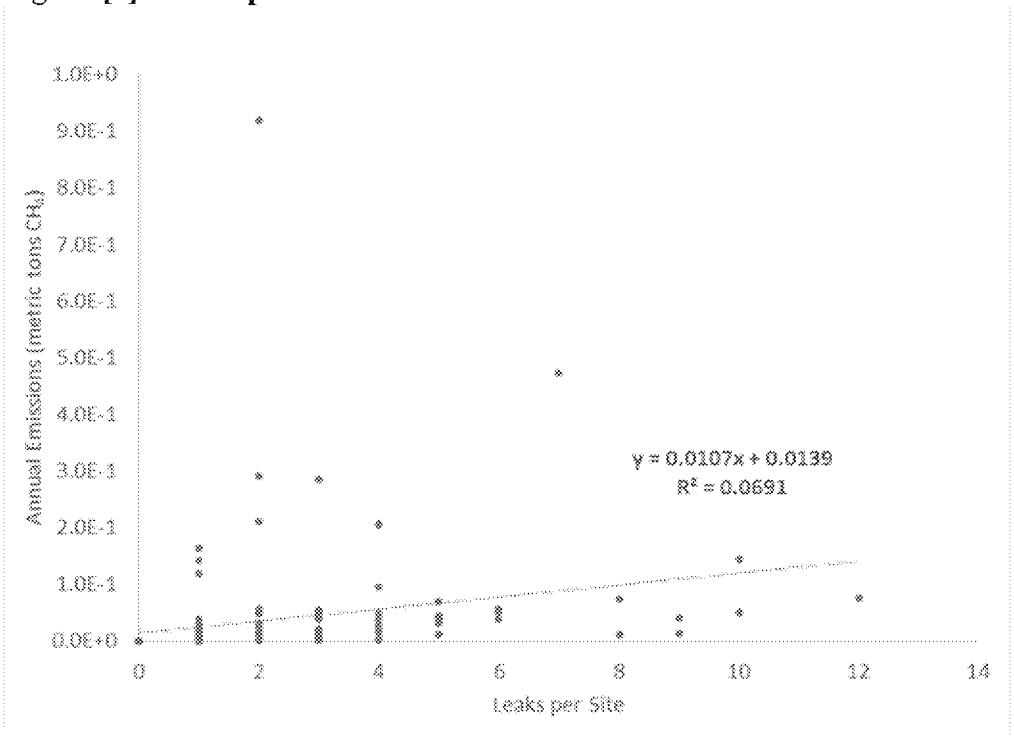


Figure [2]: Leaks per Site Versus Annual Emissions for Data in Allen et al 2013



Joint Environmental Comments at 82, Appendices K, J.

Additionally, Chevron states that their "data shows a leak occurrence rate significantly below EPA's estimates," based on the lower occurrence rate they report from their California facilities compared with the occurrence rate that Chevron has apparently calculated using emissions factors from Subpart W. However, Chevron omits a key factor from their argument. The leak emissions factors EPA published for Subpart W are general emissions factors for oil and natural gas production facilities *where LDAR inspections are not occurring*. The leak occurrence frequency (around 0.8%) that Chevron has apparently calculated from the Subpart W emissions factors are therefore applicable to facilities where LDAR inspections are not already occurring. However, the vast majority of Chevron's San Joaquin Business Unit facilities, where Chevron collected their data, are located in portions of California in the jurisdiction of the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD).[7] LDAR inspections with Method 21 have been required for oil and natural gas production facilities such as Chevron's *since at least 2005* under SJVUAPCD Rule 4409.[8] As such, while Chevron's comparison demonstrates that instrument-based LDAR programs such as those required by SJVUAPCD rules are effective in reducing leak frequency, it is inappropriate for Chevron to use this comparison to argue that EPA's emissions factors for these components are too high.

API similarly presents a self-selected set of reported Subpart OOOOa leak data, collected from 13 unnamed member companies, likewise concluding that EPA failed to give proper weight to previously-submitted data on leaks. *See* API Comments at Attachments A, B.[9] Yet as in the past, API again fails to provide key contextual information for its leak data, including equipment information for the surveyed sites, which is critical for developing accurate percentage of leaking component estimates. More fundamentally, API's arguments regarding this data—that "EPA's

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[7] Chevron's website states that "Most of the [Chevron's San Joaquin Business Unit] production from Chevron-operated leases that are part of three major crude oil fields in the San Joaquin Valley – Kern River, Midway Sunset and Cymric. We also operate and hold interests in the McKittrick, San Ardo, Coalinga and Lost Hills fields." *See* https://www.chevron.com/worldwide/united-states. With the exception of San Ardo, these fields are either in Fresno County (Coalinga), where SJVUAPCD rules apply or the portion of Kern county where SJVUAPCD rules apply (all other fields).

[8] *See* SJVUAPCD Rule 4409 § 5.2 (Apr. 20, 2005) (requiring regular inspection using Method 21).

[9] Notably, API fails to include other key data reported under Subpart OOOOa for these facilities, including survey times. As discussed in Joint Environmental Comments, these data are also relevant for this rulemaking, as they directly informs cost estimates for fugitive emissions monitoring. Joint Environmental Comments at 88-89. MJ Bradley conducted an analysis of survey times included in publicly-available Subpart OOOOa Air Emission Reports (accessed via EPA's WebFIRE website or obtained through FOIA requests), and found that based on the average survey time in the reports, EPA's estimate of leak detection and repair costs may significantly overstate the labor effort and associated cost for LDAR surveys. Joint Environmental Comments, Appendix E, Dana Lowell, MJ Bradley & Associates, *Analysis of OOOOa Annual Air Emission Reports* (Dec. 2018).

initial assumption regarding the number of components leaking at well sites (and the corresponding mass of emissions) was significantly overestimated," *id.*—suffer from the same fundamental flaw discussed above—the faulty assumption that the number of leaking components is not correlated with total site-level emissions. Like Chevron, API ignores the evidence disproving this assumption, discussed extensively in the scientific literature on super-emitters and raised in comments on the 2016 Rule,[10] when it asserts that "EPA's assumed number of leaking components, *and by direct extension, the estimated amount of fugitive emissions* are significant overestimates—by a factor of over 2.5 to up to 4 times." API Comments at 4 (emphasis added).

While API's inclusion of select Subpart OOOOa leak data does not support a weakening of the standards, it does underscore the need for EPA to make available for public analysis and comment *all* of the reported Subpart OOOOa compliance data, as Environmental Commenters have repeatedly requested.[11] EPA's failure to release *all* reported data (including leak and survey time data) precludes full analysis, including an analysis of whether the compliance data that API relies on in its comments actually supports a conclusion that the standards are less costly (and therefore more cost-effective) than forecast.

Finally, API's critiques of the emissions factors used by EPA and the agency's corresponding baseline emissions estimates for facilities affected by the NSPS, API Comments at 2-4, ignore extensive direct evidence indicating that EPA is significantly *underestimating* baseline emissions at well sites (and thus underestimating the emission reductions achieved by the NSPS). *See* Joint Environmental Comments at 85-88. For example, a recent study that synthesized previously published data to quantify methane emissions across the oil and gas supply chain, published in June 2018 in *Science* ("Synthesis")[12] found that methane emissions from the sector were *60% higher* than estimated by EPA's inventory, and that that the agency particularly underestimated methane emissions from the production and gathering segments of the oil and natural gas supply chain.[13]

Likewise, recent analysis by Dr. Mark Omara, submitted by Environmental Commenters into this rulemaking docket, utilized actual, site-level measurements from over 1,000 sites in eight U.S. basins to update fugitive emissions factors for the model facilities developed by EPA.[14] This analysis found that EPA significantly underestimated emissions at both low-production and non-low-production well sites, with mean fugitive methane emission factors for sites that are two to five times higher than EPA's estimates. This evidence from actual site-level

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[10] *See* Comments of Clean Air Task Force *et al,* Docket No. EPA-HQ-OAR-2010-0505-7062 at 47-51 (Dec. 4, 2015).

[11] *See* Environmental Defense Fund, *et al.*, Docket ID No. EPA-HQ-OAR-2017-0483-0274; Joint Environmental Comments at 55-64.

[12] Alvarez et al., *Assessment of Methane Emissions from the U.S. Oil and Gas Supply Chain*, 361 Science 186 (2018) http://science.sciencemag.org/content/361/6398/186.

[13] *Synthesis* at 2.

[14] Joint Environmental Comments, Appendix G, Omara, M., *A Technical Analysis of the Forgone CH4 Emissions Reductions as a Result of EPA's Proposed Reconsideration of the 2016 NSPS Standards for Oil and Gas Production Sites* (Dec. 2018).

emissions measurements directly controverts industry's assertions (relying upon a false correlation between the number of leaking components and overall emissions) that EPA underestimated the extent of sector-wide emissions when it promulgated the 2016 Rule.

b. Low-Production Well Sites.

In addition to general critiques of well site fugitive emissions monitoring made by industry commenters, discussed *supra*, several groups urged EPA to recognize low-production well sites as a distinct category of sources, and to either finalize biennial monitoring or completely exempt these sites from monitoring requirements.[15] None of the arguments or analysis advanced by industry commenters justifies an exemption or reduction in monitoring frequency for low-production wells. This is particularly true in light of EPA's findings and the record in the 2016 Rule, which found that there was no data indicating that low-production well sites had different equipment and component counts than higher-production sites. 81 Fed Reg. at 35,856. Furthermore, if EPA should attempt to move forward with finalizing a low-production well site distinction or category, it would be unlawful to classify well sites based on changing production over time, as advocated by industry commenters. *See* API Comments at 5; IPAA Comments at 8-14.

Commenter IPAA makes a number of complaints regarding standards for low-production wells: (1) that the numerous studies showing significant emissions from low-production well sites are the result of "manipulated" data; (2) that the cost of emissions reductions at these sites exceeds the value of recovered gas; (3) that the dataset used by EPA to characterize equipment at low-production sites is non-representative; and (4) that IPAA data shows component counts are lower at these sites than estimated by EPA. *See* IPAA Comments at 8-38. None of these complaints offers a legally defensible rationale for changing the standards—instead, IPAA's arguments themselves distort empirical evidence and are otherwise nontransparent and conclusory. We address each of IPAA's claims below.

First, IPAA fundamentally mischaracterizes scientific research and analysis conducted by scientists at the Environmental Defense Fund and other institutions on methane emissions in the oil and gas sector. *See* IPAA Comments at 15-26. These studies and other recent analysis show low-production wells have significant levels of fugitive emissions, with absolute emissions that are comparable to non-low production sites (and higher than EPA's projected model facility emissions) and production-normalized loss rates that are far greater. *See* Joint Environmental Comments at 101-104.

Specifically, IPAA wrongfully asserts that the conclusions of *Zavala-Araiza, et al. 2015*,[16] a study that develops a functional definition of "super-emitters" to inform mitigation

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[15] Independent Petroleum Association of America, et al, Docket ID No. EPA-HQ-OAR-2017-0483-1006 ("IPAA Comments"); API Comments at 5.

[16] Zavala-Araiza et al., *Toward a Functional Definition of Methane Super-Emitters: Application to Natural Gas Production Sites*, 49 ENVTL. SCI. TECH. 8167, 8169 (2015) http://pubs.acs.org/doi/pdfplus/10.1021/acs.est.5b00133. The study defines "functional super-emitters" as the 15% of sites with the highest proportional loss rates (methane emitted relative to

efforts by classifying well sites that emit a higher fraction of their production than average for wells with similar production (which could suggest abnormal operating conditions at the well or otherwise indicate avoidable emissions), are "specious." IPAA Comments at 15. IPAA begins by criticizing *Zavala-Araiza, et al. 2015* for aggregating data from different studies[17] and its sampling procedure of the underlying Barnett shale production site data. We agree that site-level measurements include intentional, vented emissions in addition to fugitive emissions. The functional super-emitter concept, however, identifies sites with high proportional loss rates that likely have a large fraction of avoidable emissions, including both fugitive emissions and excessive vented emissions. These avoidable emissions could include abnormally high emissions from venting sources such as pneumatic controllers, which could be detected and mitigated with a thorough LDAR survey. IPAA further argues that site-level measurements may not be representative if average emission rates during the sampling period differ from the annual average. Sampling period may be an issue in a region like the Fayetteville Shale, where large emissions from manual liquids unloading typically occur during daytime hours. However, we have found no evidence that there is substantial temporal variability of production site emissions in the Barnett Shale, the basin surveyed in *Zavala-Araiza et al 2015*, and IPAA offers no evidence to suggest that there is.

Next, IPAA make several criticisms of Figure 2 from *Zavala-Araiza, et al. 2015*, a graph that plots the cumulative percent of sites versus log-proportional loss rate by gas production cohort. As discussed above, the paper presents a functional super-emitter concept based on proportional loss rate in order to identify sites with high mitigation potential, not to obscure absolute emission rates. In fact, if the original dataset of 75 Barnett Shale wells are analyzed using EPA's proposed low-production well exemption threshold of 15 BOE/day, marginal wells have *higher* absolute emission rates than the full dataset (1.90 vs 1.03 kg CH_4/h). Another study, *Omara, et*

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methane produced) within their natural gas production cohort (e.g., sites with 10 – 100 Mcf/d gas production).

[17] IPAA's critique that data compiled from multiple studies are collected with "no understanding of the production from the well" is inaccurate. Scientists endeavor to ensure that the site-level methane emissions data are collected from a representative sample of sites within the study region. Most studies include a prior comprehensive assessment of the characteristics of the sites in the study region, ensuring that the distribution of site-level characteristics (e.g., production, site age, number of wells per site, etc.) among the sampled sites adequately captures the diversity among the entire population. Contrary to IPAA's suggestion, there is significant value in compiling measurement data from multiple studies in different oil and gas production regions, as this methodology provides a statistically robust means to understanding the common characteristics of the emissions at the site level or basic level. For example, *Brandt. et al.* compiled several thousands of methane emissions measurement data and arrived at the conclusion that methane emissions at natural gas facilities are significantly positively skewed, with a common distribution in which the top 5 percent of sources contribute over 50 percent of cumulative methane emissions. *Methane Leaks from Natural Gas Systems Follow Extreme Distributions*, 50 ENVTL. SCI. TECH. 12512, 12515-16 (2016). Similar meta analyses of measurement data have allowed researchers to provide statistically robust estimates of national oil and gas production methane emissions (*Omara. et al. 2018*, *Alvarez. at al. 2018*) that would not have been possible without data aggregation of several hundreds of measurements representing a diverse population of sites in the U.S.

al. 2016,[18] found that the median production-normalized loss rate of conventional low-production wells in the Marcellus Shale was 85 times higher than unconventional non- low production wells (11% vs 0.13%). While the absolute emission rate of conventional low-production wells was lower than the emission rate of unconventional non-low production wells in this study, because of large number of conventional low-production conventional wells in Pennsylvania and West Virginia, those sources contributed over half of production site emissions in these states. This demonstrates the importance of mitigating emissions from low-production sites no less than from non-low-production sites.

IPAA's criticisms of the data visualization choices of *Zavala-Araiza et al 2015*, namely the log scale y-axis and 70 – 100 percentile of Figure 2, likewise misunderstand standard graphing conventions for highly-skewed data. The paper clearly states that 30 percent of sites from the underlying dataset (*Rella et al 2015*[19]) have emissions below their detection limit (0.08 kg CH4/h). Data were presented in the chosen format to clearly show the order of magnitude differences both among and within cohorts of sites with detectable emissions.

Similarly, IPAA attempts to minimize the findings of *Alvarez et al* 2018, a peer-reviewed paper published in *Science* in June 2018, written by 24 co-authors, representing 16 different research institutions (discussed in detail in Joint Environmental Comments at 86-87), by copying an Energy In Depth article that reflects a deep misunderstanding of the approaches used in the paper and the underlying data. IPAA Comments at 18-26. A detailed response to the Energy In Depth assertions is included in Appendix A.[20]

New analysis submitted by Environmental Commenters in the Joint Environmental Comments at Appendix G provides further evidence that low-production well sites have significant emissions. This analysis of emissions from over 1,000 well sites in eight oil and gas producing basins across the country shows that emissions from low-production well sites are significantly higher than estimated by EPA:

> The data show that low-production wells have higher absolute emissions than estimated by EPA. For example, the low-production gas wells in the dataset had average fugitive, site-level CH_4 emissions of 6.8 tons per year and the oil wells with GOR >300 had average fugitive, site-level CH_4 emissions of 6.4 tons per year—both of which are far higher than EPA emission factors for either low or non-low producing wells. The data also demonstrate that low-production wells can have very high emissions—identifying low-production gas well sites with emissions as high as 40 tons per year methane and oil well sites (GOR >300) with

[18] Omara et al., *Methane Emissions from Conventional and Unconventional Natural Gas Production Sites in the Marcellus Shale Basin*, 50 ENVTL. SCI. TECH. 2099-2107. (2016) https://pubs.acs.org/doi/pdf/10.1021/acs.est.5b05503.

[19] Rella et al., *Measuring emissions from oil and natural gas producing well pads in the Barnett Shale region using the novel mobile flux plane technique*, 49 ENVTL. SCI. TECH. 4742–4748, DOI: 10.1021/ acs.est.5b00099 (2015).

[20] Appendix A, Steve Hamburg, Environmental Defense Fund, *Response to methane synthesis critiques* (June 25, 2018) http://blogs.edf.org/energyexchange/2018/06/25/response-to-methane-synthesis-critiques/.

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> emissions as high as 35 tons per year. Appendix G. All of these values represent fugitive emissions only (not total site level emissions) and are nearly ten times higher than the emissions factor EPA includes in its proposal.
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> The analysis uses these study measurements coupled with national activity data to further refine emissions factors for each of the types of model facilities EPA identifies (which, in almost every case, results in lower modeled site level fugitives than the average values reported in the dataset). Using this approach, we estimate average, fugitive site-level CH_4 emissions of 15.5 tons/site for a non-low-production gas site, while EPA uses an emission factor of 5.9 tons/site. Similarly, for low-production gas sites, our estimated CH_4 fugitive emission factor (6.1 tons/site) is 1.3 times higher than EPA's estimate for low-production sites, and slightly higher than EPA's estimate of baseline emissions for non-low-production gas sites.

Joint Environmental Comments at 103.

Second, IPAA argues that the cost of emissions reductions exceeds the value of recovered gas at low-production wells, citing analysis performed by *Carbon Limits*[21] on the cost-effectiveness of LDAR programs at well site facilities. IPAA Comments at 10-11. This argument is flawed on multiple levels. Most importantly, whether emissions reductions pay for themselves via gas savings is *not* the standard for regulation under Section 111 of the Clean Air Act, which requires EPA to safeguard public health and welfare by adopting performance standards that reflect the "best system of emission reduction," 42 U.S.C. § 7411(a)(1); *see also* Joint Environmental Comments at 16-27; *Sierra Club,* 657 F.2d at 326 (section 111 standards "must… reduc[e] emissions as much as practicable.").

Furthermore, IPAA mischaracterizes the results of the *Carbon Limits* analysis. IPAA cites Figure 1 of the document and claims that the figure shows that the effectiveness of LDAR programs for well sites is "highly limited." IPAA Comments at 10. This is a gross distortion of the *Carbon Limits* report, which in fact concluded that, even when individual well sites may have net costs associated with LDAR programs, "the overall cost for the facility owner will always be relatively low . . . because surveys are relatively inexpensive, and any identified leaks are generally economic to repair." *Carbon Limits* at 6. Specifically, *Carbon Limits* found that for well sites, the mean net present value ("NPV") for 340 surveys had a positive NPV of $4,704, indicating significant savings following the LDAR program. Furthermore, the overall abatement cost at well sites is low, and was about $0/ton CO_2e of emissions reduced. Importantly, *Carbon Limits* indicates that these estimates are based on conservative assumptions, and likely overestimates the cost per ton of emissions abatement because the data used in the analysis came from facilities where LDAR programs had been in place for some time.

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[21] Carbon Limits AS, *Quantifying the cost-effectiveness of systematic leak detection and repair programs using infrared cameras*, (Mar. 2014) http://www.catf.us/wp-content/uploads/2014/03/CATF_Pub_CarbonLimitsLDAR.pdf ("*Carbon Limits*").

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This implies that LDAR at sites where such a program had not yet been in place are likely to be even more cost-effective than estimated in this study.

Third, IPAA critiques the Fort Worth dataset used by EPA to characterize equipment at low-production sites as not representative of those sources, stating that "EPA's reliance on approximately 25 potentially low production wells in one play— the Barnett Shale in Texas — to define its Model Low Production Well is inadequate." *See* IPAA Comments at 14, 26. Environmental Commenters agree that it would be arbitrary and capricious for EPA to rely on this evidence as a sole basis for subcategorizing low-production wells and developing a separate low-production well model facility. *See* Joint Environmental Comments at 94-100. However, uncertainties regarding the representativeness of the Fort Worth dataset for low-production wells indicates that EPA lacks sufficient data to regulate low-production wells as a separate category, *not* that EPA may exempt these wells from regulation, as IPAA argues. These concerns instead underscore that EPA lacks meaningful evidence to contravene its conclusion in the 2016 Rule that "a low production well model plant would have the same equipment and component counts as a non-low production well site." 81 Fed. Reg. at 35,856. Indeed, the Fort Worth dataset shows that these low producing wells have high absolute emissions and component counts similar to those in EPA's non-low production model facility. *See* Joint Environmental Comments at 97-99.

Fourth, IPAA presents data that it alleges shows equipment counts are lower than estimated by EPA at low-production well sites. *See* IPAA Comments at 31-33. These data are nontransparent and lack key contextual information necessary for meaningful analysis. For example, there is no information provided on a site-level basis that would indicate whether these data are representative of new or modified low-production well sites under a standard definition. For instance, there is no oil/gas production information that would indicate whether these are low-production sites, no information on the age of such sites, etc. IPAA itself admits this data is "not intended to be presented as statistically accurate or fully representative of the population of low production wells." IPAA Comments at 31. It would be arbitrary for EPA to rely on such nontransparent data in a final rule.

Finally, industry commenters advocate for EPA to classify "low-production" well sites based on production over the life of the well, rather than initial production when a well is drilled or modified. *See* API Comments at 5; IPAA Comments at 8-14. If EPA should attempt to move forward with finalizing a low-production well site distinction or subcategory, which Environmental Commenters strongly oppose, it would be inappropriate to attempt to classify well sites based on changing production over time.[22] Such a classification would create an unworkable standard for both EPA and operators, as monitoring frequencies for individual wells would continually be in flux.

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[22] A change to the classification of low-production wells along the lines suggested by industry commenters would likewise require EPA to issue a re-proposal and take public comment on the proposed definition. *See* 42 U.S. Code § 7607(d)(3)(C) (EPA must include in a proposal "the major legal interpretations and policy considerations underlying the proposed rule").

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In sum, industry commenters do not provide analysis or commentary that can support EPA weakening fugitive emissions requirements at low-production well sites.

c. Reduction in Monitoring Frequency at Compressor Stations.

Several industry commenters, including the Interstate Natural Gas Association of America[23] (INGAA) and GPA Midstream Association,[24] present information that they argue supports a reduction in monitoring frequency at compressor stations. Specifically, they argue that standards for compressor stations should be weakened in light of data they present on (1) reductions in emissions at different monitoring frequencies, (2) leak frequency at compressor stations, (3) facility complexity and component counts, and (4) monitoring costs. None of these arguments provides a legally-defensible rationale for weakening the fugitive monitoring requirements for compressor stations, particularly in light of EPA's own analysis in support of the Proposal, which shows that quarterly monitoring at compressor stations is highly cost-effective while delivering greater emission reductions than either semiannual or annual monitoring. *See* Joint Environmental Comments at 109-112.

First, INGAA argues that "annual leak surveys achieve the fugitive emissions control efficiency EPA estimated for quarterly monitoring," reiterating conclusions from a report (the "CAPP Report")[25] that EPA has already evaluated and alleging "deficiencies" in EPA's data sources. INGAA Comments at 8-13, Attachment A. INGAA provides no basis for its assertion that the CAPP Report, which EPA expressly declined to rely on in the Reconsideration Proposal, represents the "best available science" regarding emissions reductions achieved at different monitoring frequencies. INGAA also fails to address EPA's fundamental critiques of the CAPP data—namely, that the CAPP study analyzed a set of voluntary best management practices (BMPs) for fugitive emissions monitoring, rather than regulatory requirements, and that those BMPs did not specify a leak definition, monitoring frequency, repair timeline, the components to monitor, or a require specific technology or method of detection.[26] Furthermore, as Environmental Commenters discuss in their comments, even if the CAPP Report were reliable evidence, it actually suggests that EPA *underestimated* the emissions reductions achieved by the current standards. *See* Joint Environmental Comments at 76.

While INGAA attempts to critique the multiple sources utilized by EPA in the 2016 Rule in estimating the emissions reductions achieved at different monitoring frequencies, INGAA ignores several of the analyses relied upon by EPA. *See* Joint Environmental Comments at 76-

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[23] Interstate Natural Gas Association of America, Docket ID No. EPA-HQ-OAR-2017-0483-1002 ("INGAA Comments").
[24] GPA Midstream Association, Docket ID No. EPA-HQ-OAR-2017-0483-1261 ("GPA Midstream Comments").
[25] Citing Canadian Association of Petroleum Producers, *Update of Fugitive Equipment Leak Emission Factors*, (Feb. 2014) ("CAPP Report").
[26] *See* Memorandum re: EPA Analysis of Fugitive Emissions Data Provided by INGAA, at 2 – 3 (Aug. 27, 2018).

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78. Furthermore, new analysis[27] supports EPA's initial estimates of efficacy at different monitoring frequencies:

> This analysis, conducted by Dr. Arvind Ravikumar, simulates emissions mitigation achieved under annual, semi-annual, and quarterly LDAR surveys using OGI-based technologies at natural gas production well sites, using the Fugitive Emissions Abatement Simulation Toolkit ("FEAST") developed at Stanford. FEAST is a dynamic simulation tool that models the evolution of leaks over time at natural gas facilities. The Ravikumar Analysis, which uses EPA's per-site baseline emissions estimates (which . . . likely significantly underestimate emissions), finds that emissions reductions achieved at different monitoring frequencies are in the range estimated by EPA, predicting emissions reductions of 32% at an annual OGI monitoring frequency and approximately 54% at a semiannual OGI monitoring frequency. This analysis further supports EPA's estimate of emissions reductions of 40% with annual OGI monitoring, 60% with semiannual OGI monitoring, and 80% with quarterly OGI monitoring.

Joint Environmental Comments at 78.

Second, GPA Midstream presents new data on leak frequency at gathering and boosting compressor stations that it alleges supports a change to annual monitoring. GPA Midstream Comments at 3-5, Attachment 1. This updated dataset does not resolve EPA's multiple concerns with GPA Midstream's initial data on leak frequency: that many of the inspections reported were not conducted pursuant to OOOOa; that the data provide no information on environmental conditions, such as thermal background and wind conditions, which can greatly affect the effectiveness of OGI; and that information on the components monitored is limited.[28] Furthermore, as discussed in detail above, leak frequency is not correlated with site-level emissions.

Third, GPA Midstream submits new data from eight of its member companies purporting to show that EPA overestimates the number of components at a gathering and boosting compressor station in its model plant. GPA Midstream Comments at 5-7, Attachment 2A. GPA Midstream's predictions of lower emissions based on fewer components run counter to studies finding that site-level emissions at gathering and boosting facilities are substantially higher than estimated by EPA in inventory estimates. For example, Marchese *et al* (2015) used facility-level emissions data to assess emissions from the gathering and processing segment, including compressor stations in that segment, and found that the U.S. Greenhouse Gas Inventory (relied upon by EPA in developing its emissions estimates) significantly underestimated methane emissions from those sources. *See* Joint Environmental Comments at 115-116.

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[27] Joint Environmental Comments, Appendix D, Arvind Ravikumar, *Impact of Survey Frequency on Emissions Mitigation at Oil and Gas Sites* (Dec. 2018) ("Ravikumar Analysis").

[28] Memorandum re: EPA Analysis of Compressor Station Fugitive Emissions Monitoring Data Provided by GPA Midstream at 2 (Apr. 17, 2018); *see also* Joint Environmental Comments at 111.

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Finally, GPA Midstream presents data from six member companies showing an average monitoring cost of $2,076 per monitoring event. GPA Midstream Comments at 7-8. While it is unclear what is encompassed in these "per event" monitoring costs, it is notable that these average costs are still several hundred dollars lower than EPA's estimates in the Technical Support Document for the Reconsideration Proposal, which estimated monitoring costs of $2,300 per survey.[29] Other data, including a submission from Target Emission Services that includes case studies of quarterly LDAR performed at over 100 compressor stations across nine states and an analysis of compressor station survey times from OOOOa compliance reports by MJ Bradley, shows that EPA likely significantly overestimated monitoring costs. *See* Joint Environmental Comments at 113-115.

GPA Midstream further suggests it is inappropriate for EPA to consider gas savings in evaluating cost-effectiveness because midstream operators may not own the gas they are transporting. GPA Midstream provides no evidence to support its assertation that midstream operators do not own the transported gas. Fundamentally, quarterly monitoring at compressor stations is cost-effective regardless of whether gas savings are considered, and cost-effectiveness only improves when gas savings are taken into account. *See* Joint Environmental Comments at 108-117. For example, analysis by Environmental Commenters indicates that the costs of monitoring are *more than offset* through gas savings. *See id.* at 116.[30] This analysis indicates that there are significant economic benefits from the compressor standards that accrue to the owners of the transported gas.

In summary, industry commenters do not provide analysis or commentary that can support EPA's proposal to weaken fugitive emissions requirements for compressor stations.

d. State Equivalency Determinations.

In their comments on EPA's Reconsideration Proposal, industry groups advocated for broader state equivalency programs, urging the agency to recognized state recordkeeping and recording requirements and component monitoring lists in lieu of federal requirements. As Environmental Commenters discussed in detail in their comments, the state equivalency determinations in the Reconsideration Proposal are already unlawful. *See* Joint Environmental Comments at 44-55. Permitting sources to substitute state recordkeeping and recording requirements and component monitoring lists for federal standards would represent an even greater legal affront to the Clean Air Act's requirements.

Many industry-submitted comments recommended that the EPA should recognize state LDAR programs in full, including the states' recordkeeping and reporting requirements. *See*

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[29] EPA, Technical Support Document, Spreadsheet Entitled "2 - Proposed Rule OOOOa TSD Section 2 - OGI Compressor Model Plant Costs," https://www.regulations.gov/document?D=EPA-HQ-OAR-2017-0483-0040.

[30] *See also* Joint Environmental Comments, Appendix F, Hillary Hull, EDF, EDF NSPS LDAR Methane Cost-Effectiveness Analysis – Source Counts, Baseline Emissions, and Costs (December 2018).

Shell Comments at 24, API Comments at 31, GPA Midstream Comments at 25, IPAA Comments at 63. For example, API states:

> EPA should give proper deference to states for compliance assurance for their state programs. Complying with multiple recordkeeping and reporting schemes for the same site(s) is an enormous administrative burden for operators to maintain with no added environmental benefit.

API Comments at 21. API and GPA Midstream both cite cooperative federalism as a primary tenet of the Clean Air Act in support of transferring recordkeeping and reporting requirements to the respective states.

EPA cannot allow state recordkeeping and reporting requirements to replace the requirements in Subpart OOOOa. Federal recordkeeping and reporting requirements are necessary to ensure consistent records among states, and consistency across states will help both the public and EPA analyze leak patterns across states and to gather more data. Additionally, federal reporting will help to promote transparency, enhance public confidence, and ensure companies are taking actions required for compliance. Some states, like Texas, only require LDAR for wells above a certain emission threshold. This could lead to a situation where operators that fall below thresholds provided in state standards may nonetheless claim they are electing to comply with state requirements (notwithstanding the fact that those state requirements would impose no state-level monitoring obligations). Federal recordkeeping and reporting would ensure that operators do not evade regulation entirely through such an unlawful loophole.

Finally, federal recordkeeping and reporting is necessary to fulfil EPA's duty to provide the public access to compliance reports. These reports collect "emission data" within the meaning of section 114 of the Clean Air Act, and so EPA is required by the statute to make this information public. Consistent with this statutory duty, the NSPS regulations state that reporting parties "must submit reports to the EPA via the [Compliance and Emissions Data Reporting Interface ("CEDRI")]." 40 C.F.R. § 60.5422a(b)(11); see also id. § 60.5422a(a). The NSPS rule stated that reports submitted pursuant to the regulations would be made electronically available on EPA's WebFIRE website, that this website would be "easily accessible to everyone" and "provide a user-friendly interface that any stakeholder can access," and that "[b]y making the records, data and reports addressed in [the NSPS] readily available, the EPA, the regulated community and the public will benefit when the EPA conducts its CAA-required reviews." 81 Fed. Reg. at 35,870.

For some states, such as Texas, it is very difficult for the public to obtain and analyze oil and gas reporting program data. Recordkeeping and reporting requirements at the federal level are necessary to ensure stakeholders will only have to obtain records from one source rather than from multiple sources in varying formats. This will increase the transparency and reliability of the leak data and provide better access for the public.

Industry commenters also argue that a state's component list be recognized for federal compliance purposes along with its recordkeeping and reporting requirements. *See* API Comments at 30, GPA Midstream Comments at 25, IPAA Comments at 2. They contend that

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owners and operators should only have to comply with one fugitive emissions component list for all sites in a single state, rather than two component lists (one for OOOOa sites, another for non-OOOOa sites). GPA Midstream Comments at 25.

Environmental Commenters strongly disagree with allowing states' component lists to be the singular requirement. EPA is obligated to ensure that alternative programs achieve *equivalent* emissions reductions to the federal standards, and there is no evidence that deferring to a state's more limited component list would achieve equivalency. In fact, EPA determined that deferring to different state component survey requirements would *not* achieve equivalent reductions in its Proposal. The agency directly states in its analysis of state programs[31] that only Wyoming explicitly includes all the components included in the 2018 Proposal (see Table 1 below). In the Reconsideration Proposal, the EPA explicitly requires operators in other states to survey their entire component list because the state component lists are different. 83 Fed. Reg. at 52,095. Allowing operators to perform LDAR with lesser component requirements in these states would contravene EPA's own judgment on the equivalency of those component requirements. While API claims that EPA "deemed these various state programs equivalent to Subpart OOOOa's LDAR program," API Comments at 30, EPA only considered these state programs reasonable alternatives when the equivalent aspects of the state requirements were combined with Subpart OOOOa requirements.

Furthermore, allowing states' component lists to be substitute for the OOOOa component list would essentially allow operators to avoid monitoring components that are required under OOOOa but not in particular states. This would result in manifestly different (and lesser) emission reductions and provide yet another reason why EPA's determinations regarding state equivalency are deficient. For instance, thief hatches are notably absent from several of the state component lists, and are a significant source of fugitive emissions.

Alternatively, these industry commenters would support the EPA requiring only the fugitive emissions component definition from Subpart OOOOa to be used when following an equivalent state program. Because the Subpart OOOOa component list includes the all components included in these state programs (as detailed in Table 1 below) requiring operators accounting for components listed by the states is not duplicative, as these industry comments argue. Requiring operators to follow the Subpart OOOOa component list ensures consistency across operators nationally, and guarantees clarity in states such as Pennsylvania, where the component types to be inspected are not specified.

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[31] *Equivalency of State Fugitive Emissions Programs for Well Sites and Compressor Stations to Proposed Standards at 40 CFR Part 60, Subpart OOOOa*, Docket ID No. EPA-HQ-OAR-2017-0483-0041 (April 12, 2018) ("State Equivalency Memo").

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Table 1: Components included in the 2018 Proposal and State Requirements[32]

	2018 Proposal	California	Colorado	Ohio	Pennsylvania[33]	Texas[34]	Utah	Wyoming
Compressors	X			X	X	X	X	X
Connectors	X	X[35]	X	X	X	X	X	X
Covers	X			X	X		X	X
CVSs	X[36]			X	X		X	X
Flanges	X	X	X	X	X	X	X	X
Instruments	X				X		X	X
Meters	X[37]	X			X		X	X
OELs	X	X		X	X	X	X	X
PRDs	X	X	X	X	X	X	X	X
Storage Vessels	X[38]			X	X			X
Thief Hatches	X				X	X	X	X
Valves	X	X	X	X	X	X	X	X
(Other)	X	X	X	X	X	X	X	X

III. New information that has become available since the close of the comment period demonstrates that the current standards are the best system of emission reductions for affected sources.

Information released since the close of the comment period underscores that the current standards are necessary for addressing the critical threat posed by methane emissions from the oil and gas sector. New research and analysis, including from EPA, shows that atmospheric methane concentrations are increasing, the oil and gas sector continues to emit significant amounts of methane, and strong federal standards are critical to address this urgent problem.[39]

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[32] Source: *Equivalency of State Fugitive Emissions Programs for Well Sites and Compressor Stations to Proposed Standards at 40 CFR Part 60, Subpart OOOOa* located at Docket ID No. EPA-HQ-OAR-2017-0483.

[33] Pennsylvania permit language does not list component types to be inspected. For this analysis, the EPA assumes all of the 2018 Proposal components are included

[34] Texas does not include definitions for "components" but mentions certain components in their requirements.

[35] "Threaded Connection"

[36] Only includes those not subject to 40 CFR §§60.5397a or 60.5411a

[37] Does not include meters owned by third parties.

[38] Only includes those not subject to 40 CFR §60.5395a.

[39] Further underscoring that EPA properly found in the 2016 Rule that semiannual monitoring constituted the best system of emissions reductions at well sites, the Wyoming Department of Environmental Quality recently found that semiannual LDAR monitoring was cost-effective and effective at reducing emissions. *See Oil and Gas Production Facilities Chapter 6, Section 2*

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A new paper approved for publication by the American Geophysical Union indicates that there has been rapid growth in atmospheric methane since 2007, including "remarkable growth" in methane concentration between 2014 and 2017.[40] One reason that the paper finds for this increase in atmospheric methane is from "very large" emissions of methane from the oil and natural gas sector.[41] The paper concluded that "[r]educing methane emissions is feasible, *especially from fossil fuel sources*, and would have rapid impact on the global methane burden."[42]

Furthermore, EPA's latest draft greenhouse gas inventory, released February 12, 2019, shows that methane emissions increased slightly for the oil and gas sector between 2016 and 2017.[43] While EPA's inventory significantly underestimates methane emissions from the oil and gas sector, as discussed *supra* Section II, the latest draft inventory continues a pattern showing that overall methane emissions remain unacceptably high.

Finally, a new policy brief from the University of Pennsylvania highlights the need for standards to reduce fugitive methane emissions from the oil and gas sector because the value of recovered product alone may be lower than the cost to control the emissions. In other words, often industry is not economically incentivized to control the emissions based on its own cost-benefit analysis.[44] Capturing these emissions is important because of the social damage from

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Permitting Guidance: 2018 O&G Guidance Revision Summary, Wyoming Dep't of Envtl. Quality (Feb. 1, 2019) ("New/modified production sites to be monitored for fugitive emissions semi-annually following 40 CFR part 60, subpart OOOOa as published June 3, 2016 satisfies P-BACT.").

[40] E.G. Nisbet et al., *Very Strong Atmospheric Methane Growth in the Four Years 2014 – 2017: Implications for the Paris Agreement*, Am. Geophys. Union, doi:10.1029/2018GB006009 at 6-7 (2019) ("*Methane Growth*"). In addition, it appears that prior climate models did not fully account for the radiative forcing from methane, which is likely 25 percent stronger than the value used by the IPCC. *Id.* at 27 (noting that this increase in the radiative forcing causes methane's 100-year global warming potential to increase by a further 14 percent) (citing Stocker, T.F., et al. (2013) IPCC, 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, 1535 pp.).

[41] *Methane Growth* at 14-15.

[42] *Id.* at 30.

[43] Total methane emissions for the Natural Gas Systems and Petroleum Systems categories increased by 1 MMT – from 202.9 MMT in 2016 to 203.9 MMT in 2017 – an increase of 0.49 percent. *See Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2017*, EPA 430-P-19-001 at 2-6 (2019) https://www.epa.gov/sites/production/files/2019-02/documents/us-ghg-inventory-2019-main-text.pdf.

[44] Catherine Hausman & Daniel Raimi, *Plugging the Leaks: Why Existing Financial Incentives Aren't Enough to Reduce Methane*, Kleinman Center for Energy Policy, University of Pennsylvania at 5 (Jan. 2019) (hereinafter "*Financial Incentives*"). This policy brief not only underscored EPA's underestimation of leaking methane – approximately 60 percent – it also

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climate change and health and safety harms from emissions, which operators do not factor into their own cost-benefit analysis. Because industry does not take these societal costs into account, the need for strong federal action is clear as "global damages reflect real economic risks to the United States, as climate change will impact the global economy."[45]

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Environmental Commenters reiterate our position that the overwhelming balance of the evidence indicates that there is no justification for weakening the 2016 Rule, and urge EPA to withdraw the Reconsideration Proposal.

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noted that federal regulation was the most appropriate vehicle to "capture the 'low hanging fruit'" of emissions from the oil and gas industry. *Id.* at 3, 5.

[45] *Financial Incentives* at 4-5.

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