Outline

• “Southeastern VISTAS II Regional Haze Analysis Project” Overview

• Update on Technical Work Supporting VISTAS II Participants on:
  • Baseline visibility conditions (2000 – 2004) and Uniform Rate of Progress (URP) glidepath (40 CFR 51.308(d)(2))
  • Reasonable Progress Goals (RPGs) for each Class I Federal Area (40 CFR 51.308(d)(1))
  • Long-Term Strategy (LTS) (40 CFR 51.308(d)(3))
  • Communications / Consultation Strategy (40 CFR 51.308(d), (f), & (i))

• What we need from EPA

• Summary / Conclusions
Project Overview

• Visibility Improvement - State and Tribal Association of the Southeast (VISTAS) Regional Planning Organization through Southeastern States Air Resource Managers, Inc. (SESARM)

• Participating Agencies:
  • 10 Southeastern (SE) states (AL, FL, GA, KY, MS, NC, SC, TN, VA, and WV)
  • The Eastern Band of Cherokee Indians (represents SE tribes)
  • Knox County, TN (represents Metro 4 local air pollution control agencies)
Project Overview

- Contractor team support:
  - Eastern Research Group, Inc. and Alpine Geophysics, LLC
    - Revisions to 2028 emissions inventory for EGU and non-EGU point sources
    - Area of Influence (AOI) screening analysis
    - Photochemical-grid air quality and source apportionment modeling
VISTAS II Project Management

State Air Directors (STAD)
Policy Decisions
Chair – Mike Abraczinskas (NC)
Vice Chair – Chad LaFontaine (MS)

Coordinating Committee (CC)
Planning Recommendations
Chair – Jim Boylan (GA)

Technical Analysis Work Group (TAWG)
Technical Recommendations
Chair – Randy Strait (NC)

Selection Committee
Pre-Modeling Review Teams
Emission Inventory Team
Modeling Review Team
Other Teams (TBD)

John Hornback
Executive Director

Technical Coordinator

Metro 4/SESARAM
Southeastern Air Pollution Control Agencies

Contractor Support

Department of Environmental Quality
18 VISTAS Class I Areas

Department of Environmental Quality
Round 2 SIP Development Process – Key Elements

1. Calculate baseline visibility conditions (2000 – 2004) and URP from baseline to 2064
   • Most impaired days = 20% of monitored days in a calendar year with the highest amounts of anthropogenic visibility impairment
   • Clearest days = 20% of monitored days in a calendar year with the lowest deciview (dv) index values

2. Calculate RPGs for each Class I Federal Area
   • Project 2028 visibility conditions using air quality modeling
   • Adjust based on results of 4-factor analysis, if applicable
   • Compare the RPG for the 20% most impaired days to the URP line
   • No degradation in 20% clearest days
Round 2 SIP Development Process – Key Elements

3. Develop LTS for 2028 (40 CFR 51.308(d)(3))
   • AOI screening analysis
   • 4-Factor analysis of stationary sources controls:
     • Costs of compliance
     • Time necessary for compliance
     • Energy and non-air quality environmental impacts of compliance; and
     • Remaining useful life of any existing source subject to such requirements

4. Communications / Consultation (40 CFR 51.308(d), (f), and (i))
Element 1

Calculate Baseline Visibility Conditions and URP

IMPROVE Monitor Data Analysis
**IMPROVE Monitor Data Analysis**

- Review monitoring data and develop charts for use in SIPs
- For each mandatory Class I Area:
  - For most impaired and clearest days:
    - Baseline visibility conditions
    - Natural visibility conditions
    - Current visibility conditions
    - Progress to date
  - Differences between current and natural visibility condition
- Define URP
Visibility Impairment Trends
(20% Most Impaired Days)

Great Smoky Mountains National Park

Swanquarter Wilderness Area

Reasonable Progress Goal for 2028 determined via air quality modeling and long-term strategy evaluation.

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IMPROVE Monitor Data for 20% Most Impaired

Great Smoky Mountains National Park

Swanquarter Wilderness Area


Department of Environmental Quality
Great Smoky Mountains National Park
20% Most Impaired vs. Worst Days, 2013 - 2017

<table>
<thead>
<tr>
<th>Year</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>In</td>
<td>16</td>
<td>15</td>
<td>12</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Out</td>
<td>7</td>
<td>8</td>
<td>11</td>
<td>12</td>
<td>11</td>
</tr>
</tbody>
</table>

“In” represents the number of daily observations that are in both the 20% worst and 20% most impaired data sets.

“Out” represents the number of daily observations that are in 20% most impaired data set but not the 20% worst set.

Swanquarter Wilderness Area
20% Most Impaired vs. Worst Days, 2013 - 2017

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</tr>
</thead>
<tbody>
<tr>
<td>In</td>
<td>12</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Out</td>
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Element 2
Calculate Reasonable Progress Goals (RPGs) for each Class I Federal Area

Air Quality and Source Apportionment Modeling
Air Quality Modeling with CAMx

• Provide initial RPGs for 2028 for each Class I Area
• Calculate Relative Response Factors (RRFs)
• Using EPA’s 2011/2028 modeling platform (v6.3el) with CAMx v6.32 (2011 meteorology)
• Replaced CAMx v6.32 with CAMx v 6.40
• Adjusted 2028 point source emissions
• Reasons for using EPA’s platform:
  • Timing - will not meet SIP deadline with any other option
  • Budget - significantly less for Round 2 vs. Round 1
  • Source sectors are reasonably well represented in EPA’s platform (i.e., SIP quality)
2028 Point Source Emissions Adjustments

• Electricity Generating Units (EGUs)
  • EPA 2028 forecast included Clean Power Plan (CPP) controls
  • VISTAS States adjusted EPA 2028 EGU emissions up/down using:
    • ERTAC EGU forecast for 2028, v2.7 (2011 base year)
    • 2023 “en” emissions (2016 base year) or other state-specific data
  • Non-VISTAS States:
    • Replaced EPA 2028 emissions with ERTAC v2.7 forecast
    • For small EGUs in IPM but not ERTAC, used 2023 “en” emissions

• Non-EGUs
  • VISTAS States adjusted emissions up/down based on best available data

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Modeling Domains
12-kilometer (km) grid

Department of Environmental Quality
Element 3
Develop Long-Term Strategy (LTS) for 2028

Area of Influence (AOI) Screening Analysis and Source Apportionment Modeling
AOI Methodology

• Method for initial prioritization of facilities for 4-factor analysis
• Combines the following for 20% most impaired days:
  • 2011 base year and 2028 projection year emissions
  • 2011-2017 meteorology
  • 2011-2017 sulfate and nitrate concentrations from IMPROVE monitors
• Calculate facility’s contribution to light extinction in each Class I Area
• Rank facilities from highest to lowest contribution
• Facilities with highest contribution to be evaluated further
• County-level contributions for onroad, nonroad, point, area, and prescribed fires also evaluated
AOI Metric (Q/d*EWRT)

- Emissions/Distance * Extinction Weighted Residence Time
- Emissions (tons/year) – calculated for both 2011 and 2028
- Distance (km):
  - For facility, distance from facility to IMPROVE monitor
  - For sector, distance from county centroid to IMPROVE monitor
- RT (%) - HYSPLIT back-trajectories re-projected to 12-km grid to calculate residence time for each grid cell
  - 12-km North American Mesoscale (NAM) meteorology data at 100; 500; 1,000; and 1,500 meter heights
- EW (Mm⁻¹) – sulfate and nitrate extinction values from IMPROVE data
## Example AOI Results by Sector

### Example Class I Federal Area

<table>
<thead>
<tr>
<th>Sector</th>
<th>SO2</th>
<th>NOx</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Point</td>
<td>4.17%</td>
<td>3.56%</td>
<td>7.73%</td>
</tr>
<tr>
<td>Non-Road (Marine, Aircraft, and Railroads)</td>
<td>0.30%</td>
<td>3.51%</td>
<td>3.81%</td>
</tr>
<tr>
<td>Non-Road (Other)</td>
<td>0.16%</td>
<td>8.69%</td>
<td>8.85%</td>
</tr>
<tr>
<td>Onroad</td>
<td>0.23%</td>
<td>4.14%</td>
<td>4.37%</td>
</tr>
<tr>
<td>Point</td>
<td>66.91%</td>
<td>7.18%</td>
<td>74.09%</td>
</tr>
<tr>
<td>Point Prescribed Fires</td>
<td>0.81%</td>
<td>0.33%</td>
<td>1.14%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>100.0%</td>
</tr>
</tbody>
</table>

*Department of Environmental Quality*
### Example AOI Results by Facility (Sorted on Sulfate Fraction Only)

<table>
<thead>
<tr>
<th>Facility</th>
<th>Distance (km)</th>
<th>2028 SO2 Emissions (Tons)</th>
<th>2028 NOx Emissions (Tons)</th>
<th>Sulfate Fraction</th>
<th>Cumulative Sulfate Fraction</th>
<th>Nitrate Fraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>53</td>
<td>4,846</td>
<td>496</td>
<td>37.59%</td>
<td>37.59%</td>
<td>0.57%</td>
</tr>
<tr>
<td>2</td>
<td>640</td>
<td>56,939</td>
<td>6,578</td>
<td>2.98%</td>
<td>40.57%</td>
<td>0.08%</td>
</tr>
<tr>
<td>3</td>
<td>69</td>
<td>687</td>
<td>1,796</td>
<td>2.25%</td>
<td>42.82%</td>
<td>1.01%</td>
</tr>
<tr>
<td>4</td>
<td>283</td>
<td>6,665</td>
<td>4,528</td>
<td>2.03%</td>
<td>44.86%</td>
<td>0.18%</td>
</tr>
<tr>
<td>5</td>
<td>651</td>
<td>41,596</td>
<td>8,123</td>
<td>1.76%</td>
<td>46.61%</td>
<td>0.06%</td>
</tr>
<tr>
<td>6</td>
<td>415</td>
<td>10,943</td>
<td>4,388</td>
<td>1.75%</td>
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<td>8</td>
<td>513</td>
<td>22,660</td>
<td>3,607</td>
<td>0.99%</td>
<td>50.65%</td>
<td>0.02%</td>
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<tr>
<td>9</td>
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<td>16,817</td>
<td>5,497</td>
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<td>60.80%</td>
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<td>20</td>
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<td>13,038</td>
<td>1,902</td>
<td>0.42%</td>
<td>0.06%</td>
<td>0.49%</td>
<td>61.28%</td>
</tr>
</tbody>
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Nitrate Fraction = EWRT.Qd_NO3_2028/(Total_NO3_2028 + Total_SO4_2028)
Source Apportionment Modeling with PSAT

• Quantify visibility impacts from individual point sources and/or geographic source sectors
• Used to evaluate AOI results and refine facility/sector contributions to visibility impairment
• Can be used to adjusted future year visibility projections to account for additional emission controls
  • No need to re-run photochemical model for final RPGs
• Contract allows for 250 tags; with option to increase number of tags
State Perspectives

• Selection of Emissions Sources for 4-Factor Analysis
  • AOI Screening Threshold Options
    • Facility and/or sector
    • Individual or cumulative impacts
  • PSAT results

• Degree of detail and difficulty
  • Where is a Class I Area on the URP?
  • Resources vs. results – less effort for Class I Areas below URP?
Element 4
Communications / Consultation Strategy

• Shared responsibility

• VISTAS will provide forums for general stakeholder calls
  • Federal Land Managers (FLMs), U.S. Environmental Protection Agency (EPA), and non-VISTAS states

• Each state will work with its stakeholders on more specific considerations germane to its Class I Federal areas

• Each state responsible for FLM and EPA consultation during SIP development (after technical work ends)
Schedule for Completing Technical Work

• AOI Analysis:
  • Completed in February 2019
  • States reviewing results and briefing management
• 2028 Air Quality Modeling Results: April – May 2019
• PSAT Modeling Results: April – September 2019
• Final VISTAS Project Report: Fall 2019
• Final SIPs are due to EPA by July 31, 2021
What we need from EPA

• Completion of the final regional haze guidance document will be most helpful to ensure technical work is on target

• Establish a website to serve as a Clearinghouse for posting State SIPs and other information
  • States should have the opportunity to review and comment on other state’s SIPs before a state submits its final SIP to EPA

• EPA expectations for use of its forthcoming 2028 regional haze modeling platform and results?
Summary / Conclusions

• Following similar approach to methods used for Round 1 SIPs
• Round 1 SIP (2000 – 2018)
  • All SE Class I Federal areas all are well below the URP for 2018 and 2028
• Round 2 SIP (2018 – 2028)
  • SO2 is primary cause of visibility impairment in SE’s Class I Federal areas
  • Evaluate methods for controlling SO2 but also evaluate NOx
  • Impact of changing from the 20% worst to the 20% most impaired days
    • Lowers URP for NC Class I Federal areas from 1 to 2 deciviews
    • For 2013-2017, shifts most impaired days from primarily summer to summer/winter months

Department of Environmental Quality
Look Rock (Great Smoky Mountains NP)

September 17, 2002, 12:30PM
6th most impaired day in 2002
Visibility: 31.9 DV or 11 miles

September 19, 2017, 12:30PM
6th most impaired day in 2017
Visibility: 18.5 DV or 38 miles

Source: National Park Service Webcam Archives - https://npgallery.nps.gov/AirWebCams/grpk
Look Rock Webcam

Landmarks on a clear day

Source: National Park Service Webcam Archives - https://npgallery.nps.gov/AirWebCams/grpk

Department of Environmental Quality
Acknowledgements

• Thank you to the following individuals that helped prepare this presentation
  • John Hornback, Executive Director, Metro 4/SESARM
  • James Boylan, PhD., Manager, Planning and Support Program, GA Department of Natural Resources, Environmental Protection Division, Air Protection Branch
  • Elliot Tardif and Nick Witcraft, Meteorologists, Attainment Planning Branch, Planning Section, North Carolina Division of Air Quality (NCDAQ)

• Contact Information:
  • Randy Strait, Chief, Planning Section, NCDAQ
  • Email: randy.strait@ncdenr.gov
  • Phone: 919-707-8721

Department of Environmental Quality