Appendix F-4e

NC's Comments on New Hampshire's Draft 2021 RH SIP

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ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
MICHAEL ABRACZINSKAS
Director

NORTH CAROLINA
Environmental Quality

February 23, 2022

Ms. Lisa Camire
SIP Planning Analyst
Air Resources Division
New Hampshire Department of Environmental Services
29 Hazen Drive, P.O. Box 95
Concord, NH 03302-0095

Subject: New Hampshire Regional Haze Plan, Periodic Comprehensive Revision, DRAFT 12/05/2021

Dear Ms. Camire:

The North Carolina (NC) Division of Air Quality (DAQ) appreciates the opportunity to review of the *New Hampshire Regional Haze Plan, Periodic Comprehensive Revision, DRAFT 12/05/2021* which describes New Hampshire's long-term plan for addressing visibility-impairing pollution at the Great Gulf and the Presidential Range-Dry River (GGPRDR) Wilderness Areas for the second planning period (2019-2028). In Appendix W of the draft 2021 SIP, New Hampshire provides responses to my December 20, 2019, comments on the initial proposal of the *New Hampshire Regional Haze Plan, Periodic Comprehensive Revision, DRAFT 10-31-2019.* The DAQ appreciates the opportunity to review the responses and offers the following additional comments on the draft 2021 SIP before New Hampshire submits its final SIP to the U.S. Environmental Protection Agency (EPA).

I. Response to Mid-Atlantic/Northeast Visibility Union (MANE-VU) Inter-Regional Planning Organization (RPO) Ask

MANE-VU has acknowledged that North Carolina's regional haze SIP includes measures that address "emission management" strategies #1, #4, and #5 in its Inter-RPO Ask. In addition, as noted in New Hampshire's response to comments in its draft 2021 SIP, and in MANE-VU's comment letter on North Carolina's draft SIP, it is acknowledged that "emission management" strategy #2 does not apply to North Carolina.[1]

The remaining "emission management" strategy #3 concerns the adoption of an ultra-low sulfur fuel (ULSF) oil standard like the one adopted by MANE-VU states. Attachment 1 to this letter provides an evaluation of recent historical residual and distillate oil sales in the North Carolina. The data show that high sulfur fuel oil sales are (1) much lower in North Carolina relative to the MANE-VU states, and (2) steadily being replaced by ULSF sales in the absence of a state rule. From this information, the DAQ concludes that adopting an ULSF standard would yield very little reduction in sulfur dioxide (SO_2) emissions or any noticeable improvement in visibility in Class I areas in North Carolina and in downwind states. This is not a reasonable measure for North Carolina to adopt to improve visibility in Class I areas,

[1] Letter from Sharon Davis, New Jersey Department of Environmental Protection, David Healy, New Hampshire Department of Environmental Services, and Co-Chairs, MANE-VU Technical Support Committee, to Randy Strait, North Carolina DAQ providing comments on the "Pre-hearing draft of the Regional Haze State Implementation Plan (SIP) for North Carolina Class I Areas for the Second Planning Period (2019 – 2028)," October 12, 2021.

and I request that New Hampshire exclude this strategy for North Carolina from its modeling of any reasonable progress goals (RPGs) for the GGPRDR Wilderness Areas.

II. North Carolina Contribution to Visibility Impairment at the GGPRDR Wilderness Areas

In my December 20, 2019, comments on New Hampshire's draft 2019 SIP, I provided preliminary results showing North Carolina's statewide emissions contribution to visibility impairment at the GGPRDR Wilderness Areas is small by any metric or comparison. Subsequently, the visibility planning organization in which North Carolina participates, the Visibility Improvement - State and Tribal Association of the Southeast (VISTAS), finalized the analysis of visibility impacts for mandatory federal Class I areas in the VISTAS modeling domain.[2] Table 1 summarizes the final Particulate Source Apportionment Technology (PSAT) modeling results for North Carolina.[3] North Carolina's total sulfate plus nitrate contribution to total sulfate plus nitrate visibility impairment in 2028 for the GGPRDR Wilderness Areas is about 0.046 Mm^{-1} (0.31%) for the 20% most impaired days and 0.004 Mm^{-1} (0.11%) for the 20% clearest days. Thus, consistent with the draft results provided in my previous comments, these contributions illustrate that it is highly unlikely that North Carolina contributes ≥2% of the visibility impairment at the GGPRDR Wilderness Areas which MANE-VU used as the only criterion for including North Carolina in the Inter-RPO Ask. Attachment 2 provides the final PSAT modeling results associated with anthropogenic and natural sources contributions from each of the VISTAS' states, other RPOs, and boundary conditions to the GGPRDR Wilderness Areas.

Table 1. North Carolina Sulfate and Nitrate Statewide Contribution from All Sources in 2028 to GGPRDR Wilderness Areas for 20% Most Impaired Days (Mm^{-1})

	Total Impairment	Total Sulfate	Total Nitrate	Total Sulfate + Nitrate	Percentage of Total
20% Most Impaired Days					
Total for GGPRDR Wilderness Areas*	35.557	13.132	1.695	14.826	
North Carolina - Final	Not available	0.043	0.003	0.046	0.31%
20% Clearest Days					
Total for GGPRDR Wilderness Areas *	17.172	3.156	0.482	3.638	
North Carolina - Final	Not available	0.003	0.001	0.004	0.11%

* Total impairment represents the contribution from all pollutants and all emissions sources within the VISTAS modeling domain plus boundary contributions. The total sulfate and nitrate contribution is associated with all SO_2 and nitrogen oxide (NO_x) emissions sources within the VISTAS modeling domain plus boundary contributions.

[2] The VISTAS 12 Kilometer (Km) modeling domain is a subset of the Continental United States (CONUS) 12 Km domain. See Section 4.0 in the document titled, Regional Haze Modeling for Southeastern VISTAS II Regional Haze Analysis Project Final Modeling Protocol Update and Addendum to the Approved Modeling Protocol for Task 6.1 (June 2018), Final - August 31, 2020, available at https://www.metro4-sesarm.org/sites/default/files/VISTAS_Modeling_Protocol_Final_180627_addendum_20200831.pdf.

[3] Sulfate and nitrate were evaluated because these two pollutants currently account for most of the visibility impairment associated with anthropogenic sources in the VISTAS and MANE-VU regions.

In addition, I provide the following information to clarify key points regarding the use of 2028 emissions and 2011 meteorology for the VISTAS modeling analysis.

A. Use of 2028 Emissions Projections

In Appendix W of the draft 2021 SIP, New Hampshire provided the following response to a comment from Virginia (a VISTAS state) requesting that 2028 be the basis for contribution threshold analyses:

> *MANE-VU states discussed using 2028 as well as other years. It was decided that it made more sense for MANE-VU to use reported emissions from a recent year rather than to assume that emissions projected more than ten years into the future (at the time of the decision) would be accurate. Much of the emission reduction during recent years took place because of economic factors that are not locked in for 2028. Thus including these reductions in the starting point distorts results if the economics change prior to 2028. MANE-VU understands that facility fuel switches and shutdowns have, and will, occur since the MANE-VU analysis 2015 base year and prefer that this information be applied towards meeting the MANE-VU Ask.*

VISTAS used the Comprehensive Air Quality Model with Extensions (CAMx) and PSAT to model the most recent emissions inventory for 2011 and 2028 available at the beginning of the VISTAS regional haze work in late 2017. The analysis calculates 2028 impacts as recommended on page 17 of EPA's August 20, 2019 guidance memorandum which states:[4]

> *All of the techniques described above require estimates of source emissions. Generally, we recommend that states use estimates of 2028 emissions (resolved by day and hour, as appropriate) to estimate visibility impacts (or related surrogates) when selecting sources, rather than values of recent year emissions.*

The DAQ disagrees with New Hampshire's assessment that much of the emission reductions between 2011 and 2028 are due to "economic factors that are not locked in for 2028" and may "distort results if the economics change prior to 2028." Sulfates from SO_2 emissions and nitrates from nitrogen oxides (NO_x) emissions are the most impactful visibility impairing pollutants followed by organic matter from volatile organic compounds. Emissions of SO_2 and NO_x are decreasing in part due to the closure of coal-fired electricity generating units (EGU) in North Carolina and other states. These closures are not temporary, and the resulting emission reductions do not distort the 2028 emission estimates. All evidence, from data reported to the National Emissions Inventory to the Clean Air Markets Division, show that emissions of SO_2 and NO_x in North Carolina are decreasing. For North Carolina, SO_2 and NO_x emission reductions from coal-fired EGUs have been driven initially by the emissions caps required by the State's Clean Smokestacks Act and subsequently permanent replacement of coal units with natural gas units and renewable resources. Further, restarting or rebuilding coal-fired facilities in North Carolina would trigger prescriptive New Source Review permitting requirements that would undoubtedly require state-of-the-art controls for SO_2 and NO_x emissions. Emissions of NO_x are also decreasing due to stringent control programs applicable to nonroad and on-road engines. These control programs are not economic factors but rather federal and state requirements.

In addition, North Carolina (as well as the other VISTAS states) included only emission reductions in its 2028 emission estimates that are based on on-the-books or on-the-way controls and emission reductions

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[4] U.S. EPA, "Guidance on Regional Haze State Implementation Plans for the Second Implementation Period," EPA-457/B-19-003, August 20, 2019, page 17, accessed from https://www.epa.gov/visibility/guidance-regional-haze-state-implementation-plans-second-implementation-period.

that can be supported by existing documentation, permits, laws, and regulations.[5] For North Carolina, the DAQ also applied growth factors to 2016 base year emissions for point sources to account for economic growth.[6] The 2028 projected emissions do not include speculative reductions such as unsubstantiated EGU shutdowns predicted by the Integrated Planning Model (IPM) or emission reductions from control programs listed in the MANE-VU Ask. This approach is consistent with the EPA's guidance for preparing emissions inventories to support regional haze modeling.[7,8] Therefore, it is completely reasonable for North Carolina to base its analysis on 2028 emissions that align with establishment of RPGs for 2028 and to incorporate permanent emission reductions that have occurred since 2015 (i.e., the year used by MANE-VU for its screening analysis).

B. Impact of Meteorology on 2028 RPGs

In its response to state comments on its draft 2019 SIP, New Hampshire noted a concern with the VISTAS modeling in that it relied on only one year (2011) of meteorology to support analysis of contribution assessments and modeling of RPGs for 2028. Base-year and future-year photochemical grid modeling (e.g., CAMx) only relies on one year of meteorological data to properly prepare the relative response factors for the base year and future year. It is inappropriate to model multiple base years of meteorology into multiple future years with the same future year's projected emissions. The EPA's 2018 modeling guidance specifically calls for -- and considers sufficient -- one year of meteorological data to be used in performing base and future-year photochemical grid modeling for regional haze planning purposes.[9] Further, when using the relative response approach as detailed in the 2018 modeling guidance,[10] the relative response factors that are computed from the modeled base and future years are applied to a five-year average of Interagency Monitoring of Protected Visual Environments (IMPROVE) monitor data for each visibility-impairing pollutant to compute what that future five-year average for the given pollutant may be.

In addition, for the 20% most impaired days, Table 2 compares the 2028 uniform rate of progress (URP) for the GGPRDR Wilderness Areas to the regional haze photochemical grid modeling results from VISTAS and MANE-VU (each using a 2011 base year and meteorology) and EPA and LADCO (each using a 2016 base year and meteorology). The four modeling studies predict impacts below the URP for the GGPRDR Wilderness Areas in 2028. VISTAS modeling shows an impact that is 0.17 deciview (dv) above the MANE-VU RPG estimate when using 2011 meteorology. When compared to the LADCO and EPA modeling using 2016 meteorology, the VISTAS modeling was 0.62 dv less and 0.13 dv higher than the LADCO and EPA RPGs, respectively. The modeling results are reasonably close given the different modeling platforms and year of meteorology data used in these studies. These results suggest that EPA's methodology to account for multiple years of monitoring data in developing the relative response factors used to calculate the 2028 RPGs mitigates the limitations of using a single year of meteorology.

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[5] Documentation of the 2028 emissions inventory (Task 2) and processing of the emissions for input to CAMx and PSAT modeling (Task 3) is provided on the VISTAS website at https://www.metro4-sesarm.org/content/vistas-regional-haze-program.

[6] Documentation of North Carolina's methods for projecting point source emissions from 2016 to 2028 is provided in Appendix B3 of the North Carolina reginal haze SIP.

[7] See reference 4.

[8] U.S. EPA, "Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations," EPA-454/B-17-002, May 2017, https://www.epa.gov/sites/production/files/2017-07/documents/ei_guidance_may_2017_final_rev.pdf.

[9] U.S. EPA, "Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM2.5 and Regional Haze," EPA 454/R-18-009, November 2018, https://www.epa.gov/sites/default/files/2020-10/documents/o3-pm-rh-modeling_guidance-2018.pdf. See page 20: "Choose time periods that reflect the variety of meteorological conditions that represent visibility impairment on the 20% clearest and 20% most impaired days in the Class I areas being modeled (high and low concentrations necessary). This is best accomplished by modeling a full year."

[10] See reference 9, see Section 5.3.

Table 2. Comparison of URP and Photochemical Grid Modeling of Visibility Impairment for the GGPRDR Wilderness Areas in 2028 for 20% Most Impaired Days

Conditions	Deciviews
Unadjusted Uniform Rate of Progress for 2028[11]	17.04
Modeled RPGs for 2028	
MANE-VU/OTC – CMAQ/2011 Meteorological Data[12]	12.13
VISTAS – CAMx/2011 Meteorological Data	12.30
EPA – CAMx/2016 Meteorological Data[13]	12.17
LADCO – CAMx/2016 Meteorological Data[14]	12.92

III. Conclusions

Based on the information provided in this and my previous 2019 letter, North Carolina has fulfilled its obligations under the MANE-VU Ask. Going forward, I would appreciate the opportunity for North Carolina and other VISTAS states to share methodologies and data during development of future regional haze SIPs with a goal to be as consistent as possible before MANE-VU states prepare an Ask of upwind states. Doing so will avoid inconsistencies between methodologies and data sets, ensure that the best data are used to support modeling and decision making, and enable states to focus on sectors and emission sources for further analysis that will benefit improvements in visibility in all Class I areas in North Carolina and MANE-VU Class I areas.

Thank you for the opportunity to comment on New Hampshire's draft regional haze SIP. I hope that these comments are helpful, and I look forward to continuing to work with you and the MANE-VU states to develop reasonable regional haze SIPs in the future. Please contact Randy Strait (randy.strait@ncdenr.gov) of my staff at 919-707-8721 if you have any questions regarding this matter.

Sincerely,

Michael A. Abraczinskas, Director
Division of Air Quality, NCDEQ

MAA/rps

Attachments

cc: Michael Pjetraj, NCDAQ
Tammy Manning, NCDAQ
Randy Strait, NCDAQ

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[11] From Table 1-2 of New Hampshire's Regional Haze Plan, Periodic Comprehensive Revision, DRAFT 12/05/2021 (file named "r-ard-21-02_SIP.pdf").
[12] Modeled without the MANE-VU Ask measures, see Table 4-6 of New Hampshire's Regional Haze Plan, Periodic Comprehensive Revision, DRAFT 12/05/2021 (file named "r-ard-21-02_SIP.pdf").
[13] U.S. EPA, from Table 3-2 in "Technical Support Document for EPA's Updated 2028 Regional Haze Modeling," Office of Air Quality Planning and Standards, September 2019, https://www.epa.gov/visibility/technical-support-document-epas-updated-2028-regional-haze-modeling.
[14] https://www.ladco.org/wp-content/uploads/Projects/Regional-Haze/Round2/LADCO_RegionalHaze_2016_28abc_PSAT_Charts_05June2021.xlsx

Attachment 1

Evaluation of MANE-VU Inter-RPO Ask Emission Management Strategy #3 (Ultra-low Sulfur Fuel Oil Standard) for North Carolina

For emission management strategy #3, the Inter-RPO Ask states that:

> *"States should pursue an ultra-low sulfur fuel oil standard similar to the one adopted by MANE-VU states in 2007 as expeditiously as possible and before 2028, depending on supply availability, where the standards are as follows:*
> *a. distillate oil to 0.0015% sulfur by weight (15 ppm),*
> *b. #4 residual oil to 0.5% sulfur by weight,*
> *c. #6 residual oil to 0.5% sulfur by weight."*

The DAQ has reviewed this request and evaluated residual and distillate oil use in the state. Based on this evaluation, North Carolina concludes that adopting an ULSF standard would yield very little reduction in SO_2 emissions or any noticeable improvement in visibility in Class I areas in North Carolina and in downwind states for the following reasons:

- Residual oil sales in North Carolina for 2019 were very low in comparison to distillate oil. The only uses for this fuel are industrial and large marine vessel bunkering. From 2005 through 2019, overall residual oil usage has been in sharp decline, particularly in the industrial sector where usage has dropped 98%.[15] Residual oil usage in North Carolina is less than 2% of that of the MANE-VU region.[16]
- Distillate oil sales in North Carolina have been relatively steady from 2014-2019, and ULSF for highway and off-highway use make up a large majority of the distillate oil used in North Carolina.[17] When considering distillate oil usage aside from highway and off-highway transportation (which is already using ULSF), North Carolina uses roughly 5% of the amount used by the MANE-VU region and less than 4% of all non-transportation distillate oil on the East Coast.[18]
- Residential heating oil use in North Carolina has never been considerable, and it has continued to decline over time.[19] Less than 3% of homes in North Carolina are heated with oil, as of 2019.[20] The U.S. Energy Information Administration (EIA) data for 2019 states that 86% of residential heating oil in the United States is consumed by states within the MANE-VU RPO.[21]

As such, it is completely reasonable to include a requirement in the Intra-RPO Ask for the MANE-VU states to restrict the sulfur content in fuel oil sales. However, to extend this requirement to an Inter-RPO Ask of North Carolina where the use of residual and distillate oil is significantly lower relative to the use of these fuels in the MANE-VU states is not reasonable. In addition, as shown in Table A-1, ULSF already makes up 95-98% of the distillate oil supplied to the east coast in 2018 and 2019, the latest year for which data are available. This percentage has been above 85% since 2015 and is trending toward 100%.[22] Based on this information and the continued trend toward the use of ULSF, the DAQ concludes that adopting an ULSF standard for North Carolina will not provide any additional SO_2 emission reductions above and beyond what would occur in the absence of a standard.

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[15] https://www.eia.gov/dnav/pet/pet_cons_821rsda_dcu_SNC_a.htm
[16] https://www.eia.gov/dnav/pet/pet_cons_821rsda_a_EPPR_VAA_Mgal_a.htm
[17] https://www.eia.gov/dnav/pet/pet_cons_821dst_dcu_SNC_a.htm
[18] https://www.eia.gov/dnav/pet/pet_cons_821dsta_a_EPD0_VAA_Mgal_a.htm
[19] https://www.eia.gov/dnav/pet/pet_cons_821use_dcu_SNC_a.htm
[20] https://www.eia.gov/state/print.php?sid=NC
[21] https://www.eia.gov/energyexplained/heating-oil/use-of-heating-oil.php
[22] https://www.eia.gov/dnav/pet/pet_cons_psup_dc_r10_mbbl_a.htm

Table A-1. Distillate Fuel Oil Supplied to East Coast by Sulfur Content, Past 10 Years

Year	Total Distillate Fuel Oil Thousand Barrels	0 to 15 ppm Sulfur Thousand Barrels (% of Total)	15 to 500 ppm Sulfur Thousand Barrels* (% of Total)	Greater Than 500 ppm Sulfur Thousand Barrels (% of Total)
2011	421,189	310,672 (73.8%)	-1,480 (-0.4%)	111,997 (26.6%)
2012	396,682	309,666 (78.1%)	-2,348 (-0.6%)	89,364 (22.5%)
2013	430,636	342,427 (79.5%)	-2,064 (-0.5%)	90,273 (21.0%)
2014	453,617	380,239 (83.8%)	1,820 (0.4%)	71,558 (15.8%)
2015	452,928	395,670 (87.4%)	3,467 (0.8%)	53,792 (11.9%)
2016	430,349	378,159 (87.9%)	3,194 (0.7%)	48,996 (11.4%)
2017	435,768	382,973 (87.9%)	2,645 (0.6%)	50,150 (11.5%)
2018	461,109	426,126 (92.4%)	7,353 (1.6%)	27,630 (6.0%)
2019	452,565	431,424 (95.3%)	1,660 (0.4%)	19,481 (4.3%)
2020	425,050	415,098 (97.7%)	450 (0.1%)	9,502 (2.2%)

* Amounts shown are net volumes supplied to the region. Negative values represent years when various factors, including exports, have resulted in net negative volumes supplied.

Attachment 2

2028 Contribution to Light Extinction of All Anthropogenic and Natural Sources to GGPRDR Wilderness Areas, NH from Sulfate + Nitrate (Mm-1) from Final VISTAS Regional Haze Modeling Analysis