Environmental Quality

PAT MCCRORY
Governor

DONALD R. VAN DER VAART
Secretary

SHEILA C. HOLMAN
Director

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EPA Docket Center
WJC West (Air Docket)
U.S. Environmental Protection Agency
1200 Pennsylvania Ave. NW
Washington, DC 20460

Subject: Cross-State Air Pollution Rule Update for the 2008 Ozone NAAQS

Dear Sir/Madam:

The North Carolina Division of Air Quality (DAQ), within the Department of Environmental Quality, appreciates the opportunity to comment on the U.S. Environmental Protection Agency's (EPA) proposed rulemaking entitled, "*Cross-State Air Pollution Rule Update for the 2008 Ozone NAAQS*" published in the *Federal Register* on December 3, 2015 (80 *FR* 75706).

The DAQ has engaged with the EPA throughout the development of this rulemaking effort to provide the EPA with the most accurate and complete data available to ensure an accurate assessment of North Carolina's ozone transport contributions. The DAQ provided the EPA with review comments on the 2011 National Emissions Inventory (NEI), 2011 and 2018 emissions modeling platforms (EMPs), Integrated Planning Model (IPM) / National Electric Energy Data System (NEEDS) versions 5.13 and 5.14, and most recently the EPA's *Notice of Availability of the Environmental Protection Agency's Updated Ozone Transport Modeling Data for the 2008 Ozone National Ambient Air Quality Standard (NAAQS)*. However, our review of the technical data and analyses supporting this proposed rule shows that the EPA has yet to address many of our comments especially related to the power sector emissions forecast and air quality modeling. I ask that the EPA address all of our comments and concerns before finalizing the rule.

On December 9, 2015, the DAQ submitted to the EPA a final "*Revision to the North Carolina State Implementation Plan - Demonstration that North Carolina Complies with the "Good Neighbor" Requirements of Clean Air Act Section 110(a)(2)(D)(i)(I) for the 2008 Ozone National Ambient Air Quality Standard.*" Through this submission, North Carolina certified that based on currently available emissions and air quality modeling data, emissions activities within North Carolina will not significantly contribute to nonattainment or interfere with maintenance of the 2008 ozone NAAQS in a neighboring state. The DAQ conducted an extensive review of the EPA's 2017 modeling files posted for states' use on July 23, 2015, upon which the EPA's proposed CSAPR Update Rule is based. This review provides substantial evidence that the

2017 modeling analysis linking (i.e., 0.93 ppb, or 1.2% of the NAAQS) North Carolina to downwind contributions to ozone concentrations at the Essex ozone monitor in Baltimore County, Maryland is associated with inaccurate emissions inventories and deficiencies in the performance of the air quality modeling rather than a real contribution. Based on these findings, we have concluded that North Carolina does not contribute significantly to downwind air quality problems, and that North Carolina has met its Good Neighbor Provision under the Clean Air Act (CAA) with respect to the 2008 ozone NAAQS. Based on this determination, I request that the EPA remove North Carolina from the final CSAPR Update Rule based on our recent State Implementation Plan (SIP) revision submittal demonstrating that North Carolina has fulfilled its "good neighbor" obligations under CAA Section 110(a)(2)(D)(i)(I) for the 2008 Ozone NAAQS.

Notwithstanding the importance of each technical issue addressed in North Carolina's good neighbor SIP and in no way prejudging the factual information provided, we are commenting on the proposed rule in its totality. Should the EPA insist on including North Carolina in the final CSAPR Rule; however, we have prepared the following comments for the EPA to address in the final rule as well as future transport modeling analyses.

The DAQ's most significant concern with the proposed CSAPR Update Rule is that the EPA's proposed $1,300/ton control case would require the power sector in North Carolina to reduce its 2017 NOx emissions by 41 percent (relative to the existing 2015 Phase I CSAPR budgets). The cost of SCR optimization alone is about $2.5 million[1] and the cost of coal unit retirements and replacements with natural gas combined cycle (NGCC) units is an additional $3 to $4 billion,[2] which the EPA did not account for in its economic analysis (see discussion below). The DAQ believes these unreasonable cost impacts are due to faulty power sector modeling that is based on poor air quality model performance that estimated a 1.2 percent contribution to only one maintenance monitor located in Baltimore County, Maryland. In addition, the proposed $1,300/ton control case would lower North Carolina's contribution to the Essex maintenance monitor by a mere 0.025 parts per billion (ppb) or 0.03% of the standard. The EPA's proposed control case only reduces our contribution to the Essex monitor by 0.025 ppb of the 0.30 ppb that the EPA calculated for the monitor to achieve attainment and increases electricity generation costs by nearly $2.5 million. In addition, the EPA's analysis grossly understates the cost of the proposed rule for North Carolina. The IPM v5.14 and v5.15 base cases retire 3,772 MWs of coal by 2017 but does not account for the cost of replacing this lost capacity. The DAQ estimated the cost of replacing 3,772 MW of coal steam units to NGCC units to range from $3 to $4 billion. This proposed rule clearly represents "over-control" of North Carolina's power sector and grossly understates the cost of the rule.

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[1] For North Carolina, the EPA's proposed control case would require an additional reduction of 1,922 tons in 2017 relative to the IPM v5.15 base case. At a cost of $1,300/ton, total costs are estimated at $2,498,600.

[2] See Attachment 1 for an explanation of how the DAQ estimated new NGCC costs.

The DAQ has also included the following attachments to our comments on the proposed CSAPR Update Rule:

- Attachment 1: Detailed Comments on 2017/2018 Power Sector Modeling for the Proposed CSAPR Update Rule.

- Attachment 2: *Revision to the North Carolina State Implementation Plan - Demonstration that North Carolina Complies with the "Good Neighbor" Requirements of Clean Air Act Section 110(a)(2)(D)(i)(I) for the 2008 Ozone National Ambient Air Quality Standard,* December 9, 2015.

- Attachment 3: Response to *Notice of Availability of the Environmental Protection Agency's Updated Ozone Transport Modeling Data for the 2008 Ozone National Ambient Air Quality Standard (NAAQS)*, October 23, 2015.

- Attachment 4: *Review of Integrated Planning Model Results Based on NEEDS v5.14*, June 9, 2015.

The comments provided in Attachment 1 regarding the power sector modeling are based on our review of new information presented in the proposed rule. Although the information in Attachments 2, 3, and 4 has previously been submitted to the EPA, we include them with our comments here to ensure that they are fully considered by the EPA during preparation of the final CSAPR Update Rule and any future transport modeling analyses.

The remainder of this letter provides specific comments on the proposed rule and summarizes our concerns related to the power sector modeling presented in Attachment 1. In addition, we have highlighted DAQ's significant concerns with how the EPA processed its 2017 air quality modeling results for the Essex monitor which had poor model performance for some of the time periods evaluated. By addressing our comments and concerns with the 2017 emissions inventory and air quality modeling issues, the DAQ believes that the revised modeling will show that North Carolina does not significantly contribute to ozone issues in any downwind state.

Comments on the Proposed CSAPR Update Rule

The EPA Must Address Controls on In-State Sources First Before Requiring Controls on Sources in Upwind States

Section 107(a) of the CAA requires states to first consider the effects of local emissions in a nonattainment area and nearby areas in state(s) closest to the nonattainment area in question before seeking emissions reductions in upwind states. In addition, EPA recognized the requirement to look locally in both its 1997 NOx SIP Call and in the Clean Air Interstate Rule (CAIR). Specifically, the DAQ emphasizes that the CAIR decision by the Court determined that ozone transport issues must first be controlled by local sources and then by upwind sources. Based on the proposed requirements for North Carolina as compared to Maryland, North Carolina's emissions reduction requirements are inappropriate and unnecessary. Furthermore, the EPA's modeling shows that Maryland has a contribution ranging from 1.8 percent to 9.5 percent of the NAAQS for 11 monitors located in four downwind states (see Table 1). We expect that if Maryland focused on controlling its own in-state emissions to address its own ozone problems as well as its contributions to violating monitors in other downwind states, it would also bring the Essex monitor into attainment with the NAAQS. Thus, it is unreasonable to expect North Carolina to impose multi-million dollar controls on its electricity generating unit (EGU) fleet before Maryland adopts and implements controls to reduce its own emissions that contribute to ozone problems not only in Maryland but also in four other states.

Table 1. Maryland Ozone Contributions to Projected Nonattainment and Maintenance Monitors

Monitor ID	State	County	2017 Projected Average Design Value for Nonattainment Monitors, ppb	2017 Projected Maximum Design Value for Maintenance Monitors, ppb	MD Contribution, ppb	MD Contribution, Percent of 75 ppm NAAQS
340150002	New Jersey	Gloucester	75.1	77.5	7.11	9.5%
421010024	Pennsylvania	Philadelphia	75.1	78.4	5.10	6.8%
360850067	New York	Richmond	76.3	77.8	2.39	3.2%
340230011	New Jersey	Middlesex	73.0	76.3	2.35	3.1%
360810124	New York	Queens	75.7	77.6	2.15	2.9%
90013007	Connecticut	Fairfield	77.1	81.4	2.07	2.8%
340290006	New Jersey	Ocean	73.9	76.6	2.01	2.7%
90019003	Connecticut	Fairfield	78.0	81.1	1.83	2.4%
90099002	Connecticut	New Haven	77.2	80.2	1.55	2.1%
361030002	New York	Suffolk	79.2	80.8	1.47	2.0%
90010017	Connecticut	Fairfield	75.8	78.4	1.34	1.8%

In addition, according to Table B-4 of the *Ozone Transport Policy Analysis Proposed Rule TSD* for the $1,300/ton control case, the EPA used an emission rate of 0.098 lb/MMBtu to calculate Maryland's allowance budget but used an emission rate of 0.078 lb/MMBtu to calculate North Carolina's allowance budget. This calls into question why the EPA is using a much higher emission rate for Maryland than for North Carolina to calculate allowances when North Carolina has such a small contribution to one monitor in Maryland. We ask the EPA to seriously evaluate its analysis and the equity issues noted here.

<u>Over-Control of North Carolina NOx Emissions</u>

On page 75737 of the *Federal Register* notice (80 FR 75706, December 3, 2015), the EPA asks for comment on the following:

"The EPA also proposes that, based on the information supporting this proposal, this level of EGU NOx control for North Carolina would not constitute over-control as to the Baltimore

County receptor. The level of the 2008 ozone standard NAAQS is 75 ppb. At the uniform $1,300 per ton cost threshold, EPA's assessment demonstrates that the receptor would just be maintaining the standard, with a maximum design value of 75.6 ppb. Therefore, the emissions reductions that would be achieved at the $1,300 per ton cost threshold would not result in air quality improvements at the Baltimore County receptor significantly better than the standard such the emission reductions might constitute over-control as to that receptor. On the contrary, the emission reductions achieved in upwind states at the $1,300 per ton cost threshold are necessary to bring the maximum design value at the Baltimore County receptor into alignment with the standard. The EPA also seeks comment on this determination."

The DAQ vehemently disagrees with the EPA's determination that emission reductions from North Carolina are necessary to bring the maximum design value at the Baltimore County receptor into alignment with the standard. The EPA's own analysis shows that North Carolina's contributions would only lead to a 0.03 percent reduction of the standard. As explained in Attachments 2 and 3, the predicted future design value for the Baltimore County monitor in 2017 is below the standard using the latest observed design values. An objective review of the recent trends in air quality data questions the EPA's determination that the subject monitor will be nonattainment in 2017. Secondly, there are many model performance issues (raised in North Carolina's submittals) that question the EPA's determination of future design values and the data used to determine North Carolina's contribution to the Essex monitor. When the EPA's model performance errors are corrected we concluded that 1) the projected maximum design value for the Essex monitor is below 76 ppb, and 2) North Carolina's contributions are at a maximum 0.45 ppb above the standard (well below the 1 percent threshold established by the EPA to show linkages).

Recognizing the fundamental weakness in the EPA' determination of linkages to North Carolina, we dispute the evidence that the EPA presents for North Carolina for each of the three control alternatives. The EPA's poor scientific analysis will result in a multi-million dollar cost to the state and will lead to a negligible reduction in North Carolina's contribution to the Essex monitor. To illustrate this point, Table 2 compares North Carolina's existing 2015 CSAPR Phase I allowance allocation budget, actual ozone season NOx emissions for 2014 and 2015, and EPA's allowance allocation for the proposed and two alternative control cases. Table 3 compares North Carolina's ozone season NOx emissions, emission reductions, and modeled ozone contributions to Essex maintenance monitor in Baltimore County, Maryland.

As shown in Table 2, North Carolina would be required to reduce its existing 2015 Phase I CSAPR budget by 41 percent in 2017. As shown in Table 3, the EPA's modeling of the proposed $1,300/ton control alternative would lower North Carolina's contribution to the Essex monitor by only 0.025 ppb (from 0.934 to 0.909 ppb). Based on these results, the proposed $1,300/ton control alternative has an insignificant impact on reducing North Carolina's ozone contribution to the Essex monitor. Furthermore, there is no difference between the $500/ton and $1,300/ton control alternatives. The EPA's modeling of the $3,400/ton control alternative would lower North Carolina's contribution to the Essex monitor by only 0.03 ppb (from 0.934 to 0.904 ppb) showing an insignificant impact on the Essex monitor as well. In addition, the EPA's air quality modeling results show that, if North Carolina is excluded from the 1,300/ton control case, the maximum design value for the Essex monitor would increase to 75.5 ppb which is below the 2008 ozone standard. Thus, the DAQ requests that the EPA remove North Carolina from the CSAPR Update Rule.

Table 2. North Carolina's Existing 2015 CSAPR Phase I Budget, Actual Emissions, and EPA Allowance Allocations for Proposed and Alternative Control Cases

				EPA Allowance Allocations for NC		
	NC 2015 Phase I CSAPR Budget	Actual 2015 EGU Ozone Season NOx Emissions (Tons)	Actual 2014 EGU Ozone Season NOx Emissions (Tons)	Proposed $1,300 / Ton Control Alternative	Less Stringent $500 / Ton EPA's Control Alternative	More Stringent $3,400 / Ton Control Alternative
Ozone Season NOx Emissions (Tons)	20,836	18,086	16,498	12,275	12,278	10,705
Reduction Relative to Proposed $1,300/Ton and $500/Ton Control Alternatives	41.1%	32.1%	25.6%			
Reduction Relative to More Stringent $3,400/Ton Control Alternative	48.6%	40.8%	35.1%			

* Includes existing and new unit allocations; value does not include the 21% variance emissions.

Table 3. North Carolina Modeled Base Case and Control Case Emissions, and Resulting Ozone Contributions to Essex Maintenance Monitor in Baltimore County, Maryland

	IPM v5.14		IPM v5.15			
	2017 Base Case	2017 Illustrative Policy Control Case	2017 Base Case	2017 $500 / Ton Control Alternative	$1,300 / Ton Proposed Control Alternative	$3,400 / Ton Control Alternative
NC Total Anthropogenic Ozone Season NOx Emissions (Tons)	98,064	91,850				
NC EGU Ozone Season NOx Emissions (Tons)*	21,929	15,716	17,307	15,385	15,389	13,784
NC EGU Ozone Season NOx Emissions - Change Relative to IPM v5.14 2017 Base Case (%)			21.1%	29.8%	29.8%	37.1%
Essex Maintenance Monitor Maximum Design Value (ppb)	76.2	75.3	76.3	76	75.4	75.4
EPA Estimate of NC Contribution to Essex Maintenance Monitor (ppb)	0.934	Not Available	0.917	0.909	0.909	0.904
NC Contribution - Change Relative to IPM v5.14 2017 Base Case (ppb)			0.017	0.025	0.025	0.03
NC Contribution Relative to 2008 Ozone NAAQS of 75 ppb (%)	1.25%		1.22%	1.21%	1.21%	1.21%

* For air quality modeling purposes, the EPA included the 21 percent variance in the ozone season NOx emissions for each of the IPM v5.15 control alternatives shown in the three columns on the right side of this table.

Over-Control of Power Sector Emissions

The EPA's use of IPM to forecast Base and Control Case emissions over a short period of time is unrealistic. The EPA uses actual 2014 heat rate data to calculate NOx emissions budgets for states. The DAQ believes that it would be much more realistic for the EPA to use actual 2014 or 2015 NOx emissions in its Base Case rather than relying on IPM which clearly forecasts significant changes in the composition of North Carolina's power sector fleet that will not happen by 2017.

For example, the IPM v5.15 $1,300/ton Control Case retires 12 of North Carolina's 29 coal steam units by 2017 accounting for 4,430 MW (about 42 percent) of NC's coal capacity (see Table 4). This retirement rate is driven by 1) the price differential between coal and natural gas assumed by the IPM v5.15 Base Case, 2) the application of the Clean Power Plan rate based case to the CSAPR Update Rule, and 3) errors in the NEEDS v5.14 and v5.15 input files for several units for which the DAQ submitted corrections to the EPA on June 9, 2014 but were not incorporated into the modeling for the proposed rule. In fact, the majority of the coal retirements (i.e., 3,772 MW) is associated with the assumptions in the IPM v5.14 and v5.15 Base Cases prior to application of selective catalytic reduction (SCR) optimization for the $1,300/ton Control Case (658 MW). Duke Energy's integrated resource plans (IRP) and current information provided by the North Carolina Utilities Commission indicate that none of the retirements predicted by IPM are expected to occur by January 1, 2017.

Table 4. Summary of Coal Steam Unit Retirements in 2017 IPM Forecast

IPM Base and Control Cases	Capacity (MW)	Actual 2015 Ozone Season NOx Emissions (tons)*
Retirements under IPM v5.14 Base Case	1,394	2,151.7
Retirements under IPM v5.15 Base Case	2,378	4,962.6
Additional Retirements under IPM v5.15 $1,300/ton Control Case	658	756.1
Total Coal Steam Generation Retirements	4,430	7,870.4
Current Total Coal Steam Generation in North Carolina	10,632	15,449
Percent Reduction due to Proposed CSAPR Update Rule	41.7%	50.9%

* Ozone season emissions are taken from EPA AMPD. Emissions for 2015 are presented here in order to capture emissions for all coal-fired EGUs including Marshall Unit 4 which did not operate in 2014 but did operate in 2015.

Due to the large number of coal unit retirements in the IPM analysis for the proposed rule, the DAQ estimated potential ozone season NOx emissions reductions on North Carolina's current fleet. The DAQ applied the EPA's proposed SCR optimization rate of 0.075 pound per million British thermal units (lb/MMBtu) to the 15 coal steam units with an existing SCR unit. An average heat rate between 2014 and 2015 was used to calculate the potential reductions.[3] No other controls were applied since 1) North Carolina is already maximizing its use of NGCC units

[3] An average of 2014 and 2015 NOx emission was used since one of North Carolina's large coal units with an SCR system (Marshall Unit 4) did not operate during the summer ozone season in 2014.

and 2) IPM v5.15 Proposed Control Case does not apply combustion controls to units in North Carolina. Optimizing SCR results in 3,835 tons of potential NOx reductions. If one assumes that the 0.075 lb/MMBtu emission rate is achievable for all coal units with SCR regardless of the load at which they operate, North Carolina's ozone season NOx emissions would be 13,542 tons rather than 12,278 tons that the EPA estimated for the $1,300 control case. North Carolina's average NOx emission rate is 0.083 lb/MMBtu under this approach.

EPA's SCR Optimization Rate is Unrealistic for Coal Steam Units Operating at Low Capacity and/or Intermediate Operations

The DAQ questions EPA's assumption of 0.075 lb/MMBtu as a technically feasible emissions rate for SCR optimization on coal units firing at low loads and cycling units supplying intermediate load. Table 5 shows the average annual capacity factors for North Carolina's coal-fired fleet equipped with SCR from 2010 through 2014. As the data indicate, the average annual capacity factor for North Carolina's coal steam units has declined from 60 percent in 2010 to about 40 percent in 2013 and 2014. At this lower load level and with more frequent swings in operating load, it may be difficult for units not equipped with an economizer bypass or reheat burners to achieve the 0.075 lb/MMBtu emission rate. For North Carolina's EGU fleet, the EPA assumes NGCC units are dispatched at a high capacity factor so coal units are assumed to operate at low capacity factors under this control scenario. The EPA needs to evaluate whether units operating at lower loads can optimize their 10+ year old SCR systems to 0.075 lb/MMBtu without the use of an economizer bypass or reheat burners. If the EPA finds this equipment or other physical or operational changes are required for SCR optimization at low operating loads, then it needs to adjust its cost estimates to account for capital costs and operating costs associated with installation and operation of this equipment, as required, and the decreased efficiency of the boiler. The EPA has not provided an adequate demonstration of the feasibility of achieving a 0.075 lb/MMBtu rate in the Technical Support Document (TSD).

Table 5. Average Annual Capacity Factors (Heat Input Base) for Coal Units with SCR

2010	2011	2012	2013	2014
60%	51%	50%	39%	40%

NGCC Re-dispatch Disincentive in Allowance Allocation Procedures

The DAQ reviewed EPA's unit allocation spreadsheet titled "Unit Level Allocations and Underlying Data for the CSAPR for the 2008 NOX NAAQS." In the methodology tab of this spreadsheet it states:

"Step 9. If a unit has an initial historic heat-input based allocation (as determined in step 6) that exceeds its maximum historic baseline emissions (as determined in step 8), then its allocation equals the maximum historic baseline emissions for that unit."

Under this proposed mechanism for distributing allowances, NGCC units are generally given allowances which equal the maximum historic baseline emissions rather than allowances which equal the historic heat-input-based allocation value. This is because the maximum historic baseline emissions are lower. However, one of the mitigation strategies of the proposed rule requires NGCC units to operate at greater capacity factors than their historical operations. Therefore, under this proposed allocation process, the NGCC units will have allowances matching their historic operations and will have to buy allowances in order meet EPA's assumed dispatch level under the rule. This is a disincentive to increasing generation at these units. If EPA wants to encourage the use of NGCC units under this rule, they should be given greater allocations than their historic emissions.

Inclusion of the Clean Power Plan (CPP) in the Baseline for Transport Modeling

In the preamble for the CSAPR Update Rule (80 FR 75754), the EPA states the following:

> *"Because the final deadline for states to submit complete plans under the CPP is September 2018 and because mandatory CPP reductions do not begin until the interim period (i.e., starting in 2022), the EPA does not anticipate significant interactions with the CPP and the near-term (i.e., starting in 2017) ozone season EGU NOx emission reduction requirements under this proposal."*

The DAQ requests that the EPA exclude the CPP from the baseline for the CSAPR Update Rule for the following reasons. First, there are a number of legal challenges to the rule. The DEQ has joined 22 other states in petitioning the District of Columbia Circuit Court of Appeals to review EPA's final Clean Power Plan. Three other states have petitioned separately. While the litigation is ongoing, the EPA should not include the CPP in its modeling of the final CSAPR Update Rule. This is in accordance with the EPA's own approach to the modeling of the previous Phase 2 CSAPR budgets which were challenged in the D.C. Circuit on July 28, 2015 and were remanded without vacatur for reconsideration for certain states. The EPA states on page 75717 of the Federal Register notice:

> *"The EPA notes that because the proposed rule modeling was performed prior to the D.C. Circuit's issuance of EME Homer City II, that modeling assumed in its baseline for all states the emission reductions associated with the CSAPR phase 2 ozone-season budgets. In the final rule modeling, the EPA will make any additional changes to the emissions inventories or modeling platform as may be justified based on comments received on the modeling performed for the proposed rule."*

In addition, the DAQ has identified significant issues associated with IPM v5.15 results. We discuss these issues in detail in our comments on the power sector modeling which can be found in Attachment 1 to this letter. Specifically, inclusion of the CPP rate-based approach in the IPM v5.15 base case results in substantial retirements of the coal steam units in North Carolina. As discussed in our comments on the EGU sector, 3,772 MW of coal are retired under the base case that includes the CPP. This level of coal retirement in less than one year is not expected and is not technically feasible.

The DAQ believes that it is extremely important that the EPA wait until states have submitted their state CPP plans so that the EPA can incorporate the state plan information into IPM to accurately model the impacts associated with the CPP. Furthermore, it is extremely important that the EPA not only get the IPM work correct for the CSAPR Update Rule but also for future ozone transport modeling analysis for the new 2015 ozone NAAQS. Too many uncertainties exist with respect to implementation of the CPP that if included in the baseline for transport modeling analysis now will exacerbate uncertainties in future transport modeling.

Comments on Air Quality Transport Analysis for 2017

Although the EPA's revised 2017 v2 modeling indicates that North Carolina has a linkage to the Essex maintenance monitor in Maryland, the DAQ's review of this modeling questions the EPA's findings due to the following factors:

1. The use of recently observed air quality trends and most recent design values show that the Essex, Maryland monitor currently is and is expected to continue to attain the 2008 ozone standard in 2017.

2. Trajectory analysis for the top 4 daily 8-hour ozone concentrations at the Essex monitor in 2010, 2011, and 2012 (ozone data that are used to compute the maximum design value) show that the trajectory for only 1 of the 12 days touched the northern portion of North Carolina, questioning whether North Carolina truly had a contribution to the observed readings. Further analysis was made for the 63 days with ozone ≥70 ppb at Essex from 2009 through 2014. Only 9 of the 63 days had trajectories that crossed into North Carolina. An analysis of the meteorological conditions on these 9 days suggest it is highly unlikely that significant amounts of ozone or ozone precursors were transported from North Carolina to the Essex monitor.

3. The model resolution of 12 kilometers (km) is unable to accurately simulate the effects of the Chesapeake Bay Breeze on modeled concentrations, which has large impacts on the modeled meteorology and air quality conditions at coastal monitors such as Essex. Poor model performance leads to greater uncertainty of future design value and contribution predictions at the Essex monitor.

4. The projected design value at the Essex monitor is inflated by water grid cells in the model. These water grid cells are shown to have much lower mixing heights compared to adjacent land cells which will inflate pollutant concentrations. Also, ozone within these water cells are at least partially the result of local emissions (i.e., shipping traffic) that cannot be controlled by North Carolina. The model is unable to accurately characterize the air quality in these water grid cells and over-predicts ozone concentrations. In addition, in its air quality modeling technical support document, the EPA acknowledges regional differences in model

performance, where the model tends to over-predict ozone concentrations from the Southeast into the Northeast.[4]

5. The EPA's Air Quality Modeling Technical Support Document (TSD) and supporting data files reported model performance results based on statistics at the single monitor grid cell where the monitor is housed. While this method may be appropriate from solely a model performance evaluation standpoint, in this case there is a disconnect between the model performance evaluation and how the significant contribution assessment is conducted. Since the Relative Reduction Factors (RRFs) are calculated using the maximum grid cell in a 3x3 array surrounding the monitor location, and in the case of the Essex monitor, the 3x3 array contains water grid cells, the grid cell with the maximum concentration is rarely the cell containing the monitor. Instead, the maximum concentration actually occurs in a water cell. In situations where the 3x3 array spans a land-water interface, alternative model performance metrics may be appropriate, such as using the maximum value from the 3x3 array to compare to the observation. Alternatively, using the maximum value from the non-water cells in the array to compare to the observation may be appropriate. The model's ability to accurately predict maximum concentrations for use in the RRF calculation is not well characterized by solely looking at the performance at the grid cell containing the monitor. Nevertheless, the model performance of the single grid cell containing the Essex monitor was poor compared to other monitors throughout the domain. The model bias was 6.79 ppb and the mean error was 10.48 ppb, among the highest for all monitors in the eastern US.

6. Due to the complexities associated with land-water interface and the over-predictions modeled for water grid cells, the EPA should determine future maximum design values using alternative approaches: (1) modified 3x3 grid cell array that eliminates grid cells over water and (2) a single cell array focused on the grid cell housing the monitor. Under both of these alternative approaches, the maximum future design values are below the 76 ppb threshold and indicate that the Essex monitor will maintain compliance with the 2008 8-hour ozone NAAQS in 2017. Both of these alternative approaches have better statistical performance than the 3x3 grid cell array used by the EPA.

7. The 2017 ozone contribution from North Carolina to the Essex monitor is 0.45 ppb after removing three days with poor model performance as directed by the EPA's photochemical modeling guidance.[5] The contribution is much more statistically robust and defensible than the 0.93 ppb calculated by the EPA which includes days with poor model performance.

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[4] Updated Air Quality Modeling Technical Support Document for the 2008 Ozone NAAQS Transport Assessment, August 2015, page A-6. http://www3.epa.gov/airtransport/pdfs/Updated_2008_Ozone_NAAQS_Transport_AQModeling_TSD.pdf.

[5] EPA, 2014: *Draft Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze*. Available from: http://www3.epa.gov/scram001/guidance/guide/Draft-O3-PM-RH-Modeling_Guidance-2014.pdf.

8. Of all the modeled ozone contributions to the Essex monitor, North Carolina had the 5th highest increase of any modeled contribution between 2018 v1 and 2017 v2, and the largest increase was due to boundary conditions. These spatial and inter-model version differences highlight volatility within the modeling platform at the Essex site.

9. The EPA defines maintenance-only sites as those that have a projected 2017 average design value <76.0 ppb, but a projected 2017 maximum design value ≥76.0 ppb. Given all of the uncertainties associated with modeling the Essex ozone maintenance site and since the 2017 projected design value of the Essex monitor is 76.2 ppb (just 0.2 ppb above the threshold), the DAQ believes that the EPA should apply a more robust acceptance test that accounts for modeling uncertainties for determining a future design value for monitors with poor model performance. Alternatively, the EPA's bright-line test of 1 percent of the NAAQS should not be applied so rigidly for a poor performing monitor to determine significant contributions. The EPA's methodology overstates the 2017 future-year design value for the Essex maintenance site particularly since the Essex monitor has demonstrated attainment with the standard based on 2012-2014 EPA-certified monitoring data and preliminary monitoring data for 2013-2015. Given the uncertainties associated with the EPA's air quality modeling methodology for the Essex, Maryland monitor and its reliance on maximum concentrations for calculating future year design values, we believe that North Carolina's contribution of 1.2 percent (i.e., 0.2 percent above the threshold) should not be used solely to link North Carolina with the Essex ozone maintenance problem.

10. No attempt was made by the EPA to adjust Canada's base year emissions to 2017. Canada will be implementing the EPA's Tier 3 vehicle emissions standards that will significantly lower Canada's onroad emissions in 2017.[6] The EPA does not provide Canada's individual contribution to the maximum design value at the Essex monitor; however, Canada's and Mexico's combined contribution is 0.68 ppb. Including emissions projections (even using simple assumptions) for Canada in the 2017 air quality modeling forecast may potentially cause the maximum design value to be less than 76 ppb. If this were the case, the Essex monitor would not be classified as exceeding the 2008 ozone standard in 2017.

11. The EPA's air quality modeling predicts that a subset of states may have significant contributions to monitors in close proximity to each other. In some situations, addressing contributions at a monitor with a higher ozone design value will remedy the ozone at a nearby monitor with a lower design value. This situation is illustrated by comparing the upwind state contributions to the Essex and Edgewood monitors in Maryland which are located 18 kilometers apart (see Table 6). It is reasonable to assume that controlling emissions from sources in the states with the highest contributions (e.g., PA, VA, OH, WV, KY and IN) at either monitor first will lower the design value for both monitors. The DAQ asks that the EPA consider applying an iterative (top-down) approach to applying emission controls based on upwind state contributions to ozone concentrations at downwind monitors. The EPA should address contributions at monitors with the highest predicted maximum design values first and then assess if the controls reduce ozone concentrations

[6] See http://cleanairasia.org/automakers-support-canadas-new-smog-emissions-standards/ or http://www.ec.gc.ca/default.asp?lang=En&n=56D4043B-1&news=03EA8555-0478-4BF9-9174-2FF4223A0787.

below 76 ppb at monitors with lower maximum design values. By using this approach the benefits associated with controlling sources in states with the highest contribution to monitors located near each other first will ensure that sources within states with lower contributions to one or more monitors will not be over controlled.

Table 6. Comparison of State Ozone Contributions (ppb) to the Essex and Edgewood Monitors in Maryland

Monitor ID (Name)	County, State	2017 Projected Average Design Value (DV)	2017 Projected Maximum Design Value (DV)	MD	PA	VA	OH	WV	KY	IN	NC	TX	MI	All Other States*
240053001 (Essex)	Baltimore, MD	73.2	76.2	23.15	4.80	4.70	2.98	2.65	1.77	1.53	0.93	0.77	0.69	6.74
State's Contribution to Projected Maximum DV (%)				30.4	6.3	6.2	3.9	3.5	2.3	2.0	1.2	1.0	0.9	8.8
240251001 (Edgewood)	Harford, MD	81.3	84.0	24.59	6.07	5.29	3.99	2.99	1.97	1.88	0.46	1.05	0.83	7.67
State's Contribution to Projected Maximum DV (%)				29.3	7.2	6.3	4.8	3.6	2.3	2.2	0.5	1.3	1.0	9.1

* Total cumulative contribution from all other states that individually have less than a 1 percent contribution to the monitor.

12. Air Quality Modeling of Control Cases: The EPA needs to conduct photochemical grid and source apportionment modeling of all control cases in order to understand the true impacts associated with reducing emissions from the affected EGUs in each state. For the proposed rule, the EPA did not conduct source apportionment modeling for any of the control cases so it is impossible to understand the potential effects of each control case on reducing contributions to monitors on a state-by-state basis. This lack of transparency could lead to possible over control for some states like North Carolina. For example, under the proposed "Illustrative Control Case," the EPA modeled emissions by applying the $1,300/ton control case to the IPM v5.14 (that did not include the effects of the Clean Power Plan) base case. Then the EPA entered the base- and control-case emissions and modeled ozone concentrations into its Air Quality Analysis Tool. It is unclear how the EPA applied adjustments in the tool to account for additional emissions reductions associated with the IPM v5.15 base case and control cases modeled incremental to the IPM v5.15 control case. In addition, it is unclear how the tool simulates the non-liner relationships between changes in emissions and observed ozone concentrations at monitors. The EPA needs to take the time to perform photochemical grid and source apportionment modeling for the proposed IPM v5.15 base case and of the all control cases and provide these results to the public for review and comment before finalizing the rule.

13. CAMx HMAX Configuration: The CAMx model contains a "super stepping" parameter (HMAX) to define the altitude below which peak winds are used in the calculation of the timestep. The model is distributed with the HMAX default set at 2,000 meters. Per comments by Alpine Geophysics, the EPA altered the CAMx code to change HMAX from the default 2,000 meters to 20 meters which may reduce the accuracy of pollution transport over the modeling domain.[7] HMAX defines the altitude below which peak winds are used in the calculation of the timestep. Using a HMAX value of 20 meters results in CAMx using winds within only the lowest vertical layer of the model to define the timestep. Since these winds are usually much weaker than winds aloft, the timestep will increase and computation time will decrease. When HMAX is set to a higher value, the peak winds over several model layers are used to calculate timestep. The EPA failed to document the change in HMAX in their technical support document.[8] The CAMx model developers set the HMAX default value to 2,000 meters as an appropriate balance between numeric accuracy and computational efficiency. The EPA did not model the impact of changing HMAX from 2,000 meters to 20 meters so the impacts on modeling performance and predicted concentrations are unknown. Modeling performed by Alpine Geophysics shows peak differences in ozone of up to 2.8 ppb. These differences call into question the predicted nonattainment/maintenance status and contributions derived from the EPA modeling. The DAQ requests that the EPA be transparent with the changes it makes to default settings in CAMx (such as the HMAX value) to enable users to peer review the impacts associated with changing default settings in CAMx. The DAQ asks that the EPA ensure that any changes it may decide to make to default CAMx settings not compromise the accuracy of model results especially those that the EPA uses to support policy decisions.

North Carolina recognizes the importance of getting the 2017 transport modeling "right" as it will form the foundation for interstate transport related rulemaking and other important actions taken in the coming years. We request the EPA to take its time to carefully and adequately address technical comments raised herein to ensure that future rulemaking is scientifically and legally defensible. We look forward to a continued dialogue with the EPA and all of our other partners as we work together to create accurate and representative emissions inventories and modeling platforms. Thank you for your consideration of these comments.

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[7] Alpine Geophysics, "Review of CAMx HMAX Configuration in Cross State Air Pollution Rule Air Quality Modeling," January 2016. http://www.midwestozonegroup.com/files/ReviewofCAMxHMAXConfigurationinCrossStateAirPollutionRuleAirQualityModeling.pdf

[8] Air Quality Modeling Technical Support Document for the 2008 Ozone NAAQS Cross - State Air Pollution Rule Proposal, November 2015. http://www.epa.gov/sites/production/files/2015-11/documents/air_quality_modeling_tsd_proposed_rule.pdf

If you should have any questions regarding this submittal, please contact Sushma Masemore of my staff at (919) 707-8700.

Sincerely,

Sheila C. Holman

Sheila C. Holman, Director
Division of Air Quality, NCDEQ

SCH/rps

Attachments

cc: Michael Abraczinskas, NCDAQ
Sushma Masemore, NCDAQ
Randy Strait, NCDAQ
Scott R. Davis, USEPA
Lynorae Benjamin, USEPA
William Barnette, Forsyth County Office of Environmental Assistance and Protection
Leslie Rhodes, Mecklenburg County Air Quality
David Brigman, Western Regional Air Quality Agency