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Re: Significant Flaws in VISTAS Regional Haze CAMx Modeling and Methods;
Recommendations to Develop Compliant State Implementation Plans

Dear Chief Gore, Director Koerner, Chief Hays, Director Duff, Chief Fortenberry,
Director Abraczinskas, Chief Thompson, Director Walker Owenby, Director Dowd,
Director Crowder, and Director Rivera;

We write today to express our serious concerns with the path Southeastern states are following for the respective regional haze State Implementation Plan (SIP) planning processes. The Regional Haze Rule is the Clean Air Act's time-tested, effective program that requires federal and state agencies to evaluate measures to restore clear skies at Class I Areas around the country. In order to meet this requirement, state SIPs are due to the Environmental Protection Agency (EPA) in 2021 specifying the pollution reducing measures they will require to make progress towards natural visibility. We commissioned an expert modeler to better understand the VISTAS approach and found critical problems with the VISTAS model itself as well as the approach recommended to Southeastern states. Based on the assessment of the independent expert, separate NPCA analysis and information provided by states and federal land managers, we believe Southeastern states intend to exclude a number of sources that emit a significant level of visibility impairing pollution from review for pollution controls in their second-round regional haze plans.

We recognize the significant amount of work that all VISTAS states have put forth into the combined effort to share resources in planning for Regional Haze compliance and offer our concerns and input in the spirit of a shared goal toward protection of our nation's most treasured wild landscapes – our national parks and wilderness areas. Clean air in these places means that their unique and delicate ecosystems will continue to thrive, inspire and support all of us and the economies that depend on them, whether through recreation and adventure or retreat and introspection. Delivering clean air to these places can also mean achieving goals toward protecting our most vulnerable populations and efficiently achieving other regulatory challenges.

Introduction

The Visibility Improvement State and Tribal Association of the Southeast (VISTAS)¹ conducted an extensive visibility modeling effort (VISTAS II Comprehensive Air Quality Model with Extensions (CAMx) modeling),^{2, 3} which was intended to assist each of your states in the development of the second-round regional haze SIPs. The specific goal of the modeling effort was to identify pollution sources negatively affecting Class I Area air quality, thus meriting evaluation through the Clean Air Act's (CAA) four-factor reasonable progress analysis to reduce visibility impairing pollution in the 18 national parks and wilderness areas located within the VISTAS region.

Figure I. Class I Areas Within the VISTAS Region.



The National Park Conservation Association (NPCA) commissioned an independent modeling expert, Howard Gebhart, to conduct a technical review of the VISTAS II CAMx modeling effort.⁴ NPCA's review reveals that the VISTAS modeling

¹ VISTAS is comprised of the following states, local air agency and Tribes: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia, the Eastern Band of Cherokee Indians, and Knox County, Tennessee.

² VISTAS Regional Haze Program, *see generally*,

<https://www.metro4-sesarm.org/content/vistas-regional-haze-program>; VISTAS Regional Haze Project, Regional Haze Modeling: Task 6, "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),

<https://www.metro4-sesarm.org/content/task-6-air-quality-modeling>; *see also*, VISTAS Regional Haze Project Update (May 20, 2020), <https://www.metro4-sesarm.org/content/vistas-haze-presentations>.

³ Commenters note that EPA's approval of regional haze modeling and SIP plans can only come after public notice and comment through the federal register process.

⁴ See enclosed report, "Technical Review of VISTAS Visibility Modeling for the Second Round of Regional Haze State Implementation Plans," (May 2021) ("Gebhart Report"), prepared by Mr. Howard Gebhart. Mr. Gebhart's Curriculum Vitae is enclosed.

effort suffers from numerous flaws and, should Southeastern states follow its parameters, will likely result in SIPs that will not be compliant with the Regional Haze Rule and Clean Air Act. If the Southeastern states are to only rely on the VISTAS II CAMx methodology, states will be ignoring the hundreds of industrial facilities and coal-fired power plants that are significant pollution sources identified by the National Park Service (NPS) and NPCA. Cognizant of the 2021 deadline for the states to submit the second round regional haze SIP to EPA, this letter concludes with a list of recommendations to resolve these flaws and asks Southeastern states to consider environmental justice intersections in their planning process.

1. Summary of VISTAS Flawed Modeling Input and Methodology Used to Identify Sources

NPCA’s commissioned independent review reveals that the VISTAS modeling effort suffers from four serious flaws summarized in Table I and further discussed below.

Table 1. Summary of VISTAS II CAMx Modeling Flaws and Consequences.

	Flawed Modeling Inputs and Methods	Consequences of Reliance on VISTAS Inputs By States in Preparing SIPs
1	Inaccurately reflects sulfate concentrations in the Southeast U.S.	Would excuse heavy sulfur dioxide (SO ₂) polluters from review.
2	Used Electric Generating Unit (EGU) emission profiles from 2011 to project the EGUs emissions in 2028, inaccurately assuming that EGUs will operate in 2028 as they did in 2011.	Would fail to identify EGUs that must be analyzed for emission reductions because the model results do not accurately reflect the actual/most recent EGUs’ contributions to visibility impairment.
3	Used outdated monitoring data that does not represent the dramatic shift in nitrate contribution to visibility impairment in the Southeast over the last 5-10 years. This shift was not reflected in future predictions.	Would erroneously exclude problematic sources from review and avoid emission controls for large NO _x emitting sources because the modeling inputs failed to properly identify EGUs and other point sources with large NO _x emissions as contributing to CIA visibility impairment.
4	Used high thresholds and unnecessary filters to select sources to analyze for emission reducing measures.	Would result in an unreasonably low number of industrial sources selected by each state for an emission control reasonable progress four-factor analysis.

2. VISTAS' High Threshold and Additional Methodology Excluded Polluting Facilities that Should be Addressed and Considered for Emission Reducing SIP Measures

By relying on the flawed VISTAS modeling to select which polluting sources to review for emission reductions, the Southeastern states plan to ignore hundreds of significant emission sources. According to NPCA's analysis, the Southeastern states SIPs would

- Ignore 309 sources from consideration in their haze plans;
- Allow 343,426 tons of NO_x and 183,458 tons of SO₂ emissions to continue dirtying the air in our national parks and wilderness areas and communities;⁵ and
- Ignore the fact that 60 of these sources are located in environmental justice communities of color and 89% of the 309 facilities are in communities living below the poverty line.⁶

Table 2. Comparison of the Number of Sources Selected by NPCA, NPS, and VISTAS in the Southeast Region for Reasonable Progress Four-Factor Analysis

<i>Number of Sources Identified By</i>					
State	NPCA ⁷	NPS	VISTAS ⁸	State	Source Categories Identified by NPCA
AL	45	34	1	Not available (NA) ⁹	Power Plants, Paper, Oil and Gas, Chemical, Iron and Steel

⁵ Emissions data was obtained from EPA's 2017 National Emissions Inventory (NEI) and EPA's 2019 Air Markets Data Program (AMPD) for power plants.

⁶ Demographic and economic characteristics obtained from the US Census Bureau's American Community Survey 5-year estimates for 2012-2016 at the county level.

⁷ NPCA's analysis and a list of sources for each of the VISTAS' states was sent to each state in the fall of 2020 via letters; see *also*, <https://www.npca.org/regionalhaze>. NPCA's nationwide analysis included the sources on the tribal reservations, however, there are no sources located on the Eastern Band of Cherokee Indians Reservation.

⁸ VISTAS Regional Haze Project Update, Stakeholder Briefing at 122 (May 20, 2020), <https://www.metro4-sesarm.org/sites/default/files/VISTAS%20Pres%20Stakeholders%20Final%200520.pdf>.

⁹ Alabama, and the other states similarly identified, have not made the source selection information available to the public.

FL	70	27	10	4	Cement, Paper, Fertilizer, Power Plants, Airports, Cane Sugar, Oil and Gas, Chemical
GA	34	31	3	NA	Power Plants, Paper, Cement, Oil and Gas, Airports, Glass
KY	29	34	2	NA	Power Plants, Lime, Cement, Oil and Gas, Iron and Steel
MS	16	8	0	NA	Power Plants, Oil and Gas, Paper, Iron and Steel, Airports
NC	25	20	3	3	Power Plants, Paper, Iron and Steel, Airports, Glass
SC	19	19	5	NA	Power Plants, Paper, Cement, Iron and Steel, Airports, Glass
TN	23	27	2	2	Power Plants, Paper, Cement, Iron and Steel, Oil and Gas, Airports, Glass
VA	30	35	2	2	Power Plants, Paper, Chemical, Cement, Oil and Gas, Lime, Airports.
WV	17	21	5	NA	Power Plants, Cement, Iron and Steel, Oil and Gas, Coal Mining, Paper
TOTAL	342	256	33	NR¹⁰	

3. Detailed Discussion of the Flaws in VISTAS' Modeling Inputs and Methodology

NPCA's independent analysis found that the VISTAS modeling inputs and methodology resulted in four serious issues, which are further explained below.

- i. VISTAS' modeling results do not accurately reflect sulfate concentrations and would excuse heavy SO₂ polluters from review.*

NPCA's expert found that the modeling inputs used by VISTAS from its 2011 baseline are outdated and do not account for the actual amount of sulfate that is polluting the Class I Areas in the Southeast. Specifically, the model is underpredicting sulfate concentrations by up to 32%.¹¹ The VISTAS II modeling results did not address

¹⁰ This number is not relevant as less than half of the states have shared the source selections with the public.

¹¹ VISTAS failed to address and account for the large and significant sulfate and organic carbon underpredictions revealed in the Model Performance Evaluation (MPE) from the 2011 baseline CAMx modeling effort.

the known bias in sulfate underpredictions, which also affects other areas of the modeling analysis.

The sulfate error underpredictions were larger in the summer. This is inconsistent with what is known about sulfate extinction because during the summer it is the greatest contributor to visibility impairment. This underprediction is crucial because the model results are not accurately predicting the sulfate levels during the period when visibility is most problematic in the Class I Areas. This modeling error results in the exclusion of sources for SO₂ emission reduction evaluations. Unless the large sulfate underprediction is corrected, the VISTAS modeling results are not reliable and Southeastern states should not use the model results without otherwise accurately accounting for the known sulfate bias. Furthermore, the Regional Haze Rule requires that states use the most up-to-date pollution data available in their consideration of source selection. Therefore, VISTAS states ought to have considered 2014-2018 or 2015-2019 available data.

- ii. *Southeastern states modeling inputs used unreasonable emissions projections for 2028 emissions from the EGUs, which produced model results that do not accurately reflect the EGUs' contributions to visibility impairment, resulting in exclusion of EGUs that must be analyzed for emission reductions.*

In order to estimate the expected emissions from EGUs in 2028, which is the end of the second regional haze planning period, VISTAS incorrectly projected the hourly, daily, and seasonal emissions using emission data profiles developed and used in 2011. VISTAS inaccurately assumed that EGUs will operate in 2028 as they did in 2011. Given the shifts in the electric utility industry over the last decade, many EGUs are being used to balance peak loads as opposed to meeting the normal baseline electric load on the grid as they were in years past. By projecting that 2011 emissions from EGUs would hold steady in 2028, the VISTAS emission projections failed to account for the dramatic shift in EGUs generation.¹²

Due to the erroneous emission projections from EGUs, the VISTAS modeling results did not accurately reflect the sources' contributions to Class I Area visibility impairment. The NPCA analysis identified 56 EGUs potentially affecting visibility in the southeast region, out of which 51 are coal-fired. In contrast, VISTAS identified only 14 EGUs. Therefore, VISTAS failed to select the appropriate number of EGU sources from this sector - outright ignoring 37 EGUs Southeastern states should consider. While many EGUs may be retired or operate at less capacity in the coming years, retirements and reduced capacity may only be relied upon if there are enforceable obligations in the state's haze SIP to ensure pollution reductions. Failing that, source reductions should not be counted in the 2028 projection nor should the source be excluded from a four-factor analysis. Because of the erroneous data input and lack of practically

¹² There are other emission issues with the less frequent use of the power plants (e.g., less efficiency, more pollution on startups and poorer operation of pollution control devices).

enforceable SIP emission limits, the states must not rely on the VISTAS approach for analyzing EGUs.

- iii. *Southeastern states use outdated monitoring data that does not represent the dramatic shift in nitrate contribution to visibility impairment, which erroneously excluded from review the sources emitting nitrogen oxides (NO_x).*

The VISTAS modeling used monitoring data from the 2009-2013 period for analyzing visibility impacts in Class I Areas.¹³ This approach is flawed because the nitrate *contribution to visibility impairment* have shifted dramatically since the 2009-2013 period in the southeast Class I Areas. According to recent observations (2014-2018), the nitrate contribution to visibility impairment in the Southeastern region has doubled and, in some areas, tripled as compared to the 2009-2013 period that VISTAS used. Since the future emissions modeled by VISTAS were based on a period when the nitrate *contribution to visibility impairment* were lower, the significant shift of nitrate was not accurately reflected in the future emission projections. The states must not use the VISTAS modeling results, which used outdated and erroneous nitrate *contribution to visibility impairment* not representative of current levels, which would exclude from review sources emitting NO_x, particularly coal-fired EGUs and point sources with large NO_x emissions. Following such an approach in the SIP would allow these significant pollutants to increase nitrates harming Class I Areas.

- iv. *The VISTAS modeling methodology approach used high thresholds and additional unnecessary filters that resulted in an unreasonably low number of sources chosen for consideration of the four-factor reasonable progress analyses. The VISTAS analysis failed to consider all visibility impairing pollutants and failed to consider them together.*

VISTAS' approach to select sources used two steps. First, VISTAS used a screening analysis (Area of Influence, AOI) to identify potential sources of visibility impairment impacting Class I Areas. Second, the sources identified using the AOI analysis were further screened and winnowed by the Particulate Matter Source Apportionment Technology (PSAT), which introduced additional errors.¹⁴ Both screening methods use arbitrary and high thresholds that substantially restrict the number of sources analyzed. Instead of assessing a number closer to the 342 sources of concern identified by NPCA or the 256 sources identified by the National Park Service (NPS), VISTAS identified only 33 sources across all ten states. The use of the high and

¹³ VISTAS erroneously used the 20% most-impaired days from 2009-2013 Interagency Monitoring of Protected Visual Environments (IMPROVE) measurement data for the 2028 model projection.

¹⁴ VISTAS flawed PSAT "tagged" modeling approach contained the following errors: (1) relied on an outdated and inaccurate emission inventory; (2) provided incomplete information on source-specific contributions to visibility impairment; and (3) carried forward known the Model Performance Evaluation (MPE) deficiencies identified in 2011 without addressing them. The PSAT analysis was made for sulfate and nitrate contributions individually. In reality, these pollutants do not exist individually but mix in the atmosphere. Despite this fact, VISTAS did not calculate or evaluate the total impact of sulfate and nitrate on visibility.

improper thresholds results in too few sources being selected by states across the region. The omission of these sources is a major issue to ensuring states make reasonable progress on regional haze because many of the non-selected sources will continue to emit pollution without emission reduction measures that are intended to protect Class I Areas. The VISTAS approach, and ultimately the states' attempt to limit the number of sources subject to the four-factor emissions control analysis through a faulty methodology and the use of high thresholds is fundamentally flawed and contrary to congressional intent and EPA's Regional Haze regulations.

The Clean Air Act and Regional Haze Rule identify additional visibility impairing pollutants beyond sulfur dioxide and nitrogen oxide. However, VISTAS did not account for emissions beyond these two pollutants. The effect from other visibility impairing pollutants such as particulate matter (PM) and volatile organic compounds (VOCs) were not included in VISTAS' modeling effort, problematically omitting additional haze emitting sources from consideration. Moreover, the PSAT analysis evaluated sulfate and nitrate contributions separately.¹⁵ However, these pollutants do not exist separately and their contributions to visibility impairment are additive. Despite this fact, VISTAS did not calculate or evaluate the combined total impact of sulfate and nitrate on visibility.

Recommendations and Conclusion

The ten Southeastern states must develop regional haze SIPs that are compliant with the Regional Haze Rule and Clean Air Act and actually make reasonable progress toward cleaner, less hazy skies in our Class I Areas. Where regional haze SIPs are found to be deficient, EPA will need to replace them with federal provisions. Given that it appears all Southeastern states will rely on the VISTAS model and approach, we provide the following recommendations with the aim of encouraging states to develop regional haze plans that adequately contribute towards the national goal of restoring natural visibility conditions across Class I Areas:

- Lower the threshold for source selection such that all Southeastern states evaluate sources that represent a significant level of their visibility impairing emissions under a four-factor analysis. The 2016 Proposed Regional Haze Guidance issued by EPA suggested states select sources that represent 80% of visibility impairing emissions, a target we believe is reasonable and achievable by states within the SIP development timeline.
- Account for actual and most recent emissions of SO₂ and NO_x, use them to inform which sources to evaluate for four-factor analyses and require practically enforceable reductions of these pollutants reflected in the SIP to help clean up air in Class I Areas in the Southeastern U.S.

¹⁵ As explained in the Gebhart Report at 13 “[t]he PSAT modeling was limited to “tagging” of sulfate and nitrate and did not address the source attribution from other visibility precursor pollutants. Any source-specific visibility attribution based solely on the sulfate and nitrate modeling projections would underestimate the overall visibility impact of an individual source. An accurate assessment of the source-specific visibility impact must be based on the source attribution considering all visibility impairing pollutants.”

- Conduct four-factor analyses for the 37 EGUs in the region and either make the planned retirement of coal units practically enforceable or require other emission reducing SIP measures.

We welcome the opportunity to discuss our concerns and recommendations with you and look forward to reviewing and commenting on your proposed SIPs in the near future.

Sincerely,

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Enclosures