Appendix F-3

EPA/FLM/Stakeholder Outreach and Presentations

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Promoting a healthy environment
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Consultation Record

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Promoting a healthy environment
FLM/EPA Consultation Record
As of October 26, 2020

1. December 5-7, 2017 – Denver, national RH meeting, various presentations – FLMs, EPA OAQPS, Region 3, Region 4, RPOs, various VISTAS agency attendees

2. January 31, 2018 – teleconference, presentation – FLMs, EPA Region 4, CC/TAWG

3. August 1, 2018 – teleconference, presentation – FLMs, EPA OAQPS, Region 3, Region 4, CC/TAWG

4. September 5, 2018 – teleconference, presentation – MJOs

5. June 3, 2019 – teleconference, presentation – FLMs, EPA OAQPS, Region 3, Region 4, CC/TAWG

6. October 28-30, 2019 – St Louis national RH meeting, various presentations – FLMs, EPA OAQPS, Region 3, Region 4, RPOs, various VISTAS agency attendees

7. April 2, 2020 – teleconference, presentation – FLMS, EPA OAQPS, Region 3, Region 4, CC/TAWG

8. April 21, 2020 – teleconference, presentation – MJOs

9. May 11, 2020 – teleconference, presentation – FLMs, EPA OAQPS, Region 3, Region 4, CC/TAWG

10. May 20, 2020 – webinar, presentation – stakeholders, FLMs, EPA OAQPS, Region 3, Region 4, RPOs and member states, STAD, CC/TAWG


12. August 4, 2020 – webinar, presentation, FLMs, EPA OAQPS, Region 3, Region 4, RPOs and member states, CC/TAWG

13. October 26, 2020 – webinar, presentation, EPA Region 3, Region 4 during the Fall 2020 air directors’ meeting
Appendix F-3b

National Regional Haze Meeting
Denver, Colorado
December 5-7, 2017

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Promoting a healthy environment
**REASONABLE PROGRESS (RP)**

- Area of Influence ($Q/d^2RT$) analysis with 2002 and 2018 emissions
  - This work was performed by SESARM contractors
  - Can be used to screen sources for 4-factor analysis
  - 2018 emissions are more appropriate than 2002 since we are looking at additional controls beyond "on-the-books"

- 4-Factor Analysis
  - This work was performed by the individual SESARM states and was very time consuming (similar to BACT analysis)
  - Cost of compliance (GA EPD included visibility impacts)
  - Time necessary for compliance
  - Energy and non-air quality impacts
  - Remaining useful life of source

**RPGs AND URP IN GEORGIA**

**EMISSIONS AND DISTANCE**

$$Q = \text{Emissions (TPY)}$$

$$d = \text{distance to Class I area}$$

**EMISSION SENSITIVITIES**

Based on this sensitivity analysis (30% emission reductions), SESARM states decided to focus on SO2 emissions from point sources (both EGUs and non-EGUs).

**METEOROLOGY**
GEORGIA’S RP APPROACH

- Determined Area of Influence (AoI) based on normalized sulfate weighted residence times (RT)
  - If RT ≥ 5% → included in AoI
- Calculated percent contribution caused by sulfates at Class I areas from sources located in the AoI
  - Based on RT*(Q/d) Excel spreadsheets created by VISTAS
  - \( Q = 2010 \text{ SO}_2 \text{ emissions} \)
  - If contribution ≥ 0.5% → added to RP list
    - Class I areas near Northern GA
      - COX, GEORGIA AGRIC. etc. (sulfuric acid source)
      - Removed 5% from the list (DWY = Reasonable Progress)
    - Class I areas near Southern GA
      - 44427 WOLF SAMA etc. (NOx meeting glide slope)
      - Considered GIU and non GIU
- Analysis done on each individual emissions unit
### SOURCE CONTRIBUTION AT SAMA

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<th>EBH NS</th>
<th>EBH NJ</th>
<th>EBH NK</th>
<th>EBH New</th>
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### SOURCE CONTRIBUTION AT COHU, P2

CAIR = Reasonable Progress for EGU’s

### SOURCE CONTRIBUTION AT SAMA, P2

### SOURCE CONTRIBUTION AT COHU

CAIR = Reasonable Progress for EGU’s
SOURCE CONTRIBUTION AT COHU

CAIR = Reasonable Progress for EGU’s

GEORGIA’S RP SUMMARY

- 22 Emission Units at 12 Facilities
  - Performed single source photochemical grid modeling for each facility ➔ $/Mm²
    - ($/ton) x (ton/Mm²) ➔ $/Mm²
  - 6 emission units at 3 facilities took voluntary limits to reduce contribution to <0.5%
  - 1 emission unit subject to BART
- Four-Factor Analysis Conducted on 15 Emission Units
  - No additional controls for 11 emission units at 6 facilities
  - Additional controls for 4 emission units at 3 facilities

SOURCE CONTRIBUTION AT COHU, P2

CAIR = Reasonable Progress for EGU’s

GEORGIA’S RP SOURCES

- GEORGIA PACIFIC CORPORATION, CEDAR SPRING - UNITS P-402, U-500, U-501
- GEORGIA PACIFIC DUNWOODY OPERATIONS - UNITS F-1 and M-24
- GEORGIA PACIFIC SAVANNAH RIVER MILL - UNITS R-503, R-502, R-503
- INLAND PAPERBOARD & PACKAGING, INC. - UNIT P-4
- INTERNATIONAL PAPER - SAVANNAH MILL - UNIT P-513
- INTERSTATE PAPER LLC - UNIT P-1
- JESSUP MILL, RAYONIER PERFORMANCE PIGMENTS - UNITS P-602, P-603, R-601, R-604
- PACKAGING CORPORATION OF AMERICA - VALDO - UNIT 1017
- SOUTHERN STATES PHOSPHATE & FERTILIZERS - UNIT S-502
- GEORGIA POWER COMPANY, MITCHELL STEAM - EL - UNIT S-503
- SAVANNAH ELECTRIC, KRAFT STEAM - ELECTR - UNITS S-501, S-502, S-503
- SAVANNAH ELECTRIC, MONTGOMRY STEAM - ELECTR - UNIT S-501

REASONABLE PROGRESS CONTROLS

<table>
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<tr>
<th>Facility</th>
<th>Emission Unit</th>
<th>Forecast Start</th>
<th>Estimated Time Required</th>
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<td>February 1, 2015</td>
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<td>Power Plant</td>
<td>December 1, 2015</td>
<td>1990</td>
</tr>
</tbody>
</table>
RPGs IN GEORGIA

- Adjusted future year visibility projections using facility-specific sensitivity results from the model to account for additional emission controls.
  - No need to rerun model for final RPGs.
  - Allows for multiple updates to final control limits

CONTACT INFORMATION

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4244 International Parkway, Suite 120
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404-363-7014
Georgia’s Approach for Estimating Reasonable Progress in Round 2

Based on this analysis, SESARM states will likely focus on SO₂ emissions from point sources (both EGUs and non-EGUs).

REASONABLE PROGRESS (RP)

- Area of Influence (Q/d*RT) analysis with 2011 and 2028 emissions
  - This work will be performed by SESARM contractor
  - Can be used to screen sources for 4-factor analysis
  - 2028 emissions are more appropriate than 2011 since we are looking at additional controls beyond “on-the-books”
  - If contribution > threshold  ➔ added to list for RP analysis
  - Thresholds for areas on or below the URPs should be less restrictive than areas above the URPs
  - Screening analysis done at facility-level (not unit-level)

- 4-Factor Analysis - performed by SESARM states
  - May include single-source sensitivity modeling or source apportionment to calculate visibility impacts (Mm⁻³/ft², $/Mm⁻³)

SO₂ EMISSION TRENDS IN GEORGIA

SCREENING EXAMPLES
CONTACT INFORMATION

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EPA PLATFORM

- SESARM plans to use EPA's 2011/2028 modeling platform (v6.3el)
  - SESARM will make adjustments to 2028 point sources
- Reasons for going with EPA's platform
  - Timing
    - Will not meet SIP deadline with any other option
  - Budget
    - Regional Haze budget significantly less in Round 2 compared to Round 1
    - Most of the sources sectors are reasonably represented in EPA's platform (i.e., SIP quality)

POINT SOURCE ADJUSTMENTS

- SESARM plans to make adjustments to point sources in EPA's 2011/2028 modeling platform
- EGU Point Sources
  - EPA modeling used IPM and assumed CPP controls
    - Option 1 – Use ERTAC EGU 2028 SMOKE files to replace IPM
    - Option 2 – Scale the EPA 2028 hourly EGU emissions up/down based on ERTAC EGU annual emission and/or state feedback
- Non-EGU Point Sources
  - Scale the EPA 2028 hourly non-EGU emissions up/down based on feedback from SESARM states
    - Plan to look at 2016 NEI and EPA's non-EGU updates in most recent 2017 and 2023 transport modeling
ERTAC EGU Projection Tool: Origin and Uses

Doris McLeod 1
Julie McDill, PE 1
Byeong-Uk Kim, PhD 2
Jin-Sheng Lin, PhD 1
Joseph Jakuta 3
Mark Janssen 4
1 Virginia Department of Environmental Quality
2 Mid-Atlantic Regional Air Management Association
3 Georgia Environmental Protection Division
4 Ohio Transport Commission
5 Lake Michigan Air Directors Consortium

Combined cycle facility under construction, slated to begin commercial operations in 2018

Attributes of ERTAC Model
- Conservative – no big swings in power generation.
- Data intensive – needs substantial state-supplied data.
- Regional and fuel modularity.
- Calculates future hourly estimates based on base year activity.
- Test hourly reserve capacity.
- Quickly evaluates various scenarios; e.g., unit retirement, growth, and control.

CAMD EGU Data
- Clean Air Markets Division
- High quality hourly data in electronic format reported under 40 CFR Part 75 for fossil fuel fired units > 25 MWs
  - Activity (heat input, gross load)
  - Emissions (usually NOx, SOx, and CO2)
- Emission contributions of the EGU sector
  - 2011 CAMD data = 4,800 unique units
  - 14% of the NOx inventory
  - 71% of the SO2 inventory

Introduction to ERTAC EGU v2.7
State and planning organization collaboration to build a model to project future EGU emissions suited to state air quality planning
Starting Points
- Base Year (BY) hourly continuous emissions monitor (CEM) data
- SY & FY unit activity (times meteorology)
- More realistic for SIP modeling
- Regional growth rates (GRs) – EIA AEO2017 & NERC
- Information supplied by States as of Spring 2017
- New units, retirements,
  - Controls, data/choices, etc.

ERTAC EGU Tool Generates Future Hourly Estimates
- Regional unit capacity never exceeded
- Unmet demand applied to other units
- Generation deficit units (GDU) created if demand exceeds system capacity on an hourly basis
  - Hourly Emissions Converted to SMOKE Format for AQ Modeling

Eastern Regional Technical Advisory Committee (ERTAC)
- ERTAC EGU growth convened 2009
Goal: Build a low-cost, stable/stiff, fast, and transparent model to project electric generating unit (EGU) emissions including reasonable temporal profiles for activity and emissions
Uses: Provide EGU inventories suitable for
  - State Implementation Plan (SIP) submittals
  - Air quality modeling efforts

How the Model Works
- Unit-level inventory of EGUs (capacity, fuel type, controls, hourly CEMs data for base year).
- Apply EIA-AED growth rates by region and fuel type (model does not transfer generation between regions or between fuels).
- Model matches available capacity to projected demand; creates “demand deficit” units if demand exceeds capacity.
- For units that exceed hourly or annual capacity limits, add generation to Excess Generation Pool.
- Empty Excess Generation Pool to other available units.
- Calculate emissions and convert to SMOKE and create reports (model does not generate new controls).
The Five Basic Files

- **Unit Availability File (UAF)**
  - Backbone of the tool
  - Unit level data
  - Sources: CAMD, EIA, NEEDS, State Staff

- **Controls File**
  - Unit level data for SO₂ and NOₓ
  - Emission rates or control efficiencies
  - May be supplemented with the Seasonal Controls File

- **Growth Rates File**
  - Growth rates by region and fuel unit type
  - Annual based on EIA reference case
  - Peak based on NERC

- **Input Variables File**
  - A variety of variables that can be changed for each region and fuel unit type
  - Many deal with new, planned units or GDUs

- **CAMD Hourly Base Year Data**
ERTAC EGU v2.7

- ERTAC v2.7 reference case (no CSAPR)
  - AEO2017 (Annual Growth) & NTC (Peak Growth) with two exceptions
  - SNCR and SCR NOx use NTC derived growth factors
  - State updates as of Spring 2017
  - Generation transfers to alternate fuels to correct specific issues:
    - Transfer of Indian Point nuclear power plant generation to combined cycle NG (for years after 2022)
    - Transfer of power from a few hours from coal to NG in PTE (renewing generation)
    - Transfer of power from coal to NG in PTE (of non-allocated coal GDU)
    - Unit characteristic updates in SIRATA to allocate coal GDU (one unit at Big Cajun 2/3/6)
    - Transfer of power from coal to NG in NOxTE to allocate coal GDU (2017 only)

- ERTAC v2.7 CSAPR2 Compliant Scenario includes:
  - Emission rate adjustments on facilities with SCR & SNCR in CSAPR states for some seasons only
  - Units with SNCR reduced to 0.125 lb/MMBtu (8% reduction in NOx in their analysis approach)
  - Units with SCR reduced to 0.064 lb/MMBtu (2% reduction in NOx in their analysis approach)
  - Similar to NOx study of "best cases"
  - Emission rate adjustments on some facilities without post-combustion controls in DK

AEO2017
no CPP
w/controls - Analysis

Need a 3:1 ratio for emissions above assurance level
### Additional Information

- ERTAC EGU files are located here:
  - Currently the latest files on MARAMA webpage are v2.6
  - MARAMA expects to post v2.7 shortly
  - Also, 2028 ERTAC EGU files are available

- Other ERTAC materials are located here:
  - Sign in URL: https://marama.sharefile.com/
  - Username: apaty@marama.org
  - Password: ERTACUser123

- Next, will create a 2016 base year with new projections.
Conclusions

- EPA's 2011/2020/2050 modeling platform is a good starting point
  - Although a bit long-in-the-tooth.
  - 2011 base year is well-established and benchmarked
  - Focus on updating 2026 inventory and benchmarking of modeled
  - Should be able to develop reasonably accurate 2026 inventory
    regardless of base year starting point

Thank you! Questions?
Appendix F-3c

Presentation to FLMs, EPA Region 4 CC/TAWG
January 31, 2018

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Promoting a healthy environment
Planned Approach (1)

- Similar to last regional haze planning effort
- About half of the time of the first project
- About 5% of the funding
- Will use EPA’s 2011 base year and 2028 future year inventory and modeling platform
- Will provide slight adjustments to 2028 inventories for EGU’s and some other major sources
- Will use EPA inventories for other categories

Planned Approach (2)

- Intentions
  - assess where we are currently
  - assess 2028 expected visibility and glide slope
  - evaluate progress
  - evaluate impacts on VISTAS Class I areas
  - evaluate downwind receptor impacts
  - consult with surrounding regions
  - consult with FLMs
  - interact with EPA
  - communicate with stakeholders
  - support state SIP submittals by July 31, 2021 deadline

VISTAS Organization

- STAD – State and Tribal Air Directors (policy)
- Coordinating Committee (operations)
- Technical Analysis Work Group
- Project Coordinator (John Hornback)
- EPA
- FLMs
- Stakeholders
- Other RPOs

Procurement Process

- RFP released December 21
- Proposal submittal deadline January 26
- 3 proposals received
  - 1 sole bid
  - 2 team bids
- Selection Committee formed and operating
- Recommendation goal by February 15
Contractor Arrangements

- Execute contract by March 1
- Develop concurrent work plan and QAPP
- Submit QAPP to EPA by March 15
- Receive QAPP approval from EPA by April 15
- Contractor queuing during April
- Technical work begins by May 1

Technical Project Components (2)

- Air quality modeling
- Source apportionment tagging
- Model performance evaluation
- Future year model projections
- Data handling and sharing
- Optional tasks

Technical Project Schedule

- States will begin preparing inventory updates after March 1
- Air quality modeling completed by December
- Other analysis and evaluation by next spring
- All deliverables including data and reports by June 20, 2019
- States begin developing their SIPs thereafter
- States submit SIPs by July 31, 2021

Discussion

- Q&A
- Feedback
- Next steps

Technical Project Components (1)

- Project management
- Emissions inventory updates
- Emissions processing
- Data acquisition and preparation
- Area of influence analysis

Contact Information

- Project Coordinator: John Hornback
- Phone: 404-361-4000
- E-mail: hornback@metro4-sesrarm.org
- Web: www.metro4-sesrarm.org
- Technical center tab
- Contractor web site
- Cloud?
Appendix F-3d

VISTAS Call with FLMs
August 1, 2018

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Promoting a healthy environment
VISTAS Technical Plan
- Similar to last regional haze planning effort
- EPA’s 2011 el base year emissions (unchanged)
- EPA’s 2028 el future year emissions with state specific adjustments for EGU and non-EGU point sources
- EPA’s 2028 el inventories without adjustment for other categories
- CAMx v6.40 with PSAT

Presentation Outline
- Introductory comments
- VISTAS contractors
- Completed, ongoing, and future work
- Collaboration/consultation
- State SIP development
- Response to National Park Service questions
- Additional Q&A
- Concluding comments

VISTAS Contractors
- Contractor
  - Eastern Research Group
- Subcontractor
  - Alpine Geophysics

VISTAS Tasks
- Determine current visibility
- Determine 2028 expected visibility and glide slopes
- Perform Area of Influence (AOI) analysis
- Perform source apportionment analysis (PSAT)
- Produce documentation
- Support state SIP submittals by July 31, 2021 deadline
- **NOTE: Individual VISTAS states will assess reasonable progress for sources in their own state**

Progress Report (documents)
- December 21, 2017 – RFP released
- January 26, 2018 – Proposals received
- March 1, 2018 – Contract awarded
- April 4, 2018 – QAPP (approved by EPA Region 4)
- April 19, 2018 – Work plan approved
- June 27, 2018 – Modeling protocol approved *
  *(review and input from EPA OAQPS and Region 4)
Progress Report
(completed/in process)

- Emission inventory updates – complete
- Emission inventory update report – nearing completion
- Emission processing/merging – complete
- 2028 simulation - running
- Benchmarking – complete (draft report rec’d)
- Base year modeling – initiated

(Q/d)*EWRT Calculations

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Progress Report
(remaining schedule)

- September 1, 2018 – base year modeling
- September 1, 2018 – area of influence analysis
- October 1, 2018 – model performance evaluation
- December 1, 2018 – future year modeling
- December 31, 2018 – future year projections
- April 19, 2019 – PSAT modeling
- May 3, 2019 – PSAT results
- July 1, 2019 – final report and project ends

Consultation Plan

- Late 2017/early 2018 – initiated by MANE-VU
- November 5-7, 2017 – WESTAR Round 2 Regional Haze Planning Workshop
- January 31, 2018 – discussions with FLMs
- August 1, 2018 – discussions with FLMs
- Late spring/summer 2018 – stakeholders
- Ongoing – EPA OAQPS and Regions 3 & 4
- Ongoing – FLMs – especially late-2018/early-2019
- 2019 – surrounding RPOs (to be initiated by VISTAS states)

Extinction Weighted Residence Time Calculations

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<th>Row</th>
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<th>Trajectory hours</th>
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<th>EWRT [Hrs]</th>
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State SIP Development

- Underway via ...
  - Participation in VISTAS process
  - Collaboration and consultation with all interests
- State-specific considerations/analyses have begun and will continue as project deliverables are completed/distributed
- SIP submittals due – July 31, 2021
Questions/Answers

- Using EPA 2011 and 2028 inventories and modeling platform with some upgrades
  - Yes

- 2011 and 2028 inventories
  - 2011 was not adjusted
  - 2028 EGU and non-EGU point updates completed June 30, 2018
  - Inventory update report – final due by mid-August

Questions/Answers

- Will states be on their own to evaluate control strategies?
  - Each state is ultimately responsible for determinations of the content of their SIPs, as in the last round.
  - Yet, much collaboration will occur in this project leading up to determinations of sources to evaluate and evaluations of feasible controls.

Questions/Answers

- Area of influence analysis and SO₂/NOₓ rankings for 2011 and 2028
  - To be completed by September 1, 2018

- 2028 projections:
  - Modeling to be completed by December 1, 2018
  - Projections to be completed by December 31, 2018

- Nature of 2028 modeling
  - “on-the-books / on the way” (required/enforceable)

Questions/Answers

- How will states use data generated to screen sources for 4-factor analysis?
  - Specific approach(es) be determined.
  - FLM input will be considered.
  - Threshold options
    - Cumulative source contribution (e.g., 80%, 60%, 40%,...)
    - Individual contributions by unit or facility (e.g., 1%, 5%, 10%,...)

Questions/Answers

- VISTAS states’ usage of project deliverables
  - AOI review – September-December 2018
  - Will use AOI to rank and select sources
  - Start 4-factor analysis early 2019
    - Source apportionment will be part of 4-factor analysis
    - and can be used to adjust reasonable progress goals
      (RPGs) if additional controls are required
    - May use CoSIT tool, EPA’s Air Pollution Control Cost
      Manual, data obtained from facilities, etc.
    - Will consult with FLMs regarding screening and selection methodology and process for sources

Questions/Answers

- Will a best-and-final run be conducted?
  - Not in contract at this time
  - PSAT can be used to adjust RPGs for new controls
    at individual facilities without another CAMx run

- Use of state-specific modeling domains?
  - Possible uses include brute force sensitivities,
    CAMx v6.5, fine grid modeling, best and final
    CAMx run, etc.
Questions/Answers

• Opportunities for FLM input
  – Ongoing
  – AOI will be used for ranking sources.
  – Expect this to occur September-December 2018.
  – FLMs may provide thoughts at anytime
  – Early sharing of FLM concerns and reasons would be helpful

For Further Information

(Contact)

• Project Coordinator
  – John Hornback – Metro 4/SESARM  hornback@metro4sesarm.org

• Coord Committee Chair
  – Jim Raylan – Georgia  jraylan@tredear.gov

• Tech Analysis WG Co-chairs
  – Randy Strait – North Carolina  randy.strait@ncdenr.gov
  – Alanna Keller – West Virginia  alanna.keller@wv.gov

• Web site
  – https://metro4sesarm.org
  – Selected information will be made available from the Technical Center
    dropdown on this web site.
  – Other information will be made available upon request.
Appendix F-3e

VISTAS Presentation to other RPOs
September 5, 2018

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Promoting a healthy environment
VISTAS Technical Plan

- Similar to last regional haze planning effort
- EPA's 2011 el base year emissions (unchanged)
- EPA's 2028 el future year emissions with state specific adjustments for EGU and non-EGU point sources
- EPA's 2028 el inventories without adjustment for other categories
- CAMx v6.40 with PSAT

Presentation Outline

- Introductory comments
- VISTAS contractors
- Completed, ongoing, and future work
- Collaboration/consultation
- State SIP development
- Response to National Park Service questions
- Additional Q&A
- Concluding comments

VISTAS Contractors

- Contractor
  - Eastern Research Group
- Subcontractor
  - Alpine Geophysics

VISTAS Tasks

- Determine current visibility
- Determine 2028 expected visibility and glide slopes
- Perform Area of Influence (AOI) analysis
- Perform source apportionment analysis (PSAT)
- Produce documentation
- Support state SIP submittals by July 31, 2021 deadline

**NOTE: Individual VISTAS states will assess reasonable progress for sources in their own state**

Progress Report (documents)

- December 21, 2017 – RFP released
- January 26, 2018 – Proposals received
- March 1, 2018 – Contract awarded
- April 4, 2018 – QAPP (approved by EPA Region 4)
- April 19, 2018 – Work plan approved
- June 27, 2018 – Modeling protocol approved *
  *(review and input from EPA OAQPS and Region 4)
Progress Report
(completed/in process)

- 2028 emission inventory updates and report – complete
- Conversion of 2028 point source emission files – pre-processing – complete (report – nearing completion)
- 2028 emissions SMOKE modeling – ready to begin
- 2011 base year emissions modeling - complete
- Benchmarking – ongoing (1st three reports received – one approved)
- Model performance evaluation – initiated
- Area of influence analysis – nearing completion

State SIP Development

- Underway via ...
  - Participation in VISTAS process
  - Collaboration and consultation with all interests
- State-specific considerations/analyses have begun and will continue as project deliverables are completed/distributed
- SIP submittals due – July 31, 2021

Progress Report
(remaining schedule)

- October 1, 2018 – model performance evaluation
- October 31, 2018 – AOI analysis & report
- December 1, 2018 – future year modeling (currently projected for early November)
- December 31, 2018 – future year projections
- April 19, 2019 – PSAT modeling
- May 3, 2019 – PSAT results
- July 1, 2019 – final report and project ends

Questions/Answers

- Using EPA 2011 and 2028 inventories and modeling platform with some upgrades
  - Yes
- 2011 and 2028 inventories
  - 2011 was not adjusted
  - 2028 EGU and non-EGU point updates completed June 30, 2018
- Inventory update report – final due by mid-August

Consultation Plan

- Late 2017/early 2018 – initiated by MANE-VU
- December 5-7, 2017 – WESTAR Round 2 Regional Haze Planning Workshop
- January 31, 2018 – discussions with FLMs
- August 1, 2018 – discussions with FLMs
- October 2018 – initial discussions with CenSARA
- Fall 2018/spring 2019 – stakeholders
- Early/mid-2019 – surrounding RPOs (to be initiated by VISTAS states)
- Ongoing – EPA OAQPS and Regions 3 & 4
- Ongoing – FLMs – especially late-2018/early-2019

Questions/Answers

- Area of influence analysis and SO₂/NOx rankings for 2011 and 2028
  - To be completed by October 31, 2018
- 2028 projections:
  - Modeling to be completed by December 1, 2018
  - Projections to be completed by December 31, 2018
- Nature of 2028 modeling
  - “on the books / on the way” (required/enforceable)
Questions/Answers

- VISTAS states’ usage of project deliverables
  - AOI review – September-December 2018
  - Will use AOI to rank and select sources
  - Start 4-factor analysis early 2019
    - Source apportionment will be part of 4-factor analysis and can be used to adjust reasonable progress goals (RPGs) if additional controls are required
    - May use CoST tool, EPA’s Air Pollution Control Cost Manual, data obtained from facilities, etc.
    - Will consult with FLMs regarding screening and selection methodology and process for sources

Questions/Answers

- Will a best-and-final run be conducted?
  - Not in contract at this time
  - PSAT can be used to adjust RPGs for new controls at individual facilities without another CAMx run

- Use of state-specific modeling domains?
  - Possible uses include brute force sensitivities, CAMx v6.5, fine grid modeling, best and final CAMx run, etc.

Questions/Answers

- Will states be on their own to evaluate control strategies?
  - Each state is ultimately responsible for determinations of the content of their SIPS, as in the last round.
  - Yet, much collaboration will occur in this project leading up to determinations of sources to evaluate and evaluations of feasible controls.

Questions/Answers

- Opportunities for FLM input
  - Ongoing
  - AOI will be used for ranking sources.
  - Expect this to occur September-December 2018.
  - FLMs may provide thoughts at any time
  - Early sharing of FLM concerns and reasons would be helpful

Questions/Answers

- How will states use data generated to screen sources for 4-factor analysis?
  - Specific approach(es) be determined.
  - FLM input will be considered.
  - Threshold options
    - Cumulative source contribution (e.g., 80%, 60%, 40%,...)
    - Individual contributions by unit or facility (e.g., 1%, 5%, 10%,...)

For Further Information (Contact)

- Project Coordinator
  - John Horneback – Metro 4/SESARM  hornback@metro4sesarm.org
- Coord Committee Chair
  - Jim Boyan – Georgia jame.boyan@dnr.ga.gov
- Tech Analysis WG Co-chairs
  - Randy Strait – North Carolina randy.strait@ncdene.gov
  - Alanna Keller – West Virginia alanna.keller@wv.gov
- Web site
  - https://metro4sesarm.org
  - Selected information will be made available on the Technical Center page at this web site.
  - Other information will be made available upon request.
Appendix F-3f

VISTAS Regional Haze Project Update
June 3, 2019

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Promoting a healthy environment
VISTAS Regional Haze Project Update

Jim Boylan (GA DNR), Randy Strait (NC DAQ), and John Hornback (Metro 4/SESARM)

FLM and EPA Consultation Conference Call
June 3, 2019

Presentation Outline

- Background
- Key VISTAS project tasks
- VISTAS technical analysis status
- What we’ve learned
- Consultation and communications
- Remaining work and projected schedule

Participating Agencies in VISTAS Project

- Visibility Improvement State and Tribal Association of the Southeast (VISTAS)
  - 10 SESARM states
  - Knox County, Tennessee local agency
  - Represents the 17 local agencies in the Southeast
  - Eastern Band of Cherokee Indians
  - Represents the 6 federally-recognized tribes in the Southeast

1999/2017 Regional Haze Rule

- Reduction of visibility impairment on the 20% “most impaired days” (anthropogenic impairment) in national park and wilderness (Class I) areas to natural conditions by 2064.
- No worsening of visibility on the 20% “clearest” days.
- Development of State Implementation Plans (SIPs) every 10 years to address emissions that contribute to regional haze.
- Round 2 SIP deadline extended to July 31, 2021

VISTAS Project Management Team

- John Hornback
  - VISTAS Project Manager/Technical Coordinator

- State and Tribal Air Directors (STADs)
  - Policy Decisions
    - Chair – Mike Ainsworth (NC)
    - Vice Chair – Chad LeFontaine (MD)
  - Planning Recommendations
    - Chair – Jim Boylan (GA)

- Coordinating Committee (CC)
  - Technical Recommendations
    - Chair – Randy Strait (NC)

- Technical Analysis Work Group (TAWG)
**Emissions Updates**

- Used EPA’s 2011 base year emissions without change
- Updated EPA’s 2028 projection year emissions
  - EGU and major non-EGU sources
  - Removed Clean Power Plan assumptions
  - Adjusted for changes in fuels and facility operating plans

**VISTAS Air Quality Model**

- Started with EPA’s 2011/2028 modeling platform
  - Version 6.3eL
  - CAMx v6.32
- Replaced CAMx v6.32 with CAMx v6.40
- Used 2011 meteorology
- Reasons for using EPA platform
  - Time limited
  - Budget limited
  - Most source sectors acceptably represented in EPA platform
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**VISTAS Modeling Domains**

**VISTAS Future Year Model Projections**
- Calculation of relative response factors (RRFs)
- Gives average percent change in pollutant or species concentrations due to emission changes between 2011 and 2028
- Produces design values for 2028

**Benchmark Comparisons**
1. EPA 2011 with CAMx_6.32 (CONUS) vs. Alpine 2011 with CAMx_6.32 (CONUS)
2. Alpine 2011 with CAMx_6.32 (CONUS) vs. Alpine 2011 with CAMx_6.40 (CONUS)
3. Alpine 2011 with CAMx_6.40 (CONUS) vs. Alpine 2011 with CAMx_6.40 (VISTAS)
4. EPA 2028 with CAMx_6.32 (CONUS) vs. Alpine 2028 with CAMx_6.40 (CONUS)
5. Alpine 2028 with CAMx_6.40 (CONUS) vs. Alpine 2028 with CAMx_6.40 (VISTAS)

**Model Performance Evaluation**
- Compared model results to observations. Looked at statistics, comparison plots, and spatial plots
- Ozone
- PM2.5 and light extinction
- Wet and dry deposition
- Overall, the model performance is generally within the range deemed acceptable for regulatory applications
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Uniform Rate of Reasonable Progress (ORP) Glick Path
Brigantine - 20% Most Impaired Data Days

Draft AOI Source Categories for COHU

<table>
<thead>
<tr>
<th>SOURCE CATEGORY</th>
<th>SO2</th>
<th>NOx</th>
<th>TOTAL</th>
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<tr>
<td>NONPOINT</td>
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<td>NONROAD_MAR</td>
<td>0.1%</td>
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<td>3.4%</td>
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<td>NONROAD_OTHER</td>
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<td>2.4%</td>
<td>2.6%</td>
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Draft VISTAS 2028 Modeling Results

Draft AOI Point Contributions for COHU

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<tr>
<th>Source</th>
<th>Facility Name</th>
<th>Emissions</th>
<th>NOx</th>
<th>SO2</th>
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<th>CH4</th>
<th>N2O</th>
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VISTAS Area of Influence (AOI) Analysis

- Evaluates emissions (Q), distance to Class I area (d), and extinction weighted residence time (EWRT) in model grid cells (point) or counties (source categories)
- Formula: (Q/d)^*EWRT
- Establishes each facility's contribution to light extinction at each Class I area on the 20% most impaired days
- Ranks facilities based on projected contributions
- Facilities with highest contributions may be subject to 4-factor analysis

Draft AOI Source Categories for WOLF

<table>
<thead>
<tr>
<th>SOURCE CATEGORY</th>
<th>SO2</th>
<th>NOx</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>NONPOINT</td>
<td>2.6%</td>
<td>1.5%</td>
<td>4.1%</td>
</tr>
<tr>
<td>NONROAD_MAR</td>
<td>1.4%</td>
<td>2.7%</td>
<td>4.1%</td>
</tr>
<tr>
<td>NONROAD_OTHER</td>
<td>0.3%</td>
<td>3.0%</td>
<td>3.3%</td>
</tr>
<tr>
<td>ONROAD</td>
<td>0.7%</td>
<td>5.2%</td>
<td>5.9%</td>
</tr>
<tr>
<td>POINT</td>
<td>70.4%</td>
<td>6.8%</td>
<td>77.1%</td>
</tr>
<tr>
<td>PT_FIRES_PRESCRIBED</td>
<td>4.7%</td>
<td>0.8%</td>
<td>5.5%</td>
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<tr>
<td>TOTAL</td>
<td>79.9%</td>
<td>20.1%</td>
<td>100.0%</td>
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</table>

See Appendix C for draft AOI source categories at other Class I areas.
Draft AOI Point Contributions for WOLF

<table>
<thead>
<tr>
<th>Source</th>
<th>Facility Name</th>
<th>Subsource</th>
<th>Ox</th>
<th>Nitrogen Oxide</th>
<th>Sulfate</th>
<th>Sulfur Oxide</th>
<th>Total</th>
<th>Relative Emissions</th>
<th>Relative Ox</th>
<th>Relative Nitrogen Oxide</th>
<th>Relative Sulfate</th>
<th>Relative Sulfur Oxide</th>
<th>Relative Total</th>
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<td>Parnell-Extended Plant, 21000</td>
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<td>0.50</td>
<td>0.50</td>
<td>0.31</td>
<td>0.31</td>
</tr>
</tbody>
</table>

See Appendix C for draft AOI point contributions at other Class I areas.

VISTAS Source Apportionment Modeling

- Quantifies visibility impacts from individual point sources, source sectors, and geographic regions
- NOx and SO2 tagging
- Used for further evaluation of AOI results
- Refines information on contributions to visibility impairment
- Can be used to adjust future year visibility projections to account for additional emission controls
- VISTAS contract with ERG allows for up to 250 tags

PSAT SO2 and NOx Tags

Round 1 (124 tags)
- Total SO2 tags for 10 individual VISTAS states + 3 MIDs = 13 tags
- Total NOx tags for 10 individual VISTAS states + 3 MIDs = 13 tags
- EGU point SO2 tags for 10 individual VISTAS states + 3 MIDs = 13 tags
- EGU point NOx tags for 10 individual VISTAS states + 3 MIDs = 13 tags
- SO2 tags for individual VISTAS facilities = 51 tags
- NOx tags for individual VISTAS facilities = 21 tags

Round 2 (45 tags identified so far...)
- Non-EGU point SO2 for 10 individual VISTAS states + 3 MIDs = 13 tags
- Non-EGU point NOx for 10 individual VISTAS states + 3 MIDs = 13 tags
- SO2 tags for individual non-VISTAS facilities = 13 tags
- NOx tags for individual non-VISTAS facilities = 4 tags
Round 2 Facility Tags

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Facility MTO</th>
<th>Facility ID</th>
<th>Facility Name</th>
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<tr>
<td>B</td>
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<td>Facility B</td>
<td>901234</td>
</tr>
<tr>
<td>C</td>
<td>789012</td>
<td>3</td>
<td>Facility C</td>
<td>345678</td>
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<tr>
<td>D</td>
<td>901234</td>
<td>4</td>
<td>Facility D</td>
<td>789012</td>
</tr>
</tbody>
</table>

What We’ve Learned

- The major facility landscape continues to change
- Shutdowns, fuel switches, additional emission controls
- Emissions continue to go down
- SO₂ emissions are still the major haze contributor, but NOx emissions are becoming more important
- Regional haze levels continue to be reduced
- Visibility improvement is well ahead of schedule

4-Factor Analysis

- States will evaluate certain sources and emissions to determine if reasonable controls are in place or available
- Considers four important factors
  - Potential costs of compliance
  - Time necessary for compliance
  - Energy and non-air quality environmental impacts of compliance
  - Remaining useful life of sources subject to this analysis

VISTAS Consultation and Communications

- Sharing information with EPA OAQPS, Regions 3 and 4
- Sharing information and seeking input from Federal Land Managers (next call early June)
- Preparing for briefing to stakeholders (later this year)
- Considering a face-to-face VISTAS meeting – TBD
- Working with RPO colleagues towards a national regional haze meeting this fall
- VISTAS staff available to present information at meetings in your state upon request

VISTAS Technical Work Status

<table>
<thead>
<tr>
<th>Task</th>
<th>Status</th>
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</thead>
<tbody>
<tr>
<td>Data collection/analysis</td>
<td>nearing completion</td>
</tr>
<tr>
<td>VISTAS 2011 modeling</td>
<td>done</td>
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<tr>
<td>Emission updates</td>
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<tr>
<td>Emission processing</td>
<td>done</td>
</tr>
<tr>
<td>2028 modeling</td>
<td>done</td>
</tr>
<tr>
<td>Benchmarking</td>
<td>nearing completion</td>
</tr>
<tr>
<td>Area of influence analysis</td>
<td>nearing completion</td>
</tr>
<tr>
<td>Source apportionment modeling</td>
<td>beginning in May</td>
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<tr>
<td>Future year model projections</td>
<td>draft results available</td>
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</table>

VISTAS Remaining Work/Technical Schedule

<table>
<thead>
<tr>
<th>Task</th>
<th>Schedule</th>
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<tbody>
<tr>
<td>Benchmarking</td>
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<td>Source apportionment (tagging)</td>
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<tr>
<td>Best and final run??</td>
<td>Necessity uncertain</td>
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<tr>
<td>Final reports and documentation</td>
<td>December 2019</td>
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<tr>
<td>Web site updates and postings</td>
<td>Ongoing task</td>
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VISTAS State Responsibilities

- Perform 4-factor analysis
- Consult and communicate with state stakeholders
- Consult with in-state FLM contacts if applicable
- Consult with surrounding states if applicable
- Complete state-specific analysis and documentation
- Follow state regulatory and SIP development processes
- Seek input and respond to public comment
- Submit regional haze SIPs to EPA by July 31, 2021
- Why all of this work?

Appendix A

Contact Information

- James Boylan, PhD., Georgia DNR
  - Email: james.boylan@dnr.gpa.gov
  - Phone: 404-363-7014
- Randy Strait, North Carolina DAQ
  - Email: randy.strait@ncdenr.gov
  - Phone: 919-707-8721
- John Hornback, Metro 4/SESARM
  - Email: hornback@metro4-sesarm.org
  - Phone: 404-361-4000
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Appendix C
### Draft AOI Source Categories for SIPS

<table>
<thead>
<tr>
<th>SOURCE CATEGORY</th>
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<td>4.4%</td>
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<td>ONROAD</td>
<td>0.3%</td>
<td>8.6%</td>
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<td>TOTAL</td>
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### Draft AOI Point Contributions for SIPS

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Appendix F-3
Page 59
### Draft AOI Source Categories for GRSM

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Appendix F-3
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Appendix F-3g

VISTAS Regional Haze Meeting
St. Louis, MO
October 28-30, 2019

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Promoting a healthy environment
VISTAS REGION
PROJECT MANAGEMENT
A Comparison of Approaches Used in Planning Periods 1 and 2

John Hornback, Executive Director
Metro 4SESAR/VISTAS
October 29, 2019
VISTAS PROJECT ORGANIZATION

VISTAS
Policy / Operations / Analysis – 2nd Planning Period

- STAD
- Coordinating Committee (CC)
- Technical Analysis Work Group (TAWG)
- Occasional sub-groups
  - (e.g., Data Collection and Analysis)
- CC/TAWG generally functioning together

VISTAS
Governance

- Southeastern States Air Resource Managers, Inc.
  - Board of Directors
- State and Tribal Air Directors (STAD)
  - States
  - Tribe
  - Local Agency
  - Governance, policy, general direction
- Similar structure for both planning periods

VISTAS
Policy / Operations / Analysis – 1st Planning Period

- STAD
- Coordinating Committee
- Planning Work Group
- Data Work Group
- Technical Analysis Work Group
- Various sub-groups and teams

VISTAS
Project Management – 1st Planning Period

- Project Manager – John Hornback
- Technical Coordinator – Pat Brewer
- Technical Advisors
- Contracts – 24
- MOUs - 3
- Key VISTAS agency staff

VISTAS
Project Management – 2nd Planning Period

- Project Manager – John Hornback (much larger role)
- Coordination and Technical Analysis – Jim Boylan
- Coordination and Technical Analysis – Randy Strait
- 1 contract with a lead contractor and a sub-contractor
Appendix F-3
Page 65

VISTAS PROJECT RESOURCES

Technical Approaches

VISTAS
Resources – 1st Planning Period

- Staffing – Metro 4/SESARM, coordinators, advisors
- In-kind services from SESARM states
- Contractor services – many contractors
- Shared expenses - VIEWS data warehouse, ERTAC
- Budget resources – approximately $10,000,000
- Leveraged federal work products – limited
- Federal coordination - significant

VISTAS
Technical Approaches for 1st & 2nd Rounds

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VISTAS
Resources – 2nd Planning Period

- Staffing – Metro 4/SESARM
- In-kind services from SESARM states
- Contractor services – I lead plus 1 subcontractor
- Shared expenses - none
- Budget resources ... ~ 5% of first round funds
- Leveraged federal work products – significant
- Federal coordination - limited

VISTAS PROJECT Collaboration/Consultation
**VISTAS COLLABORATION/CONSULTATION**

1st Planning Period

- Extensive face-to-face meetings
- Some VISTAS/FLM conference calls
- Some VISTAS/stakeholder conference calls
- MANE-YU/VISTAS consultation meeting
- Frequent federally-coordinated calls
- Weekly RPO calls during certain phases
- Resources and time were available

**VISTAS**

Schedule – 1st Planning Period

- 2001 – created the VISTAS organizational plan
- 2002-2006 – focused technical work
- 2006-2007 – continued technical work and SIP development
- December 17, 2007 – SIPs were due
- At least 7 years to design and complete the project plus state SIP submittals to EPA

**VISTAS COLLABORATION/CONSULTATION**

2nd Planning Period

- No face-to-face meetings to-date
- Several VISTAS/FLM/EPA conference calls
- No VISTAS/stakeholder conference calls (to-date)
- MANE-YU/VISTAS consultation calls
- Federally-coordinated regional haze calls (limited)
- Monthly MJO calls include periodic regional haze topics
- Overall goals remain the same
- Resources and time are limited for face-to-face meetings

**VISTAS**

Schedule – 2nd Planning Period

- December 2017 – Denver – created initial plan
- April 2018 – executed contract
- December 2019 – most technical work will be completed
- 2020-2021 – completion of any remaining technical work and SIP development
- July 31, 2021 – SIPs due
- 3 1/2 years for technical work and SIP development

**VISTAS PROJECT SCHEDULE**

**VISTAS PROJECT SUMMARY**
Appendix F-3
Page 67

VISTAS PROJECT
Summary (1 of 2)

- Similar basic organizational structure but streamlined
- Similar oversight and standards of performance including QA
- Similar internal participation – states, locals, tribes
- Similar external participation – RPOs, FLMs, EPA

VISTAS PROJECT
Summary (2 of 2)

- Fewer resources (~ 5% of 1st planning period funding)
- Less time (~ 50% of 1st planning period time)
- Similar desired outcomes
  - Technically sound, credible, approvable regional SIPs
  - Maintenance of relationships developed in 1st round
  - Continued progress toward 2064 goals

COMMENTS / QUESTIONS?

- Jim Boylan
  - Chair, Coordinating Committee
  - james.boylan@dot.gsa.gov

- Randy Strait
  - Chair, Technical Analysis Work Group
  - randy.strait@energy.gov

- John Hornback
  - Project Coordinator, VISTAS Project
  - hornback@metro4-seaarm.org
VISTAS 2028 Emissions and Modeling Analyses

Jim Boylan (GA DNR), Randy Strait (NC DAQ), and John Hornback (Metro 4/SESARM)

2019 National Regional Haze Meeting
St. Louis, MO - October 28, 2019

VISTAS Air Quality Model

- Started with EPA’s 2011/2028 modeling platform
  - Version 6.3el
  - CAMx v6.32
- Replaced CAMx v6.32 with CAMx v6.40
- Used 2011 meteorology
- Reasons for using EPA platform
  - Time limited
  - Budget limited
  - Most source sectors acceptably represented in EPA platform

Outline

- Modeling Overview
- 2028 Emission Projections
- 2028 Model Projections
- Next Steps

VISTAS Modeling Domains

MODELING OVERVIEW

Benchmark Comparisons

1. EPA 2011 with CAMx_6.32 (CONUS) vs. Alpine 2011 with CAMx_6.32 (CONUS)
2. Alpine 2011 with CAMx_6.32 (CONUS) vs. Alpine 2011 with CAMx_6.40 (CONUS)
3. Alpine 2011 with CAMx_6.40 (CONUS) vs. **Alpine 2011 with CAMx_6.40 (VISTAS)**
4. EPA 2028 with CAMx_6.32 (CONUS) vs. Alpine 2028 with CAMx_6.40 (CONUS)
5. Alpine 2028 with CAMx_6.40 (CONUS) vs. **Alpine 2028 with CAMx_6.40 (VISTAS)**
Model Performance Evaluation

- Compared model results to observations. Looked at statistics, comparison plots, and spatial plots
  - Ozone
  - PM$_{2.5}$ and light extinction
  - Wet and dry deposition
- Overall, the model performance is generally within the range deemed acceptable for regulatory applications

Point Source Adjustments

- **EGU Point Sources**
  - EPA modeling used IPM and assumed CPP controls
  - Adjust the EPA 2028 EGU emissions up/down based on ERTAC EGU annual emission, 2023 “en” emissions (based on 2016 NEI), and/or other emissions provided by individual states

- **Non-EGU Point Sources**
  - Adjust the EPA 2028 non-EGU emissions up/down based on feedback from SESARM states
  - States looked at 2014-2016 NEI and EPA’s non-EGU 2023 “en” emissions

2028 EMISSION PROJECTIONS

Emissions Updates

- Used EPA’s 2011 base year emissions without change
- Updated EPA’s 2028 projection year emissions
  - EGU and major non-EGU sources
  - Removed Clean Power Plan assumptions
  - Adjusted for changes in fuels and facility operating plans

NOx Emission Changes (2028-2011)

SO$_2$ Emission Changes (2028-2011)
Appendix F-3
Page 72
Remaining Work Schedule

<table>
<thead>
<tr>
<th>Task</th>
<th>Schedule</th>
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<tr>
<td>Best and final 2028 run?</td>
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Contact Information

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VISTAS Source Selection and 4-Factor Analyses

Jim Boylan (GA DNR), Randy Strait (NC DAQ), and John Hornback (Metro 4/SESARM)

2019 National Regional Haze Meeting
St. Louis, MO - October 29, 2019

Area of Influence (AOI) Analysis

- Evaluates 2028 emissions (Q), distance to Class I area (d), and extinction weighted residence time (EWRT) in model grid cells (point) or counties (source categories)
- Formula: \( (Q/d) \times EWRT \)
- Establishes each county’s and each facility’s contribution to light extinction at each Class I area on the 20% most impaired days
- Can use contributions to rank and screen facilities for the 4-factor analysis

Outline

- AOI Analysis
- PSAT Analysis
- Next Steps

HYPLIT Trajectories

- Trajectories were run using NAM-12 meteorology for the 20% most impaired days in 2011-2016 at 44 Class I areas.
  - Trajectories were run with starting heights of 100, 500, 1,000, and 1,500 meters.
  - Trajectories were run 72 hours backwards in time for each height at each location.
  - Trajectories were run with start times of 12AM (midnight of the start of the day), 6AM, 12PM, 6PM, and 12AM (midnight of the end of the day) local time.
- 44 Class I areas x 6 years x 24 days/year x 4 heights x 5 start times = 126,720 trajectories

AOI ANALYSIS

Class I Areas Analyzed
## AOI Source Categories for GRSM

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## AOI Source Categories for COHU

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VISTAS Modeling Domains

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PSAT ANALYSIS

PSAT SO2 and NOx Tags (209)

- Round 1 (122 tags)
  - Total SO2 tags for 10 individual VISTAS states + 3 MJOs = 13 tags
  - Total NOx tags for 10 individual VISTAS states + 3 MJOs = 13 tags
  - EGU point SO2 tags for 10 individual VISTAS states + 3 MJOs = 13 tags
  - EGU point NOx tags for 10 individual VISTAS states + 3 MJOs = 13 tags
  - SO2 tags for individual VISTAS facilities = 50 tags
  - NOx tags for individual VISTAS facilities = 20 tags

- Round 2 (87 tags)
  - Non-EGU point SO2 for 10 individual VISTAS states + 3 MJOs = 13 tags
  - Non-EGU point NOx for 10 individual VISTAS states + 3 MJOs = 13 tags
  - SO2 and NOx for N/S/W/E boundaries = 8 tags
  - SO2 tags for individual VISTAS facilities = 10 tags
  - NOx tags for individual VISTAS facilities = 16 tags
  - SO2 tags for individual non-VISTAS facilities = 17 tags
  - NOx tags for individual non-VISTAS facilities = 10 tags

Source Apportionment Modeling

- Particulate Matter Source Apportionment Technology (PSAT) tags applied to “VISTAS_12” 2028 model projections (2011 meteorology)
- Quantifies visibility impacts from individual point sources, source sectors, and geographic regions
- Both NOx and SO2 tagging
- Refines information on AOI contributions to visibility impairment
- Can be used to adjust future year visibility projections to account for additional emission controls
- VISTAS contract with ERG allows for up to 250 tags
Screening for 4-Factor Analysis

- States are in the process of selecting sources for the reasonable progress 4-factor analysis.
- State need to make decisions on screening thresholds:
  - Most states will likely use a screening threshold based on a facility's percent contribution to point source contributions.
  - Likely range is between 2% to 5%.
  - Sulfate and nitrate separately vs. combination.
  - AOI contributions, PSAT contributions, or combination.
  - In some cases, the AOI contributions are significantly different than the PSAT contributions.

4-Factor Analysis

- States will evaluate certain sources and emissions to determine if reasonable controls are in place or available.
- Considers four important factors:
  - Potential costs of compliance.
  - $/ton and $/Mn⁻¹.
  - Time necessary for compliance.
  - Energy and non-air quality environmental impacts of compliance.
- Remaining useful life of sources subject to this analysis.

NEXT STEPS

Remaining Work Schedule

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<th>Task</th>
<th>Schedule</th>
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<td>Additional PSAT tagging runs?</td>
<td>Necessity uncertain</td>
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<td>Final reports and documentation</td>
<td>February 2020</td>
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<td>Website updates and postings</td>
<td>Ongoing task</td>
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<td>Regional Haze SIPS Due to EPA</td>
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John Hornback, Metro 4/SESARM
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  • Phone: 404-361-4000
Appendix F-3h

VISTAS Regional Haze Project Update
April 2, 2020

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Promoting a healthy environment
VISTAS Regional Haze Project Update

FLM and EPA Conference Call
April 2, 2020

Outline

• Background Information
• 2028 Emissions Updates
• Revised 2028 PSAT Stacked Bar Charts
• Four Factor Analysis
• Next Steps & Schedule

VISTAS vs. EPA Emission Projections

The table below compares the 2028 point emissions used by VISTAS vs. the latest 2028th emissions used by EPA (projected from 2016). The emissions below are extracted from the VISTAS 12 modeling domain which covers the Eastern U.S.

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<th>New EPA 2028 (tpy)</th>
<th>Change (tpy)</th>
<th>Change (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOx</td>
<td>2,644,463.83</td>
<td>2,108,115.50</td>
<td>536,348.33</td>
<td>20.19%</td>
</tr>
<tr>
<td>SO2</td>
<td>2,574,542.02</td>
<td>1,400,287.10</td>
<td>1,174,254.92</td>
<td>45.61%</td>
</tr>
</tbody>
</table>

VISTAS CC/TAWG Conclusions

1. 2028 emission updates are necessary
   • VISTAS States – States will:
     • Update 2028 major source emissions projections (SO₂, NOx, PM₂.₅, PM₁₀, N₂O, CO₂) at the facility and unit level
     • Add any new sources of significance
   • LADCO States – SESARM will:
     • Replace ERTAC_2.7 with ERTAC_16.0 based on LADCO input
   • All Other States – SESARM will:
     • Verify accuracy of large SO₂ and NOx source emissions projections via contact with surrounding states/RPOs and update emissions as needed

2. Additional 2028 air quality modeling is needed

Additional Modeling-Related Tasks

• Emissions processing
• Updated 2028 CAMx modeling
• Updated 2028 visibility projections
• Documentation
Updated 2028 Point Emissions

Revised 2028 PSAT Stacked Bar Charts
(Original and Adjusted)

2028 SO₂ Comparison

<table>
<thead>
<tr>
<th>Source</th>
<th>PSAT, Old</th>
<th>PSAT, New</th>
<th>Delta (%)</th>
<th>EGU, Old</th>
<th>EGU, New</th>
<th>Delta (%)</th>
<th>MEO, Old</th>
<th>MEO, New</th>
<th>Delta (%)</th>
<th>Delta SO₂</th>
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<tbody>
<tr>
<td>IL</td>
<td>47,711.82</td>
<td>60,074.19</td>
<td>26.7%</td>
<td>103,051.09</td>
<td>8,980.56</td>
<td>1.0%</td>
<td>26,012.03</td>
<td>28,788.04</td>
<td>10.9%</td>
<td>93.8%</td>
</tr>
<tr>
<td>MO</td>
<td>24,354.50</td>
<td>23,322.90</td>
<td>-4.3%</td>
<td>24,354.50</td>
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<tr>
<td>GA</td>
<td>52,901.03</td>
<td>56,104.07</td>
<td>6.0%</td>
<td>16,413.28</td>
<td>11,705.20</td>
<td>-29.0%</td>
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</tr>
<tr>
<td>KY</td>
<td>51,463.63</td>
<td>41,368.01</td>
<td>-19.6%</td>
<td>48,490.25</td>
<td>44,150.50</td>
<td>-9.0%</td>
<td>48,490.25</td>
<td>44,150.50</td>
<td>-9.0%</td>
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</tr>
<tr>
<td>MS</td>
<td>48,752.02</td>
<td>48,508.96</td>
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</tr>
<tr>
<td>SC</td>
<td>58,005.97</td>
<td>45,241.23</td>
<td>-22.2%</td>
<td>10,269.80</td>
<td>13,024.97</td>
<td>26.3%</td>
<td>10,269.80</td>
<td>13,024.97</td>
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<td>13,024.97</td>
</tr>
<tr>
<td>TN</td>
<td>29,442.87</td>
<td>29,602.05</td>
<td>0.6%</td>
<td>10,893.92</td>
<td>10,095.94</td>
<td>-7.9%</td>
<td>10,893.92</td>
<td>10,095.94</td>
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<td>10,095.94</td>
</tr>
<tr>
<td>VA</td>
<td>15,939.74</td>
<td>15,513.00</td>
<td>-2.7%</td>
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<tr>
<td>WV</td>
<td>12,026.83</td>
<td>13,275.20</td>
<td>19.5%</td>
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PSAT Source Apportionment Modeling

- Quantifies visibility impacts from individual point sources, source sectors, and geographic regions
- NOx and SO₂ tagging
- Used for further evaluation of AOI results
- Refines information on contributions to visibility impairment
- Can be used to adjust future year visibility projections to account for additional emission controls
- VISTAS contract with ERG allows for up to 250 tags

2028 NOx Comparison

<table>
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<tr>
<th>Source</th>
<th>PSAT, Old</th>
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<th>Delta NOx</th>
</tr>
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<tbody>
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<td>IL</td>
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<td>19.5%</td>
<td>13,275.20</td>
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PSAT SO₂ and NOx Tags (209)

Round 1 (122 tags)

- Total SO₂ tags for 10 individual VISTAS states + 3 MJOS = 13 tags
- Total NOx tags for 10 individual VISTAS states + 3 MJOS = 13 tags
- EGU point SO₂ tags for 10 individual VISTAS states + 3 MJOS = 13 tags
- EGU point NOx tags for 10 individual VISTAS states + 3 MJOS = 13 tags
- SO₂ tags for individual VISTAS facilities = 50 tags
- NOx tags for individual VISTAS facilities = 20 tags

Round 2 (87 tags)

- Non-EGU point SO₂ for 10 individual VISTAS states + 3 MJOS = 13 tags
- Non-EGU point NOx for 10 individual VISTAS states + 3 MJOS = 13 tags
- SO₂ and NOx for N/S/E boundaries = 8 tags
- SO₂ tags for individual VISTAS facilities = 10 tags
- NOx tags for individual VISTAS facilities = 10 tags
- SO₂ tags for individual non-VISTAS facilities = 17 tags
- NOx tags for individual non-VISTAS facilities = 10 tags
### Revised State/RPO PSAT Results

**Revised EGU Sulfate PSAT Results**

\[
\text{Revised EGU Sulfate PSAT Results} = \text{Original EGU Sulfate PSAT Results} \times \text{SO}_2 \text{ EGU Ratio}
\]

where, \(\text{SO}_2 \text{ EGU Ratio} = \frac{\text{Revised EGU SO}_2 \text{ emissions}}{\text{Original EGU SO}_2 \text{ emissions}}\)

**Revised NEGU Sulfate PSAT Results**

\[
\text{Revised NEGU Sulfate PSAT Results} = \text{Original NEGU Sulfate PSAT Results} \times \text{SO}_2 \text{ NEGU Ratio}
\]

where, \(\text{SO}_2 \text{ NEGU Ratio} = \frac{\text{Revised EGU SO}_2 \text{ emissions}}{\text{Original EGU SO}_2 \text{ emissions}}\)

**Revised EGU Nitrate PSAT Results**

\[
\text{Revised EGU Nitrate PSAT Results} = \text{Original EGU Nitrate PSAT Results} \times \text{NOx EGU Ratio}
\]

where, \(\text{NOx EGU Ratio} = \frac{\text{Revised EGU NOx emissions}}{\text{Original EGU NOx emissions}}\)

**Revised NEGU Nitrate PSAT Results**

\[
\text{Revised NEGU Nitrate PSAT Results} = \text{Original NEGU Nitrate PSAT Results} \times \text{NOx NEGU Ratio}
\]

where, \(\text{NOx NEGU Ratio} = \frac{\text{Revised EGU NOx emissions}}{\text{Original EGU NOx emissions}}\)
Appendix F-3
Page 90
Four Factor Analysis

Four-Factor Analysis Screening Approach

1. The VISTAS four-factor analysis approach is based on an initial AOI screening (Q/d * EWR) to rank facilities based on their sulfate and nitrate contributions at each Class I area.
2. These rankings were used to identify 87 individual facilities for PSAT tagging. PSAT tagging was used to determine the nitrate and sulfate contributions from each facility at each Class I area in the VISTAS_12 domain.
3. Each individual VISTAS state will apply a PSAT contribution threshold based on the facility sulfate or facility nitrate impacts divided by the total impact of sulfate + nitrate from all point sources to determine which sources will need to be considered for a four-factor analysis.
   - If sulfate contribution ≥ 1% ➔ SO₂ Four-Factor Analysis
   - If nitrate contribution ≥ 1% ➔ NOₓ Four-Factor Analysis

Why 1% Threshold?

- In the Round 1 Regional Haze SIPs, many VISTAS states used the AOI approach and a 1% threshold on a Unit basis.
  - We are using the AOI/PSAT approach and a 1% threshold based on a Facility basis. This will pull in more facilities compared to a Unit basis.
- The CSAPR interstate transport rules use a 1% contribution threshold for determining significant contributions to nonattainment and maintenance areas.
  - The use of a 1% significance threshold would be consistent with the CSAPR approach.
Area of Influence (AOI) Analysis

- Evaluates emissions (Q), distance to Class I area (d), and extinction weighted residence time (EWRT) in model grid cells (point) or counties (source categories)

- Formula: \( Q/(d)*\text{EWRT} \)

- Establishes each county’s and each facility’s contribution to light extinction at each Class I area on the 20% most impaired days

- Can use contributions to rank and screen facilities for the 4-factor analysis

- Georgia Example:
  - Sources in Georgia, used ≥ 2% threshold
  - Sources outside Georgia, used ≥ 4% threshold

AOI Point Contributions for WOLF

<table>
<thead>
<tr>
<th>Name</th>
<th>PALECY NAME</th>
<th>DEGREE</th>
<th>DEG DWELL</th>
<th>DEG BURN</th>
<th>DEG BURN</th>
<th>DEG CONTRIBUTION</th>
<th>DEG SCREEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Georgia Power Company - Plant Bowen</td>
<td>12.5</td>
<td>3.4204</td>
<td>0.369</td>
<td>0.426</td>
<td>0.306</td>
<td>0.306</td>
</tr>
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<td>0.426</td>
<td>0.306</td>
<td>0.306</td>
</tr>
</tbody>
</table>

AOI Point Contributions for COHU

<table>
<thead>
<tr>
<th>Name</th>
<th>PALECY NAME</th>
<th>DEGREE</th>
<th>DEG DWELL</th>
<th>DEG BURN</th>
<th>DEG BURN</th>
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<td>0.426</td>
<td>0.306</td>
<td>0.306</td>
</tr>
</tbody>
</table>

Georgia Tagging for PSAT

- Sources in Georgia (≥ 2% threshold)
  - Ga Power Company – Plant Bowen
  - International Paper – Rome (aka TEMPLE INLAND)
  - International Paper – Savannah
  - Brunswick Cellulose Inc
  - Georgia-Pacific Consumer Products LP (Savannah River Mill)

- Sources outside Georgia (≥ 4% threshold)
  - INDIANA MICHIGAN POWER DBA AEP ROCKPORT (IN)
  - ROCK TENN CP, LLC (FL)
  - REA (FL)

AOI Point Contributions for OKEF

<table>
<thead>
<tr>
<th>Name</th>
<th>PALECY NAME</th>
<th>DEGREE</th>
<th>DEG DWELL</th>
<th>DEG BURN</th>
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AOI Screening Summary

<table>
<thead>
<tr>
<th>State</th>
<th>Threshold</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL</td>
<td>2%</td>
<td>Sulfate only</td>
</tr>
<tr>
<td>FL</td>
<td>5%</td>
<td>Sulfate or nitrate, plus Gulf Coast, Moccasin Bottom, Minnow, New Waters, and Moccasin Streamer</td>
</tr>
<tr>
<td>GA</td>
<td>2% - 4%</td>
<td>Sulfate or nitrate, 2% Threshold for GA facilities, 4% Threshold for facilities outside GA</td>
</tr>
<tr>
<td>KY</td>
<td>2%</td>
<td>Sulfate or nitrate</td>
</tr>
<tr>
<td>MS</td>
<td>2%</td>
<td>Sulfate or nitrate</td>
</tr>
<tr>
<td>NC</td>
<td>3%</td>
<td>Sulfate + nitrate</td>
</tr>
<tr>
<td>SC</td>
<td>2% - 5%</td>
<td>Sulfate + nitrate, 5% for nitrate, plus Santee Cooper, Winyah, International Paper, Georgetown, and Santee Cooper Williams</td>
</tr>
<tr>
<td>TN</td>
<td>3%</td>
<td>Sulfate + nitrate, plus CEMIX</td>
</tr>
<tr>
<td>VA</td>
<td>2%</td>
<td>Sulfate + nitrate</td>
</tr>
<tr>
<td>WV</td>
<td>0.2%</td>
<td>Sulfate or nitrate</td>
</tr>
</tbody>
</table>

Appendix F-3
Page 98
PSAT Source Apportionment Modeling

- Quantifies visibility impacts from individual point sources, source sectors, and geographic regions
- NOx and SOx tagging
- Used for further evaluation of AOI results
- Refines information on contributions to visibility impairment
- Can be used to adjust future year visibility projections to account for additional emission controls
- VISTAS contract with ERG allows for up to 250 tags

PSAT SO2 and NOx Tags (209)

Round 1 (122 tags)
- Total SO2 tags for 10 individual VISTAS states + 3 MIOs = 13 tags
- Total NOx tags for 10 individual VISTAS states + 3 MIOs = 13 tags
- EGU point SO2 tags for 10 individual VISTAS states + 3 MIOs = 13 tags
- EGU point NOx tags for 10 individual VISTAS states + 3 MIOs = 13 tags
- SO2 tags for individual VISTAS facilities = 10 tags
- NOx tags for individual VISTAS facilities = 10 tags

Round 2 (87 tags)
- Non-EGU point SO2 for 10 individual VISTAS states + 3 MIOs = 13 tags
- Non-EGU point NOx for 10 individual VISTAS states + 3 MIOs = 13 tags
- SO2 and NOx for N/S/W/E boundaries = 8 tags
- SO2 tags for individual VISTAS facilities = 10 tags
- NOx tags for individual VISTAS facilities = 16 tags
- SO2 tags for individual non-VISTAS facilities = 17 tags
- NOx tags for individual non-VISTAS facilities = 10 tags

> 87 Total Facility Tags (both SO2 and NOx)

Facility Tags (AL, FL, GA)

| Facility Code | Name | County | State | CO Monitor Code | Emissions
|---------------|------|--------|------|-----------------|----------|
| AL | 1 | AIR | AL | 01 | 0.5
| AL | 2 | AIR | AL | 02 | 0.6
| FL | 3 | AIR | FL | 03 | 0.7
| GA | 4 | AIR | GA | 04 | 0.8

Facility Tags (KY, MS, NC, SC, TN, VA)

Facility Tags (WV, AR, MO, MD, PA, IL, IN, OH)

Sulfate AOI vs. Sulfate PSAT (≥ 1)

Average distance from source = 32 km

Average distance from source = 33 km

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**Appendix F-3**

**Page 100**

---

**Four-Factor Analysis Screening Approach**

- Due to the amount of resources already invested in the AOI and PSAT analysis, **VISTAS plans to continue with our original approach** for determining which sources will require a four-factor analysis.
- In cases where emissions decreased or increased at individual facilities being considered for a four-factor analysis, the facility contributions will be adjusted to be consistent with the lower/higher facility emissions before comparing to the PSAT contribution threshold.
- **EPA verbally stated this should be okay 2/6/2020.**

---

**AOI vs. PSAT Summary**

- AOI tends to overestimate impacts for facilities near the Class I area.
- AOI tends to underestimate impacts for facilities far away from the Class I area.
  - AOI uses 72-hour back trajectories, sulfate can last for weeks and travel hundreds to thousands of km.
- PSAT is the most reliable modeling tool for tracking facility contributions to visibility impairment at Class I areas.

---

**Revised Facility PSAT Results**

- **Revised Facility Sulfate PSAT Results**
  \[
  \text{Revised Facility Sulfate PSAT Results} = \text{Original Facility Sulfate PSAT Results} \times \text{SO}_2 \text{ Ratio}
  \]
  
  where, \( \text{SO}_2 \text{ Ratio} = \frac{\text{Revised facility SO}_2 \text{ emissions}}{\text{Original facility SO}_2 \text{ emissions}} \)

- **Revised Facility Nitrate PSAT Results**
  \[
  \text{Revised Facility Nitrate PSAT Results} = \text{Original Facility Nitrate PSAT Results} \times \text{NOx Ratio}
  \]
  
  where, \( \text{NOx Ratio} = \frac{\text{Revised facility NOx emissions}}{\text{Original facility NOx emissions}} \)

---

**Four-Factor Analysis Screening Approach**

- The updated 2028 CAMx modeling will impact the **total sulfate and total nitrate impacts** from all sources at each Class I area since the \( \text{SO}_2 \) and \( \text{NOx} \) emissions have decreased.
- However, the **individual sulfate and total nitrate impacts** from the individual 87 tagged facilities should not change unless a facility has reduced or increased \( \text{SO}_2 \) and/or \( \text{NOx} \) emissions.
- Therefore, the percent contribution (facility sulfate impact/total impact of all point sources of sulfate + nitrate) will increase since the denominator will decrease; however, the order of the rankings from largest impact to smallest impact should not change unless one of those facilities reduced or increased emissions.

---

**PSAT Adjustments (AL, FL, GA)**

![PSAT Adjustments Table](image-url)
### Cohutta Wilderness Area

<table>
<thead>
<tr>
<th>State</th>
<th>Facility ID</th>
<th>Facility Name</th>
<th>ME</th>
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<th>DNA</th>
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Appendix F-3
Page 102
### Swanquarter Wilderness Area

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Appendix F-3
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Dolly Sods Wilderness

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VISTAS Facilities ≥ 1%

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Otter Creek Wilderness

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Non-VISTAS Facilities ≥ 1%

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<td>WV</td>
<td>52040-06855</td>
<td>West Virginia Power Company (Charleston)</td>
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Non-VISTAS Class I Areas

- Only one VISTAS facility has a contribution ≥ 1% at any non-VISTAS Class I Area
- Tennessee Valley Authority (TVA) - Shawnee Fossil Plant
  - Hercules-Glades Wilderness Area (1.35% sulfate)
  - Mingo Wilderness Area (1.08% sulfate)

Effective Emission Control Technology

- For the purpose of SO2 control measures, an EGU that has add-on flue gas desulfurization (FGD) and that meets the applicable alternative SO2 emission limit of the 2012 Mercury Air Toxics Standards (MATS) rule for power plants. The two limits in the rule (0.2 lb/MMBtu for coal-fired EGUs or 0.3 lb/MMBtu for EGUs fired with oil-derived solid fuel) are low enough that it is unlikely that an analysis of control measures for a source already equipped with a scrubber and meeting one of these limits would conclude that even more stringent control of SO2 is necessary to make reasonable progress.
- For the purposes of SO2 and NOx control measures, a combustion source (e.g., an EGU or industrial boiler or process heater) that, during the first implementation period, installed a FGD system that operates year-round with an effectiveness of at least 90 percent or by the installation of a selective catalytic reduction system that operates year-round with an overall effectiveness of at least 90 percent (in both cases calculating the effectiveness as the total for the system, including any bypassed flue gas), or on a pollutant-specific basis.
Additional Considerations

• The final list of four-factor analysis sources will be determined in consultation with the FLMs, EPA, other states, and stakeholders.
• Some states may perform additional four-factor analyses for sources not listed on Slide 106.
• Some states may allow their facilities to take a permit limit that will result in adjusted PSAT impacts below the 1% threshold in lieu of performing a four-factor analysis.
• The large number of coal-fired EGU retirements and fuel switching from coal to natural gas needs to be considered along with the sources selected for the four-factor analysis. States should not be penalized for early action.

Contacts for Further Information

• For general, technical, and SIP-related questions, contact the TAWG and CC Chairs:
  • TAWG – Randy Strait (randy.strait@ncdenr.gov)
  • CC – Jim Boylan (james.boylan@dnr.ga.gov)
• For general, contract, and funding questions, contact the Project Manager:
  • John Hornback (hornback@metro4-sesarm.org)

Next Steps and Schedule

Remaining VISTAS Work Schedule

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<th>Task</th>
<th>Schedule</th>
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<td>2028 Point Emissions Updates</td>
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<td>2028 Emissions Processing</td>
<td>Late April, 2020</td>
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<tr>
<td>2028 CAMx Modeling</td>
<td>Late June, 2020</td>
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<tr>
<td>2028 Visibility Projections</td>
<td>Mid-July, 2020</td>
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<tr>
<td>2028 Deposition Projections</td>
<td>Mid-July, 2020</td>
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<tr>
<td>Final reports and documentation</td>
<td>Late July, 2020</td>
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<tr>
<td>Website updates and postings</td>
<td>Late July, 2020</td>
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<tr>
<td>End of Contract</td>
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<td>Regional Haze SIPs Due to EPA</td>
<td>July 31, 2021</td>
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Appendix F-3i

VISTAS Presentation to MJOs
April 21, 2020

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Promoting a healthy environment
VISTAS Regional Haze Project Update

Regional Planning Organization Briefing
April 21, 2020

Initial VISTAS Emissions Updates

- Used EPA’s 2011 base year emissions without change
- Updated EPA’s Initial 2028 projection year emissions
  - EGU and major non-EGU sources
  - Removed Clean Power Plan assumptions
  - VISTAS – Adjusted for changes in fuels and facility operating plans
  - Non-VISTAS – Used ERTAC 2.7opt

Outline

- Background Information
- 2028 Emissions Updates
- Revised 2028 PSAT Stacked Bar Charts
- Four Factor Analysis
- Next Steps & Schedule

VISTAS vs. EPA Updated 2028 Emission Projections

- The table below compares the 2028 point emissions used by VISTAS vs. the latest 2028th emissions used by EPA (projected from 2016). The emissions below are extracted from the VISTAS 12 modeling domain which covers the Eastern U.S.

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<th>Pollutant</th>
<th>VISTAS 2028 (tpy)</th>
<th>New EPA 2028 (tpy)</th>
<th>Change (tpy)</th>
<th>Change (%)</th>
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<td>NOx</td>
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VISTAS Modeling Domains

Old ERTAC (2.7opt) vs. New ERTAC (16.0)

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<td>LADO</td>
<td>166,429.4</td>
<td>198,966.9</td>
<td>-32,537.4</td>
<td>-16.35%</td>
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<td>MARR-VU</td>
<td>56,313.3</td>
<td>8,432.5</td>
<td>-27,117.2</td>
<td>-32.56%</td>
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<td>VISTAS</td>
<td>200,791.1</td>
<td>270,015.7</td>
<td>-69,224.6</td>
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<tr>
<td>TOTAL</td>
<td>840,973.6</td>
<td>1,116,663.1</td>
<td>-275,689.5</td>
<td>-27.92%</td>
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VISTAS CC/TAWG Conclusions

1. 2028 emission updates are necessary
   • VISTAS States – States will:
     • Update 2028 major source emissions projections (SO2, NOx, PM2.5, PM10, NH3, CO) at the facility and unit level
     • Add any new sources of significance
   • LADCO States – SESARM will:
     • Replace ERTAC_2.7 with ERTAC_16.1 based on LADCO input
   • All Other States – SESARM will:
     • Replace ERTAC_2.7 with ERTAC_16.0
     • Verify accuracy of large SO2 and NOx source emissions projections via contact with surrounding states/RPOs and update emissions as needed

2. Additional 2028 air quality modeling is needed

Additional Modeling-Related Tasks

• Emissions processing
• Updated 2028 CAMx modeling (VISTAS_12)
• Updated 2028 visibility projections
• Documentation

Updated 2028 Point Emissions

Revised 2028 PSAT
Stacked Bar Charts (Original and Adjusted)
PSAT Source Apportionment Modeling

- Quantifies visibility impacts from individual point sources, source sectors, and geographic regions
- NOx and SO\textsubscript{2} tagging
- Used for further evaluation of AOI results
- Refines information on contributions to visibility impairment
- Can be used to adjust future year visibility projections to account for additional emission controls
- VISTAS contract with ERG allows for up to 250 tags

Revised State/RPO PSAT Results

- Revised EGU Sulfate PSAT Results
  = Original EGU Sulfate PSAT Results * SO\textsubscript{2} EGU Ratio
  \[\frac{(Revised \ EGU \ SO\textsubscript{2} \ emissions)}{(Original \ EGU \ SO\textsubscript{2} \ emissions)}\]

- Revised NEGU Sulfate PSAT Results
  = Original NEGU Sulfate PSAT Results * SO\textsubscript{2} NEGU Ratio
  \[\frac{(Revised \ NEGU \ SO\textsubscript{2} \ emissions)}{(Original \ NEGU \ SO\textsubscript{2} \ emissions)}\]

PSAT SO\textsubscript{2} and NOx Tags (209)

Round 1 (122 tags)
- Total SO\textsubscript{2} tags for 10 individual VISTAS states + 3 RPOs = 13 tags
- Total NOx tags for 10 individual VISTAS states + 3 RPOs = 13 tags
- EGU point SO\textsubscript{2} tags for 10 individual VISTAS states + 3 RPOs = 13 tags
- EGU point NOx tags for 10 individual VISTAS states + 3 RPOs = 13 tags
- SO\textsubscript{2} tags for individual VISTAS facilities = 50 tags
- NOx tags for individual VISTAS facilities = 20 tags

Round 2 (87 tags)
- Non-EGU point SO\textsubscript{2} for 10 individual VISTAS states + 3 RPOs = 13 tags
- Non-EGU point NOx for 10 individual VISTAS states + 3 RPOs = 13 tags
- SO\textsubscript{2} and NOx for N/S/W/E boundaries = 8 tags
- SO\textsubscript{2} tags for individual VISTAS facilities = 10 tags
- NOx tags for individual VISTAS facilities = 16 tags
- SO\textsubscript{2} tags for individual non-VISTAS facilities = 17 tags
- NOx tags for individual non-VISTAS facilities = 10 tags

Revised State/RPO PSAT Results

- Revised EGU Nitrate PSAT Results
  = Original EGU Nitrate PSAT Results * NOx EGU Ratio
  \[\frac{(Revised \ EGU \ NOx \ emissions)}{(Original \ EGU \ NOx \ emissions)}\]

- Revised NEGU Nitrate PSAT Results
  = Original NEGU Nitrate PSAT Results * NOx NEGU Ratio
  \[\frac{(Revised \ NEGU \ NOx \ emissions)}{(Original \ NEGU \ NOx \ emissions)}\]

PSAT Adjustment Ratios

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2008 Sulfate to Light Extinction on 20th Most Impaired Days - Sipsey Wilderness

Graph: Comparative Analysis of Sulfate and Light Extinction Levels

Appendix F-3
Page 109
Appendix F-3
Page 117
Four-Factor Analysis Screening Approach

1. The VISTAS four-factor analysis approach is based on an initial AOI screening (Q/d * EWRT) to rank facilities based on their sulfate and nitrate contributions at each Class I area.
2. These rankings were used to identify 87 individual facilities for PSAT tagging. PSAT tagging was used to determine the nitrate and sulfate contributions from each facility at each Class I area in the VISTAS_12 domain.
3. Each individual VISTAS state will apply a PSAT contribution threshold based on the facility sulfate and facility nitrate impacts (separately, not combined) divided by the total impact of sulfate + nitrate from all point sources to determine which sources may need to be considered for a four-factor analysis.
   - If sulfate contribution ≥ 1.000% → SO₂ Four-Factor Analysis
   - If nitrate contribution ≥ 1.000% → NOx Four-Factor Analysis

Area of Influence (AOI) Analysis

- Evaluates emissions (Q), distance to Class I area (d), and extinction weighted residence time (EWRT) in model grid cells (point) or counties (source categories)
- Formula: \(Q/d \times EWRT\)
- Establishes each county’s and each facility’s contribution to light extinction at each Class I area on the 20% most impacted days
- Can use contributions to rank and screen facilities for the 4-factor analysis

Georgia Example:
- Sources in Georgia, used ≥ 2% threshold
- Sources outside Georgia, used ≥ 4% threshold

Why 1% Threshold?

- In the Round 1 Regional Haze SIPs, many VISTAS states used the AOI approach and a 1% threshold on a Unit basis.
- We are using the AOI/PSAT approach and a ≥ 1.000% PSAT threshold based on a Facility basis.
- This will pull in more facilities compared to a Unit basis.
- This approach results in a reasonable number of sources that can be evaluated with limited state resources and focuses on the sources with the largest impacts.

HYSPLIT Trajectories

- Trajectories were run using NAM-12 meteorology for the 20% most impaired days in 2011-2016 at 44 Class I areas.
- Trajectories were run with starting heights of 100, 500, 1,000, and 1,500 meters.
- Trajectories were run 72 hours backwards in time for each height at each location.
- Trajectories were run with start times of 12AM (midnight of the start of the day), 6AM, 12PM, and 6PM (midnight of the end of the day) local time.
- 44 Class I areas x 6 years x 24 days/year x 4 heights x 5 start times = 126,720 trajectories

AOI Point Contributions for COHU

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AOI Point Contributions for OKEF

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<td>1.57E+07</td>
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<td>1.07E+06</td>
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<td>Georgia Power Company</td>
<td>91.4</td>
<td>4.34E+07</td>
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<td>4.33E+06</td>
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<tr>
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<td>South Carolina Power</td>
<td>77.2</td>
<td>1.27E+07</td>
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<td>1.05E+06</td>
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<td>1.50E+07</td>
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<td>1.20E+06</td>
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### PSAT Source Apportionment Modeling

- Quantifies visibility impacts from individual point sources, source sectors, and geographic regions
- NOx and SO2 tagging
- Used for further evaluation of AOI results
- Refines information on contributions to visibility impairment
- Can be used to adjust future year visibility projections to account for additional emission controls
- VISTAS contract with ERG allows for up to 250 tags

### Georgia Tagging for PSAT

- **Sources in Georgia (≥ 2% threshold)**
  - Ga Power Company – Plant Bowen
  - International Paper – Rome (aka TEMPLE INLAND)
  - International Paper – Savannah
  - Brunswick Cellulose Inc
  - Georgia-Pacific Consumer Products LP (Savannah River Mill)

- **Sources outside Georgia (≥ 4% threshold)**
  - INDIANA MICHIGAN POWER DBA AEP ROCKPORT (IN)
  - ROCK TENN CP, LLC (FL)
  - JEA (FL)

### PSAT SO2 and NOx Tags (209)

#### Round 1 (122 tags)
- Total SO2 tags for 10 individual VISTAS states + 3 RPOs = 13 tags
- Total NOx tags for 10 individual VISTAS states + 3 RPOs = 13 tags
- EGU point SO2 tags for 10 individual VISTAS states + 3 RPOs = 13 tags
- EGU point NOx tags for 10 individual VISTAS states + 3 RPOs = 13 tags
- SO2 tags for individual VISTAS facilities = 50 tags
- NOx tags for individual VISTAS facilities = 20 tags

#### Round 2 (87 tags)
- Non-EGU point SO2 for 10 individual VISTAS states + 3 RPOs = 13 tags
- Non-EGU point NOx for 10 individual VISTAS states + 3 RPOs = 13 tags
- SO2 and NOx for N/S/W/E boundaries = 8 tags
- SO2 tags for individual VISTAS facilities = 10 tags
- NOx tags for individual VISTAS facilities = 16 tags
- SO2 tags for individual non-VISTAS facilities = 17 tags
- NOx tags for individual non-VISTAS facilities = 10 tags

**Total Facility Tags (both SO2 and NOx)**

### AOI Screening Summary

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<thead>
<tr>
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<th>Threshold</th>
<th>Notes</th>
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<td>AL</td>
<td>2%</td>
<td>Sulfate only</td>
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<tr>
<td>FL</td>
<td>5%</td>
<td>Sulfite or nitrate, plus Gulf Coast, Mosaic Burtis, Mosaic New Wave, AEP, and WAC</td>
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<tr>
<td>GA</td>
<td>2% - 4%</td>
<td>Sulfite or nitrate, 2% threshold for GA facilities, 4% threshold for facilities outside GA</td>
</tr>
<tr>
<td>KY</td>
<td>2%</td>
<td>Sulfite or nitrate</td>
</tr>
<tr>
<td>MS</td>
<td>2%</td>
<td>Sulfate or nitrate</td>
</tr>
<tr>
<td>NC</td>
<td>3%</td>
<td>Sulfate + nitrate</td>
</tr>
<tr>
<td>SC</td>
<td>2% - 5%</td>
<td>2% for sulfate, 3% for nitrate, plus Sarver Cooper Whaley, International Paper Georgetown, and SCORI Williams</td>
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<tr>
<td>TN</td>
<td>3%</td>
<td>Sulfate + nitrate, plus CEMEX</td>
</tr>
<tr>
<td>VA</td>
<td>2%</td>
<td>Sulfite + nitrate</td>
</tr>
<tr>
<td>WV</td>
<td>0.2%</td>
<td>Sulfate or nitrate</td>
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### Facility Tags (AL, FL, GA)

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**Facility Tags (KY, MS, NC, SC, TN, VA)**

<table>
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<th>Facility Name</th>
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<th>Facility EPA</th>
<th>Facility NOx</th>
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**Sulfate AOI vs. Sulfate PSAT (≥ 1.00%)**

![Graph showing Sulfate PSAT and AOI Contributions](image)

**AOI vs. PSAT Summary**

- AOI tends to overestimate impacts for facilities near the Class I area.
- AOI tends to underestimate impacts for facilities far away from the Class I area.
- AOI uses 72-hour back trajectories, sulfate can last for weeks and travel hundreds to thousands of km.
- PSAT is the most reliable modeling tool for tracking facility contributions to visibility impairment at Class I areas.

**Four-Factor Analysis Screening Approach**

- The updated 2028 CAMx modeling will impact the total sulfate and total nitrate impacts from all sources at each Class I area since the SO₂ and NOx emissions have decreased.
- However, the individual sulfate and total nitrate impacts from the individual 87 tagged facilities should not change unless a facility has reduced or increased SO₂ and/or NOx emissions.
- Therefore, the percent contribution (facility sulfate impact/total impact of all point sources of sulfate + nitrate) will increase since the denominator will decrease; however, the order of the rankings from largest impact to smallest impact should not change unless one of those facilities reduced or increased emissions.
Four-Factor Analysis Screening Approach

- Due to the amount of resources already invested in the AOI and PSAT analysis, VISTAS plans to continue with our original approach for determining which sources will require a four-factor analysis.
- In cases where emissions decreased or increased at individual facilities being considered for a four-factor analysis, the facility contributions will be adjusted to be consistent with the lower/higher facility emissions before comparing to the PSAT contribution threshold.
- EPA verbally stated this should be okay 2/6/2020.

Revised Facility Nitrate PSAT Results

- Revised Facility Nitrate PSAT Results
  = Original Facility Nitrate PSAT Results
  * NOx Ratio_Facility * Ratio_Class_1_Area

  (Revised facility NOx emissions)
  where, NOx Ratio_Facility = ----------------------------
  (Original facility NOx emissions)

  (Original sulfate + nitrate point contribution)
  where, Ratio_Class_1_Area = ----------------------------
  (Revised sulfate + nitrate point contribution)

Original Facility PSAT Contributions

- Original Facility Sulfate PSAT Contributions (%)
  Facility Sulfate PSAT Contributions (Mm^-2) = ---------------------------------
  Total Sulfate + Nitrate Point Contribution (Mm^-2)

- Original Facility Nitrate PSAT Contributions (%)
  Facility Nitrate PSAT Contributions (Mm^-2) = ---------------------------------
  Total Sulfate + Nitrate Point Contribution (Mm^-2)

Revised Facility Sulfate PSAT Results

- Revised Facility Sulfate PSAT Results
  = Original Facility Sulfate PSAT Results
  * SO2 Ratio_Facility * Ratio_Class_1_Area

  (Revised facility SO2 emissions)
  where, SO2 Ratio_Facility = ----------------------------
  (Original facility SO2 emissions)

  (Original sulfate + nitrate point contribution)
  where, Ratio_Class_1_Area = ----------------------------
  (Revised sulfate + nitrate point contribution)
**Example:** New Madrid Power at SIPS

- **Revised Facility Sulfate PSAT Results**
  - Original Facility Sulfate PSAT Results
    * SO₂ Ratio_Facility * Ratio_Class_I_Area
  - Original Facility Sulfate PSAT Results = 1.46%
  - Revised Facility Sulfate PSAT Results
    = 1.46% * 0.665 (slide 91) * 1.382 (slide 92)
    = 1.34% (slide 94)
### St Marks Wilderness Area

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<th>MW Available (MW)</th>
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<th>MW Peak (MW)</th>
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### Mammoth Cave NP

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### Linville Gorge Wilderness Area

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Appendix F-3
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### Non-VISTAS Class I Areas

- Only two VISTAS facilities have a contribution ≥ 1.00% at any non-VISTAS Class I Area
- **ALLEGHENY ENERGY SUPPLY CO, LLC-HARRISON (WV)**
  - Moosehorn Wilderness EDM (1.06% sulfate)
- **Tennessee Valley Authority (TVA) - Shawnee Fossil Plant (KY)**
  - Caney Creek Wilderness Area (1.09% sulfate)
  - Hercules-Glades Wilderness Area (1.95% sulfate)
  - Mingo Wilderness Area (1.47% sulfate)
  - Great Gulf Wilderness Area (1.03% sulfate)
  - Presidential Range-Dry River Wilderness (1.03% sulfate)

---

## Shenandoah NP

<table>
<thead>
<tr>
<th>State</th>
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<th>Facility Name</th>
</tr>
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<tbody>
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## Dolly Sods Wilderness

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<th>Facility Name</th>
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<tr>
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## Otter Creek Wilderness

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<tbody>
<tr>
<td>WA</td>
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<td>Otter Creek National Park</td>
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---

## VISTAS Facilities ≥ 1.00%

<table>
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<tr>
<th>State</th>
<th>Facility ID</th>
<th>Facility Name</th>
</tr>
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<tbody>
<tr>
<td>WV</td>
<td>1380000000</td>
<td>VISTAS Associate, LLC-HARRISON (WV)</td>
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</table>

## Non-VISTAS Facilities ≥ 1.00%

<table>
<thead>
<tr>
<th>State</th>
<th>Facility ID</th>
<th>Facility Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>WV</td>
<td>1380000000</td>
<td>Non-VISTAS Associate, LLC-HARRISON (WV)</td>
</tr>
</tbody>
</table>
**EPA Guidance (August 20, 2019)**

- Many facilities already have effective emission control technologies in place. States will consider control options for these facilities on a case-by-case basis.
  - "For the purpose of SO₂ control measures, an EGU that has an add-on flue gas desulfurization (FGD) system and that meets the applicable alternative SO₂ emission limit of the 2012 Mercury Air Toxics Standards (MATS) rule for power plants. The two limits in the rule (0.2 lb/MMBtu for coal-fired EGUs or 0.3 lb/MMBtu for EGUs fired with oil/diesel solid fuel) are low enough that it is unlikely that an analysis of control measures for a source already equipped with a scrubber and meeting one of these limits would conclude that even more stringent control of SO₂ is necessary to make reasonable progress."
  - "For the purposes of SO₂ and NOx control measures, a combustion source (e.g., an EGU or industrial boiler or process heater) that, during the first implementation period, installed a FGD system that operates year-round with an effectiveness of at least 90 percent or by the installation of a selective catalytic reduction system that operates year-round with an overall effectiveness of at least 90 percent (in both cases calculating the effectiveness as the total for the system, including any bypassed flue gas), on a pollutant-specific basis."

**Remaining VISTAS Work Schedule**

<table>
<thead>
<tr>
<th>Task</th>
<th>Schedule</th>
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</thead>
<tbody>
<tr>
<td>2028 Point Emissions Updates</td>
<td>Completed</td>
</tr>
<tr>
<td>2028 Emissions Processing</td>
<td>Late April, 2020</td>
</tr>
<tr>
<td>2028 CAMx Modeling</td>
<td>Late June, 2020</td>
</tr>
<tr>
<td>2028 Visibility Projections</td>
<td>Mid-July, 2020</td>
</tr>
<tr>
<td>2028 Deposition Projections</td>
<td>Mid-July, 2020</td>
</tr>
<tr>
<td>Final Reports and Documentation</td>
<td>Late July, 2020</td>
</tr>
<tr>
<td>Website Updates and Postings</td>
<td>Late July, 2020</td>
</tr>
<tr>
<td>End of Contract</td>
<td>September 30, 2020</td>
</tr>
<tr>
<td>Regional Haze SIPs Due to EPA</td>
<td>July 31, 2021</td>
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**Additional Considerations**

- The final list of four-factor analysis sources will be determined in consultation with the FLMs, EPA, other states, and stakeholders.
- Some VISTAS states may perform additional four-factor analyses for sources not listed on Slide 113.
- States will verify projected SO₂ and NOx emissions with facilities. PSAT results can be adjusted to match.
- Some states may allow their facilities to take a permit limit that will result in adjusted PSAT impacts below the 1.00% threshold in lieu of performing a four-factor analysis.
- The large number of coal-fired EGU retirements and fuel switching from coal to natural gas needs to be considered along with the sources selected for the four-factor analysis. States should not be penalized for early action.

**Contacts for Further Information**

- For general, technical, and SIP-related questions, contact the TAWG and CC Chairs:
  - TAWG – Randy Strait (randy.strait@ncdcds.gov)
  - CC – Jim Boylan (james.boylan@dnr.pa.gov)
- For general, contract, and funding questions, contact the Project Manager:
  - John Hornback (hornback@metro4-sesarm.org)

---

**Next Steps and Schedule**
Appendix F-3j

VISTAS Regional Haze Project Update to FLMs, EPA OAQPS, Region 3, Region 4, MJOs
May 11, 2020

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Promoting a healthy environment
Appendix F-3
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Contacts for Further Information

• For general, technical, and SIP-related questions, contact the TAWG and CC Chairs:
  • TAWG – Randy Strait (randy.strait@ncdenr.gov)
  • CC – Jim Boylan (james.bowlan@dnr.ga.gov)

• For project and contract management questions, contact the Project Manager:
  • John Hornback (hornback@metro4-sesarm.org)
VISTAS Regional Haze Project
Update – Part 2

FLM/EPA Briefing
Jim Boylan
May 11, 2020

Outline
• Background Information
• 2028 Emissions Updates
• Revised 2028 PSAT Stacked Bar Charts
• Reasonable Progress Analysis
• Next Steps & Schedule

Class I Areas of Interest to VISTAS States

VISTAS Class I Areas

<table>
<thead>
<tr>
<th>VISTAS FEDERAL CLASS I AREAS</th>
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<tbody>
<tr>
<td>AL – Apalachicola National Forest Service</td>
<td>EPA Wildlife Area (WA)</td>
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<tr>
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<tr>
<td>WY – Wyoming National Park Service</td>
<td>EPA Wildlife Area (WA)</td>
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</table>

Initial VISTAS Emissions Updates
• Used EPA’s 2011 base year emissions without change
• Updated EPA’s Initial 2028 projection year emissions
  • EGU and major non-EGU sources
  • Removed Clean Power Plan assumptions
• VISTAS – Adjusted for changes in fuels and facility operating plans
  • Non-VISTAS – Used ERTAC 2.7opt
VISTAS vs. EPA Updated 2028 Emission Projections

- The table below compares the 2028 point emissions used by VISTAS vs. the latest 2028 EPA emissions used by EPA (projected from 2016). The emissions below are extracted from the VISTAS 12 modeling domain which covers the Eastern U.S.

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<tr>
<th>Pollutant</th>
<th>VISTAS 2028 (tpy)</th>
<th>New EPA 2028 (tpy)</th>
<th>Change (tpy)</th>
<th>Change (%)</th>
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<tbody>
<tr>
<td>NOx</td>
<td>2,641,463.83</td>
<td>2,108,115.50</td>
<td>-533,348.33</td>
<td>-20.19%</td>
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<td>SO2</td>
<td>2,574,542.02</td>
<td>1,400,287.10</td>
<td>-1,174,254.92</td>
<td>-45.61%</td>
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Old ERTAC (2.7opt) vs. New ERTAC (16.0)

<table>
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<th>Pollutant</th>
<th>Old ERTAC</th>
<th>New ERTAC</th>
<th>Δ ERTAC</th>
<th>Δ ERTAC %</th>
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<tr>
<td>SO2</td>
<td>367,683.7</td>
<td>760,828.2</td>
<td>-393,144.5</td>
<td>-51.67%</td>
</tr>
<tr>
<td>NOx</td>
<td>367,683.7</td>
<td>760,828.2</td>
<td>-393,144.5</td>
<td>-51.67%</td>
</tr>
</tbody>
</table>

VISTAS vs. EPA CC/TAWG Conclusions

1. 2028 emission updates are necessary
   - **VISTAS States** — States will:
     - Update 2028 major source emissions projections (SO2, NOx, PM2.5, PM10, NH3, CO) at the facility and unit level
     - Add any new sources of significance.
   - **LADCO States** — SESARM will:
     - Replace ERTAC 2.7 with ERTAC 16.1 based on LADCO input
   - **All Other States** — SESARM will:
     - Replace ERTAC 2.7 with ERTAC 16.0
     - Verify accuracy of large SO2 and NOx source emissions projections via contact with surrounding states/RPOs and update emissions as needed

2. Additional 2028 air quality modeling is needed

Additional Modeling-Related Tasks

- Emissions processing
- Updated 2028 CAMx modeling (VISTAS_12)
- Updated 2028 visibility projections
- Documentation

Updated 2028 Point Emissions
2028 SO₂ Comparison

PSAT Source Apportionment Modeling

- Quantifies visibility impacts from individual point sources, source sectors, and geographic regions
- NOx and SO₂ tagging
- Used for further evaluation of AAI results
- Refines information on contributions to visibility impairment
- Can be used to adjust future year visibility projections to account for additional emission controls
- VISTAS contract with ERG allows for up to 250 tags

2028 NOx Comparison

PSAT SO₂ and NOx Tags (209)

Round 1 (122 tags)
- Total SO₂ tags for 10 individual VISTAS states + 3 RPOs = 13 tags
- Total NOx tags for 10 individual VISTAS states + 3 RPOs = 13 tags
- EGU point SO₂ tags for 10 individual VISTAS states + 3 RPOs = 13 tags
- EGU point NOx tags for 10 individual VISTAS states + 3 RPOs = 13 tags
- SO₂ tags for individual VISTAS facilities = 50 tags
- NOx tags for individual VISTAS facilities = 20 tags

Round 2 (87 tags)
- Non-EGU point SO₂ for 10 individual VISTAS states + 3 RPOs = 13 tags
- Non-EGU point NOx for 10 individual VISTAS states + 3 RPOs = 13 tags
- SO₂ tags for individual non-VISTAS facilities = 17 tags
- NOx tags for individual non-VISTAS facilities = 10 tags

Revised 2028 PSAT Stacked Bar Charts (Original and Adjusted)

PSAT Adjustment Ratios

Appendix F-3
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Revised State/RPO PSAT Results

- Revised EGU Sulfate PSAT Results
  \[ \text{Adjusted} \]
  \[ \text{Original} \]

- Revised EGU Nitrate PSAT Results
  \[ \text{Adjusted} \]
  \[ \text{Original} \]
Reasonable Progress Screening Approach

1. The VISTAS reasonable progress work started with AOI screening (Q*W*EWR) to rank facilities based on their sulfate and nitrate contributions at each Class I area.
2. These rankings were used to identify 87 individual facilities for PSAT tagging. PSAT tagging was used to determine the sulfate and nitrate contributions from each facility at each Class I area in the VISTAS 12 domain.
3. Each individual VISTAS state will apply a PSAT contribution threshold based on the facility sulfate and facility nitrate impacts (separately, not combined) divided by the total impact of sulfate + nitrate from all point sources to determine which sources may need to be considered for a four-factor analysis.
   - If sulfate contribution ≥ 1.00% => SO2 Four-Factor Analysis
   - If nitrate contribution ≥ 1.00% => NOx Four-Factor Analysis

Why 1% Threshold?

- In the Round 1 Regional Haze SIPs, many VISTAS states used the AOI approach and a 1% threshold on a Unit basis.
  - Round 2 uses the AOI/PSAT approach and a ≥ 1.00% PSAT threshold based on a Facility basis.
    - This will pull in more facilities compared to a Unit basis.
  - Round 2 uses 2028 emissions (lower than 2018)
    - This will pull in facilities with smaller visibility impacts (in 1 km²) compared to Round 1.
  - This approach results in a reasonable number of sources that can be evaluated with limited state resources and focuses on the sources with the largest impacts.

Reasonable Progress Analysis

HYSPLIT Trajectories

- Trajectories were run using NAM-12 meteorology for the 20% most impaired days in 2011-2016 at 44 Class I areas.
  - Trajectories were run with starting heights of 100, 500, 1,000, and 1,500 meters.
  - Trajectories were run 72 hours backwards in time for each height at each location.
  - Trajectories were run with start times of 12AM (midnight of the start of the day), 6AM, 12PM, 6PM, and 12AM (midnight of the end of the day) local time.
  - 44 Class I areas x 6 years x 24 days/year x 4 heights x 5 start times = 126,720 trajectories
Area of Influence (AOI) Analysis

- Evaluates emissions (Q), distance to Class I area (d), and extinction weighted residence time (EWRT) in model grid cells (point) or counties (source categories)
- Formula: (Q/d) * EWRT
- Establishes each county’s and each facility’s contribution to light extinction at each Class I area on the 20% most impaired days
- Can use contributions to rank and screen facilities for the four-factor analysis
- Georgia Example:
  - Sources in Georgia, used ≥ 2% threshold
  - Sources outside Georgia, used ≥ 4% threshold

AOI Point Contributions for Wolf Island

- Sources in Georgia (≥ 2% threshold)
  - Ga Power Company – Plant Bowen
  - International Paper – Rome (aka TEMPLE INLAND)
  - International Paper – Savannah
  - Brunswick Cellulose Inc
  - Georgia-Pacific Consumer Products LP (Savannah River Mill)
- Sources outside Georgia (≥ 4% threshold)
  - INDIANA MICHIGAN POWER DBA AEP ROCKPORT (IN)
  - RDA TEEN CP, LLC (FL)
  - JEA (FL)

AOI Point Contributions for Cohutta

AOI Point Contributions for Okefenokee

Georgia Tagging for PSAT

- Sources in Georgia (≥ 2% threshold)
- Sources outside Georgia (≥ 4% threshold)

AOI Screening Summary

State | Threshold | Notes
--- | --- | ---
AL | 2% | Surface only
FL | 5% | Surface or remote, plus Gulf Coast, Monroe, Lake, and Escambia
GA | 2% - 4% | Surface or remote, 2% threshold for GA facilities, 4% threshold for facilities out of GA
KY | 2% | Surface or remote
MS | 2% | Surface or remote
NC | 3% | Surface + remote
SC | 2% - 5% | 2% for surface, 5% for remote, plus Savannah, Georgetown, and SCG&W Williams
TN | 3% | Surface + remote, plus CEMEX
VA | 2% | Surface + remote
WV | 0.2% | Surface or remote
Appendix F-3
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Sulfate AOI vs. Sulfate PSAT ($\geq 1.00\%$)

Azimuth AOI contributions

Average Sulfate from source $= 73\%$

Reasonable Progress Screening Approach

- Due to the amount of resources already invested in the AOI and PSAT analysis, VISTAS plans to continue with our original reasonable progress analysis approach for determining which sources will require a four-factor analysis.
- In cases where emissions decreased or increased at individual facilities being considered for a four-factor analysis, the facility contributions will be adjusted to be consistent with the lower/higher facility emissions before comparing to the PSAT contribution threshold.
- EPA verbally stated this should be okay 2/6/2020.

AOI vs. PSAT Summary

- AOI tends to overestimate impacts for facilities near the Class I area.
- AOI tends to underestimate impacts for facilities far away from the Class I area.
- AOI uses 72-hour back trajectories, sulfate can last for weeks and travel hundreds to thousands of km.
- PSAT is the most reliable modeling tool for tracking facility contributions to visibility impairment at Class I areas.

Revised Facility Sulfate PSAT Results

- Revised Facility Sulfate PSAT Results = Original Facility Sulfate PSAT Results
  * $SO_2$ Ratio_Facility $\times$ Ratio_Class_I_Area

  (Revised facility $SO_2$ emissions)

  where, $SO_2$ Ratio_Facility = ------------------------

  (Original facility $SO_2$ emissions)

  (Original sulfate + nitrate point contribution)

  where, Ratio_CLASS_I_Area = ------------------------

  (Revised sulfate + nitrate point contribution)

Reasonable Progress Screening Approach

- The updated 2028 CAMx modeling will impact the total sulfate and total nitrate impacts from all sources at each Class I area since the $SO_2$ and NOx emissions have decreased.
- However, the individual sulfate and total nitrate impacts from the individual 87 tagged facilities should not change unless a facility has reduced or increased $SO_2$ and/or NOx emissions.
- Therefore, the percent contribution (facility sulfate impact/total impact of all point sources of sulfate + nitrate) will increase since the denominator will decrease; however, the order of the rankings from largest impact to smallest impact should not change unless one of those facilities reduced or increased emissions.

Revised Facility Nitrate PSAT Results

- Revised Facility Nitrate PSAT Results = Original Facility Nitrate PSAT Results
  * NOx Ratio_Facility $\times$ Ratio_Class_I_Area

  (Revised facility NOx emissions)

  where, NOx Ratio_Facility = ------------------------

  (Original facility NOx emissions)

  (Original sulfate + nitrate point contribution)

  where, Ratio_CLASS_I_Area = ------------------------

  (Revised sulfate + nitrate point contribution)
### Facility Ratios (AL, FL, GA)

<table>
<thead>
<tr>
<th>Facility</th>
<th>AL</th>
<th>FL</th>
<th>GA</th>
<th>Total</th>
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<td>4.7</td>
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<td>1.5</td>
<td>2.0</td>
<td>4.7</td>
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### Class I Area Ratios

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<th>Ratio</th>
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### Facility Ratios (KY, MS, NC, SC, TN, VA)

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### EXAMPLE: New Madrid Power at SIPS

- **Revised Facility Sulfate PSAT Results**
  
  \[
  \text{Revised Facility Sulfate PSAT Results} = \text{Original Facility Sulfate PSAT Results} \times \text{SO}_2 \text{Ratio_Facility} \times \text{Ratio_Class I Area}
  \]

- **Original Facility Sulfate PSAT Results** = 1.46%

- **Revised Facility Sulfate PSAT Results**
  
  \[
  1.46\% \times 0.665 \text{ (Slide 94)} \times 1.382 \text{ (Slide 95)} = 1.34\% \text{ (Slide 97)}
  \]

### Facility Ratios (WV, AR, MO, MD, PA, IL, IN, OH)

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Appendix F-3  
Page 151
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### Everglades NP (FL)

| State | Facility ID | Facility Name | Type | YR | POP | ZVZI | POPX | ZVX | YRPOP | ZVXZ | YRZVZI | ZVXZX | YRPOPX | ZVXZXZ |
|-------|-------------|---------------|------|----|-----|------|------|-----|-------|------|--------|------|--------|------|--------|--------|
| NV    |             |               |      |    |     |      |      |     |       |      |        |      |        |      |        |        |
| CA    |             |               |      |    |     |      |      |     |       |      |        |      |        |      |        |        |
| OR    |             |               |      |    |     |      |      |     |       |      |        |      |        |      |        |        |
| TX    |             |               |      |    |     |      |      |     |       |      |        |      |        |      |        |        |
| WA    |             |               |      |    |     |      |      |     |       |      |        |      |        |      |        |        |

### Chassahowitzka Wilderness Area (FL)

| State | Facility ID | Facility Name | Type | YR | POP | ZVZI | POPX | ZVX | YRPOP | ZVXZ | YRZVZI | ZVXZX | YRPOPX | ZVXZXZ |
|-------|-------------|---------------|------|----|-----|------|------|-----|-------|------|--------|------|--------|------|--------|--------|
| NV    |             |               |      |    |     |      |      |     |       |      |        |      |        |      |        |        |
| CA    |             |               |      |    |     |      |      |     |       |      |        |      |        |      |        |        |
| OR    |             |               |      |    |     |      |      |     |       |      |        |      |        |      |        |        |
| TX    |             |               |      |    |     |      |      |     |       |      |        |      |        |      |        |        |
| WA    |             |               |      |    |     |      |      |     |       |      |        |      |        |      |        |        |

### Everglades NP (FL)

| State | Facility ID | Facility Name | Type | YR | POP | ZVZI | POPX | ZVX | YRPOP | ZVXZ | YRZVZI | ZVXZX | YRPOPX | ZVXZXZ |
|-------|-------------|---------------|------|----|-----|------|------|-----|-------|------|--------|------|--------|------|--------|--------|
| NV    |             |               |      |    |     |      |      |     |       |      |        |      |        |      |        |        |
| CA    |             |               |      |    |     |      |      |     |       |      |        |      |        |      |        |        |
| OR    |             |               |      |    |     |      |      |     |       |      |        |      |        |      |        |        |
| TX    |             |               |      |    |     |      |      |     |       |      |        |      |        |      |        |        |
| WA    |             |               |      |    |     |      |      |     |       |      |        |      |        |      |        |        |

### St Marks Wilderness Area (FL)

| State | Facility ID | Facility Name | Type | YR | POP | ZVZI | POPX | ZVX | YRPOP | ZVXZ | YRZVZI | ZVXZX | YRPOPX | ZVXZXZ |
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| NV    |             |               |      |    |     |      |      |     |       |      |        |      |        |      |        |        |
| CA    |             |               |      |    |     |      |      |     |       |      |        |      |        |      |        |        |
| OR    |             |               |      |    |     |      |      |     |       |      |        |      |        |      |        |        |
| TX    |             |               |      |    |     |      |      |     |       |      |        |      |        |      |        |        |
| WA    |             |               |      |    |     |      |      |     |       |      |        |      |        |      |        |        |

Appendix F-3
Page 152
### St Marks Wilderness Area (FL)

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### Appendix F-3

Page 153
## Wolf Island Wilderness (GA)

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## Mammoth Cave NP (KY)

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## Shining Rock Wilderness Area (NC)

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Appendix F-3
Page 154
### Shining Rock Wilderness Area (NC)

| State | Facility ID | Facility Name | Number of Days | Land Protected | Water Protected | Air Quality | % Renewable Energy | % Fuel Mix | % Transportation | % Energy Outcomes | Energy Efficiency | % Water Protection | % Air Protection | % Total Protection | % Health Benefits | % Environmental Benefits | % Economic Benefits | % Social Benefits | % Overall Protection |
|-------|-------------|---------------|----------------|----------------|----------------|-------------|-------------------|-----------|-----------------|----------------|-----------------|-------------------|----------------|------------------|-----------------|----------------|-------------------|-------------------|----------------|-------------------|
| NC    | 2001851-2451 |歌舞剧中的森林游客 | 100 | 80% | 80% | 80% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| NC    | 2001851-2452 |歌舞剧中的森林游客 | 100 | 80% | 80% | 80% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |

### Swanquarter Wilderness Area (NC)

| State | Facility ID | Facility Name | Number of Days | Land Protected | Water Protected | Air Quality | % Renewable Energy | % Fuel Mix | % Transportation | % Energy Outcomes | Energy Efficiency | % Water Protection | % Air Protection | % Total Protection | % Health Benefits | % Environmental Benefits | % Economic Benefits | % Social Benefits | % Overall Protection |
|-------|-------------|---------------|----------------|----------------|----------------|-------------|-------------------|-----------|-----------------|----------------|-----------------|-------------------|----------------|------------------|-----------------|----------------|-------------------|-------------------|----------------|-------------------|
| NC    | 2001851-2453 |歌舞剧中的森林游客 | 100 | 80% | 80% | 80% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| NC    | 2001851-2454 |歌舞剧中的森林游客 | 100 | 80% | 80% | 80% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |

### Joyce Kilmer-Slickrock Wilderness Area (TN/NC)

| State | Facility ID | Facility Name | Number of Days | Land Protected | Water Protected | Air Quality | % Renewable Energy | % Fuel Mix | % Transportation | % Energy Outcomes | Energy Efficiency | % Water Protection | % Air Protection | % Total Protection | % Health Benefits | % Environmental Benefits | % Economic Benefits | % Social Benefits | % Overall Protection |
|-------|-------------|---------------|----------------|----------------|----------------|-------------|-------------------|-----------|-----------------|----------------|-----------------|-------------------|----------------|------------------|-----------------|----------------|-------------------|-------------------|----------------|-------------------|
| TN/NC | 2001851-2455 |歌舞剧中的森林游客 | 100 | 80% | 80% | 80% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| TN/NC | 2001851-2456 |歌舞剧中的森林游客 | 100 | 80% | 80% | 80% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |

### Cape Romain Wilderness Area (SC)

| State | Facility ID | Facility Name | Number of Days | Land Protected | Water Protected | Air Quality | % Renewable Energy | % Fuel Mix | % Transportation | % Energy Outcomes | Energy Efficiency | % Water Protection | % Air Protection | % Total Protection | % Health Benefits | % Environmental Benefits | % Economic Benefits | % Social Benefits | % Overall Protection |
|-------|-------------|---------------|----------------|----------------|----------------|-------------|-------------------|-----------|-----------------|----------------|-----------------|-------------------|----------------|------------------|-----------------|----------------|-------------------|-------------------|----------------|-------------------|
| SC    | 2001851-2457 |歌舞剧中的森林游客 | 100 | 80% | 80% | 80% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| SC    | 2001851-2458 |歌舞剧中的森林游客 | 100 | 80% | 80% | 80% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |

### Swanquarter Wilderness Area (NC)

| State | Facility ID | Facility Name | Number of Days | Land Protected | Water Protected | Air Quality | % Renewable Energy | % Fuel Mix | % Transportation | % Energy Outcomes | Energy Efficiency | % Water Protection | % Air Protection | % Total Protection | % Health Benefits | % Environmental Benefits | % Economic Benefits | % Social Benefits | % Overall Protection |
|-------|-------------|---------------|----------------|----------------|----------------|-------------|-------------------|-----------|-----------------|----------------|-----------------|-------------------|----------------|------------------|-----------------|----------------|-------------------|-------------------|----------------|-------------------|
| NC    | 2001851-2459 |歌舞剧中的森林游客 | 100 | 80% | 80% | 80% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| NC    | 2001851-2460 |歌舞剧中的森林游客 | 100 | 80% | 80% | 80% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |

### Cape Romain Wilderness Area (SC)

| State | Facility ID | Facility Name | Number of Days | Land Protected | Water Protected | Air Quality | % Renewable Energy | % Fuel Mix | % Transportation | % Energy Outcomes | Energy Efficiency | % Water Protection | % Air Protection | % Total Protection | % Health Benefits | % Environmental Benefits | % Economic Benefits | % Social Benefits | % Overall Protection |
|-------|-------------|---------------|----------------|----------------|----------------|-------------|-------------------|-----------|-----------------|----------------|-----------------|-------------------|----------------|------------------|-----------------|----------------|-------------------|-------------------|----------------|-------------------|
| SC    | 2001851-2461 |歌舞剧中的森林游客 | 100 | 80% | 80% | 80% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| SC    | 2001851-2462 |歌舞剧中的森林游客 | 100 | 80% | 80% | 80% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
### Great Smoky Mountains National Park (TN/NC)

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<th>% DRY</th>
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<tr>
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### Joyce Kilmer-Slickrock Wilderness Area (TN/NC)

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### Shenandoah National Park (VA)

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<th>% OTHER</th>
<th>% UNPAINTED</th>
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<tbody>
<tr>
<td>CA</td>
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<td>Summit Grove / Lula Lake Bear Camp</td>
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<td>96.73%</td>
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<tr>
<td>KY</td>
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Appendix F-3
Page 156
### Dolly Sods Wilderness Area (WV)

<table>
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<td>DOLLY SODS WILDERNESS AREA</td>
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### Otter Creek Wilderness Area (WV)

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<th>HP % Time</th>
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<th>HP % @ 1.0%</th>
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### Shenandoah National Park (VA)

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### Otter Creek Wilderness Area (WV)

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### Dolly Sods Wilderness Area (WV)

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<tr>
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<td>155505019101</td>
<td>DOLLY SODS WILDERNESS AREA</td>
<td>83.1</td>
<td>1.70%</td>
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<td>0.58%</td>
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### Shenandoah National Park (VA)

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<tr>
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<td>1.70%</td>
<td>2.28%</td>
<td>0.58%</td>
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</table>

### Non-VISTAS Class I Areas

- Only two VISTAS facilities have a contribution ≥ 1.00% at any non-VISTAS Class I Area
- **ALLEGHENY ENERGY SUPPLY CO., LLC - HARRISON (WV)**
  - Moosehorn Wilderness EDM (1.06% sulfate)
- **Tennessee Valley Authority (TVA) - Shawnee Fossil Plant (KY)**
  - Carnley Creek Wilderness Area (1.09% sulfate)
  - Hercules-Glades Wilderness Area (1.95% sulfate)
  - Mingus Wilderness Area (1.47% sulfate)
  - Great Gulf Wilderness Area (1.03% sulfate)
  - Presidential Range-Dry River Wilderness (1.03% sulfate)
### Non-VISTAS Facilities ≥ 1.000%

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<th>Facility Name</th>
<th>Facility ID</th>
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<th>Emitted During Combustion</th>
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### Additional Considerations
- The final list of four-factor analysis sources will be determined in consultation with the FLMs, EPA, other states, and stakeholders.
- Some VISTAS states may perform additional four-factor analyses for sources not listed on Slide 134.
- States will verify projected SO₂ and NOₓ emissions with facilities. PSAT results can be adjusted to match.
- Some states may allow their facilities to take a permit limit that will result in adjusted PSAT impacts below the 1.000% threshold in lieu of performing a four-factor analysis.
- The large number of coal-fired EGU retirements and fuel switching from coal to natural gas need to be considered along with the sources selected for the four-factor analysis. States should not be penalized for early action.

### VISTAS Facilities ≥ 1.000%

<table>
<thead>
<tr>
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<th>Facility Name</th>
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### Next Steps and Schedule

### EPA Guidance (August 20, 2019)
- Many facilities already have effective emission control technologies in place. States will consider control options for these facilities on a case-by-case basis.
- "For the purposes of SO₂ control measures, an EGU that has added on-flue gas desulfurization (FGD) unit and that meets the applicable alternative SO₂ emission limit of the 2012 Mercury and Air Toxics Standards (MATS) rule for power plants. The two limits in the rule (0.3 lb/MMBtu for coal- fired EGU or 0.3 lb/MMBtu for EGU fired with oil-derived solid fuel) are low enough that it is unlikely that an analysis of control measures for a source already equipped with a scrubber and meeting one of these two limits would conclude that even more stringent control of SO₂ is necessary to make reasonable progress."
- "For the purposes of SO₂ and NOₓ control measures, a combustion scheme (e.g., air FGD or industrial boiler or process heater) that, during the first implementation period, installed a FGD system that operates year-round with an effectiveness of at least 90 percent or by the installation of a selective catalytic reduction system that operates year-round with an overall effectiveness of at least 90 percent (in both cases calculating the effectiveness as the total for the system, including any bypassed flue gas), as a pollutant-specific basis."

### Remaining VISTAS Work Schedule

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<tr>
<td>2028 Emissions Processing</td>
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</tr>
<tr>
<td>2028 CMX Modeling</td>
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<tr>
<td>2028 Visibility Projections</td>
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<tr>
<td>2028 Deposition Projections</td>
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<tr>
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<td>July 31, 2021</td>
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</tbody>
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*Represents technical work completion. Draft reports to follow.
Contacts for Further Information

- For general, technical, and SIP-related questions, contact the TAWG and CC Chairs:
  - TAWG – Randy Strait (randy.strait@ncdenr.gov)
  - CC – Jim Boylan (james.boylan@dnr.ga.gov)

- For project and contract management questions, contact the Project Manager:
  - John Hornback (hornback@metro4-sesarm.org)
## Appendix F

### Table F.1

<table>
<thead>
<tr>
<th>Method</th>
<th>IS 2011</th>
<th>IS 2018</th>
<th>IS 2025</th>
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### Table F.3

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Appendix F-3k

VISTAS Regional Haze Project Update Stakeholder Briefing
May 20, 2020

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Promoting a healthy environment
VISTAS Regional Haze Project Update

Stakeholder Briefing
Jim Boylan
May 20, 2020

Outline
- Background Information
- 2028 Emissions Updates
- 2028 Model Projections
- Adjusted 2028 PSAT Stacked Bar Charts
- Reasonable Progress Screening Analysis
- Next Steps & Schedule

Regional Haze Background Information
- Initial round of regional haze SIPS were due December 17, 2007
- Regional haze SIPS for second planning period due July 31, 2021
- EPA revised regional haze regulations
  - 40 CFR Part 51 and 40 CFR Part 52
  - Revisions effective January 10, 2017
- Current EPA regional haze guidance
  - December 20, 2018 – Tracking Visibility Progress
  - August 20, 2019 – Regional Haze SIPS for the Second Planning Period

VISTAS Organization
- State and Tribal Air Directors (STAD)
  - Policy Decisions
  - Michelle Walker Owenby (TN), Chair
- Coordinating Committee (CC)
  - Planning Recommendations
  - Jim Boylan (GA), Chair
- Technical Analysis Work Group (TAWG)
  - Technical Recommendations
  - Randy Strait (NC), Chair
- Project Manager
  - John Hornback (SESARM)

Class I Areas of Interest to VISTAS States

VISTAS Class I Areas

*This Class I Area does not have an IMPROVE monitor and will be represented by measurement data from a nearby Class I Area with an IMPROVE monitor.*
VISTAS Air Quality Model

- Started with EPA’s 2011/2028 modeling platform
  - Version 6.3e1
  - CAMx v6.32
  - Replaced CAMx v6.32 with CAMx v6.40
  - Used 2011 meteorology
  - Reasons for using EPA platform
    - Time limited
    - Budget limited
    - Most source sectors acceptably represented in EPA platform

Initial VISTAS vs. Updated EPA 2028 Emissions

- The table below compares the 2028 point emissions used by VISTAS vs. the latest 2028th emissions used by EPA (projected from 2016). The emissions below are extracted from the VISTAS 12 modeling domain which covers the Eastern U.S.

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>VISTAS 2028 (tpy)</th>
<th>New EPA 2028 (tpy)</th>
<th>Change (tpy)</th>
<th>Change (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOx</td>
<td>2,641,463.83</td>
<td>2,108,115.50</td>
<td>-533,348.33</td>
<td>-20.19%</td>
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<tr>
<td>SO2</td>
<td>2,574,542.02</td>
<td>1,400,287.10</td>
<td>-1,174,254.92</td>
<td>-45.61%</td>
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Old ERTAC (2.7opt) vs. New ERTAC (16.0)

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Old ERTAC (2.7opt)</th>
<th>New ERTAC (16.0)</th>
<th>Difference</th>
<th>Percentage</th>
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</thead>
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<tr>
<td>SO2</td>
<td>275,140.2</td>
<td>160,547.9</td>
<td>-114,592.3</td>
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<tr>
<td>NOx</td>
<td>67,798.1</td>
<td>22,499.9</td>
<td>-45,298.2</td>
<td>-66.67%</td>
</tr>
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</table>

Initial VISTAS Emissions Updates

- Used EPA’s 2011 base year emissions without change
- Updated EPA’s Initial 2028 projection year emissions
  - EGU and major non-EGU sources
  - Removed Clean Power Plan assumptions
  - VISTAS – Adjusted for changes in fuels and facility operating plans
  - Non-VISTAS – Used ERTAC 2.7opt

VISTAS CC/TAWG Conclusions (January 2020)

1. 2028 emission updates are necessary
   - **VISTAS States** – States will:
     - Update 2028 major source emissions projections (SO2, NOx, PM_{2.5}, PM_{10}, NH3, CO) at the facility and unit level
     - Add any new sources of significance
   - **LADCO States – SESARM will:**
     - Replace ERTAC 2.7 with ERTAC 16.1 based on LADCO input
   - **All Other States – SESARM will:**
     - Replace ERTAC 2.7 with ERTAC 16.0
     - Verify accuracy of large SO2 and NOx source emissions projections via contact with surrounding states/RPGs and update emissions as needed

2. Additional 2028 air quality modeling is needed
Additional Modeling-Related Tasks

- Emissions processing
- Updated 2028 CAMx modeling (VISTAS_12)
- Updated 2028 visibility projections
- Documentation

Recent 2028 Emissions Updates

2028 EGU & NEGU NOx Comparison

<table>
<thead>
<tr>
<th>State</th>
<th>Peak_NOx</th>
<th>Peak_NEGU</th>
<th>NOx DOD</th>
<th>NOx REW</th>
<th>Delta (NOx)</th>
<th>Delta (NEGU)</th>
<th>Delta (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL</td>
<td>87,000,000</td>
<td>12,000,000</td>
<td>11.2%</td>
<td>11.6%</td>
<td>-400,000</td>
<td>-400,000</td>
<td>-0.5%</td>
</tr>
<tr>
<td>CA</td>
<td>50,000,000</td>
<td>8,000,000</td>
<td>16.7%</td>
<td>15.5%</td>
<td>-400,000</td>
<td>-400,000</td>
<td>-0.5%</td>
</tr>
<tr>
<td>GA</td>
<td>87,000,000</td>
<td>12,000,000</td>
<td>11.2%</td>
<td>11.6%</td>
<td>-400,000</td>
<td>-400,000</td>
<td>-0.5%</td>
</tr>
<tr>
<td>FL</td>
<td>87,000,000</td>
<td>12,000,000</td>
<td>11.2%</td>
<td>11.6%</td>
<td>-400,000</td>
<td>-400,000</td>
<td>-0.5%</td>
</tr>
<tr>
<td>ME</td>
<td>87,000,000</td>
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<td>11.2%</td>
<td>11.6%</td>
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<td>-400,000</td>
<td>-0.5%</td>
</tr>
<tr>
<td>NC</td>
<td>87,000,000</td>
<td>12,000,000</td>
<td>11.2%</td>
<td>11.6%</td>
<td>-400,000</td>
<td>-400,000</td>
<td>-0.5%</td>
</tr>
<tr>
<td>SC</td>
<td>87,000,000</td>
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<td>11.2%</td>
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<td>-400,000</td>
<td>-400,000</td>
<td>-0.5%</td>
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<tr>
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<td>11.2%</td>
<td>11.6%</td>
<td>-400,000</td>
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2028 Model Projections

VISTAS States Emissions: 2011 vs. 2028

<table>
<thead>
<tr>
<th>State</th>
<th>2011 Emissions (Tons/Year)</th>
<th>2028 Emissions (Tons/Year)</th>
<th>Difference</th>
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<tbody>
<tr>
<td>West Virginia</td>
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<td>1,345,678</td>
<td>+111,111</td>
</tr>
<tr>
<td>Tennessee</td>
<td>1,234,567</td>
<td>1,345,678</td>
<td>+111,111</td>
</tr>
<tr>
<td>South Carolina</td>
<td>1,234,567</td>
<td>1,345,678</td>
<td>+111,111</td>
</tr>
<tr>
<td>North Carolina</td>
<td>1,234,567</td>
<td>1,345,678</td>
<td>+111,111</td>
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<tr>
<td>Kentucky</td>
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</tr>
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<td>Georgia</td>
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<tr>
<td>Nebraska</td>
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<td>+111,111</td>
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<tr>
<td>North Dakota</td>
<td>1,234,567</td>
<td>1,345,678</td>
<td>+111,111</td>
</tr>
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2028 EGU & NEGU SO₂ Comparison

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<thead>
<tr>
<th>State</th>
<th>Peak_EGU</th>
<th>Peak_NEGU</th>
<th>EGU DOD</th>
<th>EGU REW</th>
<th>Delta (EGU)</th>
<th>Delta (NEGU)</th>
<th>Delta (%)</th>
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<tr>
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<td>-0.5%</td>
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<tr>
<td>CA</td>
<td>50,000,000</td>
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<td>16.7%</td>
<td>15.5%</td>
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<td>-0.5%</td>
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<tr>
<td>GA</td>
<td>87,000,000</td>
<td>12,000,000</td>
<td>11.2%</td>
<td>11.6%</td>
<td>-400,000</td>
<td>-400,000</td>
<td>-0.5%</td>
</tr>
<tr>
<td>FL</td>
<td>87,000,000</td>
<td>12,000,000</td>
<td>11.2%</td>
<td>11.6%</td>
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Appendix F-3
Page 165
Adjusted 2028 PSAT Stacked Bar Charts

PSAT Source Apportionment Modeling

- **PSAT** = Particulate Matter Source Apportionment Technology
- Quantifies visibility impacts from individual point sources, source sectors, and geographic regions
- NOx and SO2 tagging
- Used for further evaluation of AOI results
- Refines information on contributions to visibility impairment
- Can be used to adjust future year visibility projections to account for additional emission controls
- VISTAS contract with ERG allows for up to 250 tags

**PSAT SO2 and NOx Tags (209)**

**Round 1 (122 tags)**
- Total SO2 tags for 10 individual VISTAS states + 3 RPOs = 13 tags
- Total NOx tags for 10 individual VISTAS states + 3 RPOs = 13 tags
- EGU point SO2 tags for 10 individual VISTAS states + 3 RPOs = 13 tags
- EGU point NOx tags for 10 individual VISTAS states + 3 RPOs = 13 tags
- SO2 tags for individual VISTAS facilities = 50 tags
- NOx tags for individual VISTAS facilities = 50 tags

**Round 2 (47 tags)**
- Non-EGU point SO2 for 10 individual VISTAS states + 3 RPOs = 13 tags
- Non-EGU point NOx for 10 individual VISTAS states + 3 RPOs = 13 tags
- SO2 and NOx for N/S/W/E boundaries = 8 tags
- SO2 tags for individual non-VISTAS facilities = 10 tags
- NOx tags for individual non-VISTAS facilities = 10 tags

**Revised State/RPO PSAT Results**

- **Revised EGU Sulfate PSAT Results**
  \[
  \text{Original EGU Sulfate PSAT Results} \times \frac{\text{SO2 EGU Ratio}}{(\text{Revised EGU SO2 emissions})} \\
  \text{where, } \frac{\text{SO2 EGU Ratio}}{(\text{Original EGU SO2 emissions})}
  \]

- **Revised NEGU Sulfate PSAT Results**
  \[
  \text{Original NEGU Sulfate PSAT Results} \times \frac{\text{SO2 NEGU Ratio}}{(\text{Revised NEGU SO2 emissions})} \\
  \text{where, } \frac{\text{SO2 NEGU Ratio}}{(\text{Original NEGU SO2 emissions})}
  \]
Revised State/RPO PSAT Results

• Revised EGU Nitrate PSAT Results
  = Original EGU Nitrate PSAT Results * NOx EGU Ratio
  \[
  \text{(Revised EGU NOx emissions)} = \frac{\text{(Original EGU NOx emissions)}}{\text{(Original NOx EGU Ratio)}}
  \]

• Revised NEGU Nitrate PSAT Results
  = Original NEGU Nitrate PSAT Results * NOx NEGU Ratio
  \[
  \text{(Revised NEGU NOx emissions)} = \frac{\text{(Original NEGU NOx emissions)}}{\text{(Original NOx NEGU Ratio)}}
  \]

PSAT Adjustment Ratios

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<th>SO\textsubscript{2}/NEGU Ratio</th>
<th>NO\textsubscript{x}/EGU Ratio</th>
<th>NO\textsubscript{x}/NEGU Ratio</th>
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<td>0.599</td>
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<tr>
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<td>0.744</td>
<td>0.599</td>
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<td>1.000</td>
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<td>0.999</td>
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</table>

For detailed calculations, see Handout - Roadmap located at: https://www.metro4-sasarm.org/content/vistas-regional-heze-program

Appendix F-3
Page 170
Reasonable Progress Screening Approach

1. The VISTAS reasonable progress work started with AOI screening \((Q/d \times EWRT)\) to rank facilities based on their sulfate and nitrate contributions at each Class I area.
2. These rankings were used to identify 87 individual facilities for PSAT tagging. PSAT tagging was used to determine the sulfate and nitrate contributions from each facility at each Class I area in the VISTAS_12 domain.
3. Each individual VISTAS state will apply a PSAT contribution threshold based on the facility sulfate and facility nitrate impacts (separately, not combined) divided by the total impact of sulfate + nitrate from all point sources to determine which sources may need to be considered for a four-factor analysis.
   - If sulfate contribution \(\geq 1.00\%\) → SO\(_2\) Four-Factor Analysis
   - If nitrate contribution \(\geq 1.00\%\) → NO\(_x\) Four-Factor Analysis

Why 1% Threshold?

- In the Round 1 Regional Haze SIPs, many VISTAS states used the AOI approach and a 1% threshold on a Unit basis.
  - Round 2 uses the AOI/PSAT approach and a \(\geq 1.00\%\) PSAT threshold based on a Facility basis.
    - This will pull in more facilities compared to a Unit basis.
  - Round 2 uses 2028 emissions (lower than 2018)
    - This will pull in facilities with smaller visibility impacts (in Mm\(^3\)) compared to Round 1
    - This approach results in a reasonable number of sources that can be evaluated with limited state resources and focuses on the sources with the largest impacts.

Reasonable Progress Screening Analysis

- Evaluates emissions \((Q)\), distance to Class I area \((d)\), and extinction weighted residence time \((EWRT)\) in model grid cells (point) or counties (source categories)
- Formula: \((Q/d)\times EWRT\)
- Establishes each county’s and each facility’s contribution to light extinction at each Class I area on the 20% most impaired days
- Can use contributions to rank and screen facilities for the four-factor analysis

Area of Influence (AOI) Analysis

- Evaluates emissions \((Q)\), distance to Class I area \((d)\), and extinction weighted residence time \((EWRT)\) in model grid cells (point) or counties (source categories)
- Formula: \((Q/d)\times EWRT\)
- Establishes each county’s and each facility’s contribution to light extinction at each Class I area on the 20% most impaired days
- Can use contributions to rank and screen facilities for the four-factor analysis
HYSPLIT Trajectories

- Trajectories were run using NAM-12 meteorology for the 20% most impaired days in 2011-2016 at 44 Class I areas.
- Trajectories were run with starting heights of 100, 500, 1,000, and 1,500 meters.
- Trajectories were run 72 hours backwards in time for each height at each location.
- Trajectories were run with start times of 12AM (midnight of the start of the day), 6AM, 12PM, 6PM, and 12AM (midnight at the end of the day) local time.
- 44 Class I areas x 6 years x 24 days/year x 4 heights x 5 start times = 126,720 trajectories

Class I Areas Analyzed

Residence Time for GRSM

100 Meter Trajectories at GRSM

Sulfate EWRT at GRSM
Appendix F-3
Page 176
PSAT Source Apportionment Modeling

- Quantifies visibility impacts from individual point sources, source sectors, and geographic regions
- NOx and SO2 tagging
- Used for further evaluation of AOI results
- Refines information on contributions to visibility impairment
- Can be used to adjust future year visibility projections to account for additional emission controls
- VISTAS contract with ERG allows for up to 250 tags

PSAT SO2 and NOx Tags (209)

Round 1 (132 tags)
- Total SO2 tags for 10 individual VISTAS states + 3 RPOs = 13 tags
- Total NOx tags for 10 individual VISTAS states + 3 RPOs = 13 tags
- EGU point SO2 tags for 10 individual VISTAS states + 3 RPOs = 13 tags
- EGU point NOx tags for 10 individual VISTAS states + 3 RPOs = 13 tags
- SO2 tags for individual VISTAS facilities = 50 tags
- NOx tags for individual VISTAS facilities = 20 tags

Round 2 (87 tags)
- Non-EGU point SO2 for 10 individual VISTAS states + 3 RPOs = 13 tags
- Non-EGU point NOx for 10 individual VISTAS states + 3 RPOs = 13 tags
- SO2 tags for individual non-VISTAS facilities = 10 tags
- NOx tags for individual non-VISTAS facilities = 15 tags
- SO2 tags for individual non-VISTAS facilities = 20 tags
- NOx tags for individual non-VISTAS facilities = 10 tags

87 Total Facility Tags (both SO2 and NOx)

Facility Tags (Al, FL, GA)

Facility Tags (WV, AR, MO, MD, PA, IL, IN, OH)

Sulfate AOI vs. Sulfate PSAT (≥ 1.00%)
**Sulfate AOI vs. Sulfate PSAT (≥ 1.00%)**

**PSAT Reasonable Progress Screening**

- Due to the amount of resources already invested in the AOI and PSAT analysis, VISTAS does not plan to redo the original AOI or PSAT analyses.
- In cases where emissions decreased or increased at individual facilities being considered for a four-factor analysis, the facility contributions will be adjusted to be consistent with the lower/higher facility emissions before comparing to the PSAT contribution threshold.
- EPA verbally stated this should be okay 2/6/2020.

**AOI vs. PSAT Summary**

- AOI tends to overestimate impacts for facilities near the Class I area.
- AOI tends to underestimate impacts for facilities far away from the Class I area.
- AOI uses 72-hour back trajectories, sulfate can last for weeks and travel hundreds to thousands of km.
- PSAT is the most reliable modeling tool for tracking facility contributions to visibility impairment at Class I areas.

**Original Facility PSAT Contributions**

- **Original Facility Sulfate PSAT Contributions (%)**
  
  \[
  \text{Facility Sulfate PSAT Contributions (Mm}^{-2}) = \frac{\text{Total Sulfate + Nitrate Point Contribution (Mm}^{-2})}{\text{Total Sulfate + Nitrate Point Contribution (Mm}^{-2})} \]

- **Original Facility Nitrate PSAT Contributions (%)**
  
  \[
  \text{Facility Nitrate PSAT Contributions (Mm}^{-2}) = \frac{\text{Total Sulfate + Nitrate Point Contribution (Mm}^{-2})}{\text{Total Sulfate + Nitrate Point Contribution (Mm}^{-2})} \]

**Revised Facility Sulfate PSAT Results**

- **Revised Facility Sulfate PSAT Results**
  
  \[
  \text{Original Facility Sulfate PSAT Results} \times \frac{\text{SO}_2 \text{Ratio_Facility} \times \text{Ratio_Class_I_Area}}{	ext{(Revised facility SO}_2\text{ emissions})} \]

  where, \(\text{SO}_2\text{Ratio_Facility} = \frac{\text{Original facility SO}_2\text{ emissions}}{\text{Original sulfate + nitrate point contribution}}\)

  \(\text{Ratio_Class_I_Area} = \frac{\text{Original sulfate + nitrate point contribution}}{\text{Revised sulfate + nitrate point contribution}}\)
Revised Facility Nitrate PSAT Results

- Revised Facility Nitrate PSAT Results
  = Original Facility Nitrate PSAT Results
  * NOx Ratio_Facility * Ratio_Class_I_Area

where, NOx Ratio_Facility = \( \frac{\text{Revised facility NOx emissions}}{\text{Original facility NOx emissions}} \)

where, Ratio_Class_I_Area = \( \frac{\text{Revised sulfite + nitrate point contribution}}{\text{Original sulfite + nitrate point contribution}} \)

---

Facility Ratios (WV, AR, MO, MD, PA, IL, IN, OH)

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For detailed calculations, see [Handout - Roadmap](https://www.metro4-soxarn.org/content/sitea-regional-sox-program) located at:

https://www.metro4-soxarn.org/content/sitea-regional-sox-program
Appendix F-3
Page 180
### Great Smoky Mountains National Park (TN/NC)

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<tr>
<th>State</th>
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### Shenandoah National Park (VA)

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### Joyce Kilmer-Slickrock Wilderness Area (TN/NC)

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### Dolly Sods Wilderness Area (WV)

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### Otter Creek Wilderness Area (WV)

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Appendix F-3

Page 182
Non-VISTAS Class I Areas

- Only two VISTAS facilities have a contribution ≥ 1.00% at any non-VISTAS Class I Area
- **ALLEGHENY ENERGY SUPPLY CO., LLC-HARRISON (WV)**
  - Moosehorn Wilderness EDM (1.06% sulfate)
- **Tennessee Valley Authority (TVA) - Shawnee Fossil Plant (KY)**
  - Caney Creek Wilderness Area (1.09% sulfate)
  - Hercules-Glades Wilderness Area (1.95% sulfate)
  - Mingo Wilderness Area (1.47% sulfate)
  - Great Gulf Wilderness Area (1.03% sulfate)
  - Presidential Range-Dry River Wilderness (1.03% sulfate)

EPA Guidance (August 20, 2019)

- Many facilities already have effective emission control technologies in place. States will consider control options for these facilities on a case-by-case basis.
  - "For the purpose of SO2 control measures, an EGU that has add-on flue gas desulfurization (FGD) and that meets the applicable alternative SO2 emission limit of the 2012 Mercury and Air Toxics Standards (MATS) rule for power plants. The two limits in the rule (0.2 lb/MMBtu for coal-fired EGU or 0.3 lb/MMBtu for EGU fired with oil-derived solid fuel) are low enough that it is unlikely that an analysis of control measures for a source already equipped with a scrubber and meeting one of these limits would conclude that more stringent control of SO2 is necessary to make reasonable progress."
  - "For the purposes of SO2 and NOX control measures, a combustion source (e.g., an EGU or industrial boiler or process heater) that, during the first implementation period, installed a FGD system that operates year-round with an effectiveness of at least 90 percent or by the installation of a selective catalytic reduction system that operates year-round with an overall effectiveness of at least 90 percent (in both cases calculating the effectiveness as the total for the system, including any bypassed flue gas, on a pollutant-specific basis)."

VISTAS Facilities ≥ 1.00%

Additional Considerations

- The final list of four-factor analysis sources will be determined in consultation with the FLMs, EPA, other states, and other stakeholders.
- Some VISTAS states may perform additional four-factor analyses for sources not listed on Slide 122.
- States will verify projected SO2 and NOX emissions with facilities. PSAT results should be adjusted to match.
- Some states may allow their facilities to take a permit limit that will result in adjusted PSAT impacts below the 1.00% threshold in lieu of performing a four-factor analysis.
- The large number of coal-fired EGU retirements and fuel switching from coal to natural gas need to be considered along with the sources selected for the four-factor analysis. States should not be penalized for early action.

Next Steps and Schedule
**Appendix: Original Analysis (Conducted 2018-2019)**
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Page 186
Appendix F-3
Page 190
### Chassahowitzka Wilderness Area (FL)

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Appendix F-3
Page 192
### Joyce Kilmer-Slickrock Wilderness Area (TN/NC)

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<td>4.71</td>
<td>4.79</td>
<td>4.79</td>
<td>4.79</td>
<td>4.79</td>
<td>4.79</td>
<td>4.79</td>
</tr>
<tr>
<td>WV</td>
<td>19497-0014071</td>
<td>4950 VOLTAGE REGULATORS (T1) - Slickrock Road</td>
<td>4.79</td>
<td>4.71</td>
<td>4.79</td>
<td>4.79</td>
<td>4.79</td>
<td>4.79</td>
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</table>

### James River Face Wilderness Area (VA)

<table>
<thead>
<tr>
<th>State</th>
<th>Facility ID</th>
<th>Facility Name</th>
<th>% HP Wasted</th>
<th>% kW Wasted</th>
<th>% Wasted</th>
<th>%教え</th>
<th>% 故障</th>
<th>% 故障</th>
<th>% 故障</th>
<th>% 故障</th>
</tr>
</thead>
<tbody>
<tr>
<td>VA</td>
<td>19497-0014071</td>
<td>4950 VOLTAGE REGULATORS (T1) - Slickrock Road</td>
<td>4.79</td>
<td>4.71</td>
<td>4.79</td>
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<td>4.79</td>
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### Otter Creek Wilderness Area (WV)

<table>
<thead>
<tr>
<th>State</th>
<th>Facility ID</th>
<th>Facility Name</th>
<th>% HP Wasted</th>
<th>% kW Wasted</th>
<th>% Wasted</th>
<th>%教え</th>
<th>% 故障</th>
<th>% 故障</th>
<th>% 故障</th>
<th>% 故障</th>
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<td>WQ</td>
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<td>4.71</td>
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<td>4.79</td>
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<td>4.79</td>
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</tr>
</tbody>
</table>

### Shenandoah National Park (VA)

<table>
<thead>
<tr>
<th>State</th>
<th>Facility ID</th>
<th>Facility Name</th>
<th>% HP Wasted</th>
<th>% kW Wasted</th>
<th>% Wasted</th>
<th>%教え</th>
<th>% 故障</th>
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</thead>
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</tbody>
</table>
Appendix F-3

VISTAS Regional Haze Project Update to EPA Region 3, Region 4, and OAQPS
July 30, 2020

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Promoting a healthy environment
VISTAS Regional Haze Project Update

Why 1% Threshold?
- In the Round 1 Regional Haze SIPs, many VISTAS states used the AOI approach and a 1% threshold on a Unit basis.
- Round 2 uses the AOI/PSAT approach and a ≥ 1.00% PSAT threshold based on a Facility basis.
  - This pulled in more facilities compared to a Unit basis.
- Round 2 uses 2028 emissions (lower than 2018)
  - This pulled in more facilities with smaller visibility impacts (in Mm⁻¹) compared to Round 1.
- This approach results in a reasonable number of sources that can be evaluated with limited state resources and focuses on the sources and pollutants with the largest impacts.

Outline
- Reasonable Progress Screening Approach
- Area of Influence
- PSAT Results
- Initial List of Sources
- EPA Discussion

Area of Influence (AOI) Analysis
- Evaluates emissions (Q), distance to Class I area (d), and extinction weighted residence time (EWRT) in model grid cells (point) or counties (source categories)
- Formula: (Q/d)*EWRT
- Establishes each county's and each facility's contribution to light extinction at each Class I area on the 20% most impaired days
- Can use contributions to rank and screen facilities for the four-factor analysis

Reasonable Progress Screening Approach
1. The VISTAS reasonable progress work started with AOI screening (Q/d * EWRT) to rank sectors and facilities based on their sulfate and nitrate contributions at each Class I area.
2. These rankings were used to identify 87 individual facilities for PSAT tagging. PSAT tagging was used to determine the sulfate and nitrate contributions from each facility at each Class I area in the VISTAS_12 domain.
3. Each individual VISTAS state will apply a PSAT contribution threshold based on the facility sulfate and facility nitrate impacts (separately, not combined) divided by the total impact of sulfate + nitrate from all point sources to determine which sources may need to be considered for a four-factor analysis.
   - If sulfate contribution ≥ 1.00% → SO₂ Four-Factor Analysis
   - If nitrate contribution ≥ 1.00% → NOₓ Four-Factor Analysis

AOI Source Categories for WOLF

<table>
<thead>
<tr>
<th>SOURCE CATEGORY</th>
<th>NOₓ</th>
<th>SO₂</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>NONPOINT</td>
<td>1.7%</td>
<td>2.8%</td>
<td>4.4%</td>
</tr>
<tr>
<td>NONROAD_MAR</td>
<td>2.9%</td>
<td>1.5%</td>
<td>4.4%</td>
</tr>
<tr>
<td>NONROAD_OTHER</td>
<td>3.3%</td>
<td>0.3%</td>
<td>3.6%</td>
</tr>
<tr>
<td>ONROAD</td>
<td>5.7%</td>
<td>0.7%</td>
<td>6.4%</td>
</tr>
<tr>
<td>POINT</td>
<td>7.3%</td>
<td>67.9%</td>
<td>75.2%</td>
</tr>
<tr>
<td>PT_FIRES_PRESERVED</td>
<td>0.9%</td>
<td>5.1%</td>
<td>6.0%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>21.8%</td>
<td>78.2%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
AOI Screening Summary

<table>
<thead>
<tr>
<th>State</th>
<th>Threshold</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL</td>
<td>2%</td>
<td>Sulfate only</td>
</tr>
<tr>
<td>FL</td>
<td>5%</td>
<td>Sulfate or nitrate, plus Gulf Coast, Mosaic Barren, Mosaic New Waters, and Mosaic Claymore</td>
</tr>
<tr>
<td>GA</td>
<td>2% - 4%</td>
<td>Sulfate or nitrate, 2% threshold for GA Facilities, 4% threshold for facilities outside GA</td>
</tr>
<tr>
<td>KY</td>
<td>2%</td>
<td>Sulfate or nitrate</td>
</tr>
<tr>
<td>MS</td>
<td>2%</td>
<td>Sulfate or nitrate</td>
</tr>
<tr>
<td>NC</td>
<td>3%</td>
<td>Sulfate + nitrate</td>
</tr>
<tr>
<td>SC</td>
<td>2% - 5%</td>
<td>2% for sulfates, 3% for nitrate, plus Carter Cooper, Wells, International Paper James Island, and SCE &amp; G Co.</td>
</tr>
<tr>
<td>TN</td>
<td>3%</td>
<td>Sulfate + nitrate, plus CEMEX</td>
</tr>
<tr>
<td>VA</td>
<td>2%</td>
<td>Sulfate + nitrate</td>
</tr>
<tr>
<td>WV</td>
<td>0.2% - 2%</td>
<td>Sulfate or nitrate</td>
</tr>
</tbody>
</table>

Each VISTAS state selected their threshold based on their state-specific situation and will document the selection process in their SIP.

AOI Point Contributions for Wolf Island

<table>
<thead>
<tr>
<th>State</th>
<th>PM contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL</td>
<td>10%</td>
</tr>
<tr>
<td>FL</td>
<td>15%</td>
</tr>
<tr>
<td>GA</td>
<td>20%</td>
</tr>
<tr>
<td>KY</td>
<td>25%</td>
</tr>
<tr>
<td>MS</td>
<td>30%</td>
</tr>
<tr>
<td>NC</td>
<td>35%</td>
</tr>
<tr>
<td>SC</td>
<td>40%</td>
</tr>
<tr>
<td>TN</td>
<td>45%</td>
</tr>
<tr>
<td>VA</td>
<td>50%</td>
</tr>
<tr>
<td>WV</td>
<td>55%</td>
</tr>
</tbody>
</table>

By setting the AOI threshold at GA’s levels, a reasonable number of tags and facilities were identified and 35.0% of the total sulfate + nitrate point contribution was captured.

Facility Tags (KY, MS, NC, SC, TN, VA)

<table>
<thead>
<tr>
<th>Facility</th>
<th>State</th>
<th>PM contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>FL</td>
<td>15%</td>
<td></td>
</tr>
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</tr>
<tr>
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<td>40%</td>
<td></td>
</tr>
<tr>
<td>TN</td>
<td>45%</td>
<td></td>
</tr>
<tr>
<td>VA</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>WV</td>
<td>55%</td>
<td></td>
</tr>
</tbody>
</table>

Facility Tags (WV, AR, MO, MD, PA, IL, IN, OH)

<table>
<thead>
<tr>
<th>Facility</th>
<th>State</th>
<th>PM contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL</td>
<td>10%</td>
<td></td>
</tr>
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</tr>
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<td>35%</td>
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<td>SC</td>
<td>40%</td>
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</tr>
<tr>
<td>TN</td>
<td>45%</td>
<td></td>
</tr>
<tr>
<td>VA</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>WV</td>
<td>55%</td>
<td></td>
</tr>
</tbody>
</table>

Facility Tags (AL, FL, GA)

<table>
<thead>
<tr>
<th>Facility</th>
<th>State</th>
<th>PM contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL</td>
<td>10%</td>
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<td>NC</td>
<td>35%</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>40%</td>
<td></td>
</tr>
<tr>
<td>TN</td>
<td>45%</td>
<td></td>
</tr>
<tr>
<td>VA</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>WV</td>
<td>55%</td>
<td></td>
</tr>
</tbody>
</table>

PSAT Source Apportionment Modeling

- Quantifies visibility impacts from individual point sources, source sectors, and geographic regions
- NOx and SO2 tagging
- Used for further evaluation of AOI results
- Refines information on contributions to visibility impairment
- Can be used to adjust future year visibility projections to account for additional emission controls
- VISTAS contract with ERG allows for up to 250 tags
Appendix F-3
Page 198

Sulfate AOI vs. Sulfate PSAT (≥ 1.00%)

- AOI tends to overestimate impacts for facilities near the Class I area. This brought in more nearby sources.
- AOI tends to underestimate impacts for facilities far away from the Class I area. This may miss some far away sources, but they are likely being captured by other Class I areas that are closer to those sources.
- PSAT is the most reliable modeling tool for tracking facility contributions to visibility impairment at Class I areas.

Sulfate Fractional Bias vs. Distance

- FB = 100% means that the AOI value is 1x the PSAT value.

Sulfate AOI vs. Sulfate PSAT (≥ 1.00%)

PSAT Reasonable Progress Screening

- The facility sulfate and nitrate contributions (Mm⁻³) from the individual 87 tagged facilities should not change unless a facility has reduced or increased SO₂ and/or NOx emissions.
- The updated 2028 CAMx modeling will impact the total sulfate and total nitrate contribution from point sources at each Class I area since the SO₂ and NOx emissions have decreased.
- The facility percent contribution will increase even if the facility emissions do not change since the denominator will decrease.

Facility Sulfate Contribution (%) =

\[
\text{Facility Sulfate Impact (Mm}^{-3}\text{)} \downarrow \uparrow
\]

\[
\frac{\text{Total Impact of All Point Sources of Sulfate} + \text{Nitrate (Mm}^{-3}\text{)}}{\downarrow \downarrow}
\]
## Appendix F-3

### Sipsey Wilderness Area (AL)

<table>
<thead>
<tr>
<th>State</th>
<th>Facility ID</th>
<th>Facility Name</th>
<th>HAP (TSS/GD)</th>
<th>Primary Source</th>
<th>Air Emissions</th>
<th>Groundwater Emissions</th>
<th>Surface Water Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>KY</td>
<td>21445-409850</td>
<td>Tennessee Valley Authority (TVA) - Shawnee Power Plant</td>
<td>9.254</td>
<td>0.800</td>
<td>0.010</td>
<td>0.012</td>
<td>0.013</td>
</tr>
<tr>
<td>KY</td>
<td>21445-392041</td>
<td>Tennessee Valley Authority (TVA) - Shawnee Power Plant</td>
<td>10.854</td>
<td>0.800</td>
<td>0.010</td>
<td>0.012</td>
<td>0.013</td>
</tr>
<tr>
<td>KY</td>
<td>21445-409851</td>
<td>Tennessee Valley Authority (TVA) - Shawnee Power Plant</td>
<td>10.854</td>
<td>0.800</td>
<td>0.010</td>
<td>0.012</td>
<td>0.013</td>
</tr>
</tbody>
</table>

8 Facilities Identified for Reasonable Progress Analysis addressing more than 13.5% of the entire sulfate plus nitrate point source visibility impact in 2028.

### St Marks Wilderness Area (FL)

<table>
<thead>
<tr>
<th>State</th>
<th>Facility ID</th>
<th>Facility Name</th>
<th>HAP (TSS/GD)</th>
<th>Primary Source</th>
<th>Air Emissions</th>
<th>Groundwater Emissions</th>
<th>Surface Water Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL</td>
<td>21445-409850</td>
<td>Tennessee Valley Authority (TVA) - Shawnee Power Plant</td>
<td>9.254</td>
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<td>0.012</td>
<td>0.013</td>
</tr>
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</table>

5 Facilities Identified for Reasonable Progress Analysis addressing more than 11.8% of the entire sulfate plus nitrate point source visibility impact in 2028.

### Chassahowitzka Wilderness Area (FL)

<table>
<thead>
<tr>
<th>State</th>
<th>Facility ID</th>
<th>Facility Name</th>
<th>HAP (TSS/GD)</th>
<th>Primary Source</th>
<th>Air Emissions</th>
<th>Groundwater Emissions</th>
<th>Surface Water Emissions</th>
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</thead>
<tbody>
<tr>
<td>GA</td>
<td>21445-409850</td>
<td>Tennessee Valley Authority (TVA) - Shawnee Power Plant</td>
<td>9.254</td>
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<td>0.013</td>
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5 Facilities Identified for Reasonable Progress Analysis addressing more than 11.8% of the entire sulfate plus nitrate point source visibility impact in 2028.

### Cohutta Wilderness Area (GA)

<table>
<thead>
<tr>
<th>State</th>
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<td>0.012</td>
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5 Facilities Identified for Reasonable Progress Analysis addressing more than 12.0% of the entire sulfate plus nitrate point source visibility impact in 2028.

### Everglades NP (FL)

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<th>State</th>
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<th>Facility Name</th>
<th>HAP (TSS/GD)</th>
<th>Primary Source</th>
<th>Air Emissions</th>
<th>Groundwater Emissions</th>
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<td>Tennessee Valley Authority (TVA) - Shawnee Power Plant</td>
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<td>21445-409851</td>
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<td>0.800</td>
<td>0.010</td>
<td>0.012</td>
<td>0.013</td>
</tr>
</tbody>
</table>

4 Facilities Identified for Reasonable Progress Analysis addressing more than 11.2% of the entire sulfate plus nitrate point source visibility impact in 2028.

### Okefenokee Wilderness Area (GA)

<table>
<thead>
<tr>
<th>State</th>
<th>Facility ID</th>
<th>Facility Name</th>
<th>HAP (TSS/GD)</th>
<th>Primary Source</th>
<th>Air Emissions</th>
<th>Groundwater Emissions</th>
<th>Surface Water Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL</td>
<td>21445-409850</td>
<td>Tennessee Valley Authority (TVA) - Shawnee Power Plant</td>
<td>9.254</td>
<td>0.800</td>
<td>0.010</td>
<td>0.012</td>
<td>0.013</td>
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<tr>
<td>FL</td>
<td>21445-392041</td>
<td>Tennessee Valley Authority (TVA) - Shawnee Power Plant</td>
<td>10.854</td>
<td>0.800</td>
<td>0.010</td>
<td>0.012</td>
<td>0.013</td>
</tr>
<tr>
<td>FL</td>
<td>21445-409851</td>
<td>Tennessee Valley Authority (TVA) - Shawnee Power Plant</td>
<td>10.854</td>
<td>0.800</td>
<td>0.010</td>
<td>0.012</td>
<td>0.013</td>
</tr>
</tbody>
</table>

9 Facilities Identified for Reasonable Progress Analysis addressing more than 14.5% of the entire sulfate plus nitrate point source visibility impact in 2028.
<table>
<thead>
<tr>
<th>State</th>
<th>Facility ID</th>
<th>Facility Name</th>
<th>MFR Tons/Day</th>
<th>HR Tons/Day</th>
<th>MFR %</th>
<th>HR %</th>
</tr>
</thead>
<tbody>
<tr>
<td>NY</td>
<td>56-0630001</td>
<td>Pleasantville</td>
<td>39.000</td>
<td>26.000</td>
<td>26.000</td>
<td>26.000</td>
</tr>
<tr>
<td>NY</td>
<td>56-0630002</td>
<td>Eastchester</td>
<td>39.000</td>
<td>26.000</td>
<td>26.000</td>
<td>26.000</td>
</tr>
<tr>
<td>NY</td>
<td>56-0630003</td>
<td>White Plains</td>
<td>39.000</td>
<td>26.000</td>
<td>26.000</td>
<td>26.000</td>
</tr>
</tbody>
</table>

10 facilities identified for Reasonable Progress Analysis addressing more than 17.8% of the entire sulfate plus nitrate point source visibility impact in 2028.
### Great Smoky Mountains National Park (TN/NC)

<table>
<thead>
<tr>
<th>State</th>
<th>Facility ID</th>
<th>Facility Name</th>
<th>NPZ Rank</th>
<th>Emissions (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GA</td>
<td>26002-04490</td>
<td>General James W. Carol Foster Plant (NC)</td>
<td>125.3</td>
<td>4.77</td>
</tr>
<tr>
<td>KY</td>
<td>21960-06077</td>
<td>General James W. Carol Foster Plant (TN)</td>
<td>125.3</td>
<td>4.77</td>
</tr>
<tr>
<td>TN</td>
<td>23150-06092</td>
<td>General James W. Carol Foster Plant (TN)</td>
<td>125.3</td>
<td>4.77</td>
</tr>
<tr>
<td>VA</td>
<td>31530-06091</td>
<td>General James W. Carol Foster Plant (VA)</td>
<td>125.3</td>
<td>4.77</td>
</tr>
<tr>
<td>WV</td>
<td>32060-06091</td>
<td>General James W. Carol Foster Plant (WV)</td>
<td>125.3</td>
<td>4.77</td>
</tr>
</tbody>
</table>

8 Facilities Identified for Reasonable Progress Analysis addressing more than 9.7% of the entire sulfate plus nitrate point source visibility impact in 2020.

### Shenandoah National Park (VA)

<table>
<thead>
<tr>
<th>State</th>
<th>Facility ID</th>
<th>Facility Name</th>
<th>NPZ Rank</th>
<th>Emissions (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VA</td>
<td>40120-06053</td>
<td>Shenandoah National Park (VA)</td>
<td>125.3</td>
<td>4.77</td>
</tr>
<tr>
<td>WV</td>
<td>40600-06053</td>
<td>Shenandoah National Park (WV)</td>
<td>125.3</td>
<td>4.77</td>
</tr>
</tbody>
</table>

10 Facilities Identified for Reasonable Progress Analysis addressing more than 5.79% of the entire sulfate plus nitrate point source visibility impact in 2020.

### Joyce Kilmer-Slickrock Wilderness Area (TN/NC)

<table>
<thead>
<tr>
<th>State</th>
<th>Facility ID</th>
<th>Facility Name</th>
<th>NPZ Rank</th>
<th>Emissions (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GA</td>
<td>26002-04490</td>
<td>General James W. Carol Foster Plant (NC)</td>
<td>125.3</td>
<td>4.77</td>
</tr>
<tr>
<td>KY</td>
<td>21960-06077</td>
<td>General James W. Carol Foster Plant (TN)</td>
<td>125.3</td>
<td>4.77</td>
</tr>
<tr>
<td>TN</td>
<td>23150-06092</td>
<td>General James W. Carol Foster Plant (TN)</td>
<td>125.3</td>
<td>4.77</td>
</tr>
<tr>
<td>VA</td>
<td>31530-06091</td>
<td>General James W. Carol Foster Plant (VA)</td>
<td>125.3</td>
<td>4.77</td>
</tr>
<tr>
<td>WV</td>
<td>32060-06091</td>
<td>General James W. Carol Foster Plant (WV)</td>
<td>125.3</td>
<td>4.77</td>
</tr>
</tbody>
</table>

9 Facilities Identified for Reasonable Progress Analysis addressing more than 11.5% of the entire sulfate plus nitrate point source visibility impact in 2020.

### Dolly Sods Wilderness Area (WV)

<table>
<thead>
<tr>
<th>State</th>
<th>Facility ID</th>
<th>Facility Name</th>
<th>NPZ Rank</th>
<th>Emissions (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WV</td>
<td>40600-06053</td>
<td>Dolly Sods Wilderness Area (WV)</td>
<td>125.3</td>
<td>4.77</td>
</tr>
</tbody>
</table>

11 Facilities Identified for Reasonable Progress Analysis addressing more than 29.0% of the entire sulfate plus nitrate point source visibility impact in 2020.

### James River Face Wilderness Area (VA)

<table>
<thead>
<tr>
<th>State</th>
<th>Facility ID</th>
<th>Facility Name</th>
<th>NPZ Rank</th>
<th>Emissions (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VA</td>
<td>40120-06053</td>
<td>James River Face Wilderness Area (VA)</td>
<td>125.3</td>
<td>4.77</td>
</tr>
</tbody>
</table>

9 Facilities Identified for Reasonable Progress Analysis addressing more than 20.7% of the entire sulfate plus nitrate point source visibility impact in 2020.

### Otter Creek Wilderness Area (WV)

<table>
<thead>
<tr>
<th>State</th>
<th>Facility ID</th>
<th>Facility Name</th>
<th>NPZ Rank</th>
<th>Emissions (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WV</td>
<td>40600-06053</td>
<td>Otter Creek Wilderness Area (WV)</td>
<td>125.3</td>
<td>4.77</td>
</tr>
</tbody>
</table>

13 Facilities Identified for Reasonable Progress Analysis addressing more than 30.6% of the entire sulfate plus nitrate point source visibility impact in 2020.

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Non-VISTAS Class I Areas

- Only two VISTAS facilities have a contribution ≥ 1.00% at any non-VISTAS Class I Area
- ALLEGHENY ENERGY SUPPLY CO, LLC - HARRISON (WV)
  - Moosehorn Wilderness EDM (1.06% sulfate)
- Tennessee Valley Authority (TVA) - Shawnee Fossil Plant (KY)
  - Caney Creek Wilderness Area (1.09% sulfate)
  - Hercules-Gladews Wilderness Area (1.95% sulfate)
  - Mingo Wilderness Area (1.47% sulfate)
  - Great Gulf Wilderness Area (1.03% sulfate)
  - Presidential Range-Dry River Wilderness (1.03% sulfate)

Summary for VISTAS Class I Areas

<table>
<thead>
<tr>
<th>VISTAS Federal Class I Areas</th>
<th>Number of Facilities</th>
<th>Percent of Point Sulfate + Nitrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI - Upper Peninsula Areas (UP)</td>
<td>3</td>
<td>14.5%</td>
</tr>
<tr>
<td>FL - Cemex inc. / Skidmore Area (CMS)</td>
<td>4</td>
<td>11.2%</td>
</tr>
<tr>
<td>AL - Edgar Marks Wilderness Area (LEMA)</td>
<td>8</td>
<td>10.8%</td>
</tr>
<tr>
<td>GA - Okefenokee National Park (OKNP)</td>
<td>8</td>
<td>12.0%</td>
</tr>
<tr>
<td>GA - Okefenokee National Park (OKNP)</td>
<td>9</td>
<td>14.3%</td>
</tr>
<tr>
<td>GA - Okefenokee National Park (OKNP)</td>
<td>9</td>
<td>14.3%</td>
</tr>
<tr>
<td>KY - Mammoth Cave National Park (MKNP)</td>
<td>6</td>
<td>8.1%</td>
</tr>
<tr>
<td>NC - Linville Gorge Wilderness Area (LAWA)</td>
<td>10</td>
<td>17.2%</td>
</tr>
<tr>
<td>NC - Shingletown River Wilderness Area (SNWA)</td>
<td>12</td>
<td>14.4%</td>
</tr>
<tr>
<td>NC - Swaggin River Wilderness Area (SWWA)</td>
<td>10</td>
<td>14.4%</td>
</tr>
<tr>
<td>SC - Cape Fear Wilderness Area (CFWA)</td>
<td>9</td>
<td>20.5%</td>
</tr>
<tr>
<td>TN/NC - Joyce Kilmer-Slickrock Wilderness Area (JKWA)</td>
<td>8</td>
<td>11.5%</td>
</tr>
<tr>
<td>VA - Shenandoah National Park (SNPA)</td>
<td>9</td>
<td>20.7%</td>
</tr>
<tr>
<td>WV - Ohooini Wilderness Area (OWA)</td>
<td>11</td>
<td>24.2%</td>
</tr>
<tr>
<td>WV - Ohooini Wilderness Area (OWA)</td>
<td>13</td>
<td>30.6%</td>
</tr>
<tr>
<td><strong>AVERAGE</strong></td>
<td><strong>8.3</strong></td>
<td><strong>15.4%</strong></td>
</tr>
</tbody>
</table>

VISTAS Facilities ≥ 1.00%

Thoughts for Discussion

- VISTAS used a screening approach with Aoi (various thresholds) and PSAT (1.00% threshold). This resulted in an average of 8% facilities per Class I area and accounts for an average of 16.4% of the point source sulfate + nitrate contributions. This should be more than adequate especially for the other recent emission controls that are already built into our 2028 emission projections (next slide).
- The VISTAS focus is on significant emission impacts on Class I areas, not on the number of facilities evaluated in each state.
- Some facilities may be interested in taking permit limits resulting in adjusted PSAT impacts below the 1.00% threshold, thus avoiding the four-factor analysis.
- We are uncertain of the documentation required to apply the four factor analysis off-ramps (e.g., MATS) discussed in the August 2019 guidance.
- We are not aware of the triggers that might require incorporation of permit conditions into the Regional Haze SIps.

VISTAS States Emissions: 2011 vs. 2028
Contacts for Further Information

- For general, technical, and SIP-related questions, contact the TAWG and CC Co-chairs:
  - TAWG – Randy Strait (randy.strait@ncdenr.gov)
  - TAWG – Doris McLeod (doris.mcLeod@dee.virginia.gov)
  - CC – Jim Boylan (james.boylan@dnr.ga.gov)
  - CC – Jimmy Johnston (james.johnston@tn.gov)

- For project and contract management questions, contact the Project Manager:
  - John Hornback (hornback@metro4-sesarm.org)
Appendix F-3m

VISTAS Regional Haze Project Update
August 4, 2020

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Promoting a healthy environment
Overview

- During the QA process, an issue was identified with the emissions used in the CAMx modeling that was previously presented on May 20, 2020.
- The emissions inventory was correct, but some SO\textsubscript{2} and NO\textsubscript{x} emissions from EGUs were dropped during the SMOKE processing.
- This issue does not impact any of the PSAT modeling or adjustments to the PSAT modeling.
- This issue does impact the projected visibility in 2028 for comparison to the URP glide slope.

Outline

- Recent Issue with 2028 Modeling
- Updated 2028 Model Projections
- Next Steps & Schedule

Recent Issue with 2028 Modeling
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Next Steps and Schedule

Remaining VISTAS Work Schedule

<table>
<thead>
<tr>
<th>Task</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>2028 Point Emissions Updates</td>
<td>Completed*</td>
</tr>
<tr>
<td>2028 Emissions Processing</td>
<td>Completed*</td>
</tr>
<tr>
<td>2028 CAMx Modeling</td>
<td>Completed*</td>
</tr>
<tr>
<td>2028 Visibility Projections</td>
<td>Completed*</td>
</tr>
<tr>
<td>2028 Deposition Projections</td>
<td>Early August 2020</td>
</tr>
<tr>
<td>Final Reports and Documentation</td>
<td>Late August 2020</td>
</tr>
<tr>
<td>Website Updates and Postings</td>
<td>Late August 2020</td>
</tr>
<tr>
<td>End of Contract</td>
<td>September 30, 2020</td>
</tr>
<tr>
<td>Regional Haze SIPs Due to EPA</td>
<td>July 31, 2021</td>
</tr>
</tbody>
</table>

*References technical work completion. Draft reports to follow.
Contacts for Further Information

• For general, technical, and SIP-related questions, contact the TAWG and CC Co-chairs:
  • TAWG – Randy Strait (randy.strait@ncdnenr.gov)
  • TAWG – Doris McLeod (doris.mcleod@deq.virginia.gov)
  • CC – Jim Boylan (james.boylan@dnr.ga.gov)
  • CC – Jimmy Johnston (james.johnston@tn.gov)

• For project and contract management questions, contact the Project Manager:
  • John Hornback (hornback@metro4-sesarm.org)
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EPA Region 4 Fall 2020 Air Director’s Meeting
Regional Haze Update
October 26, 2020

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Promoting a healthy environment
VISTAS II Regional Haze Project Update

Jim Boylan (GA DNR), Randy Strait (NC DAQ), Doris McLeod (VA DEQ), Jimmy Johnston (TN DEC), Chad LaFontaine (Metro 4/SESARM), and John Hornback (Metro 4/SESARM)

EPA Region 4 Fall 2020 Air Director's Meeting
October 26, 2020

Project Background
- Goal was to provide states with technical information needed to draft their regional haze SIPs
- Project started in December 2017
- Expenses are less than 80% of budget
- Initial tasks: RFP, bids, contractor selection, contract development, work plan, QAPP, and modeling protocol
- Contractor support provided by:

Data Acquisition and Analysis
- "Task 4 Report"
- IMPROVE
- AQS
- NADP
- CASTNET
- WBAN

Example:
Cohutta Wilderness Area (2001-2018)

Model Performance Evaluation
- "Model Performance Evaluation for Particulate Matter and Regional Haze of the CAMx 6.40 Modeling System and the VISTAS II 2011 Updated Modeling Platform for Task 8.0"
- "Model Performance Evaluation for Ozone of the CAMx 6.40 Modeling System and the VISTAS II 2011 Updated Modeling Platform (Task 8.0)"
- "Deposition Model Performance Evaluation Southeastern VISTAS II Regional Haze Analysis Project (Task 8.1)"

Air Quality Modeling
- "2011V and 2020V CAMx Benchmarking Report Task 6 Benchmark Report #1 Covering Benchmark Runs #1 and #2"
- "2011V CAMx Version 6.32 and 6.40 Comparison Report Task 6 Benchmark Report Number #2 Covering Benchmark Run #3"
- "2018 CAMx Version 6.32 and 6.40 Comparison Report Task 6 Benchmark Report #4 Covering Benchmark Run #4"
- "2011V CAMx Version 6.40 12km VISTAS and EPA 12km Continental Grid Comparison Report Benchmark Report Task 6 Benchmark Report #3 Covering Benchmark Run #5"
- "2020V CAMx Version 6.40 12km VISTAS and EPA 12km Continental Grid Comparison Report Benchmark Report Number #6 for Task 6"
- "2018 Emissions Version V3 and V5 Comparison Report Benchmark Report Task 6 Benchmark Report #6 Covering Benchmark Run #7"

Emission Inventories
- "Task 2A Emission Inventory Updates Report (Aol and PSAT)"
- "Task 2B Emission Inventory Updates Report (2026 Visibility Estimates)"
- "Conversion of Task 2A 2028 Point Source Modeling Files for Emissions Processing with SMOKE (Task 3A)"
- "Conversion of the Task 2B 2028 Point Source Remodeling Files for Emissions Processing with SMOKE (Task 3B)"

54% NOx reduction and 73% SO2 reduction across the VISTAS states
**Future Year Projections**

- “Future Year Model Projections Task 9a”

**Deposition Projections**

- Wet and dry deposition projections for SO2, SO42−, NO3−, NH4+, Cl−

- “Wet and Dry Deposition Calculations Task 9.1”

**Area of Influence**

- States used AoI results for the VISTAS and nearby Class I areas to identify 87 sources for PSAT tagging

- “Area of Influence Analysis Southeastern VISTAS II Regional Haze Analysis Project - Documentation Report for Task 5”

**Final Project Report**

- Covers everything in previous slides:
  - Task 2 – Emissions Inventories
  - Task 3 – Emissions Processing
  - Task 4 – Data Acquisition and Analysis
  - Task 5 – Area of Influence
  - Task 6 – 2011 and 2028 Photochemical Modeling
  - Task 7 – PSAT Tagging
  - Task 8 – Model Performance Evaluation
  - Task 9 – Visibility and Deposition Projections
  - Task 10 – Data Handling Sharing
  - Task 11 – Extraction of State-Specific modeling, IC/BC, and meteorology

**PSAT Tagging**

- Identified facilities with sulfate or nitrate point source contributions ≥ 1.00%

- “Particulate Source Apportionment Technology Modeling Results Task 7”

**Consultation & Communication**

- FLMs and EPA
  - Multiple VISTAS presentations on technical work

- Non-VISTAS states
  - Multiple VISTAS presentations on technical work
  - Letters to non-VISTAS states from SESARM

- VISTAS states
  - State to state phone calls and e-mails
  - Letters to VISTAS states from other VISTAS states

- Stakeholders
  - One VISTAS presentation on technical work
  - Letters to specific facilities from home states
4-Factor Analysis

- States will evaluate certain sources and emissions to determine if reasonable controls are in place or available
- Considers four important factors:
  - Potential costs of compliance ($/ton, $/Mm$^{-1}$)
  - Time necessary for compliance
  - Energy and non-air quality environmental impacts of compliance
  - Remaining useful life of sources subject to this analysis

FLM Consultation Requirements

40 CFR 51.308(i)(2) (in pertinent part):

...The State must provide the Federal Land Manager with an opportunity for consultation, in person at a point early enough in the State’s policy analyses of its long-term strategy emission reduction obligation so that information and recommendations provided by the Federal Land Manager can meaningfully inform the State’s decisions on the long-term strategy. The opportunity for consultation will be deemed to have been early enough if the consultation has taken place at least 120 days prior to holding any public hearing or other public comment opportunity on an implementation plan (or plan revision) for regional haze required by this subpart. The opportunity for consultation on an implementation plan (or plan revision) or on a progress report must be provided no less than 60 days prior to said public hearing or public comment opportunity...

SIP Template Outline

1. Introduction
2. Natural Background Conditions and Assessment of Baseline, Modeling Base Period, and Current Conditions
3. Glidepaths to Natural Conditions in 2004
4. Types of Emissions Impacting Visibility Impairment
5. Regional Haze Modeling Methods and Inputs
6. Model Performance Evaluations
7. 2028 Model Projections
8. Long-Term Strategy
9. Reasonable Progress Goals
10. Monitoring Strategy
11. Consultation Process
12. Comprehensive Periodic Implementation Plan Revisions
13. Determination of the Adequacy of the Existing Plan
14. Progress Report
APPENDICES

Tentative Timeline*

<table>
<thead>
<tr>
<th>Dates</th>
<th>Milestone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week of 11/2/2020</td>
<td>Send redacted template to FPA R4 and R5. Redacted sections to include those dealing with reasonable progress facility selection and four-factor analysis results. Would like to receive feedback on missing analyses or “show stoppers.”</td>
</tr>
<tr>
<td>12/7/2020 – 12/15/2020</td>
<td>SIP template workshop to address EPA’s comments</td>
</tr>
<tr>
<td>12/15/2020 – 1/15/2021</td>
<td>Develop state-specific draft</td>
</tr>
<tr>
<td>1/15/2021 – 1/30/2021</td>
<td>States to address EPA’s comments</td>
</tr>
<tr>
<td>1/30/2020 – 4/30/2020</td>
<td>Consultation period for FLM (may vary by state)</td>
</tr>
<tr>
<td>4/30/2021 – 5/10/2021</td>
<td>Address FLM comments</td>
</tr>
<tr>
<td>5/30/2021 – 6/30/2021</td>
<td>Public comment period</td>
</tr>
<tr>
<td>6/30/2021 – 7/31/2021</td>
<td>Address public comment and finalize package for submission</td>
</tr>
<tr>
<td>7/31/2021</td>
<td>Regional Haze SIP due to EPA</td>
</tr>
</tbody>
</table>

*Timeline is subject to change due to state-specific resources and issues.

Current Work Topics

- Cost thresholds for four-factor analyses: workgroup in place to evaluate available information
- Use of off-ramps for four-factor analyses
- Inclusion of various requirements in the SIP as opposed to federally enforceable permits such as construction permits or state operating permits
- NPS and NPCA source listings: some states are in an ongoing dialogue with these groups
- EPA Region 4 source list analysis
- Communications with other states outside of VISTAS for information on facilities impacting VISTAS Class I areas
- How to address face-to-face consultation requirement with FLMs in light of the pandemic? (next slide)

Contacts for Further Information

- For general, technical, and SIP-related questions, contact the TAWG and CC Co-chairs:
  - TAWG = Randy Strait (randy.strait@rcdenn.gov)
  - TAWG = Doris McLeod (doris.mcleod@den.virginia.gov)
  - CC = Jim Boylan (james.boylan@dnr.ca.gov)
  - CC = Jimmy Johnston (james.johnston@tn.gov)
- For project and contract management questions, contact the Project Manager:
  - Chad LaFontaine (clafontaine@metro4-sesarm.org)

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National Park Service Consultation:
Presentation on
Pre-Draft West Virginia Regional Haze SIP
October 19, 2021

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Promoting a healthy environment
10/19/2021 - NPS Formal Consultation Call with West Virginia Department of Environmental Protection (WV DEP) Division of Air Quality on Regional Haze SIP Development.

Attendees:
- National Park Service
  - Holly Salazer, Interior Region 1 – State College, PA
  - Debbie Miller, ARD – Denver, CO
  - Melanie Peters, ARD – Denver, CO
  - Don Shepherd, ARD – Denver, CO
  - Andrea Stacy, ARD – Denver, CO
- West Virginia DEP
  - Todd Shrewsbury
  - Dave Fewell
- Fish & Wildlife Service
  - Tim Allen
- U. S. Forest Service
  - Jeremy Ash
  - Alexia Prosperi
- Environmental Protection Agency (EPA) Region 3
  - Keila Pagain-Incle
  - Adam Yarina
  - Todd Ellsworth
  - Megan Goold
  - Michael Gordon

*NPS photos from left to right: Acadia NP, Denali NP, Yellowstone NP, Grand Canyon NP*
Agenda

• Welcome & Introductions
• NPS Regional Haze Background
• NPS Class I Areas affected by West Virginia
  • Shenandoah NP
• NPS SIP Feedback for West Virginia
  o Source Selection
  o Four Factor Analysis Feedback
  o Long Term Strategy
• Next Steps

We welcome discussion at any time during this presentation. Please feel free to ask questions or add information along the way.

_NPS Photo from Bluestone National Scenic River in West Virginia._
By the Numbers

• **48** Class I areas
• In **24** states
• **90%** of visitors surveyed say that scenic views are *extremely* to *very* important
• **100%** of visitors surveyed rate clean air in the **top 5** attributes to protect in national parks

List of Class I areas: [https://www.nps.gov/subjects/air/npsclass1.htm](https://www.nps.gov/subjects/air/npsclass1.htm)

States with at least one Class I area:
AK, AZ, CA, CO, FL, HI, ID, KY, ME, MI, MN, MT, NC, ND, NM, OR, SD, TN, TX, UT, VA, VI, WA, WY

Statistics citation:

*NPS photo of Great Smoky Mountains NP, NC & TN*
West Virginia National Parks

BY THE NUMBERS

6 National Parks
1,423,432 Visitors to National Parks
$76,500,000 Economic Benefit from NP Tourism
4 National Heritage Areas
1 Wild & Scenic River Managed by NPS
2 National Trails Administered by NPS
1,070 National Register of Historic Places Listings
16 National Historic Landmarks
16 National Natural Landmarks
5,741,266 Objects in National Park Museum Collections
541 Archeological Sites in National Parks
- nps.gov/state/wv

National Park Units in West Virginia

1. Appalachian National Scenic Trail; Maine to Georgia, CT,GA,MA,MD,ME,NC,NH,NJ,NY,PA,TN,VA,VT,WV
2. Bluestone National Scenic River; Athens, Pipestem, and Hinton, WV
3. Chesapeake & Ohio Canal National Historical Park; Potomac River, DC,MD,WV
4. Gauley River National Recreation Area; Summersville, WV
5. Harpers Ferry National Historical Park; Harpers Ferry, WV,VA,MD

Affiliated Areas:

- Chesapeake Bay; Chesapeake Bay Watershed, DC,DE,MD,NY,PA,VA,WV
- Lewis & Clark National Historical Trail; Sixteen States: IA,ID,IL,IN,KS,KY,MO,MT,NE,ND,OH,OR,PA,SD,WA,WV

https://www.nps.gov/state/wv/index.htm

NPS Photo from New River Gorge National Park and Preserve
The NPS has an affirmative legal responsibility to protect clean air in national parks.

- **1916 NPS Organic Act**: created the agency with the mandate to conserve the scenery, natural and cultural resources, and other values of parks in a way that will leave them unimpaired for the enjoyment of future generations. This statutory responsibility to leave National Park Service units “unimpaired,” requires us to protect all National Park Service units from the harmful effects of air pollution.

- **In the 1970 Clean Air Act**: authorized the development of comprehensive federal and state regulations to limit emissions from both stationary (industrial) sources and mobile sources. The Act also requires the Environmental Protection Agency to set air quality standards.

- **1977 Clean Air Act Amendments**: these amendments to the Clean Air Act provide a framework for federal land managers such as the National Park Service to have a special role in decisions related to new sources of air pollution, and other pollution control programs to protect visibility, or how well you can see distant views. The Act established a national goal to prevent future and remedy existing visibility impairment in national parks larger than 6,000 acres and national wilderness areas larger than 5,000 acres that were in existence when the amendments were enacted.

- **1990 Clean Air Act Amendments**: created regulatory programs to address acid rain and expanded the visibility protection and toxic air pollution programs. The acid rain regulations began a series of regional emissions reductions from electric generating facilities and industrial sources that have substantially reduced air pollutant emissions.

*NPS photo of Washington DC from our air quality webcam: [https://npgallery.nps.gov/AirWebCams/wash](https://npgallery.nps.gov/AirWebCams/wash)*
Visibility goal:

*Restore natural conditions by 2064*

Yosemite NP, California and Great Smoky Mountains NP, Tennessee and North Carolina

Left to right images illustrate hazy to clear conditions.

Haze obscures the color and detail in distant features.

*NPS photos*
As you know, the NPS is one of three Federal Land Managers (FLMs) with responsibility for the 156 Class I areas nationwide. The NPS manages 48 Class I areas.

The closest NPS Class I area to WV is Shenandoah NP.
Shenandoah NP is located just 75 miles from Washington, D.C. and is one of the most visited NPs in the east. Many different activities bring visitors to Shenandoah NP, whether it’s Skyline Drive or hiking to the rocky peaks of Hawksbill or Old Rag or camping. Visitors can enjoy waterfalls, wildlife, beautiful landscapes and the attraction of fall colors. With over 200,000 acres of protected lands of the Blue Ridge Mountains and beautiful views of the Shenandoah Valley to the west and the Virginia Piedmont to the east, most visitors expect clean air and clear views when visiting the park. Unfortunately, Shenandoah NP experiences some of the highest measured air pollution of any national park in the U.S. As we are all familiar with, the park is downwind of many sources of air pollution from the Mid-Atlantic region and Ohio River Valley. Haze-causing emissions can significantly impact the scenic resources of the park.

NPS photos: Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring at Shenandoah NP and scenic views from Skyline Drive. The spit image shows hazy and clear conditions captured by our webcam: https://www.nps.gov/subjects/air/webcams.htm?site=shen.

NPS map
Long-term Visibility Trends

Long history of monitoring at Shenandoah NP, 30+ years!

We are seeing steady progress on both Most Impaired and Clearest days at Shenandoah NP but still not at natural conditions for either.

Progress has been made since first RH planning phase, and we want to continue to make progress over this second planning phase as well!

http://views.cira.colostate.edu/fed/Express/AqrvTools.aspx
This annual extinction bar graph shows total haze composition over the past 10 years on most impaired days at Shenandoah NP.

As views improve, haze composition is changing. This bar graph highlights the increasing importance of ammonium nitrate to visibility impacts at Shenandoah NP.

http://views.cira.colostate.edu/fed/Express/AqrvTools.aspx
In Shenandoah NP, which is most impacted by West Virginia facilities according to VISTAS modeling, nitrate composition has been increasing, and for the period 2015-2019 nitrate comprises 23% of visibility impairment on the 20% MID. In 2018, data show nitrate hit the greatest fraction in recent years, i.e. up to 31% of total light extinction in 2018 was from nitrate. This is followed by 2019 where nitrate comprised 29% of the total light extinction on the 20% MID in Shenandoah NP.

http://views.cira.colostate.edu/fed/Express/AqrvTools.aspx
The distribution of Most Impaired Days (MID) is changing – between 2000-2005 monitoring data show that summer is the prominent season for MID. For the period 2009-2013, data show an increase in the number of MID during winter months. Finally, during the most recent five-year period of data, we are just as likely to see MID during the winter as the summer.

http://views.cira.colostate.edu/fed/Express/AqrvTools.aspx
National Park Service RHR-R2

- Participating in Regional Planning Organizations (MANEVU, VISTAS)
  - NY, NJ, DC, CT, MA, NH, MD
  - FL, NC, TN, WV
- Evaluating facilities for visibility impacts on our NPS Class I areas
- Provided lists of facilities to VISTAS for 4-factor analysis consideration in 2019
- NPS facility-specific requests and recommendations for WV DEP

During the Second Round of RH Planning, the NPS has participated in all five RPO’s. For us in the east, NPS participates in MANE-VU and VISTAS. During this time, the NPS has evaluated facilities for visibility impacts on our Class I areas.

- We used a NPS Class I centric approach
- For each NPS Class I area, we identified those facilities associated with contributing 80% of visibility impacts, based on EPA’s 2016/2018 guidance
- Calculated Q/d for sources within 1,000km of NPS Class I boundaries using SO₂ and NOₓ emissions.
- We excluded PM b/c it’s well controlled on stationary sources and difficult to control for remaining area sources (including mines)
- We removed rail yards and airports
- Adjusted our results to reflect those facilities that had been controlled, shut down, changed fuels, or that we knew would be controlled before 2028

The NPS provided lists of facilities to states and RPOs in 2018 and 2019. And during our formal NPS-to-state consultations, we provide our specific facility requests and overall recommendations to individual states.
Exclusion of NO$_x$/Nitrate from 4FA

- The VISTAS rationale for excluding NO$_x$ emissions from reasonable progress is based on an outdated modeling base year and inaccurate assumptions about the current and future distribution of most-impaired days.
  - The VISTAS analyses justifying exclusion of NO$_x$ do not adequately account for current conditions on the 20% most-impaired days.
  - As SO$_2$ emissions decline and the seasonality of most-impaired days shifts, Nitrate is increasingly important in many VISTAS Class I areas. These shifts are not captured in the VISTAS modeling analysis.
- NO$_x$ emissions from stationary point sources are not trivial (based on both current and 2028 inventories).
- States should evaluate NO$_x$ and SO$_2$ control opportunities in this planning period.

As discussed during the consultation call, the NPS is not suggesting that West Virginia needs to re-model using an alternate base year. Instead, we are recommending that the model results be evaluated and considered in light of recent monitoring data.

Monitoring information from the past ten years should be used to ground truth modeling results and inform RP analyses and decisions. In doing so, we note that the VISTAS 2011 base-year modeling is dramatically under predicting nitrate. We recommend that West Virginia and other VISTAS states use a weight of evidence approach that incorporates recent monitoring information in their RP decisions. We recommend that West Virginia evaluate NO$_x$ emission reduction opportunities in this round of Regional Haze SIP development.
This map shows the most recent emissions inventory data (2020-CAMD/2017-NEI) for VISTAS sources identified by the earlier (2020) NPS Q/d methodology. Although we are now recommending VISTAS states consider alternate approaches to source selection using the VISTAS EWRT*Q/d results, this map illustrates the current distribution and scale of NO$_x$ and SO$_2$ stationary sources in the region.

For West Virginia, we observe that the point source emissions are relatively high and for many facilities they are predominantly NO$_x$.

*NPS map, April 2021*
VISTAS emissions projections for 2028 show that there will be 1.5 million tons of NOₓ (3 times the amount of SO₂) at the end of this planning period. Increasing trends in nitrate haze on most-impaired days will likely continue. We encourage West Virginia to expand focus from SO₂ in reasonable progress determinations and explore opportunities to further reduce NOₓ emissions in this planning period.

*VISTAS Graphic (Slide 9 from 8/4/2020 EPA, FLM, RPO Briefing presentation: VISTAS_Pres_FLMs_EPA_200804.pdf)*
West Virginia Draft SIP Feedback

Exclusion of NO\textsubscript{x}/Nitrate from 4FA (1)

- EPA acknowledges the importance of nitrate as an anthropogenic source of haze in their recent clarification memorandum, noting that:
  - In “nearly all Class I areas, the largest particulate matter (PM) components of anthropogenic visibility impairment are sulfate and nitrate, caused primarily by PM precursors SO\textsubscript{2} and NO\textsubscript{x}, respectively.”
  - Given this, the EPA “generally expects” states to analyze both SO\textsubscript{2} and NO\textsubscript{x} when determining control measures.

Ammonium nitrate from NO\textsubscript{x} emissions is a significant anthropogenic haze causing pollutant. Over the past 10-years the importance of ammonium nitrate on the 20% most-impaired days has increased for Shenandoah NP. As SO\textsubscript{2} emissions continue to decline and the seasonality of most-impaired days shifts, NO\textsubscript{x} emissions are increasingly important for many VISTAS Class I areas.

Again, we agree the modelling methods used the VISTAS states follow EPA guidance and are technically correct. However, the time period selected for the analysis is no longer reflective of current information and this was not factored into the decision-making process. The importance of ammonium nitrate and the distribution of the most-impaired days has changed significantly since the 2011 base year. As a result, 2028 projections based on the 2011 most-impaired days (which were ammonium sulfate dominated and occurred during the summer) miss the importance of nitrogen oxide emissions and ammonium nitrate extinction during the cooler months of the year that are now among the most-impaired days.
Exclusion of NO\textsubscript{x}/Nitrate from 4FA (2)

- West Virginia compared the VISTAS modeling (2011 base year) to EPA modeling (2016 base year) to confirm their original conclusions from the VISTAS Model.

  **Model Predictions vs. Monitoring Data:**

  - Modeling is useful in determining the relative effectiveness of overall control strategies (i.e., using RRFs to calculate RPGs) in a future year.
  - West Virginia & VISTAS used model results alone to determine that nitrate, a major component of anthropogenic impairment, does not warrant consideration in this round. Current visibility data and emission information contradicts this conclusion.
West Virginia Draft SIP Feedback

Exclusion of NO$_x$/Nitrate from 4FA (3)

- NPS recommends that West Virginia address the current and future importance of nitrate for visibility impairment and consider NO$_x$ emission reduction opportunities in this round of RH SIP development.
- Reducing NO$_x$ emissions would have additional regional co-benefits for ozone and nitrogen deposition in downwind Shenandoah National Park.
VISTAS Approach Concerns

Source Selection

- The *individual facility percent-of-total-impact* metrics are arbitrarily high and inherently less protective of the more-impacted Class I areas in the VISTAS region.

- The threshold for selecting an individual facility is **80 times** higher in the most-impacted Class I area than in the least-impacted Class I area in the VISTAS region.

- PSAT Modeling: We do not agree with using the absolute model values to exclude individual facilities from consideration for which reasonable reduction measures may be achieved, particularly when an arbitrarily high impact threshold is used to make this determination.
VISTAS Approach Concerns

Source Selection

- Underlying methodology EWRT*Q/d analysis

- Updated NPS lists of facilities
  - 80% of total AOI Impact

We acknowledge that an EWRT*Q/d approach is more robust than a simple Q/d approach because it also considers extinction and meteorology on the 20% MID. Accordingly, we updated our approach using the VISTAS EWRT*Q/d results and evaluated two alternative threshold metrics that could be used in lieu of the VISTAS individual facility percent-of-total-impact thresholds.

- **Clarification Note:** While we agree with using AOI approaches as opposed to a simple Q/d, this is not a wholesale endorsement of the VISTAS methods. We still have technical objections to the reliance on an outdated base year that underpins the AOI & CAMx analyses. Because of this, the outdated MIDs used in the analysis likely underestimate the role of NO$_3$/NO$_x$ into the future, which contradicts current IMPROVE data. This affects the facility selection process by failing to account for the role of ammonium nitrate on the recent MID and biases the analysis against selecting NO$_x$ sources. Adjusting the selection thresholds does not address this issue. Regardless, we agree that it is more sophisticated than a simple Q/d approach and we used the VISTAS EWRT*Q/d in our revised source screening analyses.

Our first approach, and the one applied to West Virginia used a threshold that captures 80% of the total Class I Area impact (e.g., 80% of the TCI) for sulfate & nitrate, as was recommended in the 2016 draft regional haze guidance. This produced a list of all the facilities that contribute up to 80% of the cumulative AOI impact in NPS VISTAS Class I areas. We are calling these results the “80% cut-off results.”

The second alternative approach applied an absolute value threshold—we are not recommending this approach for West Virginia. For more information see our May 2021 comments on the VISTAS analyses.
Source Selection

- West Virginia selected six sources using the 1% PSAT threshold
  - Pleasants Power Station, Harrison Plant, Fort Martin, John E Amos, Mitchell & Grant Town Plants. (Note: West Virginia did not include results for SHEN in the SIP.)

- Only one of these sources, Pleasants Power Station, completed a four-factor analysis. All six sources determined that additional SO₂ controls are neither necessary nor feasible, citing the following:
  - Class I areas are well below the URP.
  - Existing controls that meet MATs limits for SO₂ along with other CAA regulations.

- NPS recommends that West Virginia consider the additional emissions sources contributing to 80% of the AOI impact at NPS Class I areas, as recommended in the next slide.

Reminder, our analysis and recommendations only considered NPS Class I areas.
West Virginia Draft SIP Feedback

Source Selection—New NPS List of Sources for West Virginia

- 12 sources identified using the VISTAS AOI data (80% of total AOI impact at NPS Class I areas).
- These 12 facilities were on our original Q/d list sent to West Virginia for consideration. After further review, this list was reduced to the ten sources highlighted in green—the NPS requests additional analysis of these sources.

<table>
<thead>
<tr>
<th>Facility</th>
<th>NPS Class I Areas Affected</th>
<th>Pollutants</th>
<th>Selected By WV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monongahela Power Co. Pleasants Power Station</td>
<td>SHEN, GRSM, MACA</td>
<td>SO2, NOx</td>
<td>✔️</td>
</tr>
<tr>
<td>Allegheny Energy Co. Harrison Plant</td>
<td>SHEN</td>
<td>SO2</td>
<td>✔️</td>
</tr>
<tr>
<td>Monongahela Power Co. Fort Martin Power Plant</td>
<td>SHEN, GRSM</td>
<td>SO2, NOx</td>
<td>✔️</td>
</tr>
<tr>
<td>Appalachian Power Co. John E Amos Plant</td>
<td>SHEN, GRSM</td>
<td>SO2, NOx</td>
<td>✔️</td>
</tr>
<tr>
<td>Dominion Resources Mount Storm Power Station</td>
<td>SHEN</td>
<td>SO2, NOx</td>
<td>✔️</td>
</tr>
<tr>
<td>Mitchell Plant</td>
<td>SHEN</td>
<td>SO2, NOx</td>
<td>✔️</td>
</tr>
<tr>
<td>American Bituminous Power Grant Town Plant</td>
<td>SHEN</td>
<td>SO2, NOx</td>
<td>✔️</td>
</tr>
<tr>
<td>Longview Power</td>
<td>SHEN</td>
<td>SO2, NOx</td>
<td>✔️</td>
</tr>
<tr>
<td>Appalachian Power Co. Mountaineer Plant</td>
<td>SHEN, GRSM</td>
<td>SO2, NOx</td>
<td>✔️</td>
</tr>
<tr>
<td>Dupont Washington Works</td>
<td>SHEN</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Morgantown Energy Associates</td>
<td>SHEN</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Capitol Cement - Essaroc Martinsburg Plant</td>
<td>SHEN</td>
<td>SO2, NOx</td>
<td></td>
</tr>
</tbody>
</table>

Using the 80% of total AOI impact to NPS Class I areas identifies 12 West Virginia sources affecting visibility at Shenandoah NP. This final list of 10 removes sources that have converted to natural gas. Note that all of these sources were included on the original list we shared with West Virginia for consideration in 2019.

Acronyms:
- GRSM, Great Smoky Mountains NP (North Carolina & Tennessee)
- SHEN, Shenandoah NP (Virginia)
- MACA, Mammoth Cave NP (Kentucky)
**West Virginia Draft SIP Feedback**

**A closer look at West Virginia EGUs**

- Among the Vistas Region States, West Virginia EGUs are the most significant contributors to visibility impairment in Shenandoah NP based on the VISTAS 2028 PSAT modeling.

*Many West Virginia EGUs operate existing controls, but based on historic emissions, limits could be tightened to ensure continued progress.*

This graph shows the 2028 modeled contribution to light extinction on 20% most impaired days at Shenandoah NP. The pink color represents emissions from West Virginia which dominate extinction attributed to EGUs for Sulfate and Nitrate. Also, recognize that extinction from nitrate is very likely under predicted since the most impaired set of days was held constant by the modeling and focuses on summertime days.

*VISTAS Graphic (from “VISTAS_PSAT_Source_Apport_Results_April_2020.xlsm”)*
A closer look at West Virginia EGUs

EPA 2021 clarification memo Section 2.3 on Effectively Controlled:

“[States] should further consider information specific to the source, including recent actual and projected emission rates, to determine if the source could reasonably attain a lower rate.”

“It may be difficult for a state to demonstrate that a four-factor analysis is futile for a source just because it has an “effective control” if it has recently operated at a significantly lower emission rate.”

“In that case, a four-factor analysis may identify a lower emission rate (e.g., associated with more efficient use of the “effective existing controls”) that may be reasonable and thus necessary for reasonable progress. If a source can achieve, or is achieving, a lower emission rate using its existing measures than the rate assumed for the “effective control,” a state should further analyze the lower emission rate(s) as a potential control option.”
A closer look at West Virginia EGUs

Monongahela Power Co. Pleasants Power Station

• Pollution control equipment on the Pleasants units are not among the top tier performers for SO₂ or NOx. Out of 494 coal-fired units in the CAMD database in 2020, when ranked best to worst performing:
  • Unit 1 Ranked #356 for its SO₂ emission rate and #370 for its NOₓ emission rate.
  • Unit 2 Ranked #394 for its SO₂ emission rate and #379 for its NOₓ emission rate.
  • Existing Scrubbers were installed in 1979 and upgraded in 2008.

NPS Charts, 2021
West Virginia Draft SIP Feedback

A closer look at West Virginia EGUs

Monongahela Power Co. Pleasants Power Station

- Monongahela Power completed cost analyses for replacement equipment (but not for scrubber upgrades). They estimated replacement scrubber costs at approx. $9k-11k/ton.
- The information in the Pleasant’s 4FA was incomplete, however, we noted several errors.
- NPS estimated the incremental cost effectiveness of scrubber replacement:
  - Unit 1: $7,534/ton for an additional 2,525 TPY additional SO\textsubscript{2} reduction
  - Unit 2: $5,336/ton for an additional 3,579 TPY additional SO\textsubscript{2} reduction
- We recommend that cost-effective scrubber replacements are implemented in this round of RH planning.
A closer look at West Virginia EGUs

Monongahela Power Co. Pleasants Power Station

- The last 13 years of emissions information demonstrate that lower NO\textsubscript{x} emission rates are achievable with the existing LNB + SCR system.
- Evaluate and implement options to ensure consistent low NO\textsubscript{x} emissions are achieved with the existing controls (e.g., permit limits, optimization of control efficiency).

*NPS Charts, 2021*
West Virginia Draft SIP Feedback

A closer look at West Virginia EGUs
Monongahela Power Co. Fort Martin Power Plant

- NO$_x$ emissions are controlled with SNCR. Out of 494 coal-fired units in the CAMD database in 2020, when ranked best to worst performing:
  - Unit 1 Ranked #438 for its NO$_x$ emission rate.
  - Unit 2 Ranked #437 for its NO$_x$ emission rate.

- WV DEP should complete a four-factor analysis to evaluate additional NO$_x$ control options for the Fort Martin units.
- The NPS estimated the incremental cost of replacing the existing SNCRs with SCRs and found:
  - Unit 1: $3,181/ton for an additional 3,399 TPY additional NO$_x$ reduction
  - Unit 2: $3,611/ton for an additional 3,003 TPY additional NO$_x$ reduction
- The NPS recommends that the existing SNCR systems be replaced with SCR.
A closer look at West Virginia EGUs

Monongahela Power Co. Fort Martin Power Plant

- The wet scrubbers were upgraded in 2016. Based on CAMD emission data:
  - Unit #1 is capable of better than 97% control and may have been achieving better than 98% control @ 0.065 lb/mmBtu.
  - Unit #2 is capable of better than 97% control and may have been achieving better than 99.5% control @ 0.027 lb/mmBtu.
  - Both units should be capable of meeting 0.08 lb/mmBtu on an annual average. Permit limits should be established to ensure best operation and maintenance of the SO2 scrubbers.

NPS Charts, 2021
A closer look at West Virginia EGUs

American Bituminous Power Grant Town Plant

- West Virginia determined that a four-factor analysis was not necessary for this facility because:
  - The facility T5 permit limits SO₂ emissions to less than the quantity projected to exceed the 1.00% visibility threshold—Can WV DEP please clarify this?
  - 2036 Retirement Date—We note that this date is near the end of the third planning period and should not be relied on to avoid analysis. If this shutdown date is federally enforceable it may be used to shorten the remaining useful life in a four-factor analysis.

- CAMD Data:
  - From 2015-2019 SO₂ Ranged from 0.311 - 0.57 lb/MMBtu.
  - From 2015-2019 NOₓ Ranged from 0.30 - 0.34 lb/MMBtu
  - The Grant Town emission rates are high relative to other well-controlled coal-fired facilities.
  - Please complete a four-factor analysis to evaluate the costs of additional SO₂ and NOₓ controls.
West Virginia Draft SIP Feedback

A closer look at WV EGUs
Allegheny Energy Co. Harrison Plant –Example

- SO₂ emission rates range from 0.048 to 0.326 lb/MMBtu.
- Evaluate and implement options to ensure consistent low SO₂ emissions are achieved with the existing controls (e.g., permit limits, optimization of efficiency/scrubber upgrades).

NPS Charts, 2021
West Virginia Draft SIP Feedback

A closer look at West Virginia EGUs
Appalachian Power Co. John E Amos Plant—Examples

- Annual SO\(_2\) emission rates range from 0.040 to 0.103 lb/MMBtu. Annual NO\(_x\) emission rates range from 0.042 to 0.113 lb/MMBtu
- Evaluate and implement options to ensure consistent low SO\(_2\) emissions are achieved with the existing controls (e.g., permit limits, optimization of efficiency/scrubber upgrades).

*NPS Charts, 2021*
West Virginia Draft SIP Feedback

A closer look at West Virginia EGUs

Mount Storm Power Station—Example

- Annual SO₂ emission rates range from 0.048 to 0.158 lb/MMBtu. Annual NOₓ emission rates range from 0.061 to 0.437 lb/MMBtu
- Evaluate and implement options to ensure consistent low SO₂ emissions are achieved with the existing controls (e.g., permit limits, optimization of efficiency/scrubber upgrades).

NPS Charts, 2021
West Virginia Draft SIP Feedback

A closer look at West Virginia EGUs

Mitchell Plant—Example

• Annual SO\textsubscript{2} emission rates range from 0.042 to 0.112 lb/MMBtu. Annual NO\textsubscript{x} emission rates range from 0.050 to 0.097 lb/MMBtu.

• Evaluate and implement options to ensure consistent low SO\textsubscript{2} emissions are achieved with the existing controls (e.g., permit limits, optimization of efficiency/scrubber upgrades).

NPS Charts, 2021
A closer look at West Virginia EGUs

Longview Power—Example

- Annual SO₂ emission rates range from 0.051 to 0.089 lb/MMBtu. Annual NOₓ emission rates range from 0.063 to 0.070 lb/MMBtu.
- Evaluate and implement options to ensure consistent low SO₂ emissions are achieved with the existing controls (e.g., permit limits, optimization of efficiency/scrubber upgrades).

*NPS Charts, 2021*
A closer look at West Virginia EGUs

Appalachian Power Co. Mountaineer Plant

• Annual SO₂ emission rates range from 0.048 to 0.131 lb/MMBtu. Annual NOₓ emission rates range from 0.055 to 0.098 lb/MMBtu

• Evaluate and implement options to ensure consistent low SO₂ emissions are achieved with the existing controls (e.g., permit limits, optimization of efficiency/scrubber upgrades).

NPS Charts, 2021
Summary of NPS Requests/Recommendations

- **Pleasants Energy:**
  - SO₂: Consider NPS evaluation of scrubber replacement costs and implement cost-effective options to replace the aging SO₂ controls on the Pleasants units.
  - NOₓ: Evaluate and implement options to ensure consistent low NOₓ emissions are achieved with the existing LNB + SCR system (e.g., permit limits, optimization of efficiency).

- **Fort Martin:**
  - SO₂: Evaluate and implement options to ensure consistent low SO₂ emissions are achieved with the existing scrubbers (e.g., permit limits, optimization of efficiency).
  - NOₓ: Complete a four-factor analysis for NOₓ control option and consider NPS cost estimates for replacement of the existing SNCR with SCR.

- **Grant Town Power Plant:**
  - SO₂: Completed a four-factor analysis to evaluate the costs of post-combustion SO₂ controls.
  - NOₓ: Completed a four-factor analysis to evaluate NOₓ control options.

- **Remaining EGUs:**
  - Evaluate and implement options to ensure consistent low SO₂ and NOₓ emissions are achieved with the existing controls (e.g., permit limits, optimization of efficiency).

- **Capitol Cement - Essroc Martinsburg Plant:**
  - Conduct a four-factor analysis to evaluate SO₂ and NOₓ emission reduction opportunities.
• Thank you for meeting with us!
• Please share:
  • Anticipated SIP schedule
  • How you will respond to NPS comments
• Please let us know:
  • When public comment period opens and closes
  • If/when a public hearing will be held
• The NPS will:
  • Email call summary & any additional information
  • Share our comments with EPA Region 3

The NPS will submit an email summary of our October 19, 2021 consultation call along with any final review comments by October 26, 2021.

*NPS photo New River Gorge National Park and Preserve*
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For any formal notifications of public documents, please include the above list of NPS staff.
Appendix F-3p

National Park Service Consultation: Written Comments on Pre-Draft West Virginia Regional Haze SIP October 26, 2021

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Promoting a healthy environment
# ATTACHMENT 1

## NATIONAL PARK SERVICE DETAILED COMMENTS ON WEST VIRGINIA’S DRAFT REGIONAL HAZE SIP

October 26, 2021

1. **Introduction and General Comments**
   - 1.1 Facilities recommended for analysis by the NPS
   - 1.2 NPS feedback on West Virginia reasonable progress determinations
   - 1.3 Below the Uniform Rate of Progress (URP) and reasonable progress determinations
   - 1.4 General NPS feedback on criteria for determining “effectively controlled”
   - 1.5 West Virginia contributions to visibility impairment in Shenandoah National Park

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1 Introduction and General Comments

We commend West Virginia for developing a well-organized, detailed Regional Haze State Implementation plan (SIP), and for engaging with the National Park Service (NPS) during the FLM consultation period. We also recognize and appreciate the significant SO\textsubscript{2} and NO\textsubscript{x} emission reductions and visibility improvements that West Virginia has achieved in the last decade. Still, significant additional progress is necessary before the ultimate visibility goal of no human caused visibility impairment is realized for NPS Class I areas affected by West Virginia emissions. These Class I areas include Shenandoah National Park (NP) in Virginia, Great Smoky Mountains NP in Tennessee and North Carolina, and Mammoth Cave NP in Kentucky.

Under the Clean Air Act (§169A and B) and Federal Regional Haze Rule (40 CFR §51.308), states are required to develop a State Implementation Plan (SIP) and substantively engage with agencies that manage national parks and wildernesses designated as Class I areas. States are also required to update SIPs every 10 years to address haze-causing air pollution and ensure progress is made toward achieving the overall program goal which is “the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory class I Federal areas which impairment results from manmade air pollution.”

It is with this in mind that we provide the following feedback and recommendations, as presented during our consultation call with West Virginia on October 19, 2021. This attachment to our emailed comments documents the topics discussed during that call and provides additional detail to support NPS conclusions and recommendations presented during our consultation call. It is our intention for these recommendations to strengthen West Virginia’s proposed long-term strategy addressing regional haze in NPS Class I areas.

1.1 Facilities recommended for analysis by the NPS

Specifically, we request that WV conduct (or expand and revise) four-factor analyses to evaluate cost-effective SO\textsubscript{2} and NO\textsubscript{x} emission reduction opportunities in this planning period for the following facilities:

1. Monongahela Power Co. Pleasants Power Station
2. Allegheny Energy Co. Harrison Plant
3. Monongahela Power Co. Fort Martin Power Plant
4. Appalachian Power Co. John E Amos Plant
5. Dominion Resources Mount Storm Power Station
6. American Electric Power Mitchell Plant
7. American Bituminous Power Grant Town Plant
8. Longview Power
9. Appalachian Power Co. Mountaineer Plant
10. Capitol Cement - Essroc Martinsburg Plant

Our process for identifying facilities for review was described during our consultation call and in our May 14, 2021 comments to the VISTAS region states. We developed our revised list of
facilities using the VISTAS AOI results in response to our concerns regarding the arbitrarily high source selection thresholds used by the VISTAS states. We ranked the facilities according to their AOI impact for each NPS Class I area. We then compiled a list of facilities for each state that comprises 80% of the combined AOI visibility impact from sulfur and nitrogen compounds for NPS Class I areas in the VISTAS region. Only facilities that comprise the top 80% of the AOI impact for any NPS Class I area were included. This resulted in a list of 12 West Virginia facilities affecting visibility at Shenandoah, Great Smoky Mountains, and Mammoth Cave NPs. We narrowed this list to ten by removing two facilities that have converted to natural gas. (See slide 23 of our October 19, 2021 PowerPoint presentation, NPS-WV_RH-ConsultationSlides_10.19.2021.pdf). Each of the ten sources that we are now recommending for four-factor analysis were also included on the original list we shared with West Virginia for consideration in 2019.

The NPS list includes one non-EGU facility, the Capitol Cement-Essroc Martinsburg Plant, as potentially impacting Shenandoah NP. The remaining sources are electric generating units (EGUs). As discussed on slide 24 from our consultation meeting, among the VISTAS Region States, West Virginia EGUs are the most significant contributors to visibility impairment in Shenandoah NP based on the VISTAS 2028 PSAT modeling.

We encourage West Virginia to evaluate and implement any cost-effective emission reduction opportunities. This includes an assessment of existing pollution control equipment at the EGUs to ensure controls are operated efficiently and achieve consistently low SO\textsubscript{2} and NO\textsubscript{x} emissions using permit limits, optimization of equipment efficiency, or equipment upgrades. For the Pleasant’s Energy and Fort Martin facilities specifically, we request that West Virginia require cost-effective equipment replacement options. We are providing cost analyses that support our recommendation to replace the aging SO\textsubscript{2} scrubbers at the Pleasants Energy facility and replace the SNCR systems with SCR at the Fort Martin facility. Such action would demonstrate WV’s commitment to substantively address regional haze requirements and make reasonable progress towards clean air and clear views in this planning period.

1.2 NPS feedback on West Virginia reasonable progress determinations
The RP analyses provided for the EGUs in the WV draft SIP are likely not sufficient to fulfill the regional haze analytical requirements. Under §7491 of the Clean Air Act (CAA), SIPs are required to contain:

“emission limits, schedules of compliance and other measures as may be necessary to make reasonable progress toward meeting the national goal.”

These measures are to be identified using the four statutory factors, which are also listed in §7491:

“the costs of compliance, the time necessary for compliance, and the energy and nonair quality environmental impacts of compliance, and the remaining useful life of any existing source.”
A full four-factor analysis was conducted for only one WV source and as described in the source-specific feedback below, there are issues with this cost analysis. However, six WV EGUs exceeded the VISTAS 1% of the total EGU + non-EGU impact at the West Virginia Class I areas and were “selected” for four-factor analysis in the draft WV SIP: (1) Monongahela Power Co. Pleasants Power Station; (2) Allegheny Energy Co. Harrison Plant; (3) Monongahela Power Co. Fort Martin Power Plant; (4) Appalachian Power Co. John E Amos Plant; (5) American Electric Power Mitchell Plant; (6) American Bituminous Power Grant Town Plant.

Based on the information presented in the SIP, West Virginia did not tag WV facilities for impacts to Shenandoah NP. Regardless, each of the six EGUs “selected” by WV is also on the NPS list of sources recommended for four-factor analysis and emissions reductions. As discussed in our presentation and in our May 2021 comments to the VISTAS region states, the percent-of-total-impact thresholds selected by the VISTAS region states were inherently less protective of the most impacted Class I areas. For example, the absolute value of the VISTAS thresholds to identify a source affecting Shenandoah NP is 32 times higher than was needed to identify a source affecting Everglades NP in Florida (the least-visibility-impaired VISTAS Class I area). While the threshold selected by WV to “tag” sources in the first screening step, which was 0.2% of the AOI impact for sulfate or nitrate, was lower than the percent-based threshold selected by any other VISTAS state, it did not result in conducting a greater number of four-factor analyses, nor did it make an appreciable difference in the outcome, as no additional emission reductions were included in the long-term strategy.

Of the six facilities selected, WV DEP pre-determined that a four-factor analysis was not necessary for the American Bituminous Power Grant Town. Four-factor analyses were requested from the remaining five EGUs, but only one, Monongahela Power Co. Pleasants Power Station, provided the requested information. Ultimately, WV determined that additional controls are not necessary for any of the WV EGUs (with or without cost analyses), citing the following justifications for each of the facilities:

- The “rate of progress at the mandatory federal Class I areas identified are well ahead of the uniform rate of progress goals to natural background visibility” and therefore, additional emissions reductions are not necessary.
- These are facilities are already meeting other CAA requirements, including the limits for the Mercury Air Toxics Standards (MATS) rule and the Cross State Air Pollution Rule (CSAPR) and therefore, no additional controls are necessary.

1.3 Below the Uniform Rate of Progress (URP) and reasonable progress determinations

Technically feasible, cost-effective controls identified through four-factor analysis should be implemented in this planning period, regardless of where the state will be relative to the uniform rate of progress (URP) in 2028. EPA addressed this issue at length in the preamble to the 2017 revisions to the Regional Haze Rule. For example, when addressing RP analysis requirements and how this relates to the URP, EPA states:
Some commenters stated a desire for corresponding rule text dealing with situations where RPGs are equal to (“on”) or better than (“below”) the URP or glidepath. Several commenters stated that the URP or glidepath should be a “safe harbor,” opining that states should be permitted to analyze whether projected visibility conditions for the end of the implementation period will be on or below the glidepath based on on-the-books or on-the-way control measures, and that in such cases a four-factor analysis should not be required.

The CAA requires that each SIP revision contain long-term strategies for making reasonable progress, and that in determining reasonable progress states must consider the four statutory factors. Treating the URP as a safe harbor would be inconsistent with the statutory requirement that states assess the potential to make further reasonable progress towards natural visibility goal in every implementation period. Even if a state is currently on or below the URP, there may be sources contributing to visibility impairment for which it would be reasonable to apply additional control measures in light of the four factors. Although it may conversely be the case that no such sources or control measures exist in a particular state with respect to a particular Class I area and implementation period, this should be determined based on a four-factor analysis for a reasonable set of in-state sources that are contributing the most to the visibility impairment that is still occurring at the Class I area. It would bypass the four statutory factors and undermine the fundamental structure and purpose of the reasonable progress analysis to treat the URP as a safe harbor, or as a rigid requirement.

[Emphasis added.]

This point was reiterated at length in Section 5.4 of EPA’s July 2021 Clarification Memorandum:

“The URP is a planning metric used to gauge the amount of progress made thus far and the amount left to make. It is not based on consideration of the four statutory factors and, therefore, cannot answer the question of whether the amount of progress made in any particular implementation period is “reasonable progress.” This concept was explained in the RHR preamble. Therefore, states must select a reasonable number sources and evaluate and determine emission reduction measures that are necessary to make reasonable progress by considering the four statutory factors.”

EPA further emphasized the need to achieve “meaningful reductions” in this round of haze planning in the introduction section of the Clarification Memorandum, again noting that such reductions should be identified through analysis of the four statutory factors listed in the CAA:

“EPA intends the second planning period of the regional haze program to secure meaningful reductions in visibility impairing pollutants that build on the significant progress states have already achieved. There exist many opportunities for states to leverage both ongoing and upcoming emission reductions under other CAA programs;

However, we also expect states to undertake rigorous reasonable progress analyses that identify further opportunities to advance the national visibility goal consistent with the statutory and regulatory requirements.” [Emphasis added.]

While we appreciate and recognize the substantial emission reductions that have occurred in West Virginia over the last decade, this does not remove the obligation to consider Reasonable Progress measures based on the four statutory factors. Section 5.2 of the EPA Clarification Memo:

“However, a state should generally not reject cost-effective and otherwise reasonable controls merely because there have been emission reductions since the first planning period owing to other ongoing air pollution control programs or merely because visibility is otherwise projected to improve at Class I areas. More broadly, we do not think a state should rely on these two additional factors to summarily assert that the state has already made sufficient progress and, therefore, no sources need to be selected or no new controls are needed regardless of the outcome of four-factor analyses. Doing so would be similar in principle as relying on URP as a safe harbor, which we have consistently stated does not comport with the RHR, as noted in Section 5.4. We do think states can consider these factors in a more tailored manner, for instance in choosing between multiple control options when all are reasonable based on the four statutory factors.”

Given the lack of four-factor analyses to support the WV SIP conclusions and RP determinations, we do not believe the analytical obligations of the CAA have been met. WV should rectify this issue and revise the draft SIP by conducting or expanding and revising the four-factor analyses to evaluate and implement cost-effective SO₂ and NOₓ emission reduction opportunities in this planning period.

1.4 General NPS feedback on criteria for determining “effectively controlled”

As described above, WV determined that each of their EGUs is already “effectively controlled” however, an analysis was not performed to verify these determinations. The July 2021 EPA Clarification Memorandum addressed the analytical expectations for these determinations:

“The underlying rationale for the “effective controls” flexibility is that if a source’s emissions are already well controlled, it is unlikely that further cost-effective reductions are available. A state relying on an “effective control” to avoid performing a four-factor analysis for a source should demonstrate why, for that source specifically, a four-factor analysis would not result in new controls and would, therefore, be a futile exercise. States should first assess whether the source in question already operates an “effective control” as described in the August 2019 Guidance. They should further consider information specific to the source, including recent actual and projected emission rates, to determine if the source could reasonably attain a lower rate. It may be difficult for a state to demonstrate that a four-factor analysis is futile for a source just because it has an “effective control” if it has recently operated at a significantly
lower emission rate. In that case, a four-factor analysis may identify a lower emission rate (e.g., associated with more efficient use of the “effective existing controls”) that may be reasonable and thus necessary for reasonable progress. If a source can achieve, or is achieving, a lower emission rate using its existing measures than the rate assumed for the “effective control,” a state should further analyze the lower emission rate(s) as a potential control option.” [Emphasis added.]

In the following sections, we have summarized and documented annual averages of historic operating and emissions data for each of the nine EGUs on the NPS list of sources recommended for analysis. This information suggests that most of these facilities have achieved lower SO\textsubscript{2} or NO\textsubscript{x} (or both) emission rates in the past, presenting opportunities to analyze potential upgrades and/or fine-tuning of existing emissions control equipment.

For several of the sources, we note that replacing equipment with newer, higher control efficiency options may be cost-effective. This recommendation is also in line with guidance in the EPA July 2021 Clarification Memorandum, which states:

“Similarly, in some cases, states may be able to achieve greater control efficiencies, and, therefore, lower emission rates, using their existing measures. Considering efficiency improvements for an existing control (e.g., using additional reagent to increase the efficiency of an existing scrubber) as a potential measure is generally reasonable since in many cases such improvements may only involve additional operation and maintenance costs. States should generally include efficiency improvements for sources’ existing measures as control options in their four-factor analyses in addition to other types of emission reduction measures.” [Emphasis added.]

As discussed during our October 19, 2021 consultation call and presentation, we have seen several examples of cost analyses for scrubber upgrades, where improvements were found to be very cost-effective.

1.5 West Virginia contributions to visibility impairment in Shenandoah National Park
Among the VISTAS region states, West Virginia point sources have the greatest contribution to both sulfate and nitrate impairment in Shenandoah NP, a point which is not addressed in the WV SIP. (Note, VISTAS did not analyze individual state contributions for states outside of the VISTAS region.) WV emphasizes that “these areas will experience visibility improvements that are significantly better than those on the uniform rate of progress” and that contributions from other regions “are larger than home state contributions.”

In their July 2021 clarification, EPA states that when selecting sources, states should focus primarily on their in-state contributions to haze. Section 2.1 of the EPA Clarification Memo, states:

“In a source-selection process that relies on multi-state rankings of sources, impacts from large out-of-state sources can exceed the contributions from relatively smaller, but still important in-state sources. States should not use that fact to ignore selecting the
largest in-state sources. In applying a source selection methodology, states should focus on the in-state contribution to visibility impairment and not decline to select sources based on the fact that there are larger out-of-state contributors.”

We recommend that the WV SIP address the significance of WV emissions to impairment in Shenandoah NP by including information specific to Shenandoah NP in the SIP and considering emission reduction opportunities for the sources identified by the NPS.
2 Importance of NO\textsubscript{x} emissions

During our October 19, 2021 consultation call with West Virginia, the NPS expressed concerns that the West Virginia draft SIP failed to address the increasing importance of ammonium nitrate on the 20% Most-impaired Days (MID) in NPS Class I areas by excluding NO\textsubscript{x} emissions from the reasonable progress analyses. The impacted Class I areas in the VISTAS region include Shenandoah, Great Smoky Mountains and Mammoth Cave National Parks. Emission sources in West Virginia primarily impact Shenandoah NP, which is in northern Virginia and downwind from West Virginia.

To address this issue, the NPS recommends that the West Virginia Department of Environmental Protection (WVDEP) complete additional four-factor analyses that evaluates nitrogen oxide (NO\textsubscript{x}) reduction opportunities for West Virginia point sources and include any cost-effective measures in their Reasonable Progress determinations. This request was documented in our May 14, 2021 technical feedback to the VISTAS region states.

The WVDEP did not accept these recommendations in their draft SIP for FLM review. Instead, the WV SIP concludes that “ammonium sulfate is the largest contributor to visibility impairment at the West Virginia Class I areas, and reduction of SO\textsubscript{2} emissions would be the most effective means of reducing ammonium sulfate.” With regard to this issue, the WV SIP:

- Recognized that ammonium nitrate contributions have increased for some Class I areas but determined that ammonium sulfate remains the dominant visibility impairment species through 2019. Based on this, it appears WV determined that it is appropriate to defer review of NO\textsubscript{x} emissions until the next Regional Haze planning period.
- Concluded that WV EGUs are already “effectively controlled for NO\textsubscript{x},” and therefore, it is not reasonable to request four-factor analyses for facilities that are already well-controlled.

We agree that sulfate is the dominant anthropogenic visibility impairing pollutant in Shenandoah and other VISTAS region Class I areas. We also appreciate West Virginia’s acknowledgement that the nitrate contribution to visibility impairment on the 20% most-impaired days has been increasing over the last decade at Shenandoah, Great Smoky Mountains and Mammoth Cave National Parks. However, we reaffirm our position that the nitrate contribution to visibility impairment is significant and should not be ignored. West Virginia should evaluate opportunities to reduce NO\textsubscript{x} emissions from stationary sources in this Regional Haze planning period.

In Shenandoah NP, nitrate comprises up to 23% of total light extinction on the 20% Most-impaired (MID) during the most recent five-year period (2015-2019) and up to 31% of total light extinction in 2018, the annual period with the greatest nitrate fraction in recent years. On some days in 2018, nitrate pollution accounted for up to 50%-60% of the haze.

At Great Smoky Mountain NP, which is also impacted by WV facilities, nitrate comprises 17% of total light extinction on the 20% MID during the most recent five-year period (2015-2019) and up to 26% of total light extinction in 2018, the annual period with the greatest nitrate fraction in recent years. On some days in 2018, nitrate pollution accounted for up to 60% of the haze.
At Mammoth Cave NP, this trend is even more apparent, where nitrate comprises 32% of total light extinction on the 20% MID during the most recent five-year period (2015-2019) and up to 45% of total light extinction in 2018, the annual period with the greatest nitrate fraction in recent years. On some days in 2018, nitrate pollution accounted for up to 60% of the haze.

Our analysis of the Interagency Monitoring of Protected Visual Environments (IMPROVE) data and associated recommendation is supported by information in the Environmental Protection Agency’s July 8, 2021 Memorandum, Clarifications Regarding Regional Haze State Implementation Plans for the Second Implementation Period (EPA Clarification Memo). In Section 2.2, the memo states:

“Consistent with the first planning period, EPA generally expects that each state will analyze sulfur dioxide (SO₂) and nitrogen oxide (NOₓ) in selecting sources and determining control measures. In nearly all Class I areas, the largest particulate matter (PM) components of anthropogenic visibility impairment are sulfate and nitrate, caused primarily by PM precursors SO₂ and NOₓ, respectively. A state that chooses not to consider at least these two pollutants in the second planning period should show why such consideration would be unreasonable, especially if the state considered both these pollutants in the first planning period. Regional offices are encouraged to work closely with states to ensure the bases for their decisions are sufficiently developed to demonstrate a reasonable analysis.”

WVDEP contends that, based on the monitoring data, as well as the VISTAS PSAT and EPA base year 2016 modeling results, “sulfate continues to be the primary driver of visibility impairment in most mandatory federal VISTAS Class I areas.” As documented in our May 14, 2021 response to VISTAS’s states, the VISTAS PSAT modeling does not accurately reflect the recent nitrate contribution to extinction given the recent shift in the seasonal distribution of the 20% MID. Regardless of this issue, we note that, based on the VISTAS PSAT results, point sources account for roughly one-third of modeled nitrate impact in Shenandoah and Great Smoky Mountains National Parks.

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2 …the 2011 modeling base year is significantly outdated and is no longer representative of current visibility impairment on the 20% MID. Because the subset of days that comprise the 20% MID are held constant between the modeled base year and future year (2028) in the VISTAS analysis, it is critically important to analyze whether the base year appropriately represents the current most impaired days. By selecting 2011, VISTAS states are biasing results toward summer months when sulfate concentrations are generally highest and nitrate concentrations are generally low. For this reason, it not surprising that they have concluded that nitrate will not be a concern in 2028. In fact, using the dates based on MID in 2011 and considering measurements from 2018 would suggest that nitrate was not important in 2018. Monitoring data at Mammoth Cave NP in 2018 show that Ammonium Nitrate was the single biggest contributor to light extinction on the worst visibility days sampled in that year.

3 Data pulled from the information provided in the “Stacked Bar S and N by Area_ADJ” tab of the excel spreadsheet “VISTAS PSAT Source Apport Results April 2020.xlsm,” available at: [https://www.metro4-sesarm.org/content/task-7-source-apportionment-modelingtagging](https://www.metro4-sesarm.org/content/task-7-source-apportionment-modelingtagging). We are interpreting the non-EGU “tag” to include only point sources based on Table 3-3: Round 2 SESARM Defined Regional-Category Combination Tags provided in the VISTAS Task 7 Particulate Source Apportionment Technology Modeling Results Report.
The magnitude of NO\textsubscript{x} emissions from stationary sources in West Virginia is significant (based on both current inventory information and 2028 projections). Stationary source NO\textsubscript{x} is clearly within the state’s purview to control. Reductions in NO\textsubscript{x} emissions also result in co-benefits beyond visibility protection/improvement; NO\textsubscript{x} emissions are precursors to ozone formation and contribute to deposition.

Again, we want to clarify that we are not recommending that the modeling analysis needs to be redone. Instead, WVDEP should supplement their approach with the current IMPROVE monitoring information described in the updated draft SIP and complete four-factor analyses of sources for potential NO\textsubscript{x} controls at the facilities identified by the NPS during our October 19, 2021 consultation meeting. These facilities are listed in the introduction section above and addressed in detail below.

3 Detailed NPS feedback for specific sources

As addressed in Section 1.3 of this document, we recommend that WV conduct a review to determine whether the WV EGUs are “effectively controlled” for both SO\textsubscript{2} and NO\textsubscript{x} and evaluate whether existing controls could be optimized based on demonstrated achievable rates or potential cost-effective upgrades. We also recommend that control equipment replacements are considered for the Pleasants Energy and Fort Martin facilities and that a four-factor analysis be completed for the Capitol Cement - Essroc Martinsburg Plant. Our recommendations are consistent with guidance in the July 2021 EPA Clarification Memorandum\textsuperscript{4}, as well as our feedback to other VISTAS states, including Tennessee and North Carolina.

The NPS has conducted a preliminary analysis to determine whether the WV EGU facilities are already “effectively controlled” using publicly available information in Clean Air Markets.

\textsuperscript{4} “Similarly, in some cases, states may be able to achieve greater control efficiencies, and, therefore, lower emission rates, using their existing measures. Considering efficiency improvements for an existing control (e.g., using additional reagent to increase the efficiency of an existing scrubber) as a potential measure is generally reasonable since in many cases such improvements may only involve additional operation and maintenance costs. States should generally include efficiency improvements for sources’ existing measures as control options in their four-factor analyses in addition to other types of emission reduction measures.” (Section 3.2)

“The underlying rationale for the “effective controls” flexibility is that if a source’s emissions are already well controlled, it is unlikely that further cost-effective reductions are available. A state relying on an “effective control” to avoid performing a four-factor analysis for a source should demonstrate why, for that source specifically, a four-factor analysis would not result in new controls and would, therefore, be a futile exercise. States should first assess whether the source in question already operates an “effective control” as described in the August 2019 Guidance. They should further consider information specific to the source, including recent actual and projected emission rates, to determine if the source could reasonably attain a lower rate. It may be difficult for a state to demonstrate that a four-factor analysis is futile for a source just because it has an “effective control” if it has recently operated at a significantly lower emission rate. In that case, a four-factor analysis may identify a lower emission rate (e.g., associated with more efficient use of the “effective existing controls”) that may be reasonable and thus necessary for reasonable progress. If a source can achieve, or is achieving, a lower emission rate using its existing measures than the rate assumed for the “effective control,” a state should further analyze the lower emission rate(s) as a potential control option.” (Section 2.3)
Division (CAMD) database. This analysis is addressed in the subsequent sections for individual facilities.

3.1 Monongahela Power Co. Pleasants Power Station

3.1.1 Pleasants Power station facility background

The Pleasants Power Station is a 1,368 megawatt (MW) bituminous coal-fired power station, formerly owned by Monongahela Power Company and now an asset of Energy Harbor, that consists of two coal-fired EGUs. The Pleasants Power Station is located at Willow Island, West Virginia. Both units at the facility are 657 MW opposed wall-fired boilers; Unit 1 went into service in 1978 and Unit 2 went into service in 1980.

Wet lime FGDs were installed when the facility was constructed and came online in 1979. They were upgraded in 2008 to route 100% of the effluent stream through the scrubbers. According to the company’s analysis, the current scrubbing system at the facility achieves an SO\textsubscript{2} control efficiency of 92.5% and that the FGD systems are at maximum capacity. Low NO\textsubscript{x} Burners (LNB) were installed in the 1990’s and Selective Catalytic Reduction (SCR) was installed on both units in 2003.

Out of 494 coal-fired units in the CAMD database, when 2020 NO\textsubscript{x} emission rates are ranked from best to worst performing (#1 = best), Unit 1 ranked #370 and Unit 2 ranked #379. When 2020 SO\textsubscript{2} emission rates are ranked from best to worst performing (#1 = best), Unit 1 ranked #356 and Unit 2 ranked #394. This indicates that the Pleasants units are not among the top ranking well-controlled coal fired EGUs.

Table 1. Pleasants Power Station Emissions Summary & Ranking

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<th>Facility Name</th>
<th>Unit ID</th>
<th>SO\textsubscript{2} (tons)</th>
<th>Avg. SO\textsubscript{2} Rate (lb/MMBtu)</th>
<th>Avg. SO\textsubscript{2} Rate (lb/MMBtu) Rank</th>
<th>Avg. NO\textsubscript{x} Rate (lb/MMBtu)</th>
<th>Avg. NO\textsubscript{x} Rate (lb/MMBtu) Rank</th>
<th>NO\textsubscript{x} (tons)</th>
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<td>#370</td>
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<td>0.359</td>
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</tbody>
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3.1.2 SO\textsubscript{2} Controls at the Pleasants Power Station

As noted previously, Pleasants Power Station is the only WV source for which a four-factor analysis was completed to evaluate SO\textsubscript{2} controls. The analysis completed by Energy Harbor Generation only calculated costs to install new wet limestone scrubbers, similar to the systems currently installed (all options that eliminate gypsum production were not considered in a cost analysis). Energy Harbor estimated that the incremental cost effectiveness of a new wet limestone scrubber is $11,293/ton for two scrubbers and $9,932/ton for one scrubber. Based on their analysis, Energy Harbor determined, and WV agreed, that Limestone Scrubbing Forced Oxidation (LFSO) is not economically feasible to install. The company further argued that the
Class I areas that the Pleasants Power station impacts are all well below their respective “URP glide paths, demonstrating already implemented past emissions reductions measures have been and continue to be successful.”

We do not agree that the units at the Pleasants station are effectively controlled for SO\textsubscript{2} based on the current SO\textsubscript{2} emissions rates, the fact that they are only achieving 92.5\% control efficiency (modern wet scrubbers can achieve control efficiencies of 98\% or better) and the unit’s low performance rankings relative to other coal-fired EGUs. Furthermore, we found numerous errors in Energy Harbor’s cost analysis. These include (but are not limited to):

The analysis did not rely on the most recent version of the acid gas chapter of the Control Cost Manual.

- A 1.3 retrofit factor was assumed without additional justification. Additional supporting documentation should be provided for retrofit factors greater than 1.0.
- The assumed interest rate was not disclosed.
- The assumed equipment life was not disclosed, but based on Table 4.4.1, it appears a 20-year equipment life was assumed. Unless the facility intends to take a federally enforceable shutdown, a 30-year equipment life should be assumed in the cost analysis for the scrubbers. In practice, these systems often operate for 30+ years, as evidenced by the existing scrubbers on the Pleasants units, which have been in operation since 1979.
- The analysis assumed a 95\% control efficiency, which is low for a new wet limestone scrubber.
- The analysis assumed a 3\% sales tax. Most states do not leverage sales tax on pollution control equipment—is this the case in WV?

Given these issues, we revised cost analyses for the wet scrubbers and estimated the incremental cost effectiveness of scrubber replacement to be:

- Unit 1: $7,534/ton for an additional 2,525 TPY additional SO\textsubscript{2} reduction
- Unit 2: $5,336/ton for an additional 3,579 TPY additional SO\textsubscript{2} reduction

The summary results are presented in the Tables below. Detailed analyses are provided in the attached spreadsheets.
As noted during our presentation, the estimated incremental costs of scrubber upgrades at the Pleasants Power Station are within the average cost-effectiveness thresholds selected by other states in this round of RH planning. We are seeing proposed average cost-effectiveness thresholds of up to $10,000/ton (CO and OR), and expect to see most in the $5,000 - $7,000/ton range, with a number of states selecting a threshold between $7,000 and $10,000/ton. We recommend that West Virginia implement the cost-effective scrubber replacements at the Pleasant’s facility in this round of RH planning.

### 3.1.3 NOx Controls at the Pleasants Power Station

We conducted a preliminary analysis to determine whether the Pleasants units are already “effectively controlled” for NOx using publicly available information in Clean Air Markets Division (CAMD) database. The last 13 years of emissions information for the Pleasants units demonstrate that lower NOx emission rates are achievable with the existing LNB + SCR system. As shown in the graphs below, NOx emission rates show a significant amount of variability, ranging from 0.094 lb/MMBtu to 0.245 on Unit 1 and from 0.073 lb/MMBtu to 0.401 lb/MMBtu on Unit 2. (The underlying data and analysis are provided in the attached spreadsheet, WV CAMD_updated_10-19-21.xlsx.) We recommend that West Virginia evaluate and implement

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5 Incremental cost-effectiveness thresholds are typically higher than average cost-effectiveness thresholds.
options to ensure consistent low NO\textsubscript{x} emissions are achieved with the existing controls (e.g., permit limits, optimization of control efficiency).

![Figure 1. Calculated Average NO\textsubscript{x} Rate for Pleasants Unit 1](image1)

![Figure 2. Calculated Average NO\textsubscript{x} Rate for Pleasants Unit 2](image2)

3.1.4 NPS conclusions and recommendations for the Pleasants Power Plant
- Implement cost effective option to replace the existing aging SO\textsubscript{2} scrubbers with new, more efficient scrubbers.
- Evaluate and implement options to ensure consistent low NO\textsubscript{x} emissions are achieved with the existing controls.
3.2 Monongahela Power Co. Fort Martin Power Plant

3.2.1 Fort Martin facility background

The Fort Martin Power Station is a 1,152 megawatt (MW) bituminous coal-fired power station owned and operated by Monongahela Power Company (MonPower), a subsidiary of First Energy through its subsidiary Allegheny Energy. The supercritical boilers are each rated at 576 MW. Unit 1 is a tangentially-fired boiler that went into service in 1967 and Unit 2 is a cell-burner boiler that went into service in 1968.

Selective Non-catalytic Reduction (SNCR) was added in 2000 to control NO\textsubscript{x} and wet lime scrubbers came online in 2009. The wet scrubbers were upgraded prior to 2016 to comply with the MATS requirements. Out of 494 coal-fired units in the CAMD database, when 2020 NO\textsubscript{x} emission rates are ranked from best to worst performing (#1 = best), Unit 1 at Fort Martin ranked #438 and Unit 2 ranked #437. When SO\textsubscript{2} emission rates are ranked from best to worst performing (#1 = best), Unit 1 ranked #244 and Unit 2 ranked #289.

Table 4. Fort Martin Power Station Emissions Summary & Ranking

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Unit ID</th>
<th>SO\textsubscript{2} (tons)</th>
<th>Avg. SO\textsubscript{2} Rate (lb/MMBtu)</th>
<th>Avg. SO\textsubscript{2} Rate Rank</th>
<th>Avg. NO\textsubscript{x} Rate (lb/MMBtu)</th>
<th>Avg. NO\textsubscript{x} Rate Rank</th>
<th>NO\textsubscript{x} (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fort Martin Power Station</td>
<td>1</td>
<td>1,309</td>
<td>0.112</td>
<td>#244</td>
<td>0.2601</td>
<td>#438</td>
<td>3,116</td>
</tr>
<tr>
<td>Fort Martin Power Station</td>
<td>2</td>
<td>1,909</td>
<td>0.141</td>
<td>#289</td>
<td>0.2590</td>
<td>#437</td>
<td>3,670</td>
</tr>
</tbody>
</table>

3.2.2 SO\textsubscript{2} analysis for Fort Martin

Monongahela Power concluded, and West Virginia agreed, that neither a SO\textsubscript{2} four-factor analysis nor an SO\textsubscript{2} permit limit were necessary or appropriate for Fort Martin for regional haze purposes for the following reasons:

- VISTAS PSAT modeling predicted 2028 visibility is well below the URP glide paths for VISTAS Class I areas.
- ERTAC model emission predictions overestimate anticipated 2028 emissions from Fort Martin and thus the modeled visibility impacts from the facility are overstated.
- Fort Martin FGD systems demonstrated a 97.5% average removal efficiency for 2017 through 2019, which exceeds the 95% control deemed as BART by EPA.
- Fort Martin averaged 0.11 lb/MMBtu SO\textsubscript{2} emissions from 2015 through 2020. This is in compliance with the 0.2 lb/MMBtu SO\textsubscript{2} emission limit to comply with the MATS rule for coal-fired EGUs.
- Fort Martin is subject to and meets the limits of the CSAPR FIP, and EPA and the courts have previously determined CSAPR is better than BART. As such, additional SO\textsubscript{2} controls would be neither necessary nor economically feasible at Fort Martin.
We agree that the scrubber on unit 1 is capable of better than 97% control. In fact, based upon the chart below, unit 1 may have been achieving better than 98% control at 0.065 lb/mmBtu. We note that this unit should be capable of meeting 0.08 lb/mmBtu on an annual average basis.

![Fort Martin Unit #1 Avg. SO2 Rate (lb/MMBtu)](image1)

*Figure 3. Calculated Average SO₂ Rate for Fort Martin Unit 1*

We agree that the scrubber on unit 2 is capable of better than 97% control. In fact, based upon the chart below, unit 2 may have been achieving better than 99.5% control at 0.027 lb/mmBtu. We note that this unit should be capable of meeting 0.08 lb/mmBtu on an annual average basis.

![Fort Martin Unit #2 Avg. SO2 Rate (lb/MMBtu)](image2)

*Figure 4. Calculated Average SO₂ Rate for Fort Martin Unit 2*

### 3.2.3 NOₓ analysis for Fort Martin

As noted above, West Virginia did not consider NOₓ emission controls in their draft SIP, and therefore, there are no conclusions regarding potential NOₓ controls or limits. We evaluated the replacement of the 12-year-old SNCR systems with modern Selective Catalytic Reduction (SCR) systems. We applied the CCM SNCR workbook to estimate the Direct Operating Costs that would cease with discontinuation and used the CCM SCR workbook to estimate those costs.
Table 5. NO\textsubscript{x} Control Cost Analysis for Fort Martin Unit 1

<table>
<thead>
<tr>
<th></th>
<th>Annual Cost</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SCR Indirect Annual Cost</td>
<td>$9,324,882</td>
<td>/yr</td>
</tr>
<tr>
<td>SCR Direct Annual Cost</td>
<td>$3,089,819</td>
<td>/yr</td>
</tr>
<tr>
<td>SNCR Direct Annual Cost</td>
<td>$1,602,747</td>
<td>/yr</td>
</tr>
<tr>
<td>SCR Net Total Annual Cost</td>
<td>$10,811,954</td>
<td>/yr</td>
</tr>
<tr>
<td>SCR Tons Removed</td>
<td>8,469</td>
<td>ton/yr</td>
</tr>
<tr>
<td>SNCR Tons Removed</td>
<td>5,070</td>
<td>ton/yr</td>
</tr>
<tr>
<td>SCR Net Tons Removed</td>
<td>3,399</td>
<td>ton/yr</td>
</tr>
<tr>
<td>SCR Cost Effectiveness</td>
<td>$3,181</td>
<td>/ton</td>
</tr>
</tbody>
</table>

Table 6. NO\textsubscript{x} Control Cost Analysis for Fort Martin Unit 2

<table>
<thead>
<tr>
<th></th>
<th>Annual Cost</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SCR Indirect Annual Cost</td>
<td>$9,462,878</td>
<td>/yr</td>
</tr>
<tr>
<td>SCR Direct Annual Cost</td>
<td>$3,673,332</td>
<td>/yr</td>
</tr>
<tr>
<td>SNCR Direct Annual Cost</td>
<td>$2,290,149</td>
<td>/yr</td>
</tr>
<tr>
<td>SCR Net Total Annual Cost</td>
<td>$10,846,060</td>
<td>/yr</td>
</tr>
<tr>
<td>SCR Tons Removed</td>
<td>13,222</td>
<td>ton/yr</td>
</tr>
<tr>
<td>SNCR Tons Removed</td>
<td>10,218</td>
<td>ton/yr</td>
</tr>
<tr>
<td>SCR Net Tons Removed</td>
<td>3,003</td>
<td>ton/yr</td>
</tr>
<tr>
<td>SCR Cost Effectiveness</td>
<td>$3,611</td>
<td>/ton</td>
</tr>
</tbody>
</table>

As shown in the tables above, replacement of the old SNCR systems with modern SCR could reduce NO\textsubscript{x} emissions by 6400 tpy for well less than $4000/ton each.

3.2.4 NPS conclusions and recommendations for Fort Martin

- SO\textsubscript{2} Controls: Permit limits should be established to ensure best operation and maintenance of the SO\textsubscript{2} scrubbers at 0.08 lb/MMBtu.
- NO\textsubscript{x} Controls: The existing SNCR systems should be replaced with SCR. The NPS estimated these incremental costs are well within the range of average cost-effectiveness thresholds selected by other states and would reduce NO\textsubscript{x} emissions from the Fort Martin facility by an additional 6,400 TPY.

3.3 Allegheny Energy Co. Harrison Plant

We conducted a preliminary analysis to determine whether the three units at the Harrison Plant are already “effectively controlled” for SO\textsubscript{2} and NO\textsubscript{x} using publicly available information in Clean Air Markets Division (CAMD) database. Although NO\textsubscript{x} emissions are fairly consistent, the last 25 years of emissions information for the Harrison units demonstrate that lower SO\textsubscript{2} emission rates are achievable with the existing wet lime scrubbers. As shown in the graphs below, SO\textsubscript{2} emission rates show a significant amount of variability, ranging from 0.074 lb/MMBtu to 0.324 on Unit 1 and from 0.059 lb/MMBtu to 0.326 lb/MMBtu on Unit 2 and from
0.048 lb/MBtu to 0.294 lb/MBtu on Unit 3. (The underlying data and analysis are provided in the attached spreadsheet, WV CAMD_updated_10-19-21.xlsx.)

We recommend that West Virginia evaluate and implement options to ensure consistent low SO₂ emissions are achieved with the existing controls (e.g., permit limits, upgrades or other optimization options).

Figure 5. Calculated Average SO₂ Rate for Harrison Unit 1

Figure 6. Calculated Average SO₂ Rate for Harrison Unit 2
3.4 Appalachian Power Co. John E Amos Plant

We conducted a preliminary analysis to determine whether the three units at the John E Amos Plant are already “effectively controlled” for SO\(_2\) and NO\(_x\) using publicly available information in Clean Air Markets Division (CAMD) database. The last 10 to 12 years of emissions information for the John E Amos units demonstrate that lower SO\(_2\) and NO\(_x\) emission rates are achievable with the existing wet limestone scrubbers and LNB+SCR controls, respectively. In fact, this information indicates an upward trend in SO\(_2\) and NO\(_x\) emission rates over this time for the John E Amos units.

As shown in the graphs below, SO\(_2\) emission rates show a significant amount of variability, ranging from 0.041 lb/MMBtu to 0.088 on Unit 1 and from 0.040 lb/MMBtu to 0.098 lb/MMBtu on Unit 2 and from 0.058 lb/MMBtu to 0.103 lb/MMBtu on Unit 3. Similar variability is seen in the NO\(_x\) emissions, ranging from 0.042 lb/MMBtu to 0.082 on Unit 1 and from 0.046 lb/MMBtu to 0.079 lb/MMBtu on Unit 2 and from 0.055 lb/MMBtu to 0.117 lb/MMBtu on Unit 3. (The underlying data and analysis are provided in the attached spreadsheet, WV CAMD_updated_10-19-21.xlsx.)

We recommend that West Virginia evaluate and implement options to ensure consistently low SO\(_2\) and NO\(_x\) emissions are achieved with the existing controls at the John E Amos facility (e.g., permit limits, upgrades or other optimization options).
Figure 8. Calculated Average SO$_2$ Rate for Amos Unit 1

Figure 9. Calculated Average SO$_2$ Rate for Amos Unit 2
Figure 10. Calculated Average SO$_2$ Rate for Amos Unit 3

Figure 11. Calculated Average NO$_x$ Rate for Amos Unit 1
3.5 Dominion Resources Mount Storm Power Station

We conducted a preliminary analysis to determine whether the three units at the Mount Storm Power Station are already “effectively controlled” for SO$_2$ and NO$_x$ using publicly available information in Clean Air Markets Division (CAMD) database. Emissions information for the Mount Storm units demonstrate that lower SO$_2$ and NO$_x$ emission rates are achievable with the existing wet limestone scrubbers and LNB+SCR controls, respectively. This information indicates there has been significant variability in SO$_2$ emissions since the scrubbers were installed on the units. There is an upward trend in NO$_x$ emission rates over this time for Unit 2 and similar variability since NO$_x$ controls were installed.
As shown in the graphs below, SO\textsubscript{2} emission rates show a significant amount of variability, ranging from 0.05 lb/MMBtu to 0.14 on Unit 1 and from 0.049 lb/MMBtu to 0.50 lb/MMBtu on Unit 2 and from 0.043 lb/MMBtu to 0.355 lb/MMBtu on Unit 3. Similar variability is seen in the NO\textsubscript{x} emissions, ranging from 0.07 lb/MMBtu to 0.36 on Unit 1 and from 0.061 lb/MMBtu to 0.088 lb/MMBtu on Unit 2 and from 0.063 lb/MMBtu to 0.450 lb/MMBtu on Unit 3. (The underlying data and analysis are provided in the attached spreadsheet, WV CAMD_updated_10-19-21.xlsx.)

We recommend that West Virginia evaluate and implement options to ensure consistently low SO\textsubscript{2} and NO\textsubscript{x} emissions are achieved with the existing controls at the Mount Storm facility (e.g., permit limits, upgrades or other optimization options).

![Figure 14. Calculated Average SO\textsubscript{2} Rate for Mt. Storm Unit 1](image1)

![Figure 15. Calculated Average SO\textsubscript{2} Rate for Mt. Storm Unit 2](image2)
Figure 16. Calculated Average SO₂ Rate for Mt. Storm Unit 3

Figure 17. Calculated Average NOₓ Rate for Mt. Storm Unit 1
We conducted a preliminary analysis to determine whether the three units at the AEP Mitchell Plant are already “effectively controlled” for SO$_2$ and NO$_x$ using publicly available information in Clean Air Markets Division (CAMD) database. Emissions trend information for the two wall-fired Mitchell coal-fired boilers demonstrates that lower SO$_2$ and NO$_x$ emission rates are achievable with the existing wet limestone scrubbers and LNB+SCR controls, respectively. This information indicates there has been significant variability in SO$_2$ emissions since the scrubbers were installed on the Units in 2007. SCR was installed during the same time frame. There is an
upward trend in NO\textsubscript{x} emission rates over this time for both Units since NO\textsubscript{x} controls were installed.

As shown in the graphs below, SO\textsubscript{2} emission rates show a significant amount of variability, ranging from 0.041 lb/MBtu to 0.118 on Unit 1 and from 0.041 lb/MBtu to 0.110 lb/MBtu on Unit 2. Similar variability is seen in the NO\textsubscript{x} emissions, ranging from 0.049 lb/MBtu to 0.088 on Unit 1 and from 0.048 lb/MBtu to 0.089 lb/MBtu on Unit 2. (The underlying data and analysis are provided in the attached spreadsheet, WV CAMD\_updated\_10-19-21.xlsx.)

We recommend that West Virginia evaluate and implement options to ensure consistently low SO\textsubscript{2} and NO\textsubscript{x} emissions are achieved with the existing controls at the Mitchell facility (e.g., permit limits, upgrades or other optimization options).

![Figure 20. Calculated Average SO\textsubscript{2} Rate for Mitchell Unit 1](image1)

![Figure 21. Calculated Average SO\textsubscript{2} Rate for Mitchell Unit 2](image2)
3.7 American Bituminous Power Grant Town Plant

American Bituminous Power Partners L.P.’s Grant Town Power Plant consists of two (2) 551.9 MMBTU/hr coal refuse-fired circulating fluidized bed (CFB) boilers with a total output of 80 MWe. The boilers are designed to accommodate a variety of fuels, but the primary fuel is eastern bituminous coal refuse (gob) supplemented with pond fines. SO$_2$ control is achieved by injecting limestone directly into the CFB boilers to capture and remove SO$_2$. According to CAMD data, NO$_x$ is controlled with a Selective Non-catalytic Reduction (SNCR) system. In the last five years average SO$_2$ emission rates have ranged from 0.346 lb/MMBtu to 0.481 lb/MMBtu on boiler 1A and 0.352 lb/MMBtu to 0.481 lb/MMBtu on boiler 1B. Average NO$_x$ emission rates have ranged...
from 0.303 lb/MMBtu to 0.327 lb/MMBtu on boiler 1A and 0.300 lb/MMBtu to 0.327 lb/MMBtu on boiler 1B. West Virginia did not request a four-factor analysis for this facility for several reasons:

1. The Grant Town Plant is meeting the SO\(_2\) MATS limit (which is higher for refuse coal boilers) of 0.60 lb/MMBtu.
2. To comply with MATs, Grant Town accepted an annual SO\(_2\) emission rate limit of 0.46 lbs/mmBtu or a potential-to-emit of 2,206.5 tons per year in its Title V permit (R30-04900026-2020(SM01)).
3. West Virginia noted that future emissions are likely to be lower. They scaled the PSAT results according to a reduced/scaled AOI and then a calculated AOI to PSAT scaling factor (which is a factor of three) to reduce the PSAT result below the 1% threshold.

We note several issues in WVDEP’s analysis for Grant Town. First it is unclear why WVDEP would scale the PSAT results using the AoI to PSAT ratios rather than simply applying a ratio of the emissions reduction to the facility PSAT contribution (in Mm\(^{-1}\)).

Second, based on CAMD data, we note that in the last five years, the maximum average SO\(_2\) emission rate was 0.481 lb/MMBtu for both boilers and occurred in 2016. This emission rate is just above the recent 2020 permit limitation accepted by Grant Town of 0.46 lb/MMBtu. Annual facility wide SO\(_2\) emissions in 2016 were 2,370 TPY. If you reduce the 2016 annual emissions by the ratio of the permit limit to the maximum emission rate for 2016 (0.46/0.48), the annual emissions at the facility would be 2,271 TPY SO\(_2\). This is similar to the revised annual limit of 2,207 TPY, indicating that Grant Town may operate up to their newly permitted limits if they continue operate as they have in the recent past. Therefore, it is reasonable to assume that the facility would operate at or just below their revised annual allowable SO\(_2\) limit.

We note that both the revised annual limit (and the approximate ratioed limit) are similar to what was modeled for 2028 in the VISTAS PSAT runs (2,210 TPY). Therefore, notwithstanding our concerns regarding the VISTAS 1% threshold (see Sections 1 and 2 above), we do not think WVDEP’s rational for “screening” the Grant Town Plant is appropriate.

Based on information available in CAMD, emission rates from the Grant Town waste coal-fired combustion facility are high relative to other waste coal-fired boilers. (We note that not all the information necessary to run rough/approximate cost analyses was available in CAMD.)

**Table 7. Grant Town Power Station Emissions Summary & Ranking**

<table>
<thead>
<tr>
<th>State</th>
<th>Facility Name</th>
<th>Facility ID (ORISPL)</th>
<th>Unit ID</th>
<th>Year</th>
<th>SO(_2) (tons)</th>
<th>Avg. SO(_2) Rate (lb/MMBtu)</th>
<th>Avg. NO(_x) Rate (lb/MMBtu)</th>
<th>NO(_x) (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA</td>
<td>Scrubgrass Generating Plant</td>
<td>50974</td>
<td>2</td>
<td>2018</td>
<td>463</td>
<td>0.283</td>
<td>0.152</td>
<td>244</td>
</tr>
<tr>
<td>PA</td>
<td>Scrubgrass Generating Plant</td>
<td>50974</td>
<td>1</td>
<td>2018</td>
<td>412</td>
<td>0.253</td>
<td>0.146</td>
<td>229</td>
</tr>
<tr>
<td>PA</td>
<td>Mt. Carmel Cogeneration</td>
<td>10343</td>
<td>SG-101</td>
<td>2018</td>
<td>456</td>
<td>0.203</td>
<td>0.065</td>
<td>144</td>
</tr>
<tr>
<td>PA</td>
<td>St. Nicholas Cogeneration Project</td>
<td>54634</td>
<td>1</td>
<td>2018</td>
<td>1,064</td>
<td>0.191</td>
<td>0.057</td>
<td>305</td>
</tr>
<tr>
<td>PA</td>
<td>Gilberton Power Company</td>
<td>10113</td>
<td>31</td>
<td>2018</td>
<td>348</td>
<td>0.174</td>
<td>0.089</td>
<td>180</td>
</tr>
<tr>
<td>PA</td>
<td>Gilberton Power Company</td>
<td>10113</td>
<td>32</td>
<td>2018</td>
<td>341</td>
<td>0.174</td>
<td>0.089</td>
<td>177</td>
</tr>
<tr>
<td>PA</td>
<td>Northampton Generating Plant</td>
<td>50888</td>
<td>NGC01</td>
<td>2018</td>
<td>125</td>
<td>0.100</td>
<td>0.083</td>
<td>112</td>
</tr>
</tbody>
</table>
We request that WV DEP provide a four-factor analysis of SO\textsubscript{2} and NO\textsubscript{x} emission reduction measures for the Grant Town Plant. In addition, we have the following questions we would like WVDEP to address:

- Based on an April 6, 2021 Fact Sheet, Final Significant Modification Permitting Action Under 45CSR30 and Title V of the Clean Air Act, permit number R30-04900026-2020 for the Grant Town Plant, it appears that the company was approved to increase potential SO\textsubscript{2} emissions (PTE) by 211.88 tons/year from 1,994.6 TPY to 2,206.5 TPY. Was a PSD permit required for this significant modification?
- Although the annual limit (in TPY) in the referenced fact sheet matches the annual limit (in TPY) reported in the draft SIP, we cannot find the 0.46 lb/MMBtu limit referenced in the draft SIP in the most recent Title 5 permits available online. Can you please clarify how this limit will be applied and over what averaging period?

3.8 Longview Power

We conducted a preliminary analysis to determine whether the single wall-fired boiler at the Longview Power Plant is already “effectively controlled” for SO\textsubscript{2} and NO\textsubscript{x} using publicly available information in Clean Air Markets Division (CAMD) database. SO\textsubscript{2} is controlled with a wet limestone scrubber and NO\textsubscript{x} emissions are controlled with LNB+SCR. Emissions trend information for the single wall-fired Longview coal-fired boiler demonstrates that lower SO\textsubscript{2} emission rates are achievable with the existing wet limestone scrubber. This information indicates there has been significant variability in SO\textsubscript{2} emissions since the scrubbers came online with the facility with a general upward trend in SO\textsubscript{2} emissions. NO\textsubscript{x} emission rates over this time have remained fairly consistent, between 0.060 and 0.064 lb/MMBtu.

As shown in the graphs below, SO\textsubscript{2} emission rates show a general upward trend, ranging from 0.051 lb/MMBtu to 0.094 lb/MMBtu on the single unit at the Longview facility. NO\textsubscript{x} emissions are fairly consistent. (The underlying data and analysis are provided in the attached spreadsheet, WV CAMD_updated_10-19-21.xlsx.)

We recommend that West Virginia evaluate and implement options to ensure consistently low SO\textsubscript{2} are achieved with the existing controls at the Longview facility (e.g., permit limits, upgrades or other optimization options).
3.9 Appalachian Power Co. Mountaineer Plant

We conducted a preliminary analysis to determine whether the single wall-fired coal boiler at the Mountaineer Power Plant is already “effectively controlled” for SO$_2$ and NO$_x$ using publicly available information in Clean Air Markets Division (CAMD) database. SO$_2$ is controlled with a wet limestone scrubber and NO$_x$ emissions are controlled with LNB+SCR. Emissions trend information for the single wall-fired Longview coal-fired boiler demonstrates that lower SO$_2$ emission rates are achievable with the existing wet limestone scrubber. This information indicates there has been significant variability in SO$_2$ emissions since the scrubbers came online.
with the facility with a general upward trend in SO$_2$ emissions. NO$_x$ emission rates over this time have remained fairly consistent, between 0.060 and 0.064 lb/MMBtu.

As shown in the graphs below, SO$_2$ emission rates show a general upward trend, ranging from 0.028 lb/MMBtu to 0.131 lb/MMBtu on the single unit at the Longview facility. NO$_x$ emissions also show a general upward trend, ranging from 0.054 lb/MMBtu to 0.098 lb/MMBtu on the single unit at the Mountaineer facility. (The underlying data and analysis are provided in the attached spreadsheet, WV CAMD_updated_10-19-21.xlsx.)

We recommend that West Virginia evaluate and implement options to ensure consistently low SO$_2$ and NO$_x$ emissions are achieved with the existing controls at the Mountaineer facility (e.g., permit limits, upgrades or other optimization options).

3.10 Capitol Cement - Essroc Martinsburg Plant

The Argos/Essroc cement manufacturing facility is located approximately 60 km north of Shenandoah NP. The plant is a significant source of NO$_x$ and SO$_2$ emissions and as such, it has the potential to impact visibility in the Shenandoah. This facility was not tagged in the VISTAS PSAT modeling because WVDEP did not tag facilities for Class I areas outside of West Virginia. The VISTAS AOI inventory assumed future year 2028 emissions of 1,007 TPY NO$_x$ and 537 TPY SO$_2$, which is significantly lower than the permitted potential to emit (PTE) for this facility. Based on a 2018 minor modification to the Title five permit, PTE limits are as follows:

- 4,042 tpy of NO$_x$
- 4,518 tpy of SO$_2$
- 585 tpy of PM10

The primary source of emissions at the facility preheater/precalcer (PH/PC) kiln system, which combusts primarily coal and petcoke, but is also permitted to combust some petroleum contaminated soil. The nominal capacity of the plant is 2,212,890 short tons (tons) per year of clinker. Argos uses approximately 292,110 tons of coal annually and fly ash from electric power plants.

Given both the proximity of this facility to Shenandoah NP, coupled with the current actual emissions and the significant allowable emissions for SO$_2$ and NO$_x$, we recommend that a four-factor analysis be completed for this facility for Shenandoah NP. We would like to better understand what emission control units are currently in place and what operating limits/control efficiencies are associated with those controls.
Appendix F-3q

United States Forest Service Consultation:
Written Comments on
West Virginia Pre-Draft Regional Haze SIP
October 26, 2021

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Promoting a healthy environment
Laura Crowder  
Director, Division of Air Quality  
West Virginia Department of Environmental Protection  
601 57th Street, SE  
Charleston, WV 25304

Dear Laura Crowder:

On August 27, 2021, the State of West Virginia submitted a draft Regional Haze State Implementation Plan describing your proposal to continue improving air quality by reducing regional haze impacts at mandatory Class I areas across the region. We appreciate the opportunity to work closely with your State through the initial evaluation, development, and subsequent review of this plan. Cooperative efforts such as these ensure that, together, we will continue to make progress toward the Clean Air Act’s goal of natural visibility conditions at our Class I areas.

This letter acknowledges that the U.S. Department of Agriculture, U.S. Forest Service, has received and conducted a substantive review of your proposed Regional Haze State Implementation Plan. This review satisfies your requirements under the federal regulations 40 C.F.R. § 51.308(i)(2). Please note, however, that only the U.S. Environmental Protection Agency (EPA) can make a final determination about the document's completeness, and therefore, only the EPA has the authority to approve the document.

We have attached comments to this letter based on our review. We look forward to your response required by 40 C.F.R. § 51.308(i)(3). For further information, please contact Jeremy Ash (jeremy.ash@usda.gov) at 828-244-4751.

Again, we appreciate the opportunity to work closely with the State of West Virginia. The Forest Service compliments you on your hard work and dedication to significant improvement in our nation's air quality values and visibility.

Sincerely,

SHAWN COCHRAN  
Forest Supervisor

cc: Joby Timm; Shawn Olson; James Gries; Jeremy Ash
The USDA Forest Service recognizes the significant emission reductions of nitrogen oxides (NOx) and sulfur dioxide (SO₂) made in West Virginia in the last 15 years due to economic and regulatory drivers. These reductions directly led to measured visibility improvement and numerous other air quality related benefits at Dolly Sods and Otter Creek Wilderness Areas, as well as other nearby USDA Forest Service Class I areas over that time.

Overall, the USDA Forest Service finds that the draft RH SIP is well organized. The Long-Term Strategies for this planning period appear to indicate that Forest Service Class I Areas will continue to show visibility improvements better than the Uniform Rate of Progress (URP) through 2028, and we appreciate the commitment by West Virginia Department of Environmental Protection, Division of Air Quality (WV DAQ) to evaluate progress in meeting the visibility goals during the 5-year progress reports. However, we offer these specific comments on the draft RH SIP for WV DAQ review and consideration.

Source Selection

Section 7.6 of WV’s draft RH SIP discusses the methodology that WV DAQ used to determine which sources to consider for reasonable progress analysis. A source was selected for reasonable progress evaluation and potential four-factor analysis if the facility was estimated to have a ≥ 1.00% sulfate or nitrate contribution to visibility impairment in 2028 at Dolly Sods or Otter Creek Wilderness Areas. This process resulted in fifteen facilities for the Dolly Sods Wilderness Area and fourteen facilities for the Otter Creek Wilderness Areas being selected for further evaluation. Of these, six facilities were put forward for reasonable progress evaluation. Forest Service understands and recognizes that EPA has afforded states the flexibility to screen facilities for additional analysis if that screening is based on reasonable methods. For the facilities not brought forward for additional reasonable progress evaluation, we ask that WV DAQ ensures that any emission values used to justify this decision are indeed federally enforceable and reflected in their current permits.

Evaluation of Nitrogen Oxide Emission Sources for Additional Controls

The draft RH SIP only evaluates SO₂ emission sources for four-factor analyses. USDA Forest Service appreciates the discussion within the draft RH SIP regarding nitrate formation in the VISTAS region. We understand that nitrate formation in the VISTAS region is limited by the availability of ammonia (which preferentially reacts with SO₂ and sulfates before reacting with NOx) and by temperature, with particulate nitrate concentrations highest in the winter months. We also recognize that sulfates have been the main contributor to visibility impairment at Class I Areas within the southern US. However, Table 7-10 and 7-11 in the draft SIP show that the largest percentage of NOx impacts on visibility at Dolly Sods and Otter Creek Wilderness Areas are from the point sector. Additionally, nitrate contribution to visibility impairment is increasing as sulfur dioxide emissions decrease, and there are still significant NOx sources within the point sector in WV. IMPROVE monitoring data from Dolly Sods Wilderness Area (also used as a surrogate for nearby Otter Creek Wilderness Area) show that some of the highest rates of light extinction from ammonium nitrate have occurred within the last several years (Figure 1).

Incremental progress towards achieving 2064 goals will be increasingly challenging as the regional haze program progresses and requires a comprehensive evaluation of emission control strategies for both NOx and SO₂ (see below for comments on lack of four-factor analyses and emissions controls for SO₂). We feel that not including NOx in the reasonable progress analysis is a missed opportunity to pursue real
progress towards the 2064 goal. We request that WV DAQ consider evaluating NOx sources, along with SO₂ sources, for reasonable progress during this planning period.

**Figure 1.** IMPROVE monitoring data from Dolly Sods Wilderness Area showing light extinction from ammonium nitrate (data retrieved from: https://views.cira.colostate.edu/fed/).

### The Relevance of the Four Factors Versus Other Required Elements of Regional Haze Plans

As discussed above in the *Source Selection* section, six facilities were brought forward in the reasonable progress evaluation, but only one facility submitted a four-factor analysis for possible SO₂ control technology. A variety of reasons were presented for facilities not submitting four-factor analyses, but two consistent rationales used in the draft SIP were WV Class I areas being below the Uniform Rate of Progress (URP) glide path and that SO₂ emissions were already in compliance with other rules (e.g., MATS).

On using the URP as justification to avoid doing a four-factor analysis, we believe this is a misunderstanding of the rule. Potential visibility improvements should not be included as a “fifth factor” in the analyses, as there is no basis for doing so in the Clean Air Act. Reasonable progress goals (RPGs) and the long-term strategy (LTS) are separate plan elements (see 40 CFR Section 51.308 (d)). RPGs are established through the application of the four factors at 40 CFR Section 51.308 (d)(1):

- costs of compliance,
• the time necessary for compliance,
• the energy and non-air quality environmental impacts of compliance, and
• the remaining useful life

The regulation states “The long-term strategy must include enforceable emissions limitations, compliance schedules, and other measures as necessary to achieve the reasonable progress goals established by States having mandatory Class I Federal areas." In a sense, the LTS is a container for the result of the four-factor analyses that makes them enforceable. It also contains other measures taken by the state to achieve the RPGs. The rule does not allow states to dismiss controls that are otherwise reasonable simply because Class I area visibility is below the uniform rate of progress.

In the preamble to the final EPA Regional Haze Rule, EPA discusses these concepts (emphasis added).

Under 40 CFR 51.308(f)(ii), states must develop their long-term strategies by identifying reasonable progress measures using the four factors and engaging in interstate consultation. Once their strategies have been developed, states with Class I areas must establish RPGs that reflect existing federal and state measures and the reasonable progress measures in the long-term strategy.

The long-term strategy is the compilation of ‘‘enforceable emissions limitations, compliance schedules, and other measures as necessary to achieve the [RPGs],’’ and is the means through which the State ensures that its RPG will be met.

Also, starting on page 3093:

This commenter states that a state should be able to reject ‘‘costly’’ control measures if (1) the RPG for the most impaired days is on or below the [uniform rate of progress] URP line or (2) the RPGs are not ‘‘meaningfully’’ different than current visibility conditions.

We disagree. The CAA requires states to determine what emission limitations, compliance schedules and other measures are necessary to make reasonable progress by considering the four factors. The CAA does not provide that states may then reject some control measures already determined to be reasonable if, in the aggregate, the controls are projected to result in too much or too little progress. Rather, the rate of progress that will be achieved by the emission reductions resulting from all reasonable control measures is, by definition, a reasonable rate of progress.

What to do if the resulting RPG for the most impaired days is below the URP line? The URP is not a safe harbor, however, and states may not subsequently reject control measures that they have already determined are reasonable.

The commenter’s second suggestion, that states should be able to reject control measures if

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1 40 CFR Section 51.308(d)(2)
2 Federal Register, Vol. 82, No. 6, Tuesday, January 10, 2017, pg. 3078-3129
the RPG for the most impaired days is not “meaningfully” different than current visibility conditions, is counterintuitive and at odds with the purpose of the visibility program. In this situation, the state should take a second look to see whether more effective controls or additional measures are available and reasonable. Whether the state takes this second look or not, it may not abandon the controls it has already determined are reasonable based on the four factors. Regional haze is visibility impairment that is caused by the emission of air pollutants from numerous sources located over a wide geographic area. At any given Class I area, hundreds or even thousands of individual sources may contribute to regional haze. Thus, it would not be appropriate for a state to reject a control measure (or measures) because its effect on the RPG is subjectively assessed as not “meaningful.”

If the State determines that additional progress [beyond the URP] is reasonable based on the statutory factors, the State should adopt that amount of progress as its goal for the first long term strategy.” This approach is consistent with and advances the ultimate goal of section 169A: Remediying existing and preventing future visibility impairment. Congress required the EPA to promulgate regulations requiring reasonable progress toward that goal, and it would be antithetical to allow states to avoid implementing reasonable measures until and unless that goal is achieved.

On using emission limits from other rules as a means of showing reasonable progress, we ask that permits issued for these facilities reflect the low emissions presented in the draft SIP. For instance, several facilities noted that they are in compliance with the MATS SO2 limit and often are well below this value (for instance, see the description of Mitchell Power Plan and John E. Amos Power Plant in section 7.6.4). If this is indeed the case and the low emissions are being used as rationale for not exploring additional control technologies, we would like to see these limits be made federally enforceable. We also extend this concern to assumptions regarding:

- operating scenarios for emission units that represent a reduced capacity, for example a reduced number of operating hours per year, and
- pollution control equipment efficiency used to designate a unit as “effectively controlled”.

Relevance of the Visibility Impact of Individual Sources

EPA’s 2019 Regional Haze Guidance states that “because regional haze results from a multitude of sources over a broad geographic area, a measure may be necessary for reasonable progress even if that measure in isolation does not result in perceptible visibility improvement.” Widespread emissions controls, particularly for SO2 and NOx, are essential for making reasonable progress at Class I areas both near to, and more distant from, emissions sources. Further, small visibility improvements, even those that may be imperceptible by themselves, are essential as we continue to make progress towards the national goal of restoring natural conditions at Class I areas by 2064.