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Subj: Modeling for Cape Wind's Local Impacts Relative to the National Ambient Air Quality Standards

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This note examines what effect the installation of Cape Wind's wind farm and transmission line will have on local air quality. The attainment pollutant emission rates from this activity will far exceed annual emissions projected from the completed wind farm's operation. This review proceeds as follows:

- First identify permitting regulations in the Clean Air Act that require modeling of local air quality and determine whether or not they apply to Cape Wind.
- Next identify state regulations which may require such modeling and determine whether any might apply.
- End by reviewing the modeling in Cape Wind's final EIS and conclude based on it that no further analysis of the construction's emissions would be needed to assure that they will not violate or compromise NAAQS locally.

Section 328 of the Clean Air Act "Air Pollution from Outer Continental Shelf Activities" requires EPA to review and as appropriate permit sources of air pollution which would construct and operate in OCS areas. Cape Wind Associates proposes to install and operate an array of 130 wind turbine generators (WTGs) and associated transmission cabling around Horseshoe Shoal in Nantucket Sound. As an OCS source the project must comply with applicable federal air permitting requirements and with state and local air pollution requirements of the 'corresponding onshore area'.

Federal Air Permitting Requirements

On 12-17-2008 ESS's Michael Feinblatt submitted Cape Wind's OCS permit application (Exhibit A.) to Region 1 EPA's Ida McDonnell. The application tabulated 279 tons NO2 from preconstruction and (mostly) construction activities within 25 miles of the WTG array on Horseshoe Shoal. As expected this comports with the tables below, whose entries come from Appendix A of the application but do not include relatively small preconstruction emissions. The tables appear here because they help establish what emissions were modeled in MMS's final EIS for Cape Wind

Permit modeling rarely addresses construction or mobile source emissions because both are usually minor relative to stationary source operational emissions, construction is temporary and difficult to characterize in sufficient detail to model, and mobile source emissions are typically considered incidental to stationary source permitting. Regardless of the modeling requirements of any particular permitting regulation and despite technical difficulties, temporary or construction emissions do affect air quality.

Construction-related mobile emissions from:	NO2	SO2	CO	PM10	PM2.5
Pile installation	42.5	1.1	14.8	1.8	1.8
Install scour protection	141.2	3.7	49.3	6.5	6.5
Lay transmission cable	27.2	0.7	1.7	1.7	1.7
Install wind turbines	21.5	0.6	7.5	1.0	1.0
Install electric service platform	11.6	0.3	4.0	0.5	0.5
Total tons	244	6.4	77.3	11.5	11.5

Construction-related stationary source emissions from:	NO2	SO2	CO	PM10	PM2.5
Pile installation	12.5	0.4	4.4	0.5	0.5
Install scour protection	3.2	0.0	1.4	0.4	0.4
Lay transmission cable	0.2	0.0	0.1	0.0	0.0
Install wind turbines	5.6	0.2	2.1	0.4	0.4
Install electric service platform	1.1	0.0	0.4	0.0	0.0
Total tons	22.7	0.6	8.4	1.3	1.3

While Table 1-1 of Cape Wind's air permit application suggested that NO2 emissions during construction might exceed the PSD threshold, the most recent emissions estimates from Cape Wind (submitted by ESS on 9-23-2009) lowered the criteria pollutant emission estimates for the project to well below the 250 tpy major source threshold applicable to an operation of the type Cape Wind would install (Exhibit B.). Although mobile source and construction-related emissions generally do not figure in PSD major source determinations (and are usually negligible), in this case they dominate prospective emissions and when combined with stationary source emissions, yield maximum annual emission rates below the level at which Cape Wind could be a considered a major source. Therefore, PSD NAAQS and increment modeling requirements (viz., air quality modeling and monitoring as detailed at 40 CFR 52.21(k), (l), and (m)) do not apply to this project.

Massachusetts Air Permitting Requirements

Section 328 of the Clean Air Act also requires EPA to administer state air pollution requirements of the "corresponding onshore area" which for Horseshoe Shoal includes Massachusetts DEP regulations codified under 310 CMR 7.00 "Air Pollution Control." Under 310 CMR 7.02 "Plan Approval and Emission Limitations," the permitting agency (normally MassDEP, but here EPA) must ensure that "[t]he emissions from a facility do not result in air quality exceeding either the Massachusetts or National Ambient Air Quality Standards." 310 CMR 7.02(3)(j)(1). To assist the agency in this determination, "[a]dditional information shall be furnished upon request . . . including . . . air dispersion modeling." 310 CMR 7.02(5)(c)(6).

This regulation is required pursuant to 40 CFR 51.160 which requires Massachusetts (or any other state) to have legally enforceable procedures to determine whether the "construction or modification of a facility, building, structure or installation, or combination of these... " will interfere with NAAQS compliance, and , if it does, to prevent the construction or modification. The legally enforceable procedures must provide for access to the data needed to assess NAAQS compliance including Appendix W (Guideline on Air Quality Modeling) dispersion modeling of the proposed construction or modification.

EPA Region 1 discussed permit modeling of Cape Wind's project on several occasions with ESS and MMS on several occasions. However, EPA has not specifically requested dispersion modeling, nor did Cape Wind submit such modeling with its OCS permit application. However, Cape Wind submitted dispersion modeling of construction-related mobile and stationary sources to MMS and EPA to support MMS's general conformity analysis. MMS also included that modeling in its Final EIS for the Cape Wind project. A description of that modeling (Exhibit C) indicates that Cape Wind modeled based on the higher emission rates from its 12-17-2010 OCS permit application, not the lower rates provided in ESS's 9-23-2009 letter. Based on information in Exhibit C:

Emission Points by Construction Activity		Emission Rates		Emission Rate for the Activity(#NO2/Hr.)
14 inner array WTG cables	X	1.4219 #NO2/WTG/Hr.	=	19.9066
1 ESP	X	0.5837 # NO2/Hr.	=	0.5837
Cable point ID #208	X	0.0628 # NO2/Hr.	=	0.0628
207 cable points	X	0.0210# NO2/point/Hr.	=	5.437
110 transit points	X	0.3548# NO2/point/Hr.	=	39.028
		Overall Total #NO2/Hr.		63.928

Over a year - 8760 hours - this amounts to 280 tons of NO2, which is in rough agreement with the 267 ton NO2 combined emissions from the two earlier tables. This roughly confirms that the dispersion modeling in the ESS Report No. 5.3.1-3 used the emissions of the OCS permit application. However, except for NO2, ESS's report appropriately used higher 1-hour and 24-hour emission rates than appear in the permit application. The reason for this is that the application only provided annual emission estimates, not short-term estimates which would be needed, and were used, to model for the SO2, PM, and CO short-term NAAQS.

Remarks on ESS's Modeling

Region 1 does not possess the raw output files, input files (e.g., surface and profile meteorology), receptor network detail, and such, which would be expected if EPA required the modeling.

One year of Cape Wind's 'on-site' surface data were used with concurrent 3-2004 thru 2-2005 Chatham overland upper air and Nantucket Airport overland surface data. If EPA were to require modeling, and if the 'on-site' data were not available, then EPA would require 5 years of overwater surface data.

ESS's characterization of Cape Wind's WTG and transmission line installation activities localizes them to a much smaller area than will be the reality, and these activities are modeled to all occur in a single year. This will make the dispersion modeling overestimate air quality impacts, just as does the the use of the original (higher) OCS permit application emission rates rather than the revised (lower) emission rates that ESS submitted in 2009.

ESS modeled using EPA's Appendix W ("Guideline") OCD dispersion model. This model addresses overwater pollutant releases by simulating overwater pollutant dispersion and also the TIBL (thermal internal boundary layer) that may encountered when a plume crosses a shoreline.

The table below combines Figure 3 and Table 3 in Exhibit C and renames critical receptors for nearby but commonly known features. Exhibit C does not describe whether the individual concentrations in Table 3 occur over land or over water but does indicate for each pollutant what the water location would be and what the land location would be. No land location corresponding to the limiting 24-hour PM2.5 has been listed, however.

No 'significant impact level' for the annual NAAQS will be exceeded so the construction could be termed irrelevant to annual air quality.

Because of ESS's conservative approach it is not surprising that the project will exceed SILs for all other averaging times. The table below shows that the 24-hour NAAQS for PM2.5 is most closely approached but as for the other NAAQS will not be exceeded.

The PM2.5 24-hour standard will be most closely approached but it should be noted that the background data not the construction emissions dominates the outcome of the PM2.5 modeling. To investigate EPA's AirData were retrieved from the monitoring sites (See the map below) nearest Cape Wind for the years 2003- 2008 as a check on the background values used in the Final EIS's modeling analysis. For the years 2003 thru 2005 the observation-weighted average of 98 %-tile highest 24-hour PM2.5 at the Commercial Street urban/center city monitors in Brockton is 30.29 ug/m3 within the NAAQS but considerably higher than what ESS's analysis used. More recently this monitor recorded lower values of the 98 %-tile highest PM2.5 but in these years, too, the Brockton data cannot be considered representative of Cape or especially the location where construction would have the greatest impact on PM2.5 air quality. Even the Globe Street (Fall River) PM2.5 data which ESS appears to have used will suggest the Cape has worse air quality has worse air quality than it does.

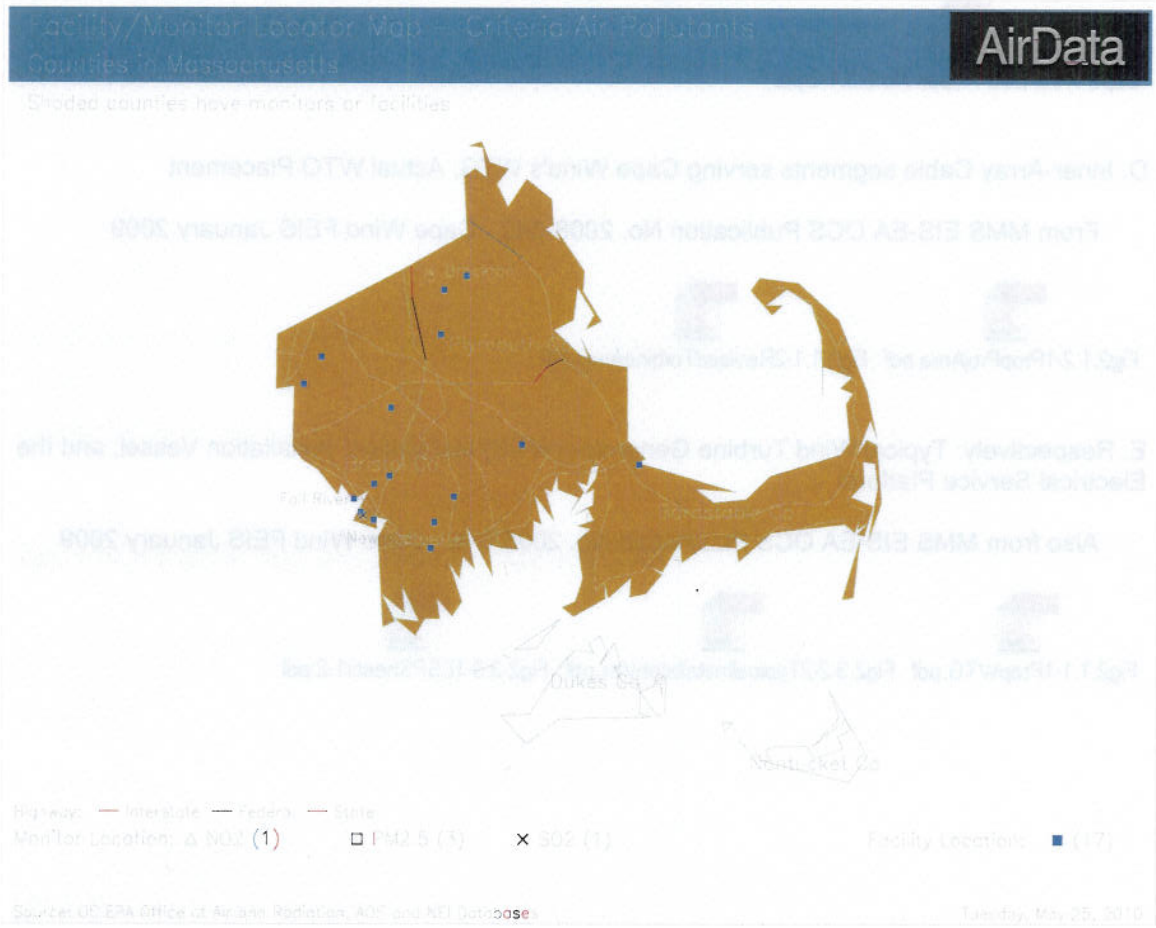
Conclusion

Based on the above review of ESS's modeling efforts to date and as shown in the table below, the project emissions will not result in air quality exceeding ambient air quality standards for NO2, CO, SO2, PM10, or PM2.5. No further modeling should be required.

Postscript: On 4 June 2010 ESS's Michael Feinblatt informed Region 1 EPA's David Conroy that EPA and MMS-required monitoring and mitigation requirements – geophysical and geotechnical surveys – would roughly treble the preconstruction emissions of NO2, CO, PM10, and PM2.5 estimated in Cape Wind's 17 December 2008 OCS permit application. If these preconstruction activities are homologous with the construction emissions of the modeling (as appears the case) the conclusion that NAAQS will not be violated remains valid. That is, after adjusting for the increase in preconstruction emissions within 25 miles, project-wide emissions remain below those modeled in ESS's 15 October 2008 report.

Pollutant	Averaging Time (ug/m3)	Significant Impact Level (ug/m3)	Modelled Impact (ug/m3)	Water location/Land location	Background Concentration (ug/m3)	Total (Bkgrnd + Model) (ug/m3)	NAAQS (ug/m3)
NO2	Annual	1.0	0.78	~1 mi. SW of ESP/ Oak Bluffs	9.56	10	100
CO	8-hour	500	5842	west of Pt. Gammon/end Smith's Pt. Rd., Great I.	1863	7705	10000
	1-hour	2000	32636	west of Pt. Gammon/~Park Ave-Hyannis	3261	35897	40000
SO2	Annual	1	0.02	~1 mi. SW of ESP/Oak Bluffs	13	13	80
	24-hour	5	7.12	Lewis Bay/end Smith's Pt. Rd., Great I.	59	66	365
	3-hour	25	976.2	west of Pt. Gammon/~Park Ave-Hyannis	160	1136	1300
PM10	24-hour	5	14.2	Lewis Bay/end Smith's Pt. Rd., Great I.	54	68	150
PM2.5	Annual	*0.3 to 1.0	0.03	~1 mi. SW of ESP/Oak Bluffs	9.11	9.1	15.0
	24-hour	*1.2 to 5.0	9.00	west of Pt. Gammon/**No Information**	24.13	33	35

* *2007* Notice of Proposed Rulemaking <u>proposed</u> lowest option *to* <u>proposed</u> highest option



Sources for the AirData figure:

Cape Wind monvals.txt Cape Wind pltmon.cgm Cape Wind pltmon.txt

Exhibits

A. Cape Wind's 12-17-2008 OCS Permit Application

OCS Air Permit Application - Final.doc

B. ESS' Michael Feinblatt 9-23-2009 letter to David Conroy Region1 EPA Air Branch Manager

Cape Wind Revised Emissions - EPA - Letter.doc Cape Wind Project Emissions - OCS Permit - rev July 09.xls

C. ESS' dispersion modeling of air pollutant emissions associated with the Cape Wind project construction

From MMS EIS-EA OCS Publication No. 2008-040 - Cape Wind FEIS January 2009

Cape Wind ESS Report No 5.3.1-3.pdf

D. Inner-Array Cable segments serving Cape Wind's WTG; Actual WTO Placement

From MMS EIS-EA OCS Publication No. 2008-040 - Cape Wind FEIS January 2009

Fig2.1.2-1PropProjArea.pdf Fig2.1.1-2RevisedTurbineArray.pdf

E. Respectively: Typical Wind Turbine Generator (WTG) Installation; Installation Vessel; and the Electrical Service Platform

Also from MMS EIS-EA OCS Publication No. 2008-040 - Cape Wind FEIS January 2009

Fig2.1.1-1PropWTG.pdf Fig2.3.2-2TypicalInstallatonVes.pdf Fig2.3.3-1ESPSheets1-2.pdf