

# Commonwealth of Pennsylvania



**pennsylvania**

DEPARTMENT OF ENVIRONMENTAL PROTECTION

## **Revision to the State Implementation Plan for Regional Haze**

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Bureau of Air Quality  
Pennsylvania Department of Environmental Protection  
P.O. Box 8468  
Harrisburg, PA 17105-8468  
717-787-9495

**[www.dep.state.pa.us](http://www.dep.state.pa.us)**

John Hanger  
Secretary

Edward G. Rendell  
Governor



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## LIST OF ACRONYMS

ACHD – Allegheny County Health Department  
AMS – Philadelphia Air Management Services  
AoI - Area of Influence  
BART - Best Available Retrofit Technology  
BRIG - Brigantine Wilderness Area, NJ  
CAA - Clean Air Act  
CAIR - Clean Air Interstate Rule  
CAMR - Clean Air Mercury Rule  
CEM - Continuous Emissions Monitoring  
CERR - Consolidated Emissions Reporting Rule  
CMAQ - Community Multiscale Air Quality  
DOE - Department of Energy  
DOSO1 - Dolly Sods Wilderness Area, WV  
DV - Deciview  
EAC - Early Action Compact  
EGAS – Economic Growth Analysis System  
EGU - Electric Generating Unit  
EPA - Environmental Protection Agency  
EQB – Environmental Quality Board  
ESP – Electrostatic Precipitator  
FAA – Federal Aviation Administration  
FGD – Flue Gas Desulfurization  
FLM - Federal Land Manager  
Grains/dscf – grains per dry standard cubic feet  
HAP - Hazardous Air Pollutant  
HNO<sub>3</sub> – Nitric Acid  
IMPROVE - Interagency Monitoring of Protected Visual Environments  
IPM - Integrated Planning Model  
JAR1 - James River Face Wilderness Area, VA  
LSD - Low Sulfur Diesel  
LTS - Long-Term Strategy  
MANE-VU – Mid-Atlantic/Northeast Visibility Union  
MARAMA – Mid-Atlantic Regional Air Management Association  
MM5 - Mesoscale Meteorological Model  
NAAQS - National Ambient Air Quality Standard  
NEI – National Emissions Inventory  
NH<sub>3</sub> - Ammonia  
NESCAUM – Northeast States for Coordinated Air Use Management  
NO<sub>x</sub> - Nitrogen Oxides  
OTB/OTW - On the books/On the Way  
PBL - Planetary Boundary Layer  
PM - Particulate Matter  
PM<sub>2.5</sub> - Particulate Matter with a diameter of 2.5 micrometers or less (fine particles)  
PM<sub>10</sub> - Particulate Matter with a diameter of 10 micrometers or less (coarse matter)

## LIST OF ACRONYMS (cont.)

Ppmvd – Parts per Million Volume Dry  
PSAT - PM Source Apportionment Technology  
PSD – Prevention of Significant Deterioration  
PSU/NCAR - Pennsylvania State University/National Center for Atmospheric Research  
RAMS - Regional Air Modeling System  
RHR - Regional Haze Rule  
RPG - Reasonable Progress Goal  
RPO - Regional Planning Organization  
SAMI - Southern Appalachian Mountain Initiative  
SCC - Source Classification Code  
SCR – Selective Catalytic Reduction  
SHEN1 - Shenandoah National Park, VA  
SIP - State Implementation Plan  
SMOKE - Sparse Matrix Operator Kernel Emissions (model)  
SMP - Smoke Management Plan  
SNCR – Selective Non-Catalytic Reduction  
SOA - Secondary Organic Aerosols  
SO<sub>2</sub> - Sulfur Dioxide  
STN - Speciated Trends Network  
TDF – Tire-Derived Fuel  
TDM - Travel Demand Model  
TPY – Tons Per Year  
UAM - Urban Airshed Model  
EPA - United States Environmental Protection Agency  
VIEWS – Visibility Information Exchange Web System  
VISTAS - Visibility Improvement - State and Tribal Association of the Southeast  
WVDEP - West Virginia Department of Environmental Protection  
WVDAQ - West Virginia Division of Air Quality  
VDEQ – Virginia Department of Environmental Quality  
VOC - Volatile Organic Compound  
VMT - Vehicle Miles Traveled

## **1.0. Introduction**

### **1.1. Regional Haze Background**

Regional haze is visibility impairment caused by the cumulative effect of air pollution from numerous sources over a wide geographic area. Regional haze results in impaired visibility over a large region, affecting urban and rural areas including national parks, forests, and wilderness areas (federal “Class I” areas). In the eastern United States, average visual range has been reduced to approximately 30 kilometers or one-fifth of the visual range that would exist under natural conditions. In Section 169A of the Clean Air Act (CAA), Congress established the ultimate national goal of the regional haze program as follows:

*Congress hereby declares as a national goal the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory class I Federal areas which impairment results from man-made air pollution.*

(See 42 U.S.C. § 7491(a)(1))

Regional haze is caused by sources and activities emitting fine particles and their precursors. Fine particles have a diameter smaller than 2.5 micrometers ( $\mu\text{m}$ ) and are also called PM<sub>2.5</sub>. Particles affect visibility through the scattering and absorption of light, and PM<sub>2.5</sub> – particles similar in size to the wavelength of light – are most efficient, per unit of mass, at reducing visibility.

PM<sub>2.5</sub> may either be emitted directly or formed from emissions of precursors, the most important of which are sulfur dioxides (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>). Reducing PM<sub>2.5</sub> in the atmosphere will reduce regional haze, resulting in improved visibility. The most important sources of PM<sub>2.5</sub> and its precursors are coal-fired power plants, industrial boilers and other combustion sources. Other significant contributors to PM<sub>2.5</sub> and visibility impairment include mobile sources, area sources, fires, and wind blown dust.

PM<sub>2.5</sub> adversely impacts human health, especially respiratory and cardiovascular systems. PM<sub>2.5</sub> also has significant environmental impacts, including acid rain and stream eutrophication. To protect public health and the environment, the United States Environmental Protection Agency (EPA) has set national ambient air quality standards for daily and annual levels of PM<sub>2.5</sub>. Although the goal of the regional haze program is a return to natural visibility in the Class I areas, actions taken to improve visibility can also be expected to benefit public health and reduce certain adverse effects on the environment. Visibility throughout the region will improve as a result of the actions taken to achieve the goals of the regional haze program.

## 1.2. History of the Federal Regional Haze Rule

The EPA addressed reasonably attributable visibility impairment or plume blight by promulgating regulations in 1980. (45 FR 80045 (Dec. 2, 1980)). The regulations reduced visibility impairment from specific pollution sources. However, EPA deferred development of regional haze regulations until better monitoring, modeling and scientific knowledge about regional haze were available.

When the CAA was amended in 1990, Congress added Section 169B (42 U.S.C. § 7492), authorizing further research and regular assessments of the progress made so far toward the national visibility goals. In 1993, the National Academy of Sciences concluded that “current scientific knowledge is adequate and control technologies are available for taking regulatory action to improve and protect visibility.”<sup>1</sup>

In addition to authorizing creation of visibility transport commissions and setting forth their duties, Section 169B(f) of the CAA mandated creation of the Grand Canyon Visibility Transport Commission (GCVTC) to make recommendations to EPA for the region affecting the visibility of the Grand Canyon National Park. The GCVTC submitted its report to EPA in June 1996, following four years of research and policy development. The GCVTC report, as well as the many research reports prepared by the GCVTC, contributed invaluable information to EPA in its development of the federal Regional Haze Rule (RHR).

EPA provided grant funding for five Regional Planning Organizations (RPOs) throughout the country to assist with the multi-state coordination and cooperation needed to address regional haze issues. In 2001, the Mid-Atlantic and Northeast states, the District of Columbia, and tribes within the region formed the Mid-Atlantic/Northeast Visibility Union (MANE-VU)<sup>2</sup> to coordinate regional haze planning activities for the region.

EPA’s RHR was published in the *Federal Register* on July 1, 1999. The RHR aims to achieve the national visibility goal set by the CAA by 2064. The rule addresses the combined visibility effects of various pollution sources over a wide geographic region. The RHR requires all states, even those that do not contain a Class I area, to submit a revision to their State Implementation Plan (SIP) containing emission reduction strategies to improve visibility in Class I areas that their emissions affect. Guidelines for implementation of the Best Available Retrofit Technology (BART) requirements of the federal RHR were initially proposed on July 20, 2001 (66 FR 38108).

EPA’s RHR was subsequently revised in response to a legal challenge brought by industry and environmental groups. On May 24, 2002, the United States Court of Appeals for the District of Columbia Circuit issued a ruling vacating the RHR in part and sustaining it in part. The ruling vacated and remanded to EPA the BART provisions of

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<sup>1</sup> *Protecting Visibility in National Parks and Wilderness Areas*, National Research Council (Washington, D.C. 1993).

<sup>2</sup> For a description of MANE-VU and a full list of its members, see Section 3, below.

the rule. The Court's ruling denied industry's challenge to the RHR's goal of natural visibility and requirement of no degradation of visibility. On May 5, 2004, EPA published proposed revisions to the regional haze rule and guidelines for BART determinations in the *Federal Register* (69 FR 25184). The final RHR and BART guidelines were published in the *Federal Register* on July 6, 2005 (70 FR 39104). A further revision to the rule was proposed August 1, 2005 (70 FR 44154) and finalized October 13, 2006 (71 FR 60612), pertaining to requirements for alternative trading programs. The regulations can be found at 40 C.F.R. Part 51, subpart P (relating to protection of visibility).

### **1.3. General Overview of Regional Haze SIP Requirements**

Section 51.308(d) of the RHR requires states to demonstrate reasonable progress toward meeting the national goal of a return to natural visibility conditions by 2064. As a guide for reasonable progress, the RHR directs states to consider what would be a "uniform rate of progress" toward natural conditions for each mandatory Class I Federal area within the State and/or for each mandatory Class I Federal area located outside the State, which may be affected by emissions from sources within the State. States with Class I areas are to establish baseline visibility conditions for 2000-2004, natural background visibility conditions in 2064, and the rate of uniform progress between baseline and background conditions. The uniform rate of progress is also known as the "glidepath." The RHR stipulates that visibility targets and tracking of visibility changes over time be expressed in terms of the "deciview" haze metric. Deciview is an atmospheric haze index that expresses changes in visibility, and is a measurement of visibility impairment (see 40 CFR § 51.301). This means that the lower the deciview value, the better the perception of visibility.

The RHR also requires States with Class I areas to establish reasonable progress goals (RPGs), expressed in deciviews, for visibility improvement at each Class I area. The goals must provide for reasonable progress toward achieving natural visibility conditions, provide for improvement in visibility for the most impaired days over the period of the implementation plan, and ensure no degradation in visibility for the least impaired days over the same period (see 40 C.F.R. § 51.308(d)(1)).

This first set of reasonable progress goals must be met through measures contained in each state's long-term strategy covering the period from the present until 2018. The long-term strategy includes enforceable emissions limitations, compliance schedules, and other measures as necessary to achieve the reasonable progress goals, including all controls required or expected under all federal and state regulations by 2009 and by 2018. During development of the long-term strategy, states are also required to consider specific factors, such as the abovementioned ongoing control programs, measures to mitigate construction activities, source retirement and replacement schedules, smoke management programs for agriculture and forestry, and enforceability of specific measures (see 40 C.F.R. § 51.308(d)(3)).



In addition, a specific component of each state's first long-term strategy is dictated by the specific BART requirements in 40 CFR § 51.308(e) of the RHR. Section 51.308(e) of the RHR requires states to include a determination of BART for each BART-eligible source in the state that emits any air pollutant, which may reasonably be anticipated to cause or contribute to any impairment of visibility in any mandatory Class I area. Section 169A(b) of the CAA defines "BART-eligible sources" as sources in 26 specific source categories, in operation within a 15-year period prior to enactment of the 1977 Clean Air Act amendments. States must determine BART according to five factors set out in section 169A(g)(2) of the CAA. Emission limitations representing BART and schedules for compliance with BART for each source subject to BART must be included in the long-term strategy.

The federal Clean Air Interstate Rule (CAIR) was promulgated on May 12, 2005 (70 FR 25162). CAIR is an interstate trading program designed to mitigate the interstate transport of NO<sub>x</sub> and SO<sub>2</sub> from electric generating units (EGUs). CAIR was vacated by the United States Court of Appeals for the District of Columbia Circuit on July 11, 2008 and subsequently remanded on December 23, 2008, to EPA to promulgate a new rule consistent with the Court's July 11, 2008 opinion. As a result of the remand and EPA approval of Pennsylvania's CAIR as a SIP revision effective December 10, 2009 (74 FR 65446), CAIR is being implemented in this Commonwealth. The owners and operators of EGUs in the Commonwealth must reduce nitrogen oxide (NO<sub>x</sub>) and sulfur dioxide (SO<sub>2</sub>) emissions according to the Department's CAIR regulation. As a result of the Court's remand of the federal CAIR to EPA, it is reasonable to expect that a replacement for the federal CAIR will be in place to evaluate the Commonwealth's emissions controls by the time the first regional haze progress report is due.

Under the federal RHR, states are required to evaluate progress toward reasonable progress goals every five years to assure that installed emissions controls are on track with emissions reduction forecasts in the SIP. The first progress report is due 5 years from the submittal of the initial implementation plan. If emissions controls are not on track to meet SIP forecasts, then a state would need to take action to assure emissions controls by 2018 will be consistent with the SIP or to revise the SIP to be consistent with the revised emissions forecast.

## **2.0. General Planning Provisions**

Pursuant to 40 CFR § 51.308(a) and (b), the Pennsylvania Department of Environmental Protection (Department) submits this SIP revision to meet the requirements of the CAA and its implementing provisions in EPA's RHR. Elements of this SIP revision address the core requirements of 40 CFR § 51.308(d) and the BART components of 40 CFR § 51.308(e). In addition, this SIP revision addresses regional planning and State/Tribe and Federal Land Manager coordination, and sets forth how Pennsylvania will address those requirements.

Pennsylvania is authorized under the Air Pollution Control Act and implementing regulations to submit this SIP revision in accordance with State laws and regulations.

## **3.0. Regional Planning**

In 1999, EPA and affected States and Tribes agreed to create five RPOs to facilitate interstate coordination on Regional Haze SIPs and Tribal Implementation Plans. Pennsylvania is a member of the MANE-VU RPO. MANE-VU was formed by the Mid-Atlantic and Northeastern states, tribes, and federal agencies to coordinate regional haze planning activities for the region. MANE-VU was formed to encourage a coordinated approach to meeting the requirements of EPA's RHR and reducing visibility impairment in major national parks and wilderness areas in the Northeast and Mid-Atlantic. The MANE-VU document, "MANE-VU Interim Report (May 2006)," outlines the Mid-Atlantic and Northeast region's approach to air quality planning for regional haze and can be found in Appendix A.

MANE-VU provides technical assessments and assistance to its members, evaluates linkages to other regional air pollution issues, provides a forum for discussion, and encourages coordinated actions. MANE-VU also facilitates coordination with other regions. MANE-VU is governed by a Board of state and tribal Commissioners and Secretaries, and air program directors. It has two committees composed of agency personnel: a Technical Support Committee to assess the nature of regional haze and help states develop coordinated programs; and a Communications Committee to develop outreach messages and approaches. MANE-VU also established a Policy Advisory Group to facilitate coordination among members on policy issues. Members of MANE-VU are listed in Table 3.0-1. The MANE-VU Class I areas are shown in Figure 3.0-1.

**Table 3.0.-1 MANE-VU Members**

Connecticut	Pennsylvania
Delaware	Penobscot Nation
District of Columbia	Rhode Island
Maine	St. Regis Mohawk Tribe
Maryland	Vermont
Massachusetts	U.S. Environmental Protection Agency (EPA)*
New Hampshire	National Park Service (NPS)*
New Jersey	U.S. Fish and Wildlife Service (FWS)*
New York	U.S. Forest Service (USFS)*

\* Non-voting members

**Figure 3.0.-1 MANE-VU Class I Areas**



This SIP revision utilizes data analysis, modeling results and other technical support documents prepared for MANE-VU members. By coordinating with MANE-VU and other RPOs, the Department has worked to ensure that its long term strategy and BART determinations provide sufficient reductions to mitigate impacts of emissions from sources located in Pennsylvania on affected Class I areas.

In accordance with 40 CFR § 51.308, emissions sources within Pennsylvania have or may have impacts on the following Class I Areas in MANE-VU: Acadia National Park, Maine; Brigantine Wilderness (within the Edwin B. Forsythe National Wildlife Refuge), New Jersey; Great Gulf Wilderness, New Hampshire; Lye Brook Wilderness, Vermont; Moosehorn Wilderness (within the Moosehorn National Wildlife Refuge), Maine; Presidential Range – Dry River Wilderness, New Hampshire; and Roosevelt Campobello International Park, New Brunswick.

A contribution assessment analysis was completed by the Northeast States for Coordinated Air Use (NESCAUM), entitled *Contributions to Regional Haze in the Northeast and Mid-Atlantic States* (see the Contribution Assessment for MANE-VU, August 2006, Appendix B). The MANE-VU Contribution Assessment indicates that emission sources located in Pennsylvania may impact visibility at the following Class I areas outside MANE-VU: Dolly Sods Wilderness/Otter Creek Wilderness Area (the Dolly Sods IMPROVE monitor is also representative of Otter Creek) in West Virginia; and Shenandoah National Park and James River Face Wilderness Area in Virginia. The Department has conferred with regional haze planning staff in both Virginia and West Virginia. Neither of these two States intends to request that Pennsylvania make additional reductions at emission sources located in Pennsylvania.

The RPO that represents West Virginia and Virginia, the Visibility Improvement State and Tribal Association of the Southeast (VISTAS), conducted 2018 visibility modeling to establish the reasonable progress goals for the Dolly Sods Wilderness Area (and the Otter Creek Wilderness Area because the Dolly Sods IMPROVE monitor is also representative of Otter Creek), and for Shenandoah National Park (VISTAS, Shenandoah Group Contribution Assessment, May 2007, Appendix C). This modeling shows that the maximum projected contribution of any single source unit from Pennsylvania to visibility impairment at Dolly Sods Wilderness Area, Shenandoah National Park or James River Face Wilderness Area is less than 1%. The West Virginia Department of Environmental Protection sent an email, dated September 13, 2007, to the Department stating “we are not going to ask PA to make any additional reductions or to consult further.” The Virginia Department of Environmental Quality sent an email to the Department, dated September 14, 2007, stating “VA is not asking PA for any additional reductions or for further consultation during this round of RH since our analysis shows that maximum normalized contribution of any PA source to Shenandoah or James River Face is <1%.” (See Appendix D for copies of the West Virginia and Virginia emails.)

#### **4.0. State/Tribe and Federal Land Manager Coordination**

In accordance with Section 169A(d) of the CAA, (42 U.S.C. § 169A(d), and 40 CFR § 51.308(i)), coordination between States or Tribes and the Federal Land Managers (FLMs) is required. The Department is also required under 40 CFR § 51.308(i)(2), to provide the Federal Land Managers the opportunity for consultation, in person and at least 60 days prior to holding any public hearing on an implementation plan (or plan revision) for regional haze. This coordination has occurred, during both the MANE-VU and the Department processes. Opportunities have been provided by MANE-VU for FLMs to review and comment on each of the technical documents developed by MANE-VU and included in this SIP revision. The Department has provided agency contacts to the FLMs, as required.

Prior to beginning the mandated consultation process, the Department sent a preliminary draft of the regional haze SIP revision to the FLMs on August 24, 2007. Additionally, the Department held conference calls with the FLMs on August 31, 2007, September 14, 2007 and October 19, 2007. The following agencies participated in some or all of the conference calls: U.S. EPA, U.S. Forest Service, U.S. Department of Interior, U.S. Fish and Wildlife Service, and the National Park Service. (See Appendix D for copies of the Agendas for the August 31, 2007 and September 14, 2007 conference calls with the FLMs.)

The Department provided the FLMs an opportunity for consultation, in person and at least 60 days prior to holding Pennsylvania's public hearings on the proposed regional haze SIP revision. During development of this plan, the FLMs were consulted in accordance with 40 CFR § 51.308(i)(2). The Department sent a draft of the regional haze SIP revision to the FLMs on June 2, 2010, beginning the mandated 60-day consultation period. During the consultation process, the FLMs were given the opportunity to address:

- Assessment of the impairment of visibility in mandatory Class I Federal areas.
- Recommendations on the development of reasonable progress goals.
- Recommendations on the development and implementation of strategies to address visibility impairment.
- BART Determinations.
- Ongoing Consultation Process.

As required under 40 CFR § 51.308(i)(3), the Department received specific comments from the FLMs regarding the draft proposed SIP revision during the mandated 60-day consultation period. The FLM's comments and the Department's responses are included in Appendix AA. The Department did not receive any comments during the public comment period; therefore a Comment and Response document is not included in this final SIP revision.

The Department will continue to coordinate and consult with the FLMs on the implementation of the visibility protection program, in accordance with 40 CFR

§ 51.308(i)(4). This process will include coordination and consultation on the development and review of implementation plan revisions and 5-year progress reports and on the implementation of other programs having the potential to contribute to visibility impairment in mandatory Class I areas. The following may be appropriate topics for future, ongoing consultations with the FLMs:

1. Implementation of emissions strategies identified in the SIP as contributing to achieving improvement in the worst-day visibility.
2. Summary of major new source permits issued.
3. Status of actions to complete any future assessments or rulemakings on sources identified as likely contributors to visibility impairment, but not directly addressed in the most recent SIP revision
4. Any changes to the monitoring strategy or monitoring stations status that may affect tracking of reasonable progress.
5. Preparation for the 5-year review and /or 10-year SIP revision.
6. Items for FLMs to consider or provide support for in preparation for any visibility protection SIP revisions (based on a 5-year review or the 10-year revision schedule under EPA's RHR).
7. Summary of topics covered in ongoing communications between the Department and the FLMs regarding implementation of the visibility program.

The ongoing consultations will be coordinated with the designated visibility protection program coordinators for the National Park Service, United States Fish and Wildlife Service and United States Forest Service.

In addition to the consultations required under 40 CFR § 51.308(i)), the Department, EPA Region 3, and the FLMs for Shenandoah National Park, James River Face Wilderness, Dolly Sods Wilderness, Otter Creek Wilderness and Brigantine Wilderness entered into a Memorandum of Understanding (MOU), effective on August 30, 2006, that established mutually acceptable guidelines for the effective protection of air quality related values, which include visibility impairment. The MOU was developed to define the framework for operational procedures for the review and comment on Prevention of Significant Deterioration (PSD) plan approval applications submitted to the Department which could have an impact on the above referenced Class I areas. In addition, this MOU supports the Department's efforts in meeting reasonable progress. This MOU is found in Appendix D.

## **5.0. Assessment of Baseline Conditions and Estimate of Natural Conditions in Class I Areas**

Under the CAA, this regional haze SIP revision must contain measures to make reasonable progress toward the goal of achieving natural visibility. Each state containing a Class I area must determine baseline and natural visibility conditions for its Class I area(s) in consultation with FLMs and states identified as containing sources whose emissions contribute to visibility impairment in the Class I area. Comparing baseline conditions to natural background visibility conditions determines the uniform rate of progress that must be considered as states set reasonable progress goals for each Class I area.

In September 2003, EPA finalized guidance for the calculation of natural background and baseline visibility conditions. The guidance provides a default method and describes certain refinements that states may wish to evaluate to tailor these estimates to a specific Class I area if it is poorly represented by the default method. At that time, MANE-VU calculated estimated natural visibility for each of the MANE-VU Class I areas using the default method. MANE-VU calculated estimates for the 20% best and worst visibility days. MANE-VU evaluated options for refining the estimates. Potential refinements assessed included: increasing the multiplier used to calculate impairment attributed to carbon, adjusting the formula used to calculate the 20% best and worst visibility days, and accounting for visibility impairment due to sea salt at coastal sites. MANE-VU found that these refinements, however, did not significantly improve the accuracy of the estimates, and MANE-VU states desired a consistent approach. Therefore, MANE-VU proposed using the default estimates with the understanding that refinements would be reconsidered as scientific consensus on refinements develops.

After the technical analysis was complete, MANE-VU provided an opportunity for federal agencies and stakeholders to comment on the analysis. The proposed approach was posted on the MANE-VU website on March 17, 2004, and a stakeholder briefing was held on the same day. Comments were received from the Electric Power Research Institute, the Midwest Ozone Group, the Appalachian Mountain Club, the National Parks Conservation Association, the National Park Service, and the United States Forest Service.

Several commentators supported the proposal. Other comments addressed four main topics: the equation used to calculate visibility, the statistical technique used to estimate the 20% best and worst visibility days, the inclusion of trans-boundary effects and fires, and the timing of when new information should be included. All comments were reviewed and summarized by MANE-VU. The MANE-VU air directors were briefed on the comments, the proposed response options, and the implications.

After serious consideration, MANE-VU decided, at that time, to support the use of the default approach to calculating baseline and natural background conditions because national consistency in calculating estimates would allow MANE-VU to collaborate with

other regions more effectively. The MANE-VU position on natural background conditions was issued in June 2004, and stated that, “Refinements to other aspects of the default method (e.g., refinements to the assumed distribution or treatment of Rayleigh extinction, inclusion of sea salt, and improved assumptions about the chemical composition of the organic fraction) may be warranted prior to submission of SIPs depending on the degree to which scientific consensus is formed around a specific approach...”

In 2006, the Interagency Monitoring of Protected Visual Environments (IMPROVE) Steering Committee adopted an alternative reconstructed extinction equation to address certain aspects of the default method. The aspects addressed are scientifically well understood and improve the performance of the equation at reproducing observed visibility at Class I sites. In 2006, MANE-VU conducted an assessment of the default and alternative approaches for calculation of baseline and natural background conditions at MANE-VU Class I areas. Based on that assessment, in December 2006, MANE-VU recommended adoption of the alternative reconstructed extinction equation for use in the December 2007 regional haze SIPs. (See the MANE-VU document, “Baseline and Natural Background Visibility Conditions: Considerations and Proposed Approach to the Calculation of Baseline and Natural Background Visibility Conditions at MANE-VU Class I Areas,” Appendix E.) MANE-VU will continue to participate in further research efforts on this topic and will reconsider the calculation methodology as scientific understanding evolves.

The IMPROVE program was initiated in 1985 to establish current visibility conditions, track changes in visibility, and help determine the causes of visibility impairment in Class I areas. Data from the following IMPROVE monitors (Table 5.0-1 and Table 5.0-2) are representative of Class I Areas in and near MANE-VU.

**Table 5.0-1 IMPROVE Information for MANE-VU Class I Areas**

<b>Class I Area</b>	<b>IMPROVE Site</b>	<b>Location (latitude and longitude)</b>	<b>State</b>
Acadia National Park	ACAD1	44.38, -68.26	Maine
Moosehorn Wilderness Area	MOOS1	45.13, -67.27	Maine
Roosevelt/Campobello International Park	MOOS1	45.13, -67.27	Maine
Great Gulf Wilderness Area	GRGU1	44.31, -71.22	New Hampshire
Presidential Range/Dry River Wilderness	GRGU1	44.31, -71.22	New Hampshire
Lye Brook Wilderness Area	LYBR1	43.15, -73.13	Vermont
Brigantine Wilderness Area	BRIG1	39.47, -74.45	New Jersey

Source: VIEWS (<http://vista.circa.colostate.edu/views/>), prepared on 7/06/06



**Table 5.0-2 IMPROVE Information for Nearby Class I Areas**

<b>Class I Area</b>	<b>IMPROVE Site</b>	<b>Location (latitude and longitude)</b>	<b>State</b>
Dolly Sods Wilderness	DOSO1	39.11, -79.43	West Virginia
Otter Creek Wilderness	DOSO1	39.11, -79.43	West Virginia
Shenandoah National Park	SHEN1	38.52, -78.43	Virginia
James River Face Wilderness	JARI1	37.63, -79.51	Virginia

Source: VIEWS (<http://vista.circa.colostate.edu/views/>), prepared on 9/10/07

The IMPROVE program has calculated baseline (2000-2004) and natural visibility conditions for each IMPROVE monitoring site at MANE-VU Class I areas using EPA-approved methods. These values are posted on the Visibility Information Exchange Web System (VIEWS) operated by the RPOs (available online at <http://vista.cira.colostate.edu/views/>). Table 5.0-3 displays the baseline visibility for the 20% worst and the 20% best visibility days based on the five-year average for 2000-2004, natural background visibility for the 20% worst and the 20% best visibility days, and the difference between baseline and natural visibility conditions for each MANE-VU Class I area.

**Table 5.0-3 Summary of Baseline Visibility and Natural Conditions for the 20% Worst and 20% Best Visibility Days at MANE-VU Class I Areas**

<b>Class I Area</b>	<b>2000-2004 Baseline (dv)</b>		<b>Natural Conditions (dv)</b>		<b>Difference (dv)</b>	
	<b>Worst 20%</b>	<b>Best 20%</b>	<b>Worst 20%</b>	<b>Best 20%</b>	<b>Worst 20%</b>	<b>Best 20%</b>
Acadia National Park	22.89	8.77	12.43	4.66	10.46	4.11
Moosehorn Wilderness Area	21.72	9.15	12.01	5.01	9.71	4.14
Roosevelt/Campobello International Park	21.72	9.15	12.01	5.01	9.71	4.14
Great Gulf Wilderness Area	22.82	7.66	11.99	3.73	10.83	3.93
Presidential Range/Dry River Wilderness	22.82	7.66	11.99	3.73	10.83	3.93
Lye Brook Wilderness Area	24.45	6.36	11.73	2.79	12.72	3.57
Brigantine Wilderness Area	29.01	14.33	12.24	5.51	16.77	8.82

Source: VIEWS (<http://vista.circa.colostate.edu/views/>), prepared on 5/12/08.

Table 5.0-4 displays the baseline visibility for the 20% worst and the 20% best visibility days based on the five-year average for 2000-2004, natural background visibility for the

20% worst and the 20% best visibility days, and the difference between baseline and natural visibility conditions for nearby Class I Areas.

**Table 5.0-4 Summary of Baseline Visibility and Natural Conditions for the 20% Worst and 20% Best Visibility Days at Nearby Class I Areas**

Class I Area	2000-2004 Baseline (dv)		Natural Conditions (dv)		Difference (dv)	
	Worst 20%	Best 20%	Worst 20%	Best 20%	Worst 20%	Best 20%
Dolly Sods Wilderness Area	29.04	12.28	10.39	3.63	18.65	8.65
Otter Creek Wilderness Area	29.04	12.28	10.39	3.63	18.65	8.65
Shenandoah National Park	29.31	10.93	11.35	3.14	17.96	7.79
James River Face Wilderness Area	29.12	14.21	11.13	4.39	17.99	9.82

Source: VIEWS (<http://vista.circa.colostate.edu/views/>), prepared on 9/10/2007

There are no Class I areas in Pennsylvania. As described in Section 3, the Department coordinated and consulted with the MANE-VU Class I area states that are or may be affected by emissions from sources located in Pennsylvania as those States assessed baseline and natural background visibility conditions in their respective Class I areas. The Department also consulted with other States by participating in the MANE-VU and Inter-RPO regional haze planning strategies.

## 6.0. Monitoring Strategy

Visibility conditions representative of those within the MANE-VU Class I areas are monitored by IMPROVE. In the mid-1980's, the IMPROVE program was established to measure visibility impairment in mandatory Class I areas throughout the United States. The monitoring sites are operated and maintained through a formal cooperative relationship between the EPA, National Park Service, United States Fish and Wildlife Service, Bureau of Land Management, and United States Forest Service. In 1991, several additional organizations joined the effort: the State and Territorial Air Pollution Program Administrators and the Association of Local Air Pollution Control Officials, which is now the National Association of Clean Air Agencies (NAACA), the Western States Air Resources Council, the Mid-Atlantic Regional Air Management Association (MARAMA), and Northeast States for Coordinated Air Use Management (NESCAUM).

### 6.1. IMPROVE Program Objectives

Data collected at IMPROVE sites are used by land managers, industry planners, scientists, public interest groups, and air quality regulators to understand and protect the visual air quality resource in Class I areas. Most importantly, the IMPROVE program scientifically documents for American citizens the visual air quality of their wilderness areas and national parks. A Quality Assurance Project Plan (QAPP) for the IMPROVE program, dated March 2002, can be found at:

[http://vista.cira.colostate.edu/improve/Publications/QA\\_QC/IMPROVE\\_QAPP\\_R0.pdf](http://vista.cira.colostate.edu/improve/Publications/QA_QC/IMPROVE_QAPP_R0.pdf)

The IMPROVE Program objectives include:

- Establish current visibility and aerosol conditions in mandatory Class I areas,
- Identify chemical species and emission sources responsible for existing anthropogenic visibility impairment,
- Document long-term trends for assessing progress towards the national visibility goals,
- Provide regional haze monitoring representing all mandatory federal Class I areas where practical, as required by EPA's RHR.

Section 51.308(d)(4)(iii) of EPA's RHR requires the inclusion of procedures by which monitoring data and other information are used in determining the contribution of emissions from within Pennsylvania to regional haze visibility impairment at the mandatory Class I Federal areas outside of Pennsylvania. Pennsylvania accepts the contribution assessment analysis completed by NESCAUM entitled, *Contributions to Regional Haze in the Northeast and Mid-Atlantic States* (see Appendix B). Methods of visibility and emissions data analysis used in preparing the contribution assessment include source apportionment analysis (see Appendix B), trajectory analysis (see Chapter 5), emissions divided by distance (see Chapter 4), emissions times upwind probability (see Chapter 4), chemical transport models (see Chapter 6), and Lagrangian dispersion modeling (see Chapter 7). The many techniques used provided a stronger weight of evidence for the assessment of contribution by source types and regions.

Pennsylvania agrees that NESCAUM is providing quality technical information by using the IMPROVE program data and the VIEWS site. Information about the use of the default and alternative approaches to the calculation of baseline and natural background conditions can be found in Section 5 Assessment of Baseline and Natural Conditions of this SIP.

Because there are no Class I areas located in Pennsylvania, a monitoring plan is not required under 40 CFR § 51.308(d)(4). The Department considers the IMPROVE monitors located at Class I areas in MANE-VU to be representative of those Class I areas and the monitoring data from those monitors to be a reasonable basis for assessing progress toward the regional haze program goals. The Department believes that every effort should be made to maintain the IMPROVE monitoring network to provide the long-term consistency necessary to track progress toward the regional haze program goals. A description of the representative IMPROVE monitor for each MANE-VU Class I area is provided in the following section.

## **6.2. Monitoring Information for MANE-VU Class I Areas**

### **Acadia National Park, Maine**

The IMPROVE monitor for the Acadia National Park (indicated as ACAD1) is located at Acadia National Park Headquarters in Maine at an elevation of 157 meters, a latitude of 44.38° and a longitude of -68.26°. The haze data for Acadia National Park is collected by an IMPROVE monitor (ACAD1) that is operated and maintained by the National Park Service.

**Figure 6.2-1 Map of Acadia National Park** (source: <http://www.maine.gov/dep/air/meteorology/images/Acadia.jpg>)



**Figure 6.2-2 Acadia National Park on a clear day** (source <http://www.hazecam.net/class1/acadia.html>)



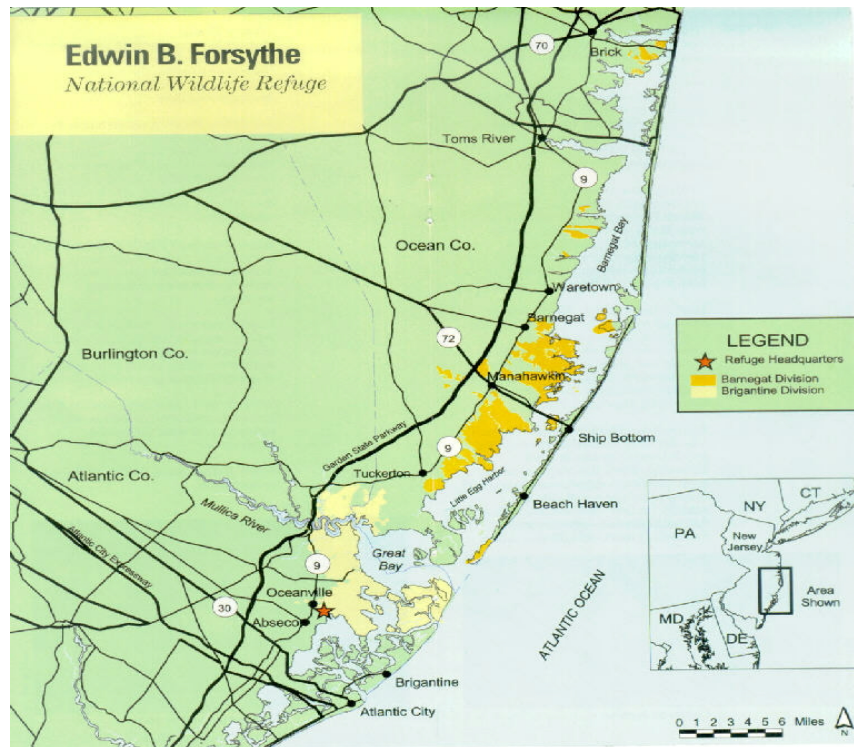
**Figure 6.2-3 Acadia National Park on a hazy day** (source: <http://www.hazecam.net/class1/acadia.html>)



### Brigantine Wilderness Area, New Jersey

The IMPROVE monitor for the Brigantine Wilderness Area (indicated as BRIG1) is located at the Edwin B. Forsythe National Wildlife Refuge Headquarters in Oceanville New Jersey at an elevation of 5 meters, a latitude of 39.47° and a longitude of -74.45°. The haze data for Brigantine Wilderness Area is collected by an IMPROVE monitor (BRIG1) that is operated and maintained by the Fish & Wildlife Service.

**Figure 6.2-4 Map of Edwin B. Forsythe National Wildlife Refuge** (source: <http://www.fws.gov/northeast/forsythe/MAP.htm>)



**Figure 6.2-5 Brigantine Wilderness Area on a clear day** (source: <http://www.hazecam.net/class1/brigantine.html>)



**Figure 6.2-6 Brigantine Wilderness Area on a hazy day** (source: <http://www.hazecam.net/class1/brigantine.html>)

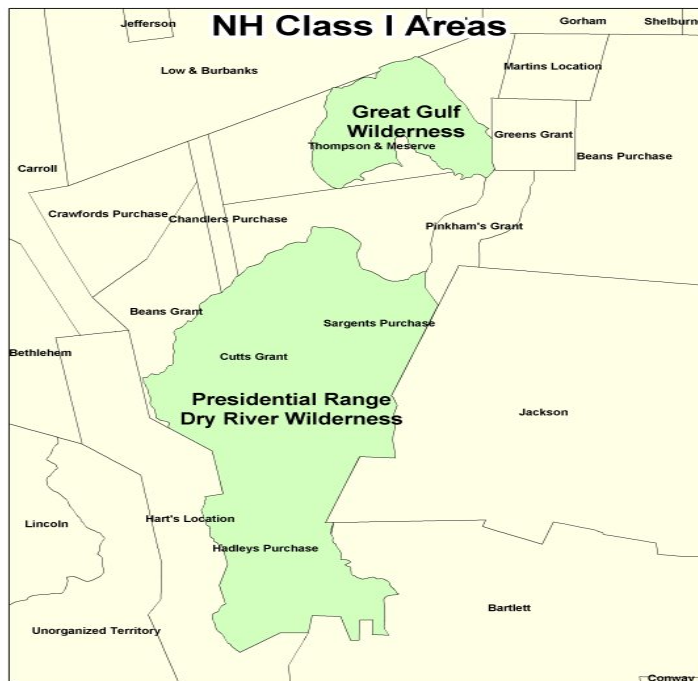




### Great Gulf Wilderness Area, New Hampshire

The IMPROVE monitor for the Great Gulf Wilderness Area (indicated as GRGU1) is located at Camp Dodge, White Mountain NF, South of Gorham New Hampshire, at an elevation of 454 meters, a latitude of 44.31° and a longitude of -71.22°. This monitor also represents the Presidential Range/Dry River Wilderness Area in New Hampshire. The haze data for Great Gulf Wilderness Area is collected by an IMPROVE monitor (GRGU1) that is operated and maintained by the Forest Service.

**Figure 6.2-7 Map of Great Gulf Wilderness Area and Presidential Range/Dry River Wilderness Area** (source: <http://www.maine.gov/dep/air/meteorology/images/NHclass1.jpg>)



**Figure 6.2-8 Great Gulf Wilderness Area on a clear day** (source: <http://www.wilderness.net/>)



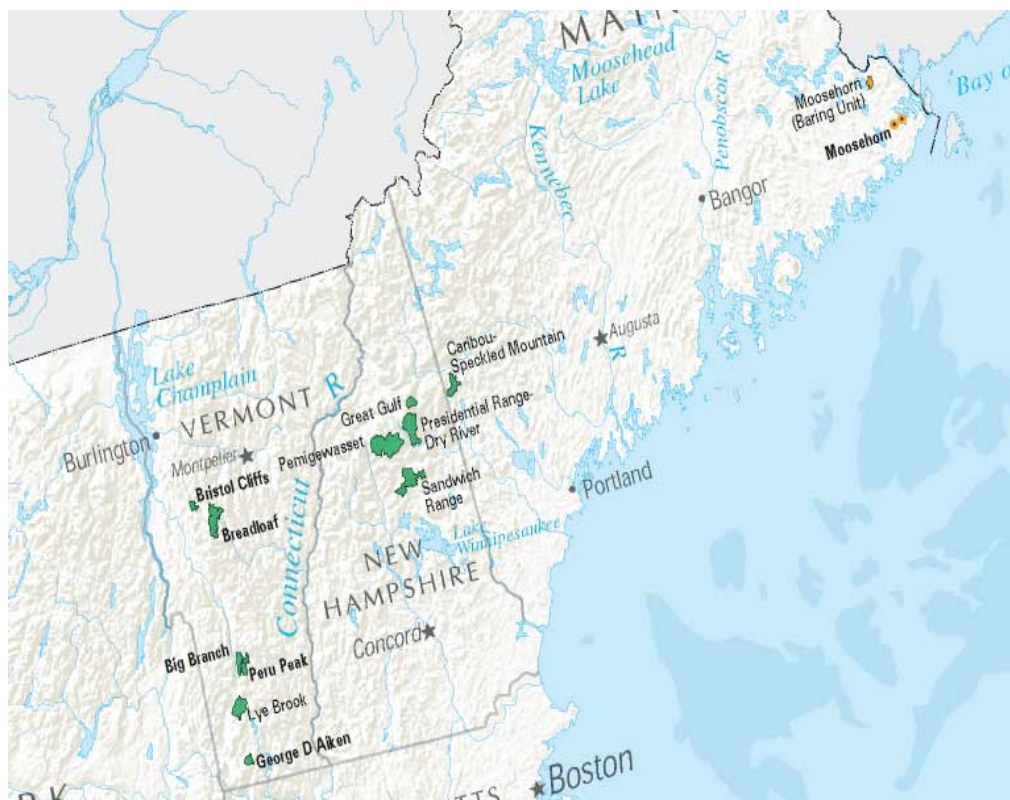
**Figure 6.2-9 Great Gulf Wilderness Area on a hazy day** (source: <http://www.wilderness.net/>)



### Lye Brook Wilderness, Vermont

The IMPROVE monitor for the Lye Brook Wilderness Area (indicated as LYBR1) is located on Mount Equinox at the windmills in Manchester Vermont at an elevation of 1015 meters, a latitude of 43.15° and a longitude of -73.13°. The haze data for Lye Brook Wilderness Area is collected by an IMPROVE monitor (LYBR1) that is operated and maintained by the Forest Service.

**Figure 6.2-10 Map of Lye Brook Wilderness Area** (source: <http://www.wilderness.net/index.cfm?fuse=NWPS&sec=stateView&state=NH&map=menhvt>)



**Figure 6.2-11 Lye Brook Wilderness Area on a clear day** (source: <http://www.hazecam.net/class1/lye.html>)



**Figure 6.2-12 Lye Brook Wilderness Area on a hazy day** (source: <http://www.hazecam.net/class1/lye.html>)



### Moosehorn Wilderness Area, Maine

The IMPROVE monitor for the Moosehorn Wilderness Area (indicated as MOOS1) is located near McConvey Road, about one mile northeast of the National Wildlife Refuge Baring Unit Headquarters in Maine at an elevation of 78 meters, a latitude of 45.13° and a longitude of -67.27°. This monitor also represents the Roosevelt/Campobello International Park in New Brunswick, Canada. The haze data for Moosehorn Wilderness Area is collected by an IMPROVE monitor (MOOS1) that is operated and maintained by the Fish & Wildlife Service.

**Figure 6.2-13 Map of Moosehorn Wilderness Area** that differentiates between the Wilderness Area and the Wildlife Refuge (source: Martha Webster of Maine Department of Environmental Protection-Bureau of Air Quality)



**Figure 6.2-14 Moosehorn Wilderness Area on a clear day** (source: NESCAUM)



**Figure 6.2-15 Moosehorn Wilderness Area on a hazy day** (source: NESCAUM)

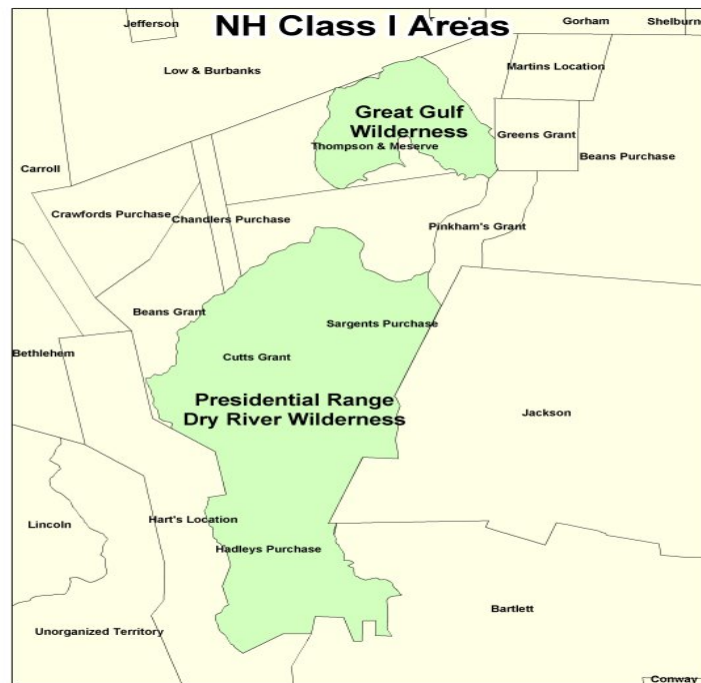


### Presidential Range/Dry River Wilderness Area, New Hampshire

The IMPROVE monitor for the Great Gulf Wilderness Area also represents the Presidential Range/Dry River Wilderness Area (indicated as GRGU1). The Presidential Range/Dry River Wilderness Area monitor is located at Camp Dodge, White Mountain NF, South of Gorham New Hampshire, at an elevation of 454 meters, a latitude of 44.31° and a longitude of -71.22°. The haze data Presidential Range/Dry River Wilderness Area is collected by an IMPROVE monitor (GRGU1) that is operated and maintained by the Forest Service.

**Figure 6.2-16 Map of Great Gulf Wilderness Area and Presidential Range/Dry River Wilderness Area** (source:

<http://www.maine.gov/dep/air/meteorology/images/NHclass1.jpg>)





**Figure 6.2-17 Presidential Range/Dry River Wilderness Area** shares a scene camera with Great Gulf Wilderness Area. Since the pictures would be the same for both sites, below is a picture of Presidential Range/Dry River Wilderness Area in autumn (source: <http://www.wilderness.net/>)



**Roosevelt/Campobello International Park, New Brunswick, Canada**

The IMPROVE monitor for the Moosehorn Wilderness Area is also the monitor for Roosevelt/Campobello International Park (indicated as MOOS1). The monitor is located near McConvey Road, about one mile northeast of the Moosehorn National Wildlife Refuge Baring Unit Headquarters in Maine at an elevation of 78 meters, a latitude of 45.13° and a longitude of -67.27°. The haze data for Roosevelt/Campobello International Park is collected by the IMPROVE monitor (MOOS1) that is operated and maintained by the United States Fish & Wildlife Service.

**Figure 6.2-18 Map of Roosevelt/Campobello International Park** (source:

<http://www.maine.gov/dep/air/meteorology/images/rcip.jpg>)



**Figure 6.2-19 Roosevelt/Campobello International Park on a clear day** (source: Chessie Johnson)



**Figure 6.2-20 Roosevelt/Campobello International Park on a hazy day** (source: Roosevelt Campobello International Park Commission)



### **6.3. Use of Monitoring Data in Contribution Assessment**

Monitoring data contributes to our understanding of visibility impairment in the region. A review of the literature and of recent monitoring data has yielded a conceptual model of visibility impairment in the MANE-VU region that attributes a dominant role, on the worst visibility days, to the sulfate component of fine particle matter. Available monitoring data support and validate this conceptual model.

Given that sulfates, in particular, play a dominant role in causing visibility impairment throughout the Eastern United States, MANE-VU has employed multiple methods of apportioning the sulfate mass found in ambient air at Class I sites to contributing states and regions. This weight-of-evidence approach relies on several independent methods for assessing the contribution of different emissions sources and geographic source regions to regional haze in the northeastern and mid-Atlantic portions of the United States. These include Eulerian (grid-based) source models, Lagrangian (air pollution-based) source dispersion models, and a variety of data analysis techniques that include source apportionment models, back trajectory calculations, and the use of monitoring and inventory data. This weight-of-evidence approach to the contribution assessment and pollution apportionment analysis required by the regional haze regulations is intended to overcome large uncertainties that would otherwise undermine confidence in the results obtained using any one modeling or analysis technique by itself.

### **6.4. Additional Monitoring Data**

While the Department believes that the current IMPROVE network provides sufficient data to adequately measure and report progress toward the goals set for Class I areas that emission sources located in Pennsylvania may affect, the Department has also found additional monitoring information useful to assess visibility and fine particle pollution in

the region. Examples of these data include results from the MANE-VU Rural Aerosol Intensive Network (RAIN) network, which provides continuous, speciated information on rural aerosol characteristics and visibility parameters; the EPA Clean Air Status and Trends Network (CASTNET) program, which provides complementary rural fine particle speciation data at non-class I sites; the EPA Speciation Trends Network (STN), which provides speciated, urban fine particle data to help develop a comprehensive picture of local and regional sources; state-operated rural and urban speciation sites using IMPROVE or STN methods; and the Supersites program, which has provided information through special studies that generally expands our understanding of the processes that control fine particle formation and transport in the region. The Department will continue to utilize these and other data -- as they are available and fiscal realities allow -- to improve our understanding of visibility impairment and to document progress toward reasonable progress goals set under the regional haze regulations for Class I areas that emissions sources located in Pennsylvania may affect.

## **7.0. Emissions Inventory**

### **7.1. Emissions Inventory Background and Requirements**

Section 51.308(d)(3)(iii) of EPA's RHR requires the Department to identify the baseline emission inventory on which strategies are based. The EPA guidance document, *2002 Base Year Emission Inventory SIP Planning: 8-hour Ozone, PM<sub>2.5</sub>, and Regional Haze Programs*, identifies 2002 as the anticipated baseline emission inventory year for regional haze. Consistent with this guidance, MANE-VU and the Department are using 2002 as the baseline emission inventory year.

Section 51.308(d)(4)(v) of EPA's RHR requires a statewide emission inventory of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any mandatory Class I area. As specified in the above-mentioned EPA guidance document, the pollutants inventoried by the Department include volatile organic compounds (VOC), nitrogen oxides (NO<sub>x</sub>), fine particulate (PM<sub>2.5</sub>), coarse particulate (PM<sub>10</sub>), ammonia (NH<sub>3</sub>), and sulfur dioxide (SO<sub>2</sub>). In addition, projections of future emissions have been made for the milestone year 2018. In accordance with Section 51.308(d)(4)(v), the Department will update this inventory periodically.

The emissions inventory as required under Section 51.308(d)(4)(v) is provided only to assess progress in making reductions in accordance with Section 51.308(d)(3)(iii). The inventory does not, in and of itself, indicate contribution to visibility impairment.

Information on emissions of VOC, NO<sub>x</sub>, PM<sub>2.5</sub>, PM<sub>10</sub>, NH<sub>3</sub>, and SO<sub>2</sub> is compiled for:

- “Stationary sources” (or “point” sources), which refer to those sources for which the Department collects individual emissions-related information. Generally they represent major stationary sources but may be smaller.
- “Stationary area sources”, which are industrial, commercial or residential sources too small or too numerous to be handled individually, such as commercial and residential open burning, architectural and industrial maintenance coatings application and clean-up, consumer product use, and vehicle refueling at service stations. Where there is overlap between stationary point sources and stationary area sources, the area source values are adjusted to remove any double counting.
- “Highway vehicles”, which include passenger cars and light-duty trucks, other trucks, buses and motorcycles.
- “Nonroad sources”, which cover a diverse collection of engines including outdoor power equipment, recreational vehicles, farm and construction machinery, lawn and garden equipment, industrial equipment, recreational marine, commercial marine vessels, locomotives, ships, aircraft and many other applications.

Emissions inventory data for 2002, projected emissions inventory data for 2018, and related technical support documents are available on the MARAMA website at: [http://www.marama.org/visibility/EI\\_Projects/index.html](http://www.marama.org/visibility/EI_Projects/index.html).

A summary of the inventory follows. See Appendix F for the complete 2002 baseline emissions inventory for Pennsylvania.

## 7.2. Summary of 2002 Baseline Emissions Inventory

An emissions inventory for the base year, 2002, was developed in accordance with EPA guidance. Table 7.2-1 summarizes the Pennsylvania emissions for 2002.

**Table 7.2-1 Pennsylvania’s 2002 Emissions In Tons Per Year**

	<b>SO2</b>	<b>NOx</b>	<b>PM10</b>	<b>PM2.5</b>	<b>VOC</b>	<b>NH3</b>
Stationary Point Sources	995,175	297,379	40,587	20,115	37,323	1,388
Stationary Area Sources	63,679	47,591	391,897	74,925	240,785	79,911
Highway Vehicles	10,882	346,472	7,468	5,450	176,090	10,497
Nonroad Engines/Vehicles	7,915	103,824	9,738	8,440	102,331	55
<b>TOTAL</b>	<b>1,077,651</b>	<b>795,266</b>	<b>449,690</b>	<b>108,930</b>	<b>556,529</b>	<b>91,851</b>

### 7.2.1. Summary of Inventory Methodologies

The 2002 emissions were first generated by individual states in the MANE-VU area. MARAMA then coordinated and quality-assured the 2002 inventory data, and projected it for the relevant control years. The 2002 emissions from the non-MANE-VU states within the modeling domain were obtained from other Regional Planning Organizations (RPOs) for their corresponding areas. These RPOs included the Visibility Improvement State and Tribal Association of the Southeast (VISTAS), the Midwest Regional Planning Organization (MRPO) and the Central Regional Air Planning Association (CenRAP). Version 3 of the 2002 base year emission inventory was used in the regional modeling exercise.

Work on Version 1 of the 2002 MANE-VU inventory began in April 2004. The consolidated inventory for point, area, mobile and nonroad sources was prepared starting with the inventories that MANE-VU state/local agencies submitted to the EPA from May through July of 2004 as a requirement of the Consolidated Emissions Reporting rule. The EPA’s format and content quality assurance (QA) programs (and other QA checks not included in EPA’s QA software) were run on each inventory to identify format and/or data content issues.<sup>3</sup> A contractor, E.H. Pechan & Associates, Inc. (Pechan), worked with

<sup>3</sup> EPA. Basic Format and Content Checker 3.0 (Formerly known as the Quality Assurance / Quality Control Software 3.0) – March 2004. Extended Quality Control Tool – Updated May 18, 2004, United States Environmental Protection Agency, 2004.

the MANE-VU state/local agencies and the MARAMA staff to resolve QA issues and augment the inventories to fill data gaps in accordance with the Quality Assurance Project Plan prepared for MANE-VU.<sup>4</sup> The final inventory and SMOKE and input files were finalized during January 2005.

Work on Version 2 (covering the period from April through September 2005) involved incorporating revisions requested by some MANE-VU state/local agencies on the point, area, and nonroad inventories. Work on Version 3 (covering the period from December 2005 through April 2007) included additional revisions to the point, area, and nonroad inventories as requested by some states. Thus, Version 3 inventory for point, area, and nonroad sources was built upon Versions 1 and 2. This work also included development of the biogenics inventory. In Version 3, the nonroad inventory was completely redone because of changes that the EPA made to the NONROAD2005 model. Emissions inventory data files are available on the MARAMA website at:  
[http://www.marama.org/visibility/EI\\_Projects/index.html](http://www.marama.org/visibility/EI_Projects/index.html).

The Technical Support Document for the 2002 MANE-VU SIP Modeling Inventories, Version 3 (Pechan, 2006), is available on the MARAMA website at:  
[http://www.marama.org/visibility/EI\\_Projects/index.html](http://www.marama.org/visibility/EI_Projects/index.html). This document explains the data sources, methods, and results for preparing this version of the 2002 baseline inventory. The following link summarizes the 2002 emissions inventory used by MANE-VU:  
<http://www.marama.org/visibility/Inventory%20Summary/2002EmissionsInventory.htm>

### 7.3. Projected Inventories

#### 7.3.1. Summary of 2018 Estimated Emissions

Table 7.3.1-1- summarizes the projected emissions in 2018 for Pennsylvania. These emissions take activity and emissions growth and/or controls from 2002 into account. More specific information on the 2018 projected emissions inventory for Pennsylvania is compiled in the Appendix H.

**Table 7.3.1-1 Pennsylvania’s 2018 Projected Emissions**  
 (TONS PER YEAR)

	<b>SO2</b>	<b>NOx</b>	<b>PM10</b>	<b>PM2.5</b>	<b>VOC</b>	<b>NH3</b>
Stationary Point Sources	266,455	162,067	60,480	39,468	46,004	3,381
Stationary Area Sources	42,072	50,829	195,467	50,842	230,011	117,400
Highway Vehicles	1,436	91,516	2,148	2,064	78,624	13,933
Nonroad Engines/Vehicles	607	55,771	6,949	5,808	69,956	73
<b>TOTAL</b>	<b>310,570</b>	<b>360,183</b>	<b>265,044</b>	<b>98,182</b>	<b>424,595</b>	<b>134,787</b>

<sup>4</sup> MANE-VU. Quality Assurance Project Plan (QAPP) for Area and Point Source Emissions Modeling Inventory Project, Final. (Prepared for MANE-VU by E.H. Pechan & Associates, Inc. and Carolina Environmental Program, August 3, 2004).

### 7.3.2. Growth Projection Methodologies

This section describes the data, methods, and assumptions utilized in developing estimates of emissions changes between 2002 and the milestone year 2018. Please see Appendix V for detailed descriptions and development of the MANE-VU projected emission inventories: "Development of Emission Projections for 2009, 2012, and 2018 for non-EGU Point, Area, and Nonroad Sources in the MANE-VU Region" (MACTEC, February 28, 2007). Available online:

<http://www.marama.org/visibility/Inventory%20Summary/FutureEmissionsInventory.htm>

The mass emissions Inventory files were converted to the National Emissions Inventory Input Format Version 3.0. Section 10.3 (Technical Documentation) of this SIP, provides more information on how the modeling inventory files were processed in Sparse Matrix Operator Kernel Emissions/Inventory Data Analyzer (SMOKE).

The SMOKE Processing System is principally an emissions processing system, as opposed to a true emissions inventory preparation system, in which emissions estimates are simulated from "first principles." This means that, with the exception of mobile and biogenic sources, its purpose is to provide an efficient, modern tool for converting emissions inventory data into the formatted emissions files required for a photochemical air quality model.

Inside the MANE-VU region, the modeling inventories were processed by the NYSDEC using the SMOKE (Version 2.1) processor to provide inputs for the CMAQ model. There are five emission source classifications in the emissions inventory as follows:

- Stationary point,
- Stationary area,
- Off-road mobile,
- Highway mobile, and
- Biogenic.

**Stationary Point Sources.** Point source emissions are emissions from large individual sources. Generally, point sources have permits to operate and their emissions are individually calculated based on source specific factors on a regular schedule. The largest point sources are inventoried annually. Point sources are grouped into electric generating unit (EGU) sources and other industrial point sources, termed as non-EGU point sources. The non-EGU category used annual emissions as reported for the Consolidated Emission Reporting Rule (CERR) for the base year 2002 (MANE-VU Version 3). These emissions were temporally allocated to month, day, and source category code (SCC) based allocation factors. The general approach for estimating future year emissions was to use growth and control data consistent with EPA's CAIR analyses. This data was supplemented with site specific growth factors as appropriate.



The base year inventory for EGU sources used 2002 continuous emissions monitoring (CEM) data reported to the EPA in compliance with the Acid Rain program or 2002 hourly emission data provided by stakeholders. These data provide hourly emission profiles that can be used in the modeling of emissions of SO<sub>2</sub> and NO<sub>x</sub> from these large sources. Emission profiles are used to estimate emissions of other pollutants (volatile organic compounds, carbon monoxide, ammonia, fine particles, soil) based on measured emissions of SO<sub>2</sub> and NO<sub>x</sub>.

Future year inventories of EGU emissions for 2018 were developed using the Integrated Planning Model (IPM<sup>®</sup>) to forecast growth in electric demand and replacement of older, less efficient and more polluting power plants with newer, more efficient and cleaner units.

The output of the IPM<sup>®</sup> model predicts that a certain number of older plants will be replaced by newer units to meet future electric growth and State-by-State NO<sub>x</sub> and SO<sub>2</sub> caps, and the Department did directly rely upon the closure of the Pennsylvania Power and Light (PPL) Martins Creek plant's coal-fired Units 1 and 2 in establishing the 2018 inventory upon which the reasonable progress goals were set. This specific plant closure is addressed in Section 10.5.3 of this SIP.

In general, the IPM<sup>®</sup> model results are not the basis upon which to reliably predict plant closures. Preliminary modeling was performed with unchanged IPM<sup>®</sup> 2.1.9 model results. However, prior to the Best and Final Modeling, future year EGU inventories were modified as discussed in the paragraphs below.

First, IPM<sup>®</sup> predictions were reviewed by the MANE-VU states' permitting and enforcement staff. In many cases staff felt that the IPM<sup>®</sup> predictions of shutdowns were unlikely to occur. In particular, many oil fired EGUs in urban areas were predicted to be shutdown by IPM<sup>®</sup>. Similar source information was solicited from states in both VISTAS and MWRPO. As a result of this model validation, the IPM<sup>®</sup> modeling output was adjusted before Best and Final modeling to reflect staff source knowledge of specific plant status in MANE-VU, VISTAS and MWRPO states. Where EGUs operating status was contrary to what was predicted by IPM<sup>®</sup> modeling, the future year emissions inventory was adjusted to reflect the operation of those plants expected by state staff.

Second, as a result of inter- and intra- RPO consultations, MANE-VU agreed to pursue a coordinated course of action. This course of action includes pursuing the adoption and implementation of certain "emission management strategies", as appropriate and necessary. See Section 9.3 of this SIP for a complete description of this coordinated course of action. For EGUs, the agreed upon approach was to reduce emissions from 167 stacks located in MANE-VU, MWRPO and VISTAS by 90%. This control strategy is further described in Section 10.4 of this SIP.

**Stationary Area Sources.** Stationary area sources include sources whose individual emissions are relatively small but due to the large number of these sources, the collective emissions are significant. Some examples include the combustion of fuels for heating,

dry cleaners, and service stations. Emissions are estimated by multiplying an emission factor by some known indicator of collective activity, such as fuel usage, or number of households or population. The general approach for estimating future year emissions was to use growth and control data consistent with EPA's CAIR analyses. This data was supplemented with state specific growth factors as appropriate.

**Highway Mobile Sources.** For on-road vehicles, MOBILE6.2 was used to estimate emissions. For future year emissions the model considers that a certain number of the vehicle fleet in each State will be replaced every year by newer, less polluting vehicles that meet the EPA Tier II motor vehicle standards. These lower emissions have been built into the 2018 inventory as well as the benefits received from lower sulfur gasoline in on-road diesel and gasoline vehicles and the 2007 heavy-duty diesel standards. All new mobile source measures and standards, as well as any benefits from implementation of individual State Inspection and Maintenance programs, were used in developing the 2018 inventory.

**Off-Road Mobile Sources.** Non-road mobile sources are equipment that can move but do not use the roadways, such as construction equipment, aircraft, railroad locomotives, lawn and garden equipment. For the majority of the non-road mobile sources, the emissions for base year 2002 were estimated using the EPA's Non-Road model. The Non-Road model considers that a certain number of non-road sources will be replaced every year by newer, less polluting vehicles that meet the new EPA standards for off-road sources. These lower emissions have been built into the 2018 inventory as well as the benefits received from lower sulfur gasoline in off-road vehicles. Aircraft engine, railroad locomotives and commercial marine are not included in the Non-Road model. For these sources growth and control data consistent with EPA's CAIR analyses were used. This data was supplemented with state specific growth factors as appropriate. Additionally, control measures for aircraft, railroad, and commercial marine sources are implemented through federal rules, which are the responsibility of EPA to enforce. EPA estimates for these source categories were relied on.

**Biogenic Emission Sources.** Biogenic emissions were estimated using SMOKE-BEIS3 (Biogenic Emission Inventory System 3 version 0.9) preprocessor. Further information on Biogenic emissions estimation is contained in Section 10.3 (Technical Documentation) of this SIP.

## **8.0. Best Available Retrofit Technology (BART)**

### **8.1. Overview of EPA's BART Rule**

On July 1, 1999, EPA promulgated a final regional haze rule (64 FR 35714). On July 20, 2001, EPA proposed guidelines for implementation of the BART requirements (66 FR 38108). The BART rule and proposed guidelines outlined the method for determining if a facility is subject to the BART requirements, and methods for conducting a BART control review.

The 2001 proposed guidelines were not finalized because industry and environmental groups filed legal challenges to the RHR. Industry challenged the rule as it related to the method by which it directed states to determine the degree of visibility improvement resulting from application of BART controls. Under EPA's interpretation of the rule, a state would have deemed sources to be subject to BART if they emitted pollutants into a geographic area or region that likely transports pollutants downwind into a protected area. In May 2002, the United States Court of Appeals for the District of Columbia Circuit issued a ruling in *American Corn Growers et al. v. EPA*, 291 F.3d 1 (2002), which partially vacated and remanded to EPA the RHR.

On May 5, 2004, EPA proposed regional haze amendments and guidelines for BART determinations in the Federal Register (69 FR 25184); the final regional haze amendments and BART guidelines were published in the Federal Register on July 6, 2005 (70 FR 39104). A further revision to the rule pertaining to alternative trading programs was proposed August 1, 2005 (70 FR 44154) and finalized October 13, 2006 (71 FR 60612). The regulations are codified at 40 CFR Part 51, Subpart P (relating to protection of visibility).

The BART provisions require states and tribes to develop an inventory of sources within each state or tribal jurisdiction that would be eligible for controls. The rule contains the following elements that:

- Outline methods to determine if a source is “reasonably anticipated to cause or contribute to haze”.
- Define the methodology for conducting BART control analysis.
- Provide presumptive limits for EGUs larger than 750 Megawatts.
- Provide a justification for the use of the CAIR as BART for CAIR-affected EGUs.

Beyond the specific elements listed above, EPA provided the states with a great deal of flexibility in implementing the BART program.

The BART requirements apply to sources that were in existence on August 7, 1977 but were not in operation before August 7, 1962 that collectively, at a facility, have the potential to emit more than 250 tons per year of a visibility impairing pollutant.

Visibility impairing pollutants include: NO<sub>x</sub>, SO<sub>2</sub>, PM<sub>10</sub>, and PM<sub>2.5</sub>. VOC and NH<sub>3</sub> (ammonia) may be visibility impairing pollutants; however the Department has determined that modeling tools and accurate emissions inventories to assess the visibility impacts from VOC and NH<sub>3</sub> adequately are not available at this time. The Department did not include VOCs and NH<sub>3</sub> as part of the BART determinations for the following reasons:

EPA's final rule for the "Implementation of the New Source Review Program for Particulate Matter less than 2.5 Micrometers ( PM<sub>2.5</sub>)," (PM<sub>2.5</sub> NSR rule), states the following: "*Volatile organic compounds are presumed not to be precursors to PM<sub>2.5</sub> in any attainment or unclassifiable area, unless the State demonstrates to the Administrator's satisfaction that emissions of volatile organic compounds from stationary sources in a specific area are a significant contributor to that area's ambient PM<sub>2.5</sub> concentrations. However, while significant progress has been made in understanding the role of gaseous organic material in the formation of organic PM, this relationship remains complex. We recognize that further research and technical tools are needed to better characterize emissions inventories for specific VOC compounds, and to determine the extent of the contribution of specific VOC compounds to organic PM mass. In light of the factors discussed above, EPA proposes that States are not required to address VOCs as PM<sub>2.5</sub> nonattainment plan precursors, unless the State or EPA makes a finding that VOCs significantly contribute to a PM<sub>2.5</sub> nonattainment problem in the State or to other downwind air quality concerns. In proposing this policy, we are mindful of the fact that a majority of areas that have been designated as nonattainment for PM<sub>2.5</sub> are already designated as nonattainment for the 8-hour ozone standard. Thus, these areas will already be required to evaluate VOC control measures for ozone purposes. (The inventory of VOC as defined here, including gaseous organic compounds, is essentially identical to the inventory of VOC for ozone control purposes.)*" (See, 73 FR 28329, May 16, 2008)

In discussing ammonia, EPA in the preamble for the PM<sub>2.5</sub> NSR rule states: "...*In regard to ammonia, however, we believe there is sufficient uncertainty about emissions inventories and about the potential efficacy of control measures from location to location such that the most appropriate approach for proposal is a case-by-case approach...*". (See, 73 FR 28330)

The Department agrees with EPA's rationale discussed above. Because of the lack of tools to estimate emissions and subsequently model VOC and ammonia, and because Pennsylvania is aggressively addressing VOCs through the ozone SIPs, the Department asserts that SO<sub>2</sub>, NO<sub>x</sub> and PM<sub>10/2.5</sub> are the only reasonable contributing visibility impairing pollutants to target under BART.

The BART requirements only apply to sources in specific categories listed in the Clean Air Act. These categories are:

1. Fossil-fuel fired steam electric plants of more than 250 million British thermal units (BTU) per hour heat input,
2. Coal cleaning plants (thermal dryers),

3. Kraft pulp mills,
4. Portland cement plants,
5. Primary zinc smelters,
6. Iron and steel mill plants,
7. Primary aluminum ore reduction plants,
8. Primary copper smelters,
9. Municipal incinerators capable of charging more than 250 tons of refuse per day,
10. Hydrofluoric, sulfuric, and nitric acid plants,
11. Petroleum refineries,
12. Lime plants,
13. Phosphate rock processing plants,
14. Coke oven batteries,
15. Sulfur recovery plants,
16. Carbon black plants (furnace process),
17. Primary lead smelters,
18. Fuel conversion plants,
19. Sintering plants,
20. Secondary metal production facilities,
21. Chemical process plants,
22. Fossil-fuel boilers of more than 250 million BTUs per hour heat input,
23. Petroleum storage and transfer facilities with a capacity exceeding 300,000 barrels,
24. Taconite ore processing facilities,
25. Glass fiber processing plants, and
26. Charcoal production facilities.

The BART determination process consists of three key steps:

1. Identify all BART-eligible sources.
2. For each BART-eligible source, determine whether it “emits any pollutants which may reasonably be anticipated to cause or contribute to any visibility impairment” at a Class I area. Such sources are “subject to BART.”
3. For each source that is “subject to BART”, determine if additional controls or emission limits are necessary.

The following sections provide information regarding the BART identification and determination process. The Department’s BART analysis review memos for each source subject to BART are included in Appendix J.

## **8.2. EGUs and CAIR**

The BART-eligible EGUs in MANE-VU represent the largest emissions reduction potential among the various BART-eligible source categories. EPA has decided that CAIR satisfies the BART requirement for SO<sub>2</sub> and NO<sub>x</sub> for EGUs in states participating in the CAIR program. EPA did not rescind that decision as a result of the court remand of CAIR to EPA for revisions, in *State of North Carolina v. Environmental Protection Agency*, 531 F.3d 896 (D.C. Cir. 2008). CAIR remains in place during EPA’s revisions.

BART-eligible EGUs that are subject to the CAIR provisions are those in Pennsylvania, Delaware, Maryland, the District of Columbia, New Jersey, and New York. BART-eligible EGUs located in Connecticut and Massachusetts are also included in the CAIR program, but only with respect to their ozone-season NOx emissions. Because BART-eligible EGUs located in Pennsylvania are subject to the federal CAIR program for SO2 and NOx, BART determinations were conducted for emissions of PM only.

### 8.3. BART Source Cap-Out Permits

Several BART-eligible facilities in Pennsylvania are relatively small emission sources with potential emissions that exceed the statutory threshold of 250 tons per year or more, but with actual emissions of visibility impairing pollutants well below 250 tons in any year. The Department gave these facilities the option to accept federally enforceable permit limitations restricting their emissions to less than 250 tons per year. The owners and operators of facilities limiting their emissions in this way are no longer BART-eligible.

For completeness, facilities containing units otherwise eligible for BART that elected to become not BART-eligible by accepting federally enforceable permit limits to restrict their emissions to below the BART threshold are listed in Table 8.3-1 below. Changes at these sources or in their permits that would allow for an increase in emissions would subject these sources to a BART review. The Eastman Chemical Resins Company, one of the sources listed in the table below, is a chemical process plant located in Allegheny County. Seventy-five units at the facility were determined to be BART date-eligible units. Eastman Chemical Resins decided to retire four of the BART units (four tanks) to reduce potential emissions to below 250 tons per year for all BART eligible pollutants. The Enforcement Order from the Allegheny County Health Department (ACHD) that restricts emissions to below 250 tons per year from Eastman Chemical Resins is included with this SIP, and is submitted to the EPA as a part of this SIP. (See Appendix BB for the ACHD cover letter and Order, and the ACHD review memo.)

**Table 8.3-1 Pennsylvania Facilities Not BART-Eligible Due to Federally Enforceable Permit Restrictions**

<b>Facility Name and County Location</b>	<b>Permit # and Permit Issue Date</b>	<b>Pollutant(s) Restricted and PTE Permit Limit</b>	<b>PTE Permit Limit Date and Statutory Authority</b>
VICTAULIC CO AMER/FORKS FACILITY Northampton	TV 48-00009 9/12/07	PM10 - < 250 tpy	9/12/07 25 Pa. Code §127.441
AMERICAN REFINING GR/BRADFORD	TV 42-00004 6/16/08	NOX - < 250 tpy PM10 - < 250 tpy SO2 - < 250 tpy	6/16/08 25 Pa. Code §127.441

<b>Facility Name and County Location</b>	<b>Permit # and Permit Issue Date</b>	<b>Pollutant(s) Restricted and PTE Permit Limit</b>	<b>PTE Permit Limit Date and Statutory Authority</b>
McKean		VOC - < 250 tpy	
MERCER LIME & STONE /BRANCHTON Butler	TV 10-00023 1/10/07	NOX – 249 tpy SO2 – 249 tpy	1/10/07 25 Pa. Code §127.441
DUFERCO FARRELL CORP/FARRELL PLT Mercer	TV 43-00310 6/16/08	NOX - < 250 tpy	6/16/08 25 Pa. Code §127.441
INMETCO/ELLWOOD CITY Lawrence	TV 37-00243 12/12/06	NOX – 249.5 tpy PM10 – 249.5 tpy	12/12/06 25 Pa. Code §127.441
INDSPEC CHEM CORP/PETROLIA Butler	TV 10-00021 3/9/07	VOC – 247 tpy	3/9/07 25 Pa. Code §127.441
LWB REFRACTORIES CO/W MANCHESTER York	PA 67-05001D 2/13/07	SO2 – 249 tpy	2/13/07 25 Pa. Code §127.12b
EXIDE TECH/READING SMELTER Berks	PA 06-05066E 4/3/07	SO2 - < 240 tpy	4/3/07 25 Pa. Code §127.12b
HORSEHEAD CORP/MONACA SMELTER Beaver	TV 04-00044 10/22/07	NOX - < 249 tpy PM10 - < 249 tpy SO2 - < 249 tpy VOC - < 249 tpy	10/22/07 25 Pa. Code §127.441
EASTMAN CHEMICAL RESINS INC Allegheny <sup>5</sup>	Enforcement Order 4/24/08	VOC - < 250 tpy	5/9/08 ACHD’s Rules and Regulations, Article XXI, §2109.03

<sup>5</sup> The Department has determined that the Eastman Chemical Resins, Inc. facility is not a BART-eligible source since its potential to emit is below the 250 tons per year threshold. The Department makes this determination for the following three reasons: 1) the April 28, 2008, Allegheny County Health Department (ACHD) cover letter states that the tanks are out of service and incapable of storing liquid; 2) the April 28, 2008, ACHD Order renders the tanks unusable for the storage of VOCs; and, 3) the review memo states that “ACHD had conducted an inspection of the tanks in November 2007, and found that one had large holes cut into it and the piping and instrumentation had been removed from the others, making it impossible for the tanks to be placed back into service without making major modifications.”

#### 8.4. BART-Eligible Sources in Pennsylvania

The list of facilities in Pennsylvania that include BART-eligible units is shown in Table 8.4-1. The BART-eligible sources were identified using the methodology in the Guidelines for Best Available Retrofit Technology (BART) Determinations under the Regional Haze Rule (40 CFR Part 51, Appendix Y.) The Department’s BART analysis review memos for each source subject to BART are included in Appendix J.

**Table 8.4-1 Pennsylvania Facilities with Bart-Eligible Units**

<b>Facility</b>	<b>County</b>
EXELON GENERATION CO/EDDYSTONE	Delaware
ISG PLATE LLC/COATESVILLE	Chester
SUNOCO INC (R&M)/MARCUS HOOK REFINERY	Delaware
CONOCOPHILLIPS CO/TRAINER REF	Delaware
PPL MONTOUR LLC/MONTOUR SES	Montour
PPL MARTINS CREEK LLC/MARTINS CREEK	Northampton
RELIANT ENERGY/PORTLAND GENERATING STATION	Northampton
LAFARGE CORP/WHITEHALL PLT	Lehigh
KEYSTONE PORTLAND CE/EAST ALLEN	Northampton
ORION POWER MIDWEST /NEW CASTLE PLT	Lawrence
CEMEX INC/WAMPUM CEMENT PLT	Lawrence
ESSROC/BESSEMER	Lawrence
AK STEEL CORP/BUTLER WORKS	Butler
UNITED REFINING CO/WARREN PLT	Warren
PPL BRUNNER ISLAND LLC/BRUNNER ISLAND	York
APPLETON PAPERS INC/SPRING MILL	Blair
PH GLATFELTER CO/SPRING GROVE	York
LEHIGH CEMENT CO /EVANSVILLE CEMENT PLT	Berks
CARMEUSE LIME INC/MILLARD LIME PLT	Lebanon
LEHIGH CEMENT CO/YORK OPERATIONS	York
ALLEGHENY ENERGY SUPPLY/HATFIELDS FERRY POWER STA	Greene
ALLEGHENY ENERGY SUPPLY/MITCHELL POWER STA	Washington
EME HOMER CITY GEN LP	Indiana
RELIANT ENERGY NORTHEAST/CONEMAUGH PLT	Indiana
RELIANT ENERGY NORTHEAST MGMT/KEYSTONE POWER PLT	Armstrong
FIRSTENERGY GEN CORP/BRUCE MANSFIELD PLT	Beaver
DYNO NOBEL INC/DONORA	Washington
RELIANT/CHESWICK	Allegheny
US STEEL/CLAIRTON WORKS	Allegheny
ALLEGHENY LUDLUM/BRACKENRIDGE	Allegheny



<b>Facility</b>	<b>County</b>
SUNOCO CHEMICALS/FRANKFORD PLANT	Philadelphia
SUNOCO INC (R&M)/PHILADELPHIA REFINERY	Philadelphia
TRIGEN/EDISON STATION	Philadelphia
TRIGEN/SCHUYLKILL STATION	Philadelphia

## **8.5. Sources Subject to BART**

According to the Guidelines for Best Available Retrofit Technology (BART) Determinations, once the state has compiled its list of BART-eligible sources, it needs to determine whether to make BART determinations for all of the sources or to consider exempting some of them from BART because they may not reasonably be anticipated to cause or contribute to any visibility impairment in a Class I area. The Department decided not to exempt a BART-eligible source based on a cause or contribute deciview threshold, and made BART determinations for all BART-eligible sources. The Department’s BART analysis review memos for each source subject to BART are included in Appendix J.

### **8.5.1. Making BART Determinations for all BART-Eligible Sources**

Based on the collective importance of BART sources, in June 2004, the MANE-VU Board decided that a BART determination would be made for each BART-eligible source. Consistent with the MANE-VU decision, the Department made a BART determination for each of these sources.

### **8.5.2. Anticipated Visibility Improvement as a Result of BART**

MANE-VU conducted modeling analyses of individual BART-eligible sources using CALPUFF – a model preferred by EPA for assessing long range transport of pollutants and their impacts - in order to provide a regionally consistent foundation for assessing the degree of visibility improvement that could result from installation of BART controls. Summary spreadsheets of the MANE-VU CALPUFF modeling results for the Pennsylvania BART sources are included in Appendix I. Affected facilities also had the option of conducting additional modeling to be considered in the BART determination.

The Department considered the results of the CALPUFF modeling analysis, and also any additional modeling conducted by individual BART sources in its determination of BART for each BART source. In accordance with the Guidelines for Best Available Retrofit Technology (BART) Determinations, in making BART determinations for the sources subject to BART in Pennsylvania, the Department considered the following five factors in identifying the best system of continuous emission control technology available: the costs of compliance; the energy and the non-air quality environmental impacts of compliance; any pollution control equipment in use or in existence at the source; the remaining useful life of the source; and the degree of improvement in visibility which may reasonably be anticipated to result from the use of such technology.

The CALPUFF modeling results were used in consideration of the factor of the degree of improvement in visibility expected from available control technology.

The Department did not establish or utilize bright line thresholds for cost or for visibility improvement. Instead, the Department employed an approach that considered the multiple BART Guideline factors. As a result, sources with a higher degree of potential visibility improvement from control would justify higher cost controls. Conversely, only low cost controls would be justified for sources with a lower degree of potential visibility improvement.

## **8.6. BART Determinations, Control Levels and Schedules**

The BART determinations for the sources subject to BART in Pennsylvania are summarized in the paragraphs below. BART is the emission limit for each pollutant based on the degree of reduction achievable through the application of the best system of continuous emission control technology available, taking into consideration: the costs of compliance, the energy and the non-air quality environmental impacts of compliance, any pollution control equipment in use or in existence at the source, the remaining useful life of the source, and the degree of improvement in visibility which may reasonably be anticipated to result from the use of such technology. The Department's BART analysis review memos for each source subject to BART are included in Appendix J. All review memos are confirmed as the Department's conclusions. The BART analyses identified the best system of continuous emission control technology available and include the consideration of these five factors: the costs of compliance, the energy and non-air quality environmental impacts, any existing pollution controls at the source, the remaining useful life of the source and the degree of improvement in visibility, the latter of which is determined in the Visibility Impacts portion of each review memo. The consideration of the degree of improvement in visibility is based on the maximum 24-hour NESCAUM-modeled impact at the Class I area of maximum impact. However, if an affected BART source conducted a CALPUFF modeling analysis that used three years of meteorological data input, a BART determination was performed using the 98<sup>th</sup> percentile deciview modeled impact, as allowed in the Regional Haze Regulations and Guidelines for Best Available Retrofit Technology (BART) Determinations, Final Rule (40 CFR Part 51, July 6, 2005).

The BART for each source subject to BART was determined based on the methodology in the Guidelines for Best Available Retrofit Technology (BART) Determinations Under the Regional Haze Rule (40 CFR Part 51, Appendix Y).

The Regional Haze Rule requires the control levels that are determined to be BART are be installed and operated no later than five years after approval of this implementation plan revision by EPA (40 CFR 51.308(e)(1)(iv)). The Regional Haze Rule also requires that each source subject to BART maintain the required control equipment and establish procedures to ensure such equipment is properly operated and maintained (40 CFR 51.308(e)(1)(v)). The existing Title V operating permits issued by the Department contain conditions that require any existing controls determined to be BART to be operated and

maintained. The Title V permit conditions also contain reporting, monitoring, and recordkeeping requirements adequate to determine the source's compliance.

The table below summarizes the level of control determined to be BART for the 34 BART-eligible sources in Pennsylvania, and includes the permit number and issue date of the current Title V permit (or applicable consent decree), and the emissions monitoring and reporting requirements cited in the Title V permit (or applicable consent decree) for each BART-eligible unit. The Department proposes to determine that existing controls satisfy BART for the BART sources listed below in Table 8.6. The Department's BART analyses for each source subject to BART are detailed in review memos and provide a complete analysis of the BART control level established. The BART analysis review memos are in Appendix J.

**Table 8.6 BART Control Levels**

<b>BART Source Name &amp; Unit Id</b>	<b>Permit No. and Date of Issue</b>	<b>Pollutant and Emission Limit</b>	<b>Emissions Reporting and Monitoring</b>
ConocoPhillips FCCU/CO Boiler Unit ID #C01	Consent Decree, Civil Action H-05-0258 (1/27/05) Title V Permit 23- 00003 (12/22/08)	SO <sub>2</sub> : 25 ppmvd (365-day rolling average). PM: 0.5 lb/1000 lb coke burn (3- hr average). NO <sub>x</sub> : 121.1 ppmvd (365-day) 155.3 ppmvd (7-day).	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139. 40 CFR Parts 60 and 63. See Consent Decree, Appendix DD. 40 CFR Part 60 and Part 60 Appendices A, B and F.
ConocoPhillips Platform Feed Heater Unit ID 738	Title V Permit 23- 00003 (12/22/08)	NO <sub>x</sub> : 0.12 lb/MMBtu. SO <sub>2</sub> : 0.011 lb/MMBtu (both limits are on an annual basis).	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139. 40 CFR Parts 60 and 63.
Sunoco Inc. Marcus Hook Refinery FCCU/CO Boiler Unit ID 101 and COB1	Consent Decree, Civil Action 05-CV-02866 (6/16/05) Title V Permit 23- 00001 (11/18/08)	SO <sub>2</sub> : 25 ppmvd (365-day rolling average). NO <sub>x</sub> : 20 ppmvd (365-day rolling average). PM: 1.0 lb/1000 lb coke burn.	See Consent Decree, Appendix EE. 40 CFR Part 60 and Part 60 Appendices A, B and F.
Sunoco Inc. Marcus Hook Refinery 17-2A, H-01 Heater	Title V Permit 23- 00001 (11/18/08)	NO <sub>x</sub> : 0.25 lb/MMBtu (24-hr basis). SO <sub>2</sub> : 500 ppmvd.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139. 40 CFR Parts 60 and 63.
United Refining Co. Boiler 4	Title V Permit 62- 00017 (8/20/07)	NO <sub>x</sub> : 0.173 lb/MMBtu. SO <sub>2</sub> : 24.3 lbs/hr.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139. 40 CFR Parts 60 and 63.
United Refining Co. Crude Heater- North	Title V Permit 62- 00017 (8/20/07)	NO <sub>x</sub> : 0.226 lb/MMBtu. SO <sub>2</sub> : 207.7 lbs/hr.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139. 40 CFR Parts 60 and 63.
Carmeuse Lime Inc. Kiln Number 5	Title V Permit 38- 05003 (4/27/06)	NO <sub>x</sub> : 6.0 lb/ton lime. SO <sub>2</sub> : 500 ppmvd.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139. 40 CFR Part 64.
Lehigh Cement Co. Evansville Plant	Title V Permit 06- 05002 (9/14/09)	NO <sub>x</sub> : 367.7 lbs/hr. SO <sub>2</sub> : 59.4 lbs/hr.	25 Pa. Code §§ 127.441, 127.442, 127.511, and

<b>BART Source Name &amp; Unit Id</b>	<b>Permit No. and Date of Issue</b>	<b>Pollutant and Emission Limit</b>	<b>Emissions Reporting and Monitoring</b>
Kiln Number 1		PM: 34.8 tons/12 month period. PM10: 87.4 tons/12 month period.	§§ 123, 135 and 139. 40 CFR Part 63.
Lehigh Cement Co. Evansville Plant Kiln Number 2	Title V Permit 06-05002 (9/14/09)	NOx: 367.7 lbs/hr. SO2: 59.4 lbs/hr. PM: 34.8 tons/12 month period. PM10: 87.4 tons/12 month period.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139. 40 CFR Part 63.
Lehigh Cement Co. York Operations White Cement Kiln	Title V Permit 67-05024 (2/17/06)	NOx: 8.2 lbs/ton. SO2: 500 ppmvd. PM: 0.02 grains/dscf.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139. 40 CFR Part 63.
Lafarge Corp. Whitehall Plant Kiln K-2	Title V Permit 39-00011 (12/31/00)	NOx: 297.7 lbs/hr. NOx: 260.5 lbs/hr (TDF). SO2: 362 lbs/hr. PM: 14.8 lbs/hr.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139. 40 CFR Parts 60 and 63.
Lafarge Corp. Whitehall Plant Kiln K-3	Title V Permit 39-00011 (12/31/00)	NOx: 202.3 lbs/hr. NOx: 166.0 lbs/hr (TDF). SO2: 195.0 lbs/hr. PM: 7.3 lbs/hr.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139. 40 CFR Parts 60 and 63.
CEMEX Inc. Wampum Plant Kiln No. 3	Title V Permit 37-00013 (3/5/07)	NOx: 6.2 lbs/ton clinker (May-Sep 6.0 lbs/ton). SO2: 500 ppmvd. PM: 0.02 grains/dscf.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139. 40 CFR Part 63.
ESSROC Cement Bessemer Plant Kiln No. 5	Title V Permit 37-00003 (1/18/07)	NOx: 476 lbs/hr. SO2: 500 ppmvd. PM: 0.02 grains/dscf.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139. 40 CFR Part 63.
Keystone Cement Co. East Allen Plant Kiln No. 2	Title V Permit 48-00003 (8/31/01)	NOx: 529 lbs/hr SO2: 500 ppmvd PM: 0.02 grains/dscf	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123 and 139. 40 CFR Part 63.
ISG Plate LLC Coatesville Plant Electric Arc Furnace D	Title V Permit 15-00010 (1/7/08)	SO2: 500 ppmvd.  PM: 0.02 grains/dscf (primary baghouse). PM: 0.0052 grains/dscf (secondary baghouses).	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139. 40 CFR Part 64.
AK Steel Corp. Butler Works Electric Arc Furnaces: #2, #3, and #4	Title V Permit 10-00001 (2/13/06)	NOx: 75 lbs/hr. SO2: 500 ppmvd. PM: 0.0036 grains/dscf.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 135 and 139. 40 CFR Part 64.
PH Glatfelter Co. Spring grove Plant No. 1 Power Boiler	Title V Permit 67-05004 (11/8/07)	NOx: 0.66 lb/MMBtu (30-day rolling average). SO2: 3.7 lb/MMBtu (30-day rolling average). PM: 3.6 x Heat Input (lbs/MMBtu) raised to a negative 0.56 power.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139. 40 CFR Parts 63 and 64.
Appleton Papers Inc. Spring Mill Plant No. 3 Power Boiler	Title V Permit 07-05001 (10/1/07)	NOx: 0.63 lb/MMBtu. SO2: 4.0 lb/MMBtu (over any 1-hr period). PM: 3.6 x Heat Input	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139. 40 CFR Parts 63 and 64.

<b>BART Source Name &amp; Unit Id</b>	<b>Permit No. and Date of Issue</b>	<b>Pollutant and Emission Limit</b>	<b>Emissions Reporting and Monitoring</b>
		(lbs/MMBtu) raised to a negative 0.56 power.	
Dyno Nobel Inc. Donora Plant Ammonia Oxidation Plant	Title V Permit 63-00070 (12/31/07)	NOx: 396 tons/12-month period. NO2: 5.5 lb/ton acid product (expressed as 100% HNO3).	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 135 and 139. 40 CFR Parts 64 and 70.
Allegheny Energy Hatfields Ferry Power Main Boilers (#1, #2, and #3)	Title V Permit 30-00099F (9/12/07)	PM: 0.075 lb/MMBtu for each boiler.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139.
PPL Brunner Island Brunner Island Boilers 2 and 3	Title V Permit 67-05005 (4/16/07)	PM: 0.1 lb/MMBtu for each boiler.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139.
Exelon Generation Eddystone Plant Boilers 3 and 4	Title V Permit 23-00017 (12/29/04)	PM: 0.1 lb/MMBtu for each boiler.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139.
EME Homer City Homer City Plant Main Boilers (#1, #2, #3)	Title V Permit 32-00055 (1/30/04)	PM: 0.1 lb/MMBtu for each boiler.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139.
PPL Montour LLC Montour SES Boilers 1 and 2	Title V Permit 47-00001 (5/2/06)	PM: 0.1 lb/MMBtu for each boiler.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139.
Reliant Energy LLC Portland Generating Boiler #2	Title V Permit 48-00006 (5/31/06)	PM: 0.1 lb/MMBtu.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139.
First Energy Corp. Bruce Mansfield Plt Main Boilers (#1, #2, #3)	Title V Permit 04-00235 (11/22/02)	PM: 0.1 lb/MMBtu for each boiler.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139.
Allegheny Energy Mitchell Power Station Boiler #3	Title V Permit 63-00016 (3/26/02)	PM: 0.1 lb/MMBtu.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139.
Orion Power Midwest New Castle Plant Boiler #5	Title V Permit 37-00023 (1/23/07)	PM: 0.1 lb/MMBtu.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139.
Reliant Energy NE Keystone Power Plant Boilers 1 and 2	Title V Permit 03-00027 (12/18/06)	PM: 0.1 lb/MMBtu for each boiler.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139.
PPL Martins Creek Martins Creek Plant Boilers 3 and 4	Title V Permit 48-00011 (4/15/08)	PM: 0.1 lb/MMBtu for each boiler.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139.
Reliant Energy NE Conemaugh Plant Boilers 1 and 2	Title V Permit 32-00059 (3/28/08)	PM: 0.1 lb/MMBtu for each boiler.	25 Pa. Code §§ 127.441, 127.442, 127.511, and §§ 123, 135 and 139.
Trigen Edison Station Philadelphia Boilers 3 and 4	Title V Permit: V06-11 (1/29/07)	NOx: 0.5 lb/MMBtu for each boiler. PM: 0.1 lb/MMBtu for each boiler. SO2: 0.5% sulfur (#6 fuel oil), 0.2% sulfur (#2 oil).	25 Pa. Code §§ 127.441(c), (d), 127.442, 127.463(e), 127.511(c), § 139, and Philadelphia County AMS Regulation I Sec. II and III.
Trigen Schuylkill Station Philadelphia Boiler # 26	Title V Permit: V06-007 (10/12/06)	NOx: 0.36 lb/MMBtu (30-day rolling avg). PM: 0.1 lb/MMBtu. SO2: 0.5% sulfur (#6 fuel oil).	25 Pa. Code §§ 127.441(c), (d), 127.442, 127.463(e), 127.511(c), § 139, and Philadelphia County AMS

<b>BART Source Name &amp; Unit Id</b>	<b>Permit No. and Date of Issue</b>	<b>Pollutant and Emission Limit</b>	<b>Emissions Reporting and Monitoring</b>
			Regulation I Sec. II and III.
Sunoco Chemicals Frankfort Plant Philadelphia Boiler No. 3	Title V Permit: V95-047 (4/17/03)	NOx: 0.3 lbs/MMBtu. PM: 0.1 lb/MMBtu. SO2: 0.52 lbs/MMBtu.	25 Pa. Code §§ 127.441(c), (d), 127.442, 127.463(e), 127.511(c), § 139, and Philadelphia County AMS Regulation I Sec. II and III.
Sunoco Refinery, Inc Philadelphia FCCU/CO Boiler Unit ID 1232	Consent Decree, Civil Action 05-CV-02866, (6/16/05) Title V Permit: V95-038 (1/17/02) AMS Plan Approval: 04322 (2/28/06)	SO2: 25 ppmvd (365-day rolling average). NOx: 20 ppmvd (365-day rolling average). PM: 0.5 lb/1000 lb coke burn.	See Consent Decree, Appendix EE. 40 CFR Part 60 and Part 60 Appendices A, B and F.
Sunoco Refinery Inc. Philadelphia Process Heaters	Consent Decree, Civil Action 05-CV-02866 (6/16/05) Title V Permit: V95-038 (1/17/02)	NOx: 0.020 lb/MMBtu (24-hr basis). SO2: 500 ppmvd.	See Consent Decree, Appendix EE. 40 CFR Part 60 and Part 60 Appendices A, B and F.
Allegheny Ludlum Corp. Allegheny County Basic Oxygen Furnaces  Slab Grinder  Plate Burner/Torch Cutter  Loftus Soaking Pits	Operating Permits: 0025603-000-82900 (9/29/94) 0025603-000-65304 (12/14/73) 0025603-000-1160 (12/14/73) 0025603-000-22803, 0025603-000-22804 (12/14/73)	Permitted PTE: PM: 68 tpy  PM: 230 tpy  PM: 13 tpy  PM: 14 tpy, NOx: 194 tpy	ACHD Rules and Regulations- Article XXI, Part C, Operating Permits (All Major & Minor) §2103.12.i, j & k, Issuance, Standard Conditions-Standard Monitoring Requirements, Standard Recordkeeping Requirements, & Standard Reporting Requirements. Article XXI, Part H, §2108.01.e, Reports Required-Emissions Inventory Statements.
US Steel Clairton Allegheny County Clairton Coke Works Desulfurization Plant  Boiler #2  R1 Boiler  T1 Boiler	Operating Permits: 7035003-010-25600 (12/14/73) 7035003-010-00800 (11/28/79) 7035003-010-01300 (5/11/77) 7035003-010-00600 (7/12/77)	Permitted PTE: SO2: 590 tpy; NOx: 27 tpy  SO2: 1508 tpy; NOx: 1285 tpy  SO2: 796 tpy; NOx: 525 tpy  SO2: 572 tpy; NOx: 358 tpy	See above citations of ACHD Rules and Regulations.
Orion Power Cheswick Plant Allegheny County Boiler No. 1	Operating Permit: 1065009-003-00100 (12/8/81)	Permitted PTE: SO2:67,452 tpy;NOx:10,840 tpy PM10: 361 tpy	See above citations of ACHD Rules and Regulations.

## **8.7. Reasonably Attributable Visibility Impairment**

Section 51.302(c) of EPA's RHR provides for general plan requirements in cases in which the affected FLM has notified the state that a Reasonably Attributable Visibility Impairment (RAVI) source exists that affects a Class I area in the state. There are no Class I areas in Pennsylvania, and the Department has not been notified by any affected FLM that a RAVI source exists in Pennsylvania.

## **9.0. Reasonable Progress Goals**

Section 51.308(d)(1) of EPA's RHR requires each state containing a Class I area to establish for each Class I area within the state goals (in deciviews) that provide for reasonable progress toward achieving natural visibility. In addition, EPA released guidance on June 7, 2007 for use in setting reasonable progress goals. The goals must provide improvement in visibility for the most impaired days and ensure no degradation in visibility for the least impaired days over the SIP period.

Under 40 CFR § 51.308(d)(1)(iv), consultation is required in developing reasonable progress goals. The rule states:

*In developing each reasonable progress goal, the State must consult with those States which may reasonably be anticipated to cause or contribute to visibility impairment in the mandatory Class I Federal area. In any situation in which the State cannot agree with another such State or group of States that a goal provides for reasonable progress, the State must describe in its submittal the actions taken to resolve the disagreement. In reviewing the State's implementation plan submittal, the Administrator will take this information into account in determining whether the State's goal for visibility improvement provides for reasonable progress towards natural visibility conditions.*

In developing the reasonable progress goals, the Class I state must also consider four factors specified in 40 CFR § 51.308(d)(1)(i)(A), namely, cost, time needed, energy & non-air quality environmental impacts and remaining useful life. The Class I state must also, under 40 CFR § 51.308(d)(1), show that the state considered the uniform rate of improvement and the emission reduction measures needed to achieve it for the period covered by the implementation plan, and if the state proposes a rate of progress slower than the uniform rate of progress, assess the number of years it would take to attain natural conditions if visibility improvement continues at the rate proposed.

### **9.1. Consultation and Agreement With Other States' Goals**

#### **9.1.1. The MANE-VU States**

The following Class I areas are found in the MANE-VU region: Acadia National Park, Roosevelt/Campobello International Park, Moosehorn Wilderness Area, Presidential Range/Dry River Wilderness Area, Great Gulf Wilderness Area, Lye Brook Wilderness, Brigantine Wilderness.



In accordance with 40 CFR § 51.308(d)(1)(iv), the Department consulted with the following states in MANE-VU that have Class I areas while those states were establishing reasonable progress goals for their Class I areas:

- Maine
- New Hampshire
- Vermont
- New Jersey

There are no Class I areas in Pennsylvania. The MANE-VU states of New Jersey, Vermont and Maine sent letters to the Department in the spring of 2007 stating that, based on 2002 emissions, Pennsylvania contributed to visibility impairment to Class I areas in those states. New Jersey, Vermont and Maine have asked for Pennsylvania's continued participation in further consultations with MANE-VU. Consistent with the RHR requirements specified in 40 CFR § 51.308(d)(3)(i), the Department consulted with the Class I area states that are or may be impacted by emission sources operating in Pennsylvania as they establish reasonable progress goals for each Class I area within their state. **Accordingly, Pennsylvania agrees with the reasonable progress goals established by Maine, New Jersey, New Hampshire and Vermont.**

#### **9.1.2. The VISTAS States**

In accordance with 40 CFR § 51.308(d)(3)(i), the Department consulted with the following states in VISTAS that have nearby Class I areas while those states were establishing reasonable progress goals for their Class I areas:

- West Virginia
- Virginia

Shenandoah National Park in Virginia and the Dolly Sods/Otter Creek Wilderness Area in West Virginia are Class I areas in the VISTAS region that are impacted by emissions from Pennsylvania and other MANE-VU states. The Department consulted with West Virginia and Virginia when they were establishing their reasonable progress goals for the Class I areas in their states that are or may be impacted by emission sources operating in Pennsylvania. The 2018 visibility improvement projections that are used to establish reasonable progress for the Dolly Sods/Otter Creek Wilderness Area and the Shenandoah National Park were presented to the MANE-VU member states by VISTAS on March 18, 2008 (Appendix K).

The Department agrees with the reasonable progress goals that were established by West Virginia for Dolly Sods/Otter Creek Wilderness Area. The reasonable progress goals established by the West Virginia DEP for the Dolly Sods/Otter Creek Wilderness Area are documented in West Virginia's Regional Haze SIP posted for public comment in April 2008, submitted to EPA as a final SIP revision on June 18, 2008, and found on their website at:

<http://www.wvdep.org/>.

The Department agrees with the reasonable progress goals that were established by Virginia for the Shenandoah National Park. The reasonable progress goals established by the Virginia DEQ for the Shenandoah National Park are documented in Virginia's Regional Haze SIP posted for public comment on August 18, 2010, submitted to EPA as a final SIP revision on October 4, 2010, and found on their website at: <http://www.deq.state.va.us/air/permitting/>.

To establish reasonable progress targets for their Class I areas, West Virginia and Virginia used modeling that assumed implementation of CAIR for EGUs in the eastern United States, including the EGUs in Pennsylvania. Therefore, EGU controls in Pennsylvania that are consistent with CAIR are also consistent with the reasonable progress goals established for Dolly Sods Wilderness Area by West Virginia in their Regional Haze SIP revision, and for the reasonable progress goals established by Virginia in their Regional Haze SIP revision for the Shenandoah National Park. (See Appendix K for the Power Point presentation given to the MANE-VU member states on March 18, 2008, by VISTAS on VISTAS 2018 Regional Haze Best and Final Modeling Projections.)

Modeling conducted for VISTAS and used by West Virginia and Virginia to set their reasonable progress goals for the Dolly Sods Wilderness Area and the Shenandoah National Park, respectively, projected different 2018 visibility than was predicted by the most recent MANE-VU modeling at those two Class I areas. MANE-VU predicted less visibility improvement by 2018 than VISTAS predicted at both Dolly Sods and Shenandoah, but only at Dolly Sods did the MANE-VU modeling project that the uniform rate of progress in 2018 would not be met. This is primarily because the two regions used different assumptions about the efficacy of CAIR in reducing emissions from EGUs. MANE-VU's emissions assumptions regarding anticipated CAIR reductions from the EGUs are more conservative than are VISTAS', because the MANE-VU emissions were not reduced as much as the VISTAS's emissions were.

The primary reason for the different SO<sub>2</sub> emissions inventory that MANE-VU and VISTAS used in their respective modeling for 2018 is that the CAIR program is a cap and trade program. Consultations between the RPOs (MANE-VU, VISTAS and MRPO) concerning an appropriate and consistent modeling approach for the CAIR EGUs yielded differing opinions and no enforceable mechanism to require the vast majority of the CAIR allowances claimed by MANE-VU's neighboring RPOs to be retired. MANE-VU believed it to be appropriate to take a conservative approach and estimate the potential for emissions reductions under the CAIR program. Therefore, in the most recent modeling NESCAUM performed for MANE-VU, MANE-VU decided to keep the CAIR cap whole and added EGU SO<sub>2</sub> emissions to the inventory to estimate the impact of banking and trading under CAIR. In the most recent modeling, NESCAUM increased the inventory emissions from MANE-VU states, and from the MRPO and VISTAS states subject to the CAIR cap and trade program.

Because the MANE-VU Class I states made the decision to maintain the CAIR level of emissions throughout all three RPOs in the most recent modeling, NESCAUM determined that 516,350 tons of SO<sub>2</sub> in total should be added back. For MANE-VU, 75,809 tons of SO<sub>2</sub> were added back to the hypothetical facility controlled to meet the 'Ask'. The remaining 440,188 tons were allocated to VISTAS and MRPO at EGUs that were not among the "167 stack" list. The additional emissions correspond to an increase of 20.5 percent at each of these facilities, with a total of 216,685 tons added to MRPO and 223,504 tons added to VISTAS. The visibility projections from this modeling show that all MANE-VU Class I areas are projected to meet or exceed the uniform rate of progress goal for 2018 on the 20 percent worst days, and no area indicated an increase in visibility impairment on the 20 percent best days, relative to the baseline. The nearby Class I areas of Shenandoah and Dolly Sods also showed improvement relative to the baseline conditions on the 20 percent worst days. The *2018 Visibility Projections* report on page 14 concludes: "At Dolly Sods, however, projected visibility impairment on the 20 percent worst days exceed the level determined by the uniform rate using the MANE-VU modeling approach. Apparently the net result of adding back SO<sub>2</sub> emissions across the modeled domain, in order to maintain the CAIR cap, has been to increase the projected visibility impairment at Dolly Sods relative to previous modeled scenarios. This result is most evident at southern and western Class I areas where more emissions (on an absolute basis) were added back to the EGUs." (See pages 10-14 of Appendix L, *2018 Visibility Projections*, NESCAUM, May 13, 2008).

The most recent modeling completed by VISTAS for the Class I areas in VISTAS showed the uniform rate of progress in 2018 would be met at both Shenandoah and Dolly Sods. VISTAS did not add back SO<sub>2</sub> emissions to their 2018 projected inventory, and have stated that they believe their inventory represents the best estimate of 2018 SO<sub>2</sub> emissions from OTB/OTW controls in that region. (See Appendix CC, VISTAS Letter of Comments on the MANE-VU Best and Final Modeling.)

In summary, the VISTAS modeling results indicate that the projected level of emissions controls for Pennsylvania's sources by 2018 will allow the Dolly Sods Class I area to meet the reasonable progress goals established by West Virginia by 2018. The emissions control strategy for the MANE-VU Class I areas' reasonable progress analysis is therefore a reasonable emissions control strategy for the reasonable progress analysis for the Dolly Sods Class I area. Pennsylvania is achieving a reasonable level of control by pursuing, as appropriate and necessary, the four goals of the MANE-VU 'Ask' Statement in order to meet the reasonable progress goals established for the Dolly Sods Class I area. The Commonwealth adopted a CAIR regulation on April 12, 2008, which was approved by the EPA as a SIP revision effective December 10, 2009 (74 FR 65446). The EGUs in the Commonwealth are now required to reduce NO<sub>x</sub> and SO<sub>2</sub> emissions under Pennsylvania's CAIR Program. As a result of the Court's remand of the federal CAIR to EPA, it is reasonable to expect that a revised federal CAIR will be in place to evaluate the Commonwealth's SO<sub>2</sub> emissions controls on Pennsylvania's EGUs by the time the first regional haze progress report is due.

## **9.2. Calculation of Uniform Rate of Progress**

As a benchmark to aid in developing reasonable progress goals, MANE-VU compared the baseline visibility conditions to natural visibility condition in each Class I area and determined the uniform rate of visibility improvement (in deciviews) that would need to be maintained during each implementation period in order to attain natural visibility condition by 2064. The uniform rate of improvement per year needed to achieve natural background visibility conditions is shown in Table 9.2-1 below.

**Table 9.2-1 Uniform Rate of Progress for MANE-VU Class I Areas**

<b>Class I Area</b>	<b>Deciview Improvement Needed by 2018</b>	<b>Total Deciview Improvement Needed by 2064</b>	<b>Uniform Rate of Improvement Annually</b>	<b>Projected Year for Reaching Natural Visibility</b>
Acadia National Park	2.4	10.5	0.17	2064
Moosehorn Wilderness Area	2.3	9.7	0.16	2064
Roosevelt/Campobello International Park	2.3	9.7	0.16	2064
Great Gulf Wilderness Area	2.5	10.8	0.18	2064
Presidential Range/Dry River Wilderness Area	2.5	10.8	0.18	2064
Lye Brook Wilderness Area	3.0	12.8	0.21	2064
Brigantine Wilderness Area	3.9	16.8	0.28	2064

Source: VIEWS (<http://vista.cira.colostate.edu/views/>), prepared on 6/22/2007

In 2006, MANE-VU conducted an assessment of the default and alternative approaches for calculation of baseline and natural background conditions at MANE-VU Class I areas. Based on that assessment, in December 2006, MANE-VU recommended adoption of the alternative reconstructed extinction equation for use in the December 2007 regional haze SIPs. Both natural conditions and baseline visibility for the 5-year period from 2000 through 2004 were calculated in conformance with an alternative method recommended by the IMPROVE Steering Committee.<sup>6</sup>

As explained below, the reasonable progress goals established for the Class I areas in MANE-VU provide for at least as much visibility improvement by 2018 as would be achieved by the uniform rate of progress rate shown above.

### **9.3. Reasonable Progress Goals for Class I Areas in MANE-VU**

<sup>6</sup>“Baseline and Natural Visibility Conditions, Considerations and Proposed Approach to the Calculation of Baseline and Natural Visibility Conditions at MANE-VU Class I Areas,” NESCAUM, December 2006, Appendix E.

This section of the regional haze SIP revision describes the reasonable progress goals developed by MANE-VU for each Class I area located within the MANE-VU region. A summary of the reasonable progress goals developed by MANE-VU is listed below in Table 9.3-1 and Table 9.3-2.

**Table 9.3-1 Reasonable Progress Goals for the 20% Worst Days**

<b>Class I Area</b>	<b>Baseline Visibility (deciviews) (20% Worst Days 2000-2004)</b>	<b>Reasonable Progress Goals, 20% worst days (expected deciview level by 2018)</b>	<b>Deciview improvement expected by 2018</b>	<b>Natural Visibility Conditions (20% worst days)</b>
Acadia National Park	22.9	19.4	3.5	12.4
Roosevelt/Campobello International Park	21.7	19.0	2.7	12.0
Moosehorn Wilderness Area	21.7	19.0	2.7	12.0
Presidential Range/Dry River Wilderness Area	22.8	19.1	3.7	12.0
Great Gulf Wilderness Area	22.8	19.1	3.7	12.0
Lye Brook Wilderness	24.5	20.9	3.6	11.7
Brigantine Wilderness	29.0	25.1	3.9	12.2

Source: 2018 Visibility Projections Report, May 2008, (Appendix L).

**Table 9.3-2 Reasonable Progress Goals for the 20% Best Days**

<b>Class I Area</b>	<b>Baseline Visibility (deciviews) (20% Best Days)</b>	<b>Reasonable Progress Goals, 20% best days (deciviews) (expected by 2018)</b>	<b>Deciview improvement expected by 2018</b>	<b>Natural Visibility (20% best days) (deciviews)</b>
Acadia National Park	8.8	8.3	0.5	4.7
Roosevelt/Campobello International Park	9.2	8.6	0.6	5.0
Moosehorn Wilderness Area	9.2	8.6	0.6	5.0
Presidential Range/Dry River Wilderness Area	7.7	7.2	0.5	3.7
Great Gulf Wilderness Area	7.7	7.2	0.5	3.7
Lye Brook Wilderness	6.4	5.5	0.9	2.8
Brigantine Wilderness	14.3	12.2	2.1	5.5

Source: 2018 Visibility Projections Report, May 2008, (Appendix L).

In 2006, MANE-VU conducted an assessment of the default and alternative approaches for calculation of baseline and natural background conditions at MANE-VU Class I areas. Based on that assessment, in December 2006, MANE-VU recommended adoption of the alternative reconstructed extinction equation for use in the December 2007 regional haze SIPs. Both natural conditions and baseline visibility for the 5-year period from 2000 through 2004 were calculated in conformance with an alternative method recommended by the IMPROVE Steering Committee.<sup>7</sup> Progress toward the 2018 target will be calculated based on 5-year averages calculated in a nationally consistent manner consistent with EPA’s *Guidance for Tracking Progress Under the Regional Haze Rule* (EPA-454/B-03-004, September 2003), as updated by the alternative method for calculating regional haze recommended by the IMPROVE Steering Committee.

To determine the reasonable progress goals in deciviews, the MANE-VU Class I area States conducted modeling with certain control measure assumptions. The control measures reflected in these reasonable progress goals are summarized below in Section

<sup>7</sup>“Baseline and Natural Visibility Conditions, Considerations and Proposed Approach to the Calculation of Baseline and Natural Visibility Conditions at MANE-VU Class I Areas,” NESCAUM, December 2006, Appendix E.

9.4 of this SIP revision. In establishing these reasonable progress goals for 2018, the MANE-VU Class I area states recognize that Pennsylvania and other contributing states have the flexibility to submit SIP revisions between now and 2018 as they are able to adopt control measures to implement these goals. The overall approach to reducing and preventing emissions that contribute to regional haze will allow each state up to 10 years to pursue adoption and implementation of reasonable and cost-effective NO<sub>x</sub> and SO<sub>2</sub> control measures, as appropriate and necessary. The Department will pursue these measures, as appropriate and necessary, and in five years at the time of Pennsylvania's first periodic SIP report expects to report on progress toward adoption of these measures by 2018.

#### **9.4. The MANE-VU 'Ask' Statement Strategy**

Section 51.308(d)(1)(vi) of EPA's RHR requires that reasonable progress goals represent at least the visibility improvement expected from implementation of other CAA programs during the applicable planning period. As documented in the emissions inventory and long term strategy sections of this SIP, the modeling that formed the basis for determining the reasonable progress goals for the MANE-VU Class I areas included an estimate of all of the other programs required by the CAA. (See Sections 7 and 10 of this SIP revision.)

The reasonable progress goals shown above in Tables 9.3-1 and 9.3-2 represent implementation of the regional course of action set forth by MANE-VU on June 20, 2007 and entitled, "Statement of the Mid-Atlantic/Northeast Visibility Union (MANE-VU) Concerning a Course of Action Within MANE-VU toward Assuring Reasonable Progress", (Appendix M), also known as the "Ask" Statement. As such, these goals are intended to reflect the pursuit by MANE-VU States, including Pennsylvania, of a course of action, including pursuing the adoption and implementation of the following "emission management" strategies, as appropriate and necessary:

- "Timely implementation of BART requirements; and
- "A low sulfur fuel oil strategy in the inner zone states (New Jersey, New York, Delaware, and Pennsylvania, or portions thereof) to reduce the sulfur content of:
  - Distillate oil to 0.05% sulfur by weight (500 ppm) by no later than 2012,
  - #4 residual oil to 0.25% sulfur by weight by no later than 2012,
  - #6 oil to 0.3 – 0.5% sulfur by weight by no later than 2012, and
  - Further reduce the sulfur content of distillate oil to 15 ppm by 2016; and
- "A low sulfur fuel oil strategy in the outer zone states (the remainder of the MANE-VU region) to reduce the sulfur content of:
  - Distillate oil to 0.05% sulfur by weight (500 ppm) by no later than 2014,
  - #4 residual oil to 0.25%-0.50% sulfur by weight by no later than 2018,
  - #6 oil to no greater than 0.5% sulfur by weight by no later than 2018, and
  - Further reduce the sulfur content of distillate oil to 15 ppm by 2018; and

- “A 90% or greater reduction in sulfur dioxide (SO<sub>2</sub>) emissions from each of the electric generating unit (EGU) stacks identified by MANE-VU (Attachment 1- comprising a total of 167 stacks, dated June 20, 2007) as reasonably anticipated to cause or contribute to impairment of visibility in each mandatory Class I Federal area in the MANE-VU region. If it is infeasible to achieve that level of reduction from a unit, alternative measures will be pursued in such State; and
- “Continued evaluation of other control measures including energy efficiency, alternative clean fuels, and other measures to reduce SO<sub>2</sub> and nitrogen oxide (NO<sub>x</sub>) emissions from all coal-burning facilities by 2018 and new source performance standards for wood combustion. These measures and other measures identified will be evaluated during the consultation process to determine if they are reasonable and cost-effective.”

The Long Term Strategy portion of this SIP (Section 10) provides a detailed technical description of how these regional strategies were modeled to estimate the visibility impact of the MANE-VU Statement’s emission management strategies described above.

These measures and other measures identified were evaluated by Pennsylvania and other MANE-VU States prior to and during the consultation process, and the above course of action was determined to be reasonable. Assumptions about the implementation of these measures are represented by the emissions and modeling assumptions described in Section 10. As stated above, this long-term strategy to reduce and prevent regional haze will allow the MANE-VU States, including Pennsylvania, up to 10 years to pursue adoption and implementation of reasonable and cost-effective NO<sub>x</sub> and SO<sub>2</sub> emissions reduction measures, as appropriate and necessary. The Department will pursue these measures, as appropriate and necessary, and in five years at the time of Pennsylvania’s first periodic SIP report expects to report on progress toward adoption of these measures by 2018.

In conclusion, the reasonable measures proposed by the MANE-VU States, including Pennsylvania, are found to be consistent with the stated national goals of preventing further visibility degradation while making measurable progress toward achieving natural visibility conditions in wilderness areas by 2064.



## **10.0. Long-Term Strategy**

Section 51.308(d)(3) of EPA's RHR requires Pennsylvania to submit a long-term strategy that addresses regional haze visibility impairment for each Class I area outside Pennsylvania that may be affected by emissions from within Pennsylvania. The long-term strategy must include enforceable emissions limitations, compliance schedules and other measures necessary to achieve the reasonable progress goals established by states or tribes where the Class I areas are located. This section describes how the Department meets the long-term strategy requirements.

The Department will continue to evaluate all measures included in the long term strategy to determine whether they remain reasonable for Pennsylvania to pursue implementation of by 2018. Pennsylvania will formalize that determination in the first regional haze SIP progress report, which is due five years from the date of the initial submittal of the regional haze SIP. In developing this long-term strategy, the Department considered the requirements of Section 110(a)(2)(D)(i) of the CAA pertaining to the requirement that SIPs contain adequate provisions to prohibit any source or activity from emitting air pollutants in amounts that would interfere with another state's ability to protect visibility. The measures described in the Commonwealth's long-term strategy are designed to meet the reasonable progress goals contained in the SIPs of states with Class I areas that may be affected by emissions from the Commonwealth, as required by 40 CFR § 51.308 (d)(3). These measures thereby constitute adequate protection against interference with another state's ability to protect visibility.

## **10.1. Consultation**

Section 51.308(d)(3)(i) of the RHR requires the Department to consult with other states and tribes to develop coordinated emission strategies. This requirement applies where emissions from Pennsylvania are reasonably anticipated to contribute to visibility impairment in Class I areas outside Pennsylvania.

The Department consulted with states with mandatory Class I areas that Pennsylvania sources may cause or contribute to visibility impairment in by participation in the MANE-VU and inter-RPO processes, through which technical information necessary for development of coordinated strategies was developed. The Department also coordinated with MANE-VU and other RPOs to develop the MANE-VU Contribution Assessment (Appendix B) that was used to develop the Department's long-term strategy. Strategy development considered the impacts of Pennsylvania's emissions on Class I areas outside Pennsylvania. The Department has held discussions with staff in both Virginia and West Virginia. Neither of these two states intends on requesting that Pennsylvania make additional reductions at emission sources located in Pennsylvania. The 2018 visibility modeling conducted for VISTAS and used by West Virginia and Virginia to establish the reasonable progress goals for the Dolly Sods Wilderness Area and for Shenandoah National Park (VISTAS, Shenandoah Group Contribution Assessment, May 2007, Appendix C) shows that the maximum projected contribution of any single source unit

from Pennsylvania to visibility impairment at Dolly Sods Wilderness Area, Shenandoah National Park or James River Face Wilderness Area is less than 1%. The West Virginia Department of Environmental Protection sent an email, dated September 13, 2007, to the Department stating, “we are not going to ask PA to make any additional reductions or to consult further.” The Virginia Department of Environmental Quality sent an email to the Department, dated September 14, 2007, stating, “VA is not asking PA for any additional reductions or for further consultation during this round of RH since our analysis shows that maximum normalized contribution of any PA source to Shenandoah or James River Face is <1%.” (See Appendix D for copies of the West Virginia and Virginia emails.)

As a participant in MANE-VU, Pennsylvania supported a regional approach toward deciding which control measures to pursue for regional haze that was based on technical analyses documented in the following reports:

- Contributions to Regional Haze in the Northeast and Mid-Atlantic United States (called the Contribution Assessment, Appendix B),
- Comparison of CAIR and CAIR Plus Proposal using the Integrated Planning Model® (called the CAIR+ Report, Appendix N),
- Assessment of Reasonable Progress for Regional Haze in MANE-VU Class I Areas (called the Reasonable Progress Report, Appendix O),
- Five-Factor Analysis of BART-Eligible Sources: Survey of Options for Conducting BART Determinations, Appendix P, and
- Assessment of Control Technology Options for BART-Eligible Sources: Steam Electric Boilers, Industrial Boilers, Cement Plants and Paper and Pulp Facilities, Appendix Q.

The regional strategy development process identified reasonable measures that would reduce emissions contributing to visibility impairment at Class I areas affected by emissions from within the MANE-VU region by 2018 or earlier. Section 10.9 provides a detailed description of the consultation process the Department was a part of with MANE-VU that developed the technical information necessary for developing the coordinated long-term strategies.

The Department’s coordination with FLMs on long-term strategy development is described in Section 4.0 State/Tribe and Federal Land Manager Coordination.

## **10.2. Contribution to Visibility Impairment at Class I Areas**

Pursuant to 40 CFR § 51.308(d)(3)(iv), each state must identify all anthropogenic sources of visibility impairment considered by the state in developing its long-term strategy. EPA’s *Guidance for Setting Reasonable Progress Goals Under the Regional Haze Program* (June, 2007) notes that this process begins with the identification of key pollutants and source categories that contribute to visibility impairment at the Class I area(s) affected by emissions from the state.

Finalized in August 2006, the MANE-VU Contribution Assessment reflects a conceptual model in which sulfate emerges as the most important single constituent of haze-forming fine particle pollution and the principle cause of visibility impairment across the region. Sulfate alone accounts for approximately one-half to two-thirds of total fine particle mass on the 20 percent haziest days at MANE-VU Class I sites. Organic carbon was shown to be the second largest contributor to haze. Its contribution typically ranges from 20 to 30 percent of total fine particle mass on the haziest days. The Contribution Assessment for MANE-VU (Appendix B) provides this information concerning organic carbon:

“The term organic carbon encompasses a large number and variety of chemical compounds that may come directly from emission sources as a part of primary PM or may form in the atmosphere as secondary pollutants. The conceptual models that explain elevated regional PM<sub>2.5</sub> peak concentrations in the summer differ significantly from models that explain the largely urban peaks observed during winter. On average, summertime concentrations of sulfate in the northeastern United States are more than twice that of the next most important fine particle constituent, OC, and more than four times the combined concentration of nitrate and black carbon (BC) constituents (NARSTO, 2003). Episodes of high summertime sulfate concentrations are consistent with stagnant meteorological flow conditions and the accumulation of airborne sulfate (via atmospheric oxidation of SO<sub>2</sub>) through long-range transport of sulfur emissions from industrialized areas within and outside the region. The organic carbon present at Class I locations almost certainly includes a mix of species, including pollutants originating from anthropogenic (manmade) sources as well as biogenic hydrocarbons emitted from vegetation. The inorganic constituents of fine particles (sulfates and nitrates) are the dominant contributors to visibility impairment, accounting for about 80 percent of total particle extinction.

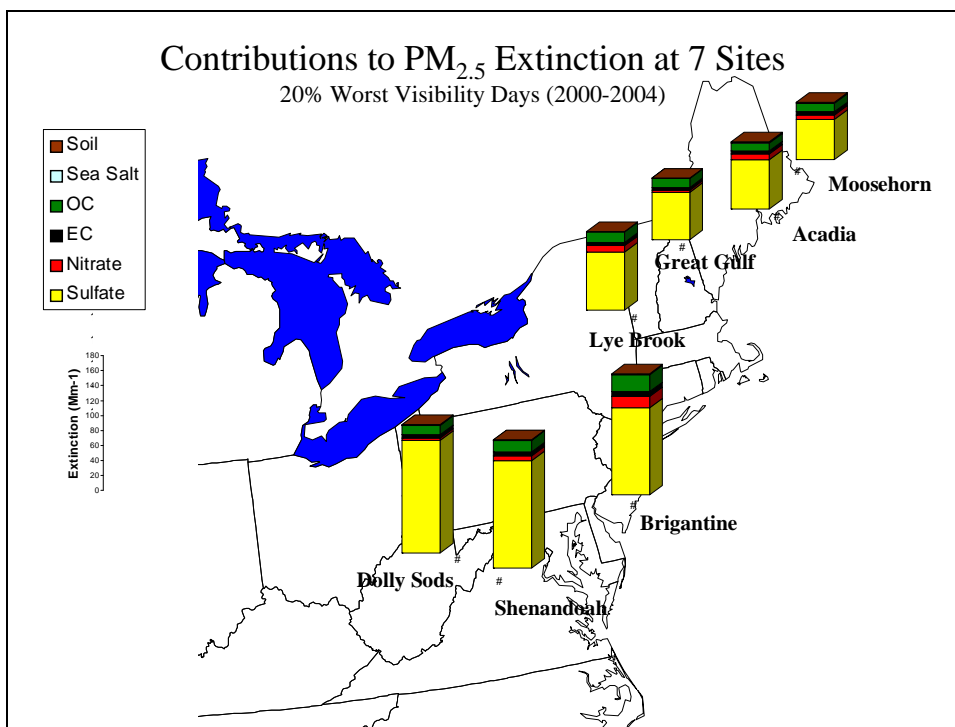
“Within the MANE-VU sites, the relative split between these two components is about eight to one sulfate to nitrate (at Shenandoah, the average 20 percent worst day contribution of sulfates is even more dominant). Carbonaceous components account for the bulk of the remaining particle extinction, ranging from 12 to nearly 20 percent, mostly in the form of organic carbon. Almost all particle sulfate originates from sulfur dioxide (SO<sub>2</sub>) oxidation and typically associates with ammonium (NH<sub>4</sub>) in the form of ammonium sulfate ((NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>), 95 percent of SO<sub>2</sub> emissions are from anthropogenic sources (primarily from fossil fuel combustion), while the majority of ammonium comes from agricultural activities and, to a lesser extent, from transportation sources in some areas (NARSTO, 2003). The fact that the contribution from organic carbon can be as high as 40 percent at the more rural sites on the 20 percent clearest days is likely indicative of the role played by organic emissions from vegetation (so-called ‘biogenic hydrocarbons’ (HC)). Relative contributions to overall fine particle mass from nitrate (NO<sub>3</sub>), elemental carbon, and fine soil are all smaller (typically under 10 percent), but the relative ordering among the three species varies with location. Nitrate plays a noticeably more important role at urban sites compared to northeastern and mid-Atlantic Class I locations, perhaps reflecting a greater contribution from vehicles and other urban pollution sources (NESCAUM, 2001).

“For urban areas of the northeastern and southeastern United States, an effective emissions management approach may be to combine regional SO<sub>2</sub> control efforts aimed at reducing summertime PM<sub>2.5</sub> concentrations with local SO<sub>2</sub> and OC control efforts. Local SO<sub>2</sub> reductions would help reduce wintertime PM concentrations, while OC reductions can help reduce overall PM concentrations year-round. Long-range pollutant transport and local pollutant emissions are important, especially along the eastern seaboard, so one must also look beyond the achievement of further sulfate reductions. Given the dominant role of sulfate and nitrate, however, and the difficulty in obtaining reductions in some of the other categories such as soil or coarse mass, sulfate- and nitrate-based control programs are likely to offer more reasonable emission reduction opportunities. Recent efforts to reduce manmade organic carbon emissions have been undertaken primarily to address summertime ozone formation in urban areas. Future efforts to further reduce organic carbon emissions may be driven by programs that address fine particles and visibility.”

As a result of the dominant role of sulfate in the formation of regional haze in the Northeast and Mid-Atlantic region, MANE-VU concluded that an effective emissions management approach would rely heavily on broad-based regional SO<sub>2</sub> control efforts in the eastern United States. The Department agrees with this approach.

The following Figure 10.2 shows the dominance of sulfate in the extinction calculated from the 2000-2004 baseline data.

**Figure 10.2 Contributions to PM<sub>2.5</sub> Extinction at Seven Class I Areas**



The MANE-VU Contribution Assessment used various modeling techniques, air quality data analysis, and emissions inventory analysis to identify source categories and states that contribute to visibility impairment in MANE-VU Class I areas. With respect to sulfate, based on estimates from four different techniques, the Contribution Assessment estimated emissions from within MANE-VU in 2002 were responsible for about 25-30 percent of the sulfate at MANE-VU and nearby Class I areas. (See Chapter 8 of the Contribution Assessment, Appendix B.) Emissions from other regions, Canada, and outside the modeling domain were also important. For more details about the methods used to identify contributing states and regions, please see the Contribution Assessment document.

MANE-VU considered modeling results documented in the Contribution Assessment to determine which states should be consulted in developing the long-term strategy for improving visibility in MANE-VU Class I areas. Because sulfate was the primary pollutant of concern, and the Modeling System for Aerosols and Deposition (REMSAD, SAI, 2002) model results quantified sulfate impacts, three methods of evaluating states' impacts using REMSAD results were considered:

1. States/regions that contributed  $0.1 \text{ ug/m}^3$  sulfate or greater on the 20 percent worst visibility days in the base year (2002).
2. States/regions that contributed at least 2 percent of total sulfate observed on 20 percent worst visibility days in 2002.
3. The top ten contributing states on the 20 percent worst visibility days in 2002.

For purposes of deciding how broadly to consult, the MANE-VU States decided to use method 2, including states that contributed at least 2 percent of total sulfate observed on the 20 percent worst visibility days in 2002. Based on the MANE-VU Contribution Assessment, emissions from Pennsylvania contribute to visibility degradation in the following Class I Areas: Acadia National Park, Brigantine Wilderness, Dolly Sods Wilderness, Great Gulf Wilderness, Lye Brook Wilderness, Presidential Range/Dry River Wilderness, Moosehorn Wilderness, Roosevelt/Campobello International Park, Shenandoah National Park.

Table 10.2-1 below shows the results of the REMSAD model of assessing state-by-state contributions to sulfate impacts at Class I areas within MANE-VU and nearby the MANE-VU region (See Table 8-1 of Appendix B). Shenandoah and Dolly Sods are Class I areas in the VISTAS region that are impacted by emissions from MANE-VU states. The Dolly Sods IMPROVE monitor is also representative of the Otter Creek Wilderness Area in West Virginia. The other five Class I areas are in MANE-VU. The IMPROVE monitor at Great Gulf also represents the Presidential Range/Dry River Wilderness. The IMPROVE monitor at Moosehorn also represents Roosevelt Campobello International Park. This table highlights the importance of emissions from outside the MANE-VU region.

**Table 10.2-1 Percent of Modeled Sulfate Due to Emissions from Listed States<sup>8</sup>**

<b>Contributing States or Areas</b>	<b>Acadia, Maine (%)</b>	<b>Brigantine, New Jersey (%)</b>	<b>Dolly Sods, Otter Creek, West Virginia (%)</b>	<b>Great Gulf and Presidential Range Dry River, New Hampshire (%)</b>	<b>Lye Brook, Vermont (%)</b>	<b>Moosehorn and Roosevelt Campobello, Maine (%)</b>	<b>Shenandoah, Virginia (%)</b>
<b>Connecticut</b>	0.76	0.53	0.04	0.48	0.55	0.56	0.08
<b>Delaware</b>	0.96	3.20	0.30	0.63	0.93	0.71	0.61
<b>District of Columbia</b>	0.01	0.04	0.01	0.01	0.02	0.01	0.04
<b>Maine</b>	6.54	0.16	0.01	2.33	0.31	8.01	0.02
<b>Maryland</b>	2.20	4.98	2.39	1.92	2.66	1.60	4.84
<b>Massachusetts</b>	10.11	2.73	0.18	3.11	2.45	6.78	0.35
<b>New Hampshire</b>	2.25	0.60	0.04	3.95	1.68	1.74	0.08
<b>New Jersey</b>	1.40	4.04	0.27	0.89	1.44	1.03	0.48
<b>New York</b>	4.74	5.57	1.32	5.68	9.00	3.83	2.03
<b>Pennsylvania</b>	6.81	12.84	10.23 <sup>9</sup>	8.30	11.72	5.53	12.05 <sup>10</sup>
<b>Rhode Island</b>	0.28	0.10	0.01	0.11	0.06	0.19	0.01
<b>Vermont</b>	0.13	0.06	0.00	0.41	0.95	0.09	0.01
<b>MANE-VU</b>	36.17	34.83	14.81	27.83	31.78	30.08	20.59
<b>Midwest RPO</b>	11.98	18.16	30.26	20.10	21.48	10.40	26.84
<b>VISTAS</b>	8.49	21.99	36.75	12.04	13.65	6.69	33.86
<b>Other</b>	33.79	16.78	12.70	23.54	18.99	44.17	12.48

### 10.3. Technical documentation

#### 10.3.1. Basis for Emission Reduction Obligations

Section 51.308(d)(3)(iii) of EPA’s RHR requires the Department to document the technical basis for Pennsylvania’s apportionment of emission reductions necessary to meet reasonable progress in each Class I area affected by Pennsylvania’s emissions.

<sup>8</sup> Percentages based on 2002 annual average sulfate impact estimated with REMSAD model as described in MANE-VU Contribution Assessment Chapter 4 and summarized on page 8-2 of the Contribution Assessment.

<sup>9</sup> The percent contribution of the sulfate impact at Dolly Sods due to Pennsylvania sources modeled by the West Virginia RPO (VISTAS) is 5.26%. (See Appendix C).

<sup>10</sup> The percent contribution of the sulfate impact at Shenandoah due to Pennsylvania sources modeled by the Virginia RPO (VISTAS) is 6.11%. (See Appendix C).

The Department relied on technical analyses developed by MANE-VU to demonstrate that Pennsylvania's emission reductions, when coordinated with those of other states and tribes, are sufficient to achieve the reasonable progress goals in Class I areas affected by Pennsylvania's emissions.

The emission reductions relied upon to meet reasonable progress goals in Class I areas affected by Pennsylvania are described in the following documents:

- Baseline and Natural Background Visibility Conditions—Considerations and Proposed Approach to the Calculation of Baseline and Natural Background Visibility Conditions at MANE-VU Class I Areas (NESCAUM, December 2006) (Appendix E).
- The Nature of the Fine Particle and Regional Haze Air Quality Problems in the MANE-VU Region: A Conceptual Description (NESCAUM, November 2006) (Appendix R).
- Contributions to Regional Haze in the Northeast and Mid-Atlantic United States (NESCAUM, August 2006)(called the Contribution Assessment) (Appendix B.)
- Comparison of CAIR and CAIR Plus Proposal using the Integrated Planning Model® (called the CAIR+ Report) (ICF, May 2007) (Appendix N).
- Assessment of Reasonable Progress for Regional haze in MANE-VU Class I Areas (MACTEC, July 2007)(called the Reasonable Progress Report) (Appendix O).
- Five-Factor Analysis of BART-Eligible Sources: Survey of Options for Conducting BART Determinations (June, 2007) (Appendix P).
- Assessment of Control Technology Options for BART-Eligible Sources: Steam Electric Boilers, Industrial Boilers, Cement Plants and Paper and Pulp Facilities (NESCAUM, March 2005) (Appendix Q).
- MANE-VU Modeling for Reasonable Progress Goals: Model Performance Evaluation, Pollution Apportionment, and Control Measure Benefits (NESCAUM, February 2008) (Appendix S).
- 2018 Visibility Projections (NESCAUM, March 2008) (Appendix L).

In addition, MANE-VU relied on analysis conducted by neighboring RPOs, including the following documents, which are available upon request but are not incorporated into this SIP:

- VISTAS Reasonable Progress Analysis Plan by VISTAS, dated September 18, 2006.
- Reasonable Progress for Class I Areas in the Northern Midwest-Factor Analysis, by EC/R, dated July 18, 2007.

### **10.3.2. Baseline inventory**

Section 51.308(d)(3)(iii) of EPA's RHR requires the Department to identify the baseline emissions inventory on which the long-term strategy is based.

- For the MANE-VU region, the Department used the 2002 MANE-VU Emissions Inventory Version 3.0 as its baseline inventory. The inventory is documented in Section 7 of this SIP.
- For other regions, MANE-VU used emissions inventories developed by the RPOs for those regions, including VISTAS Base G2, MRPO's Base K, and CenRAP's emissions inventory.

More specific information about the baseline emissions inventory data used may be found in Section 7 of this SIP.

The Department used the 2002 MANE-VU Emissions Inventory Version 3.0 as its baseline inventory. (The inventory is documented in Section 7 Emissions Inventory, of this SIP)

### **10.3.3. Modeling Techniques Used**

The following documents describe preliminary and final modeling runs conducted by MANE-VU and used in developing this long term-strategy:

- Contributions to Regional Haze in the Northeast and Mid-Atlantic United States (NESCAUM, August 2006)(called the Contribution Assessment) (Appendix B).
- MANE-VU Modeling for Reasonable Progress Goals: Model Performance Evaluation, Pollution Apportionment, and Control Measure Benefits (NESCAUM, February 2008) (Appendix S).
- 2018 Visibility Projections (NESCAUM, March 2008) (Appendix L).

As documented in the MANE-VU Contribution Assessment, two regional-scale air quality models were used to perform air quality simulations for MANE-VU. These are the Community Multi-scale Air Quality modeling system (CMAQ; Byun and Ching, 1999) and the REMSAD model. CMAQ was developed by EPA, while REMSAD was developed by ICF Consulting/Systems Applications International (ICF/SAI) with EPA support. CMAQ provides one-atmosphere results for multiple pollutants while the REMSAD model was used primarily for attribution of sulfate species in the eastern United States via the species-tagging scheme included in Version 7.10 and newer versions of the model.

Three rounds of modeling were conducted:



- CMAQ was run for a complete set of baseline simulations including 2002, 2009 and 2018. Preliminary runs are described in greater detail in Appendix C of the *MANE-VU Contribution Assessment*, (Appendix B).
- Runs assessing impacts of potential control measures are described in the *Modeling for Reasonable Progress Goals* report (NESCAUM, 2008) (Appendix S).
- Final modeling to help develop reasonable progress goals is described in the *2018 Visibility Projections* report (NESCAUM, 2008) (Appendix L).

The modeling tools utilized for these analyses include MM5, SMOKE, CMAQ and REMSAD, and incorporate tagging features that allow for the tracking of individual source regions or measures.

A significant feature of the REMSAD work used to evaluate regional contributions is that NESCAUM reprocessed the SO<sub>2</sub> emission data from each state to take advantage of REMSAD's tagging capabilities. Thus, all SO<sub>2</sub> emissions included in the model for the eastern half of the country were tagged according to state of origin, and emissions from Canada and the boundary conditions were also tagged. This allowed for a rough estimation of the total contribution from elevated point sources in each state to simulated sulfate concentrations at eastern receptor sites. Using identical emission and meteorological inputs to those prepared for the Integrated SIP (CMAQ) platform, REMSAD was used to simulate the annual average impact of each state's SO<sub>2</sub> emission sources on the sulfate fraction of PM<sub>2.5</sub> over the northeastern United States. For more information see Appendix C of the *MANE-VU Contribution Assessment* (Appendix B).

In addition to the REMSAD run with tagging, NESCAUM and its modeling partners at the University of Maryland and Rutgers University performed a sensitivity run with the CMAQ Particle and Precursor Tagging Methodology (CMAQ-PPTM) system. This run was used to assess the impacts of potential control measures under consideration. This work is described in the *Modeling for Reasonable Progress Goals* report (Appendix S).

The modeling platform is further described in the reports *Modeling for Reasonable Progress Goals* and *2018 Visibility Protections* (Appendix L). MANE-VU used the Inter-RPO modeling domain. The 36-km gridded domain covers the continental US, southern Canada, and northern Mexico. The 12-km gridded inner domain covers the northeastern, central, and southeastern United States, as well as southeastern Canada.

Meteorological inputs for CMAQ, provided by Dalin Zhang's group at the University of Maryland, were derived from the Fifth-Generation Pennsylvania State University/National Center for Atmospheric Research (NCAR) Mesoscale Model (MM5). A detailed description of the meteorological inputs can be found in the *Modeling for Reasonable Progress Goals* report.

The evaluation of model performance is also described in Section 2 of the report *Modeling for Reasonable Progress Goals* (Appendix S). Section 2.2 Model Evaluation of the report *Modeling for Reasonable Progress Goals* states: "predicted PM<sub>2.5</sub> sulfate an measure sulfate are in a good 1:1 linear relationship.... PM<sub>2.5</sub> nitrate also has close to a 1:1

linear relationship between the model and observations.” The modeling tools were evaluated and found to perform adequately relative to USEPA modeling guidance. The modeling results were used in a relative sense by calculating the relative reduction factor (RRF) relative to the 2002 base case and then applying those factors to the baseline observations to estimate future projections. U.S. EPA guidance documents spell the process out in great detail. This guidance is the same for ozone, PM2.5 and regional haze and can be found at: [http://www.epa.gov/scram001/guidance\\_sip.htm](http://www.epa.gov/scram001/guidance_sip.htm).

#### **10.3.4. Monitoring and Emissions Data**

Chapters 4 and 5 of the MANE-VU Contribution Assessment (Appendix B) document the techniques for analyzing air monitoring data and emissions data used by MANE-VU to assess the contribution of various states, regions, and source categories to visibility impairment at MANE-VU Class I areas.

#### **10.4. Anthropogenic Sources of Visibility Impairment**

Section 51.308(d)(3)(iv) of EPA’s RHR requires the Department to identify all anthropogenic sources of visibility impairment considered by it in developing its long-term strategy, including major and minor stationary sources, mobile sources, and areas sources. The contribution assessment analysis completed by NESCAUM entitled, *Contributions to Regional Haze in the Northeast and Mid-Atlantic States*, (Appendix B) identifies the anthropogenic sources of visibility impairment considered by the Department.

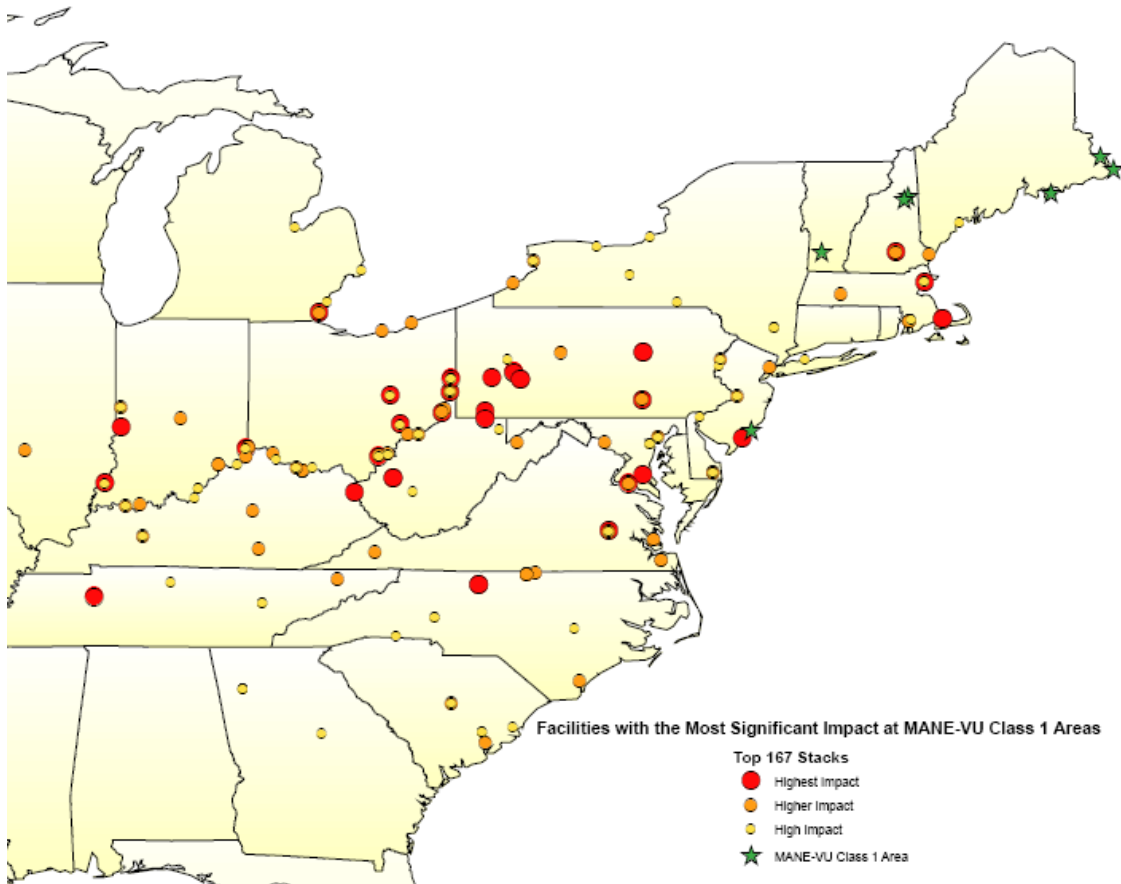
The MANE-VU Contribution Assessment (Appendix B) and the MANE-VU Conceptual Model for Fine Particles and Regional Haze Air Quality Problems (Appendix R) identify sulfate as the largest contributor to visibility impairment in the Mid-Atlantic and Northeastern Class I areas. Organic carbon was shown to be the second largest contributor to haze in the MANE-VU region.

Chapter 4 of the MANE-VU Contribution Assessment summarizes an analysis of haze-associated pollutant emissions. Chapter 5 of the same document describes the results of numerous source apportionment analyses, which are further explained in Appendix B of the Contribution Assessment. Together, these studies identify the major source categories affecting Class I areas in and near MANE-VU.

As a result of the dominant role of sulfate in the formation of regional haze in the Northeast and Mid-Atlantic region, MANE-VU concluded that an effective emissions management approach would rely heavily on broad-based regional SO<sub>2</sub> control efforts in the eastern United States. Roughly 70 percent of the 2.3 million tons of SO<sub>2</sub> emission in the 2002 MANE-VU emissions inventory Version 3.0 were from EGUs, making them the largest SO<sub>2</sub> source category in terms of visibility impairing emissions. MANE-VU found through modeling analysis documented in the Contribution Assessment that emissions from specific EGUs were important contributors to visibility impairment in MANE-VU Class I areas in 2002. The Figure 10.4 below shows the locations of 167 EGU stacks that

impair visibility at one or more MANE-VU Class I area. Some of the stacks identified as important were outside the states identified as contributing at least 2 percent of the sulfate at MANE-VU Class I areas; therefore they were dropped from the list.

**Figure 10.4 167 EGU Stacks Affecting MANE-VU Class I Areas**



The largest source categories of sulfur dioxide in the MANE-VU region are EGUs, industrial, commercial, and institutional (ICI) boilers, cement kilns, lime kilns, and distillate-oil fired heating units.

To assist with the assessment of potential control strategies for these important source categories, MANE-VU contracted with engineering and consulting company MACTEC. The project produced a technical support document that summarizes MANE-VU's assessment of pollutants and associated source categories affecting visibility in Class I areas in and near MANE-VU, lists possible control measures, and compiles data on each control measure necessary to determine whether the control measure is reasonable to pursue. The final report, *Assessment of Reasonable Progress for Regional Haze in*

*MANE-VU Class I Areas Final Report* (called the Reasonable Progress Report), is found in Appendix O.

Pennsylvania worked with other members of the Ozone Transport Commission (OTC) and MANE-VU to consider a wide variety of potential emission reduction strategies covering a wide range of sources of SO<sub>2</sub> and other pollutants contributing to regional haze. Based on available information about emissions and potential impacts, the MANE-VU Reasonable Progress Workgroup selected the following source categories for detailed analysis of the four factors the CAA establishes as the basis for determining how much progress in visibility improvement is reasonable:

- Coal and oil-fired EGUs;
- Point and area source industrial, commercial and institutional (ICI) boilers;
- Cement kilns;
- Lime kilns;
- The use of heating oil, and,
- Residential wood combustion and open burning.

Coal and oil-fired EGUs in Pennsylvania are subject to the Department's CAIR regulation (see page 100 of this SIP revision). The Department's recently adopted cement kiln regulation is described on page 105 in this SIP revision. The rulemaking status of the Department's low-sulfur fuel oil regulation is described on page 120 of this SIP revision. ICI boilers and lime kilns are source categories included in the Department's developing Reasonably Available Control Technology (RACT) regulation to address the eight-hour ozone standard. New indoor wood stoves in Pennsylvania are regulated by EPA's Residential Woodstoves NSPS. The NSPS for residential woodstoves was part of the area source inventory developed by MANE-VU to model the 2018 inventory for area sources (see page 106 of this SIP revision). The final outdoor wood boiler (OWB) regulation was published in the *Pennsylvania Bulletin* on October 2, 2010 (40 *Pa.B.* 5571). The Department's final regulation will require EPA's Phase 2 emission standards, including the particulate matter standard of 0.32 lb/MMBtu, for all new OWBs in the Commonwealth by May 1, 2011.

#### **10.4.1. The MANE-VU Reasonable Progress Strategy**

As required under 40 CFR § 51.308(d)(1)(i)(A), the MANE-VU states applied a four-factor analysis to potential control measures for the purpose of establishing reasonable progress goals. The MANE-VU states also identified additional control measures found to be reasonable, and these were included in the modeling used to establish the reasonable progress goals. All of the control measures, including the additional measures (described below), comprise the long-term strategy for improving visibility at MANE-VU Class I areas. The reasonable progress goals adopted by the MANE-VU Class I States represent implementation of the regional course of action set forth by MANE-VU on June 20, 2007 and entitled, "Statement of the Mid-Atlantic/Northeast Visibility Union (MANE-VU) Concerning a Course of Action within MANE-VU toward Assuring Reasonable Progress", (Appendix M), also known as the 'Ask' Statement. As such, these

reasonable progress goals, also described below, are intended to reflect the pursuit by Pennsylvania and the other MANE-VU States of a course of action including pursuing the adoption and implementation of the following “emission management” strategies, as appropriate and necessary:

- “Timely implementation of BART requirements; and
- “A low sulfur fuel oil strategy in the inner zone states (New Jersey, New York, Delaware, and Pennsylvania, or portions thereof) to reduce the sulfur content of:
  - Distillate oil to 0.05 percent sulfur by weight (500 ppm) by no later than 2012,
  - #4 residual oil to 0.25 percent sulfur by weight by no later than 2012,
  - #6 residual oil to 0.3 – 0.5 percent sulfur by weight by no later than 2012, and
  - Further reduce the sulfur content of distillate oil to 15 ppm by 2016; and
- “A low sulfur fuel oil strategy in the outer zone states (the remainder of the MANE-VU region) to reduce the sulfur content of:
  - Distillate oil to 0.05 percent sulfur by weight (500 ppm) by no later than 2014,
  - #4 residual oil to 0.25 percent-0.50 percent sulfur by weight by no later than 2018,
  - #6 residual oil to no greater than 0.5 percent sulfur by weight by no later than 2018, and
  - Further reduce the sulfur content of distillate oil to 15 ppm by 2018 depending on supply and availability; and
- “A 90 percent or greater reduction in sulfur dioxide (SO<sub>2</sub>) emissions from each of the electric generating unit (EGU) stacks identified by MANE-VU (Attachment 1-comprising a total of 167 stacks, dated June 20, 2007) as reasonably anticipated to cause or contribute to impairment of visibility in each mandatory Class I Federal area in the MANE-VU region. If it is infeasible to achieve that level of reduction from a unit, alternative measures will be pursued in such State; and
- “Continued evaluation of other control measures including energy efficiency, alternative clean fuels, and other measures to reduce SO<sub>2</sub> and nitrogen oxide (NO<sub>x</sub>) emissions from all coal-burning facilities by 2018 and new source performance standards for wood combustion.”

As stated above, this long-term strategy to reduce and prevent regional haze will allow each state up to 10 years to pursue adoption and implementation of reasonable and cost-effective NO<sub>x</sub> and SO<sub>2</sub> control measures as appropriate and necessary. The Department will pursue these measures, as appropriate and necessary, and in five years at the time of Pennsylvania’s first periodic SIP report expects to report on progress toward adoption of these measures by 2018.

The MANE-VU states, including Pennsylvania, agreed on the additional reasonable strategies listed above after consideration of an analysis of the four factors that the CAA requires to be considered in determining whether controls are reasonable.

The Department relied on analysis developed for MANE-VU in applying the four factors to a series of emission control measures. This analysis is described in detail in the *Reasonable Progress Report* (Appendix O). The *Reasonable Progress Report* summarizes MANE-VU's assessment of pollutants and associated source categories affecting visibility in Class I areas in and near MANE-VU, lists possible control measures for those pollutants and source categories, and develops the requisite four factor analysis. Table 10.4.1 below presents a summary of the four factor analysis for the source categories analyzed in the Reasonable Progress Report<sup>11</sup>.

**Table 10.4.1: Summary of Results from the Four Factor Analysis**

Source Category	Primary Regional Haze Pollutant	Control Measure(s)	Average Cost in 2006 dollars (per ton of pollutant reduction)	Compliance Timeframe	Energy and Non-Air Quality Environmental Impacts	Remaining Useful Life
Electric Generating Units	SO <sub>2</sub>	Switch to a low sulfur coal (generally <1% sulfur), switch to natural gas (virtually 0% sulfur), coal cleaning, Flue Gas Desulfurization (FGD)-Wet, -Spray Dry, or -Dry.	IPM®* v.2.1.9 predicts \$775-\$1,690. \$170-\$5,700 based on available literature	2-3 years following SIP submittal	Fuel supply issues, potential permitting issues, reduction in electricity production capacity, wastewater issues	50 years or more
Industrial, Commercial, Institutional Boilers	SO <sub>2</sub>	Switch to a low sulfur coal (generally <1% sulfur), switch to natural gas (virtually 0% sulfur), switch to a lower sulfur oil, coal cleaning, combustion control, Flue Gas	\$130-\$11,000 based on available literature. Depends on size.	2-3 years following SIP submittal	Fuel supply issues, potential permitting issues, control device energy requirements, wastewater issues	10-30 years

<sup>11</sup> Assessment of Reasonable Progress for Regional Haze in MANE-VU Class I Areas by MACTEC

		Desulfurization (FGD)- Wet, - Spray Dry, or - Dry.				
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\*Integrated Planning Model®

**Table 10.4.1 (cont.): Summary of Results from the Four Factor Analysis**

Source Category	Primary Regional Haze Pollutant	Control Measure(s)	Average Cost in 2006 dollars (per ton of pollutant reduction)	Compliance Timeframe	Energy and Non-Air Quality Environmental Impacts	Remaining Useful Life
Cement and Lime Kilns	SO <sub>2</sub>	Fuel switching, Dry Flue Gas Desulfurization-Spray Dryer Absorption (FGD), Wet Flue Gas Desulfurization (FGD), Advanced Flue Gas Desulfurization (FGD).	\$1,900-\$73,000 based on available literature. Depends on size.	2-3 years following SIP submittal	Control device energy requirements, wastewater issues	10-30 years
Heating Oil	SO <sub>2</sub>	Lower the sulfur content in the fuel. Depends on the state.	\$550-\$750 based on available literature. There is a high uncertainty associated with this cost estimate.	Currently feasible. Capacity issues may influence timeframe for implementation of new fuel standards	Increases in furnace/boiler efficiency, Decreased furnace/boiler maintenance requirements	18-25 years
Residential Wood Combustion	PM	State implementation of NSPS, Ban on resale of uncertified devices, installer training certification or inspection program, pellet stoves, EPA Phase II certified RWC devices, retrofit requirement, accelerated changeover requirement, accelerated changeover inducement.	\$0-\$10,000 based on available literature	Several years - dependent on mechanism for emission reduction	Reduce greenhouse gas emissions, increase efficiency of combustion device	10-15 years



Guided by this analysis, MANE-VU arrived at a suite of suggested control measures that the MANE-VU states agreed to pursue as a region, including Pennsylvania. The corollary was that the MANE-VU Class I states (Maine, New Hampshire, Vermont, and New Jersey) also asked states outside of MANE-VU that also contribute to visibility impairment to pursue similar strategies for reducing sulfate emissions from source sectors, or equivalent sulfate reductions if not from the source sectors that MANE-VU has identified for its own sulfate reductions. The request was documented in “Statement of the Mid-Atlantic/Northeast Visibility Union (MANE-VU) Concerning a Request for a Course of Action by States Outside of MANE-VU toward Assuring Reasonable Progress”, and is found in Appendix M of this SIP. The states outside MANE-VU to whom this request was addressed were identified in the MANE-VU Contribution Assessment as those states contributing at least 2 percent of the sulfates at MANE-VU Class I areas in 2002. The following states outside MANE-VU were identified: Georgia, Illinois, Indiana, Kentucky, Michigan, North Carolina, Ohio, South Carolina, Tennessee, Virginia, and West Virginia.<sup>12</sup>

This MANE-VU June 20, 2007 ‘Ask’ Statement requested that the above-listed States outside of MANE-VU pursue the adoption and implementation of the following control strategies, as appropriate and necessary:

- “Timely implementation of BART requirements; and
- “A 90 percent or greater reduction in sulfur dioxide (SO<sub>2</sub>) emissions from each of the electric generating unit (EGU) stacks identified by MANE-VU (Attachment 1-comprising a total of 167 stacks, dated June 20, 2007) as reasonably anticipated to cause or contribute to impairment of visibility in each mandatory Class I Federal area in the MANE-VU region. If it is infeasible to achieve that level of reduction from a unit, alternative measures will be pursued in such State; and
- “The application of reasonable controls on non-EGU sources resulting in a 28 percent reduction in non-EGU SO<sub>2</sub> emissions relative to on-the-books, on-the-way 2018 projections used in regional haze planning, by 2018, which is equivalent to the projected reductions MANE-VU will achieve through its low sulfur fuel oil strategy; and
- “Continued evaluation of other measures including measures to reduce SO<sub>2</sub> and NO<sub>x</sub> emissions from all coal-burning facilities by 2018 and promulgation of new source performance standards for wood combustion. These measures and other measures identified will be evaluated during the consultation process to determine if they are reasonable.”

These measures and other measures were evaluated prior to and during the consultation process and the above course of action was determined to be reasonable. Assumptions

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<sup>12</sup> In addition, the State of Vermont identified at least one source in the State of Wisconsin as a significant contributor to visibility impairment at the Lye Brook Wilderness Class I Area.

about the implementation of these measures are represented by the inventory and modeling assumptions described below in sections 10.4.2 through 10.4.4.

As stated above, this long-term strategy to reduce and prevent regional haze will allow each state up to 10 years to pursue adoption and implementation of reasonable and cost-effective NO<sub>x</sub> and SO<sub>2</sub> control measures, as appropriate and necessary. The Department will pursue these measures, as appropriate and necessary, and in five years at the time of Pennsylvania's first periodic SIP report expects to report on progress toward adoption of these measures by 2018.

In addition to the above controls in the United States, the MANE-VU Class I states determined that it was reasonable to include anticipated emissions reductions in Canada in the modeling used to set reasonable progress goals. Six coal-burning EGUs in Canada totaling 6500 megawatts (MW) are scheduled to be shut down and replaced with nine natural gas turbine units with SCR before 2018.

Preliminary modeling was conducted to estimate the impact of various elements of the MANE-VU 'Ask' Statement. This modeling is described in NESCAUM's report entitled, *MANE-VU Modeling for Reasonable Progress Goals* (February 2008, Appendix S). NESCAUM also conducted additional revised modeling to assess combined impacts. This modeling is described in NESCAUM's report entitled *2018 Visibility Projections* (March 2008, Appendix L). The information in the following sections (10.4.2 through 10.4.4) is taken from those reports and describes the effects of the specific strategies. These sections (10.4.2 through 10.4.4) explain the assumptions used to model the impact of potential control strategies, and describe the combined potential visibility benefits of all the strategies based on CMAQ modeling. As with all modeling, emissions estimates and modeling results for 2018 entail uncertainty, and further evaluation may be conducted as part of the SIP report required in five years under 40 CFR § 51.308(g). NESCAUM evaluated the visibility benefits of the potential control strategies described above that go beyond the "on the books/on the way" (OTB/OTW) controls that are already required by actions to implement other requirements of the CAA.

#### **10.4.2. The Best Available Retrofit Technology Modeling Strategy**

BART controls are among the reasonable strategies included in this SIP revision. The BART control determinations for sources in Pennsylvania are identified in Section 8 of this SIP revision.

EPA determined that CAIR fulfills the BART requirement for EGUs for SO<sub>2</sub> and NO<sub>x</sub> for EGUs in states participating in the CAIR program. In 2009, EPA did not rescind that decision as a result of the court remand of CAIR to EPA for revisions, in *State of North Carolina v. Environmental Protection Agency*, 531 F.3d 896 (D.C. Cir. 2008). CAIR remains in effect pending the promulgation of a rule to replace the CAIR. To assess the impacts of MANE-VU states' implementation of the BART provisions of the Regional Haze Rule for other facilities, NESCAUM included estimated reductions anticipated for BART-eligible facilities in the MANE-VU region in the final 2018 CMAQ modeling

analysis. Table 10.4.2 lists affected facilities and emissions assumptions used in the modeling.

Additional visibility benefits are likely to result from installation of controls at other non-CAIR BART-eligible facilities located in adjacent RPOs. These benefits were not accounted for in the MANE-VU modeling, since information about final BART determinations was not available. None of the eight facilities listed in Table 10.4.2 are located in Pennsylvania.

**Table 10.4.2 Estimated Emissions from Non-EGU BART-Eligible Facilities Located in MANE-VU Used in Final Modeling**

	Facility Name	Unit Name	SCC Code	Plant ID (from the MANE-VU Inventory)	Point ID (from the MANE-VU Inventory)	Facility Type	Fuel	2002 Emissions (tons)	2018 Emissions (tons)
MD	EASTALCO ALUMINUM	28	30300101	021-0005	28	Metal Production		1506	1356
MD	EASTALCO ALUMINUM	29	30300101	021-0005	29	Metal Production		1506	1356
MD	LEHIGH PORTLAND CEMENT	39	30500606	013-0012	39	Portland Cement		9	8
MD	LEHIGH PORTLAND CEMENT	16	30500915	021-0003	16	Portland Cement		1321	1,189
MD	LEHIGH PORTLAND CEMENT	17	30500915	021-0003	17	Portland Cement		976	878
MD	WESTVACO FINE PAPERS	2	10200212	001-0011	2	Paper and Pulp		8923	1338
ME	Wyman Station	Boiler 3	10100401	2300500135	004	EGU	Oil	616	308
ME	SAPPI Somerset	Power Boiler #1	10200799	2302500027	001	Paper and Pulp	Oil/Wood Bark/Process Gas	2884	1442
ME	IP Jay	Power Boiler #2	10200401	2300700021	002	Paper and Pulp	Oil	3086	1543
ME	IP Jay	Power Boiler #1	10200401	2300700021	001	Paper and Pulp	Oil	2964	1482
NY	KODAK PARK DIVISION	U00015	10200203	8261400205	U00015	Chemical Manufacturer		23798	14216
NY	LAFARGE BUILDING MATERIALS INC	41000	30500706	4012400001	041000	Portland Cement		14800	4440

### 10.4.3. The Low-Sulfur Fuel Oil Modeling Strategy

The MANE-VU states agreed through consultations to pursue a low sulfur fuel strategy within the region, as appropriate and necessary. Although this phased strategy would be implemented in two steps, both components of the strategy would be fully implemented by 2018. NESCAUM initially analyzed both steps of the program as separate strategies, but it is the combined benefit of implementing the program that is relevant to the question of program benefits in 2018.

To estimate the total 2018 emissions reductions from this strategy, 2018 OTB/OTW SO<sub>2</sub> emissions were reduced from all MANE-VU non-EGU sources burning #1, #2, #4, #5, or #6 oil. Emissions reductions reflected lowering the sulfur content in fuel from its original level to 0.015 percent for #1 and #2 oil; to 0.25 percent for #4 oil; and to 0.5 percent for #5 and #6 oil.

The first phase of the MANE-VU low sulfur fuel strategy calls for the lowering of fuel-sulfur content in distillate (No. 2 oil) from current levels that range between 2,000 and 2,300 ppm down to 500 ppm by weight. It also calls for restricting the sale of heavier blends of residual oil (No. 4 fuel oil and No. 6 bunker fuels) that have sulfur content greater than 0.25 percent sulfur and 0.5 percent sulfur by weight, respectively. The second phase of the strategy calls for further reducing the fuel-sulfur content of the distillate fraction to 15 ppm sulfur by weight.

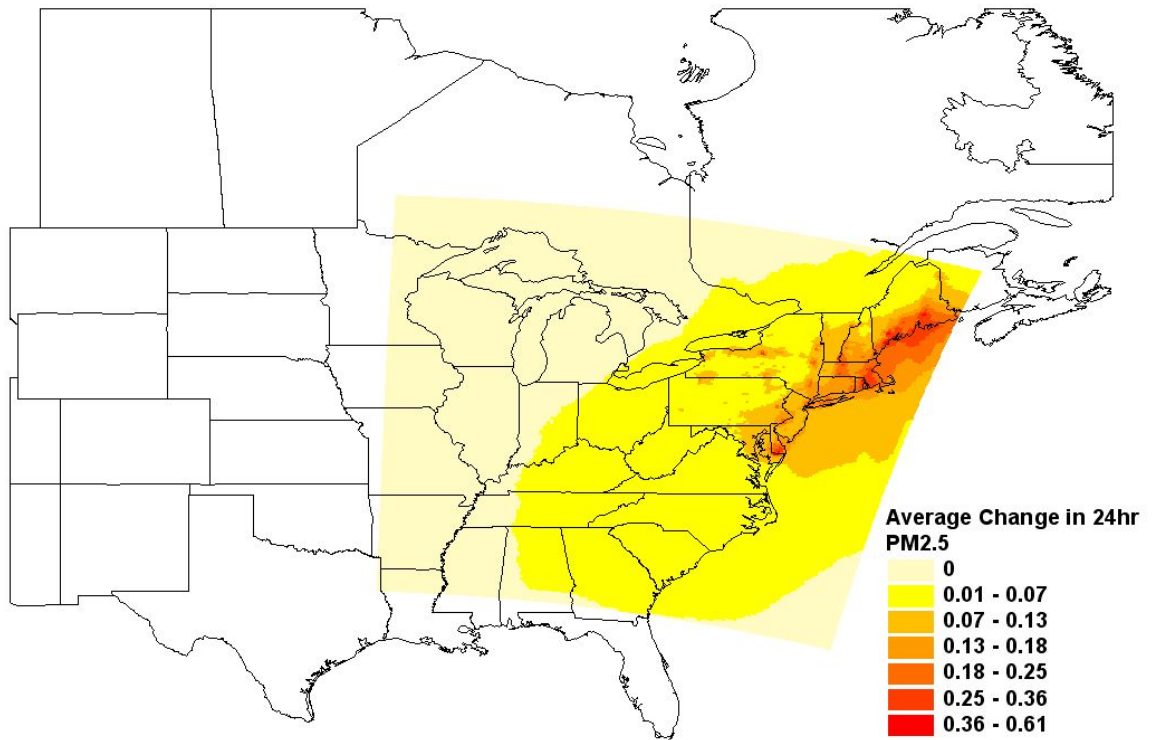
The two phases of the MANE-VU low sulfur fuel strategy are designed to be implemented in sequence with slightly different timing for inner zone states (New Jersey, New York, Delaware and Pennsylvania, or portions thereof) and the outer zone states (the remainder of the MANE-VU region). All states, however, have agreed to pursue reductions that would take place no later than 2018.

Based on the fuel sulfur limits within the first phase of the strategy, MANE-VU estimated a decrease of 140,000 tons of SO<sub>2</sub> emitted from distillate combustion and a decrease of 40,000 tons of SO<sub>2</sub> from residual combustion in MANE-VU.

The second phase of the MANE-VU low sulfur fuel strategy calls for reducing the sulfur content of distillate from 500 ppm to 15 ppm while keeping the sulfur limits on residual oils to 0.25 percent and 0.5 percent for No. 4 and No. 6 oils, respectively. By states lowering the distillate fuel sulfur limit from 500 ppm to 15 ppm, MANE-VU estimated an additional reduction of 27,000 tons of SO<sub>2</sub> emissions in MANE-VU from distillate combustion in 2018.

Figure 10.4.3 shows the full benefit of the MANE-VU fuel strategies being considered relative to the OTB/OTW baseline. NESCAUM used the concentration changes illustrated in Figure 10.4.3 to estimate the visibility benefits for this strategy. Because the fuel sulfur program only affects sources within MANE-VU, that region sees the largest PM<sub>2.5</sub> reduction and the greatest visibility benefits.

**Figure 10.4.3 Average Change in 24-hr PM<sub>2.5</sub> Due to Low Sulfur Fuel Strategies Relative to OTB/OTW (µg/m<sup>3</sup>)**



The assumption underlying the MANE-VU low-sulfur fuel oil strategy is that refiners can, by 2018, produce home heating and fuel oils that contain 50 percent less sulfur for the heavier grades (#4 and #6 residual), and a minimum of 75 percent and maximum of 99.25 percent less sulfur in #2 fuel oil (also known as home heating oil, distillate, or diesel fuel), at an acceptably small increase in price to the end user. As much as 75 percent of the total sulfur reductions that may be achieved by this strategy come from using the low-sulfur #2 distillate for space heating in the residential and commercial sectors. While costs for these emissions reductions are somewhat uncertain, they appear reasonable in comparison to costs of controlling other sectors, as documented in the MANE-VU Reasonable Progress Report, estimated at \$550 to \$750 per ton.

The MANE-VU states agreed to pursue the adoption and implementation of a low-sulfur oil strategy, as appropriate and necessary. The Department will pursue this measure, as appropriate and necessary, and in five years at the time of Pennsylvania's first periodic SIP report expects to report on progress toward adoption for the Commonwealth or portions thereof by 2018. As is described in the MANE-VU 'Ask' Statement, June 20,

2007, if the inner zone strategy cannot be implemented statewide, the Department will pursue the outer zone strategy by 2018. The inner zone strategy states: “A low sulfur fuel oil strategy in the inner zone states (New Jersey, New York, Delaware, and Pennsylvania, or portions thereof) to reduce the sulfur content of:

- Distillate oil to 0.05 percent sulfur by weight (500 ppm) by no later than 2012,
- #4 residual oil to 0.25 percent sulfur by weight by no later than 2012,
- #6 residual oil to 0.3 – 0.5 percent sulfur by weight by no later than 2012, and
- Further reduce the sulfur content of distillate oil to 15 ppm by 2016.”

Should any portion of Pennsylvania fall into the outer zone, the Department will pursue, as appropriate and necessary, the outer zone strategy for those portions. The outer zone strategy states: “A low sulfur fuel oil strategy in the outer zone states (the remainder of the MANE-VU region) to reduce the sulfur content of:

- Distillate oil to 0.05 percent sulfur by weight (500 ppm) by no later than 2014,
- #4 residual oil to 0.25 percent-0.50 percent sulfur by weight by no later than 2018, and
- #6 residual oil to no greater than 0.5 percent sulfur by weight by no later than 2018, and to further reduce the sulfur content of distillate oil to 15 ppm by 2018 depending on supply and availability.”

MANE-VU adopted the two-zone low sulfur fuel oil strategy because of concerns about supply, and anticipated that New Jersey, New York and Pennsylvania would evaluate supply concerns in the adoption of compliance dates. Pennsylvania intends to pursue, as appropriate and necessary, a single strategy for the state. Based on supply concerns, Pennsylvania will pursue a strategy that will not be less stringent than the outer zone strategy and would meet the sulfur content emission limits listed above by 2018.

#### **10.4.4. The EGU Modeling Strategy**

SO<sub>2</sub> emissions from power plants are the single largest sector contributing to the visibility impairment experienced in the Northeast’s Class I areas. The SO<sub>2</sub> emissions from power plants continue to dominate the inventory. Sulfate formed through atmospheric processes from SO<sub>2</sub> emissions are responsible for over half the mass and approximately 70-80 percent of the extinction on the worst visibility days (NESCAUM’s Contribution Assessment, Appendix B).

In order to ensure that EGU controls are targeted at those EGUs with the greatest impact on visibility in MANE-VU, a modeling analysis was conducted to determine which sources those were. A list of 167 EGU stacks was developed that includes the 100 largest impacts at each MANE-VU Class I site during 2002. MANE-VU requested 90 percent control on all units emitting from those stacks by 2018 as part of consultations within MANE-VU and with other RPOs.

Preliminary modeling showed that requiring SO<sub>2</sub> emissions from these 167 EGU stacks to be reduced by 90 percent could reduce 24-hour PM<sub>2.5</sub> concentrations. NESCAUM modeled 2018 emissions for the 167 EGU stacks in the Northeast, Southeast, and Midwest at levels equal to 10 percent of their 2002 emissions. NESCAUM used CMAQ to model the sulfate concentrations in 2018, after implementation of this EGU control strategy, and converted sulfate concentrations to PM<sub>2.5</sub> concentrations. Figure 10.4.4 displays the average change in 24-hr PM<sub>2.5</sub>.

**Figure 10.4.4 Preliminary Modeled Estimate of Average Change in 24-hr PM<sub>2.5</sub> Due to 90% Reduction in SO<sub>2</sub> Emissions from 167 EGU Stacks Affecting MANE-VU**

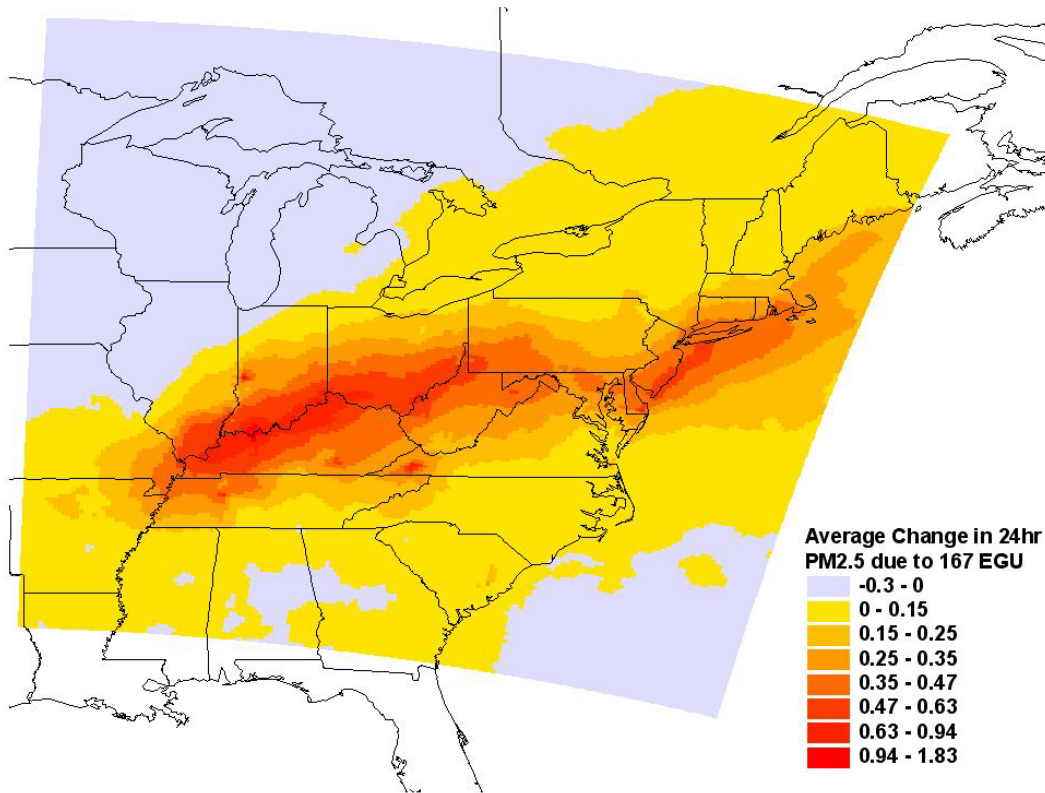


Figure 10.4.4 shows that significant reductions of PM<sub>2.5</sub> were predicted for the MANE-VU region as well as for portions of the VISTAS and Midwest RPO regions as a result of reducing SO<sub>2</sub> emissions by 90 percent from 167 EGU stacks affecting MANE-VU. While the anticipated SO<sub>2</sub> emissions reductions are significant, based on consultations with affected states, MANE-VU determined that it may be unrealistic to expect the full 90 percent emissions reductions would be achieved by 2018. Therefore, further modeling was conducted to assess a more realistic scenario. The final EGU modeling inventory is described fully in the report entitled, *Documentation of 2018 Emissions from Electric Generating Units* (Alpine, 2008, Appendix W).

MANE-VU's most recent modeling is documented in the report *2018 Visibility Projections* (NESCAUM 2008, Appendix L). This modeling estimated composite visibility benefits of all strategies within and outside MANE-VU rather than the benefits

of individual strategies. These modeling results and the estimated composite visibility benefits projected by 2018 are described in Section 10.6.

MANE-VU identified emissions from 167 stacks at EGU facilities as having visibility impacts in MANE-VU Class I areas that make controlling emissions from those stacks crucial to improving visibility at MANE-VU Class I areas. MANE-VU's agreed regional approach for this source sector is to pursue a 90 percent control level on SO<sub>2</sub> emissions from these 167 stacks by 2018 as appropriate and necessary. MANE-VU has concluded that pursuing this level of sulfur reduction is both reasonable and cost-effective. Table 10.4.4-1 below lists the EGU stacks in Pennsylvania identified on the list of 167 stacks in all of MANE-VU, (including for reference purposes and where applicable, the BART facility identification number associated with the stack modeled in the MANE-VU Class I area deciview impact spreadsheets contained in Appendix I) with their current and anticipated controls, the permit status of the SO<sub>2</sub> controls, and the anticipated SO<sub>2</sub> emissions reductions achieved by 2018:

**Table 10.4.4-1 EGU Stacks in Pennsylvania and Controls Identified from the MANE-VU 167 Stack List**

Facility Name & Stack ID in Appendix I	Facility ID ORISPL	Unit ID	Unit Type	PF ID	Facility ID	Identified Stacks	Current Controls	Anticipated Controls & Permit Status	Anticipated Reduction in SO <sub>2</sub> Emissions
Armstrong	3178	2	Coal Steam	251515	43086	D031782	LNB, / CS ESP		90% *
Brunner Island PA_26	3140	2	Coal Steam	473196	45820	D03140C12	LNB, SOFA / CS ESP	Wet Scrubber in 2009 Plan Approval No. 67-05005D	95%
Brunner Island	3140	3	Coal Steam	473196	45821	D031403	LNB, SOFA / CS ESP	Wet Scrubber in 2009 Plan Approval No. 67-05005D	95%
Cheswick AC_04	8226	1	Coal Steam			D082261	SCR / CS ESP	Wet Scrubber in 2010	95%
Hatfields Ferry PA_35	3179	2	Coal Steam	280920	43072	D03179C01	LNCB, Gas Reburn, SNCR in 2006 / CS ESP	Wet Scrubber in 2009 Plan Approval No. 30-00099F	95%
Homer City PA_37	3122	1	Coal Steam	262713	49780	D031221	SCR / CS ESP		95% **
Homer City PA_37	3122	2	Coal Steam	262713	49781	D031222	SCR / CS ESP		95% **
Keystone PA_39	3136	1	Coal Steam	275229	49769	D031361	SCR / CS ESP	Wet Scrubber in 2009 Plan Approval No. 03-00027B	95%
Keystone PA_39	3136	2	Coal Steam	275229	49770	D031362	SCR / CS ESP	Wet Scrubber in 2010 Plan Approval No. 03-00027B	95%



Martins Creek PA_08	3148	2	Coal Steam	252187	45859	D03148C12	Permanent Shutdown 9/07	N/A	
Montour PA_07	3149	1	Coal Steam	254018	45872	D031491	SCR / CS ESP	Wet Scrubber in operation. Plan Approval No.:47-00001B	95%
Montour PA_07	3149	2	Coal Steam	254018	45873	D031492	SCR / CS ESP	Wet Scrubber in operation. Plan Approval No.:47-00001B	95%
Portland PA_09	3113	1	Coal Steam	549766	45735	D031131	LNB-SOFA		
Portland	3113	2	Coal Steam	549766	45736	D031132	LNB-SOFA		
Shawville	3131	1	Coal Steam	249235	49763	D03131CS1	SNCR / CS ESP		

\* The Department is currently in litigation with Allegheny Energy, owner of Armstrong, to require SO<sub>2</sub> controls as part of NSR and PSD alleged violations by the Department.

\*\* In June 2008, May and November 2010, EPA issued notices of violation to EME Homer City Generating Facility to require SO<sub>2</sub> controls as part of NSR alleged violations under the Clean Air Act. In addition, the Department, together with New York State in July 2010, filed a 60-day notice of intent to sue related to these violations.

In addition to these measures (BART controls within MANE-VU, low sulfur fuel within MANE-VU, and controls on specific EGUs), MANE-VU asked neighboring RPOs to consider further non-EGU emissions reductions comparable to those achieved through MANE-VU's low sulfur fuel strategies, which are expected to achieve a greater than 28 percent reduction in non-EGU SO<sub>2</sub> emissions in 2018. After consultation with other states and consideration of comments received, the MANE-VU Class I States decided that MANE-VU's most recent modeling would include implementation of these additional emissions reductions.

In order to model the impact of this strategy on visibility at MANE-VU Class I areas, the following reductions were made to emissions in the VISTAS and MRPO regions:

For both Southeast and Midwest States:

Coal-Fired ICI Boilers: emissions were reduced by 60 percent.

Oil-Fired ICI boilers: emissions were reduced by 75 percent.

ICI Boilers lacking fuel specification: emissions were reduced by 50 percent.

Additional controls in the Southeastern States:

Emissions from Other Area Oil-Combustion sources were reduced by 75 percent. (Used the same SCCs identified in MANE-VU Oil strategies list.)

As requested by the MANE-VU Class I States for the most recent modeling, NESCAUM also removed SO<sub>2</sub> emissions from 6500 MW of six coal-burning EGUs in Canada that are

scheduled to be shut down.<sup>13</sup> It is expected that these units will be replaced with nine natural gas turbine units with SCR controls. NESCAUM based estimated emission rates for modeled pollutants on a combination of factors, including recommendations from the State of New Hampshire, a New York State Energy Research and Development Authority (NYSERDA) study, and AP-42 (Air Pollution emission factors compilation) ratios among pollutants. Emissions were reduced by more than 144,000 tons per year as a result of this measure.

The Department intends to re-evaluate the projections of SO<sub>2</sub> reductions due to CAIR at the time of Pennsylvania’s first periodic report to determine whether the predicted reductions are realized. The Department’s CAIR was approved by the EPA as a SIP revision effective December 10, 2009 (74 FR 65446). The EGUs in the Commonwealth are now required to reduce NO<sub>x</sub> and SO<sub>2</sub> emissions under Pennsylvania’s CAIR Program. As a result of the Court’s remand of the federal CAIR to EPA for revision, it is reasonable to expect that a revised CAIR will be in place to evaluate the Commonwealth’s SO<sub>2</sub> emissions controls on Pennsylvania’s EGUs by the time the first progress report is due. Based on the controls proposed, constructed and under construction in Pennsylvania, the Department has concluded that at this time, the Department’s CAIR regulation constitutes a reasonable measure for EGUs in Pennsylvania. Therefore, consistent with the MANE-VU ‘Ask’ Statement, the Department projects a 94.5% reduction in SO<sub>2</sub> emissions from the EGUs listed above in Table 10.4.4-1 (or from alternative measures, as appropriate and necessary). Because of the SO<sub>2</sub> controls installed in 2009 and 2010 (as shown in Table 10.4.4-1), no additional measures will be needed to meet the reasonable progress goals. Additionally, several EGU stacks in Pennsylvania not identified on the 167 stack list that are expected to be controlled as a result of the Department’s CAIR regulation are listed in the following Table 10.4.4-2:

**Table 10.4.4-2 Additional EGU Stacks and Controls in Pennsylvania**

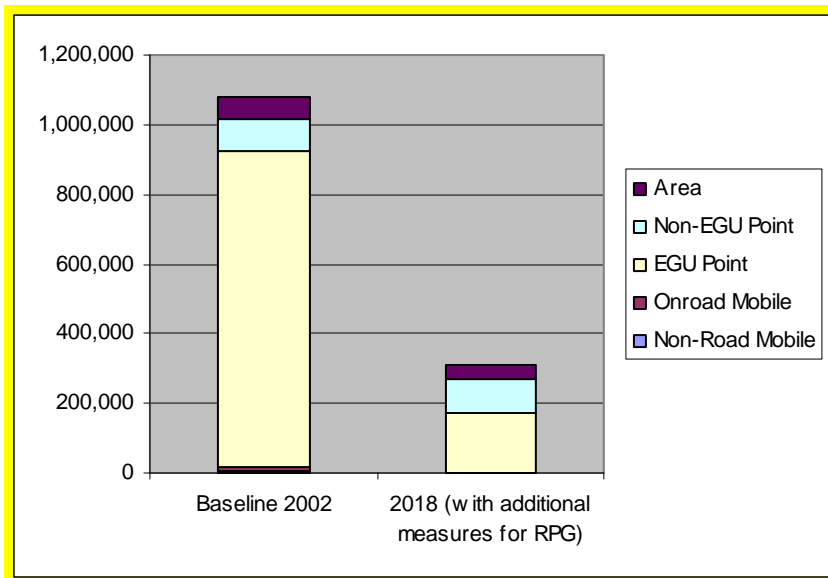
Facility Name	Facility ID ORISPL	Unit ID	Unit Type	PF ID	Facility ID	Identified Stacks	Current Controls	Anticipated Controls & Permit Status	Anticipated Reduction in SO <sub>2</sub> Emissions
WPS Res. Sunbury Six Boilers (Units 1-4)	3152	1-4	Coal Steam	4612		D03152CS2 D03152CS3 D03152CS4	LNB, Baghouse, Multiclone, ESPs.	Wet Scrubber in 2010 with a new stack that will exhaust all six boilers. Plan Approval No. 55-00001C	95%

<sup>13</sup> NESCAUM’s 2018 Visibility Projections report cited a November 2006 paper by the Ontario Power Authority, “Ontario’s Integrated power System Plan Discussion Paper 7: Integrating the Elements—A Preliminary Plan.” See [http://www.powerauthority.on.ca/ipsp/Storage/32/2734\\_DP7\\_IntegratingTheElements.pdf](http://www.powerauthority.on.ca/ipsp/Storage/32/2734_DP7_IntegratingTheElements.pdf)

Reliant Shawville Units 3 & 4	3131	3 4	Coal Steam	249235	49765 49766	D03131CS2	SNCR / CS ESP	FGD - Dry Scrubber (spray dryer absorber) in 2010. Plan Approval No. 17-00001D	95%
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The EGU SO<sub>2</sub> emission reductions that the Department agreed to pursue are consistent with the assumptions used in the MANE-VU final modeling used to establish reasonable progress goals for MANE-VU Class I areas. Table 10.4.4-3 below shows the reductions in SO<sub>2</sub> emissions anticipated from 2002 to 2018 for all Pennsylvania source sectors:

**Table 10.4.4-3 Pennsylvania’s SO<sub>2</sub> Baseline Emissions for 2002 and Projected Emissions for 2018 (tons per year)**



#### 10.4.5. The VISTAS Modeling Approach

In addressing emissions from EGUs, the Department has also considered impacts on Class I areas outside MANE-VU where visibility may be affected by emissions from within Pennsylvania.

As described more fully in Section 9.1.2 of this SIP revision, to establish reasonable progress targets for their Class I areas, West Virginia and Virginia used modeling that assumed implementation of CAIR for EGUs in the eastern United States, including the EGUs in Pennsylvania. Therefore, EGU controls in Pennsylvania that are consistent with CAIR are also consistent with the reasonable progress goals established for Dolly Sods Wilderness Area by West Virginia in their Regional Haze SIP revision, and for the reasonable progress goals established by Virginia in their Regional Haze SIP revision for

the Shenandoah National Park. (See Appendix K for the Power Point presentation given to the MANE-VU member states on March 18, 2008, by VISTAS on VISTAS 2018 Regional Haze Best and Final Modeling Projections.)

Modeling conducted for VISTAS and used by West Virginia and Virginia to set their reasonable progress goals for the Dolly Sods Wilderness Area and the Shenandoah National Park, respectively, projected different 2018 visibility than was predicted by the most recent MANE-VU modeling at those two Class I areas. MANE-VU predicted less visibility improvement by 2018 than VISTAS predicted at both Dolly Sods and Shenandoah, but only at Dolly Sods did the MANE-VU modeling project that the uniform rate of progress in 2018 would not be met. This is primarily because the two regions used different assumptions about the efficacy of CAIR in reducing emissions from EGUs. MANE-VU's emissions assumptions regarding anticipated CAIR reductions from the EGUs are more conservative than are VISTAS', because the MANE-VU emissions were not reduced as much as the VISTAS's emissions were. MANE-VU decided to keep the CAIR cap whole and added EGU SO<sub>2</sub> emissions to the inventory to estimate the impact of banking and trading under CAIR. In the most recent modeling, NESCAUM increased the inventory emissions from MANE-VU states, and from the MRPO and VISTAS states subject to the CAIR cap and trade program.

The most recent modeling completed by VISTAS for the Class I areas in VISTAS showed the uniform rate of progress in 2018 would be met at both Shenandoah and Dolly Sods. VISTAS did not add back SO<sub>2</sub> emissions to their 2018 projected inventory, and have stated that they believe their inventory represents the best estimate of 2018 SO<sub>2</sub> emissions from OTB/OTW controls in that region. (See Appendix CC, VISTAS Letter of Comments on the MANE-VU Best and Final Modeling.)

In summary, the VISTAS modeling results indicate that the projected level of emissions controls for Pennsylvania's sources by 2018 will allow the Dolly Sods Class I area to meet the reasonable progress goals established by West Virginia by 2018. The emissions control strategy for the MANE-VU Class I areas' reasonable progress analysis is therefore a reasonable emissions control strategy for the reasonable progress analysis for the Dolly Sods Class I area. Pennsylvania is achieving a reasonable level of control by pursuing, as appropriate and necessary, the four goals of the MANE-VU 'Ask' Statement in order to meet the reasonable progress goals established for the Dolly Sods Class I area. The Commonwealth adopted a CAIR regulation on April 12, 2008, which was approved by the EPA as a SIP revision effective December 10, 2009 (74 FR 65446). The EGUs in the Commonwealth are now required to reduce NO<sub>x</sub> and SO<sub>2</sub> emissions under Pennsylvania's CAIR Program. As a result of the Court's remand of the federal CAIR to EPA, it is reasonable to expect that a revised federal CAIR will be in place to evaluate the Commonwealth's SO<sub>2</sub> emissions controls on Pennsylvania's EGUs by the time the first regional haze progress report is due.

## **10.5. Consideration of Factors Required by the Regional Haze Rule**

Section 51.308(d)(3)(v) of EPA's RHR requires the Department to consider several factors in developing its long-term strategy. These are discussed below.

### **10.5.1. Emission Reductions Due to Ongoing Air Pollution Programs**

Section 51.308(d)(3)(v)(A) requires that emission reductions from ongoing pollution control programs be considered. The Department, and MANE-VU, considered emission control programs being implemented between the baseline period and 2018, as discussed below. Significant emissions control programs are being implemented between the baseline period and 2018. These programs are described in more detail below.

MANE-VU's 2018 "beyond on the way" (BOTW) emissions inventory accounts for emission controls already in place as well as emission controls that are not yet finalized but are likely to achieve additional reductions by 2018. The BOTW inventory was developed based on the MANE-VU 2002 Version 3.0 inventory and the MANE-VU 2018 OTB/OTW inventory. Inventories used for other RPOs also reflect anticipated emissions controls that will be in place by 2018. The inventory is termed "beyond on the way" because it includes control measures that were developed for ozone SIPs which were not yet on the books in some states. For some states, BOTW also included controls that were under consideration for regional haze SIPs that have not yet been adopted. More information may be found in the following documents:

- *Development of Emissions Projections for 2009, 2012, and 2018 for Non-EGU Point, Area, and Non-road Sources in the MANE-VU Region* (MACTEC, February 2007)(Appendix V).
- *Documentation of 2018 Emissions from Electric Generation Units in the Eastern U.S. for MANE-VU's Regional Haze Modeling* (Alpine Geophysics, March 2008)(Appendix W).
- *MANE-VU Modeling for Reasonable Progress Goals: Model Performance Evaluation, Pollution Apportionment, and Control Measure Benefits*, (NESCAUM, February 2008)(Appendix S).
- *2018 Visibility Projections*, NESCAUM (March 2008)(Appendix L).

For other regions, MANE-VU used inventories developed by the RPOs for those regions, including VISTAS Base G2, MRPO's Base K, and CenRAP's emissions inventory. (Emissions for CenRAP states in the MANE-VU modeling domain were taken from the VISTAS Base G2 inventory.)

The following suite of measures is part of the Department's strategy for reducing emissions as part of its long-term strategy to reduce emissions:

### 10.5.1.1. Stationary Point Sources

**Clean Air Interstate Rule (CAIR).** This major federal CAIR (70 FR 25162, May 12, 2005), as amended, and the CAIR FIPs (71 FR 25328, April 28, 2006) provided a transition from the NO<sub>x</sub> SIP Call EGU regulations in 2009 and were designed to continue to ensure that large EGUs within and upwind of the area would maintain background emissions at or below 2002 levels, while any new large EGUs locating within the area would be required to obtain both offsets and allowances. Pennsylvania and other nearby states were required to adopt a regulation implementing the requirements of the CAIR or an equivalent program. On April 28, 2006, EPA promulgated FIPs to reduce the interstate transport of NO<sub>x</sub> and SO<sub>2</sub> that contribute significantly to nonattainment and maintenance of the 8-hour ozone and PM<sub>2.5</sub> NAAQS. This major federal rule imposed permanent emissions caps on NO<sub>x</sub> and SO<sub>2</sub> in the eastern United States by 2015. When fully effective, CAIR would have reduced SO<sub>2</sub> emissions in the CAIR region by up to 70 percent. However, the federal CAIR was vacated by the United States Court of Appeals for the District of Columbia Circuit on July 11, 2008, in *State of North Carolina v. Environmental Protection Agency*, 531 F.3d 896 (D.C. Cir. 2008), and subsequently remanded to EPA on December 23, 2008. The final replacement rule for CAIR, expected in 2011, must be consistent with the Court's July 11, 2008, decision. In the meantime, as a result of the remand and EPA approval of Pennsylvania's CAIR as a SIP revision effective December 10, 2009 (74 FR 65446), Pennsylvania's CAIR is being implemented in this Commonwealth. The IPM<sup>®</sup> model was used to predict future emissions from EGUs after implementation of CAIR.<sup>14</sup> Modifications to the output of IPM<sup>®</sup> made to better represent anticipated controls are described in the report *Documentation of 2018 Emissions from Electric Generating Units* (Alpine Geophysics, 2008) (Appendix W).

**Pennsylvania CAIR Program.** The Department's CAIR SIP revision was approved by the EPA on December 10, 2009 (74 FR 65446). The EGU owners and operators in the Commonwealth are now required to reduce emissions according to the Department's CAIR regulation. The annual SO<sub>2</sub> budget for EGUs is 275,990 tons per year for the years 2010-2015.

**Interstate Pollution Transport Reduction.** In response to the Federal NO<sub>x</sub> SIP call rule, Pennsylvania and other covered states adopted NO<sub>x</sub> control regulations for large industrial boilers and internal combustion engines, EGUs, and cement plants. The regulation covering industrial boilers and electric generators required emission reductions to commence May 1, 2003, while the regulation covering large internal combustion engines and cement plants required emission reductions to commence May 1, 2005. EPA

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<sup>14</sup> Although the IPM<sup>®</sup> model runs also anticipated the implementation of EPA's Clean Air Mercury Rule (CAMR), that rule has since been vacated by the courts. However, it is anticipated the adjustments to the predicted SO<sub>2</sub> emissions from electric generating units (EGUs) used in the air quality modeling, which were based on state-specific comments on the amount of SO<sub>2</sub> controls that will actually be installed due to state specific regulations and the EPA's CAIR rule, will have more of an impact on the air quality modeling analysis conducted for this SIP than the vacature of the CAMR rule. MANE-VU believes the adjustments based on state-specific comments improved the reliability of the inventory and made the modeling results more dependable.

approved this regulation, found in *25 Pa. Code* Chapter 145, on September 29, 2006 (71 FR 57428).

**Small Sources of NO<sub>x</sub>, Cement Kilns, and Large Stationary Internal Combustion Engines.** The Department established additional ozone season requirements for small sources of NO<sub>x</sub> in the counties of Bucks, Chester, Delaware, Montgomery, and Philadelphia in regulations that were adopted December 11, 2004. The rules (*25 Pa. Code* Chapter 129) apply to owners and operators of certain boilers, turbines, and stationary internal combustion units located in Bucks, Chester, Delaware, Montgomery, and Philadelphia Counties. The emission limits are differentiated by fuel type and allow alternative compliance mechanisms. By November 1<sup>st</sup> of each year, owners and operators of these sources must surrender NO<sub>x</sub> allowances if actual emissions exceed allowable emissions. The amendments required the NO<sub>x</sub> emission limits to be implemented by May 1, 2005. EPA approved this program on September 29, 2006 (71 FR 57428).

**Refinery Consent Decrees.** EPA's national petroleum refinery initiative has produced 19 multi-facility settlements with United States petroleum refining companies. These settlements require significant reductions of NO<sub>x</sub>, SO<sub>2</sub>, VOC, PM, and toxics. Three refinery facilities in Pennsylvania have negotiated settlements: Sunoco/Marcus Hook Refinery, Sunoco/Philadelphia Refinery, and ConocoPhillips/Trainer Refinery. These three consent decree settlements are described below:

**United States et al v Sunoco USA, Inc.:**

On June 16, 2005, the United State Department of Justice, acting at the request and on behalf of the EPA, simultaneously filed a Complaint and lodged a Consent Decree in the United States District Court for the Eastern District of Pennsylvania against Sunoco, Inc. ("Sunoco") for alleged environmental violations at Sunoco's four petroleum refineries located in Marcus Hook, Pennsylvania; Philadelphia, Pennsylvania; Toledo, Ohio; and Tulsa, Oklahoma. The Plaintiff/Intervenors include the States of Ohio, Oklahoma, and the City of Philadelphia. This consent decree is found in Appendix EE of this SIP revision.

**Sunoco/Marcus Hook and Sunoco/Philadelphia Refineries.** This federally-enforceable consent decree requires Sunoco, Inc., to install certain controls that are estimated to yield reduction of emissions from the Marcus Hook refinery of approximately 1500 tons of NO<sub>x</sub>, 4000 tons of SO<sub>2</sub>, and 200 tons of PM from the 2002 baseline inventory and a reduction of emissions from the Philadelphia Refinery of approximately 1200 tons of NO<sub>x</sub> and 3000 tons of SO<sub>2</sub> from the 2002 baseline inventory.

At the Marcus Hook Refinery, the consent decree requires installation of a wet scrubber to reduce SO<sub>2</sub> and PM emissions and SCR or equivalent to reduce NO<sub>x</sub> emissions from the Fluidized Catalytic Cracking (FCC) Unit. The consent decree also mandates that the FCC unit meet the New Source Performance Standard (NSPS) PM limit of 1 lb/1000 lb coke or lower. The consent decree mandates that Sunoco agree to do

one of the following by June 30, 2013: Continue to operate its existing ESP, install a new ESP, or accept a PM limit of 0.5 lb/1000 lb coke or lower.

At Sunoco's Philadelphia Refinery, the consent decree requires installation of a wet gas scrubber to reduce SO<sub>2</sub> and PM emissions and SCR or equivalent to reduce NO<sub>x</sub> emissions from the 1232 FCC Unit. The consent decree also mandates that the 1232 FCC Unit wet gas scrubber meets a PM limit of 0.5 lb/1000 lb coke or lower. The consent decree mandates that the 1232 FCC Unit and the 868 FCC Unit with CO Boiler meet the NSPS requirements for SO<sub>2</sub>, PM, CO, and opacity.

In addition to addressing requirements related to the FCC unit, Sunoco was required to submit a NO<sub>x</sub> control plan for their combustion units. At the Marcus Hook Refinery, Sunoco is complying by shutting down four boilers and one process heater. At the Philadelphia Refinery, Sunoco will comply by installing ULNB on 4 boilers and 2 process heaters.

#### **United States et al v. ConocoPhillips Company:**

On January 27, 2005, the United States Department of Justice, acting at the request and on behalf of the EPA, simultaneously filed a Complaint and lodged a Consent Decree in the United States District Court for the Southern District of Texas. The States of Illinois, Louisiana, New Jersey and Pennsylvania, and the Northwest Clean Air Agency were Plaintiff/Intervenors in the matter. This consent decree is found in Appendix DD of this SIP revision. The consent decree requires ConocoPhillips, the defendant, to install certain controls that are estimated to yield reduction of emissions from the ConocoPhillips Trainer Refinery of approximately 1100 tons of NO<sub>x</sub>, 2100 tons of SO<sub>2</sub>, and 100 tons of PM from the 2002 baseline inventory.

#### **ConocoPhillips/Trainer Refinery.**

The consent decree requires installation of a wet scrubber (installed in 2006) to reduce SO<sub>2</sub> and PM emissions and enhanced SNCR (also installed in 2006) to reduce NO<sub>x</sub> emissions from the FCC unit/CO Boiler. EPA proposed final NO<sub>x</sub> limits for the Trainer FCC unit pursuant to paragraphs 50 and 51 of the referenced consent decree on January 5, 2010. Subsequently, ConocoPhillips accepted EPA's limits on August 5, 2010. Based on ConocoPhillips's acceptance of the NO<sub>x</sub> limits on August 5, 2010, ConocoPhillips will act to incorporate the limits into a federally enforceable permit pursuant to paragraph 257 of the referenced consent decree by November 2010. The final FCC NO<sub>x</sub> limits are: 121.1 ppmvd (365-day) and 155.3 ppmvd (7-day). The consent decree also mandates that the emissions of Particulate matter from the FCC unit/CO Boiler meet a limit of 0.5 lb/1000 lb coke or lower.

In addition to requirements related to the FCC unit/CO Boiler, the consent decree requires ConocoPhillips to submit a NO<sub>x</sub> control plan for their combustion units. ConocoPhillips' NO<sub>x</sub> control plan includes shutdown of three boilers and the FCC unit feed heater by 2006 and installation of ULNB on certain heaters.



**New Source Review and PSD Programs.** The federal new source review (NSR) programs are preconstruction review and permitting programs applicable to new or modified major stationary sources subject to Title I, Parts C and D of the federal the CAA. The programs consists of the PSD program requirements, which are applicable in areas attaining the national ambient air quality standards (NAAQS), and the nonattainment NSR program requirements that apply in geographic areas which are not attaining and maintaining the NAAQS.

Pennsylvania's PSD program, codified in 25 Pa.Code Chapter 127, Subchapter D, was approved by EPA on August 21, 1984 (49 FR 33128) and codified at codified at 40 CFR § 52.2058. The federal PSD regulations codified in 40 CFR Part 52 are incorporated by reference in their entirety in 25 Pa. Code § 127.83 (relating to adoption by reference). The PSD program requires any new source to implement Best Available Control Technology (BACT) and limits a new source's allowable impact on the environment. As part of additional impact analyses under the PSD program, pursuant to 40 CFR § 52.21 (p), new or modified sources are required to demonstrate that their proposed emissions will not adversely impact any air quality related values (AQRV), including visibility, in Federal Class I areas.

These federally enforceable programs, incorporated in the Commonwealth's State Implementation Plan, will also reduce emissions to provide continued improvements in visibility in mandatory Class I Federal areas.

#### **Additional Point Source Controls in MANE-VU Expected by 2018:**

Control factors were applied to the 2018 MANE-VU inventory to represent the following national, regional, or state control measures:

- NO<sub>x</sub> SIP Call Phase I (NO<sub>x</sub> Budget Trading Program)
- NO<sub>x</sub> SIP Call Phase II
- NO<sub>x</sub> RACT in 1-hour Ozone SIPs
- NO<sub>x</sub> OTC 2001 Model Rule for ICI Boilers
- 2-, 4-, 7-, and 10-year MACT Standards
- Combustion Turbine and Rotating Internal Combustion Engine (RICE) MACT
- Industrial Boiler/Process Heater MACT<sup>15</sup>
- EPA's Refinery Enforcement Initiative

In addition, states provided specific control measure information about specific sources or regulatory programs in their state. MANE-VU used the state-specific data to the extent it was available in the BOTW 2018 MANE-VU inventory.

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<sup>15</sup> The inventory was prepared before the MACT for Industrial Boilers and Process Heaters was vacated. Control efficiency was assumed to be at 4 percent for SO<sub>2</sub> and 40 percent for PM.

For the specific states identified, the measures included in this analysis reduced emissions for the following pollutants and non-EGU point source categories due to strategies developed for purposes of reducing ozone in the Ozone Transport Region (OTR):

- NO<sub>x</sub> measures:
  - asphalt production plants in CT, DC, NJ, and NY;
  - cement kilns in ME, MD, NY, PA;
  - glass and fiberglass furnaces in ME, MD, NY, PA;
- VOC measure: adhesives and sealants application (all MANE-VU states except NJ and VT).

**The Final Rulemaking for Cement Kilns:** The Commonwealth adopted a regulation to lower the ozone season NO<sub>x</sub> emission limits for cement kilns based on the type of kiln. The regulation became effective on June 19, 2010, when it was published in the *Pennsylvania Bulletin* (40 Pa.B. 3346). The current ozone season NO<sub>x</sub> limit for cement kilns is one rate regardless of kiln type. The revised regulation for cement kilns further reduces NO<sub>x</sub> emissions in Pennsylvania by lowering the allowable emission limit. This regulation has a compliance date of May 1, 2011.

**The Final Rulemaking for Glass Furnaces:** The Commonwealth adopted a regulation to reduce the ozone season NO<sub>x</sub> emissions from glass melting furnaces, based on the type of product the glass furnace makes. The regulation became effective on June 19, 2010, when it was published in the *Pennsylvania Bulletin* (40 Pa.B. 3328). The glass furnaces regulation will further reduce NO<sub>x</sub> emissions in Pennsylvania by reducing the allowable emission limit from the furnaces. This regulation has a compliance date of January 1, 2012.

**Pennsylvania's Energy Initiatives:**

The Department intends to pursue a proposed rulemaking to address NO<sub>x</sub> and fine particulate emissions reductions during high electric demand days at electric generating sources.

The Commonwealth's Alternative Energy Investment Act (73 P.S. §§ 1649.101-1649.711) provides for a \$650 million energy initiative program.

The Alternative Energy Portfolio Standards (AEPS) Act (73 P.S. §§ 1648.1-1648.8) provides for the acquisition and sale of electricity generated from renewable and environmentally beneficial sources. Under the AEPS, by February 28, 2007 (two years after the effective date), at least 1.5% of the electric energy sold by an electric distribution company or electric generation supplier to retail customers in this Commonwealth was required to be generated by Tier I alternative energy sources. Three

years after the effective date of the AEPS (February 28, 2008), it was required to be 3.0%. The percentage increases by at least 0.5% each year until at least 8% of the electric energy sold by an electric distribution company or electric generation supplier to retail customers in this Commonwealth is generated by Tier I alternative energy sources by February 28, 2020 (15 years after the effective date of the AEPS).

Phase 1 of Act 129 of 2008 (the act of October 15, 2008 (P.L.1592, No. 129)) (Act 129) imposes an obligation on the Pennsylvania Public Utility Commission to adopt an energy efficiency and conservation (EE&C) program by January 15, 2009. Act 129 requires utilities to adopt and implement cost-effective plans to cut electricity use 1% by 2011 and 3% by 2013. Utilities must also implement plans by 2013 to cut energy use 4.5% during peak electric demand periods when electricity prices are highest - typically the hottest days of summer and the coldest days of winter.

#### **10.5.1.2. Area Source Controls in MANE-VU**

For area sources within MANE-VU, the 2018 inventory for area sources was developed by applying growth and control factors to the 2002 Version 3.0 inventory. Area source control factors were developed for the following national or regional control measures:

- OTC VOC Model Rules.
- Federal On-board Vapor Recovery.
- New Jersey Post-2002 Area Source Controls.
- Residential Woodstove NSPS.

#### **10.5.1.3. Highway Vehicle Sources**

Even with increases in VMT that occur from 2002 through 2009, highway vehicle emissions of both VOC and NO<sub>x</sub> will continue to decrease. As more vehicles subject to cleaner new car standards replace older vehicles subject to less stringent new vehicle standards, the fleet as a whole emits fewer emissions, compensating for the increase in vehicle miles traveled. These decreases can be attributed to the programs described below.

#### **Federal Motor Vehicle Control Programs (FMVCP) and Pennsylvania Clean Vehicles Program for passenger vehicles and light-duty trucks and cleaner gasoline**

Tier 1 tailpipe standards established by the CAA amendments of 1990 include NO<sub>x</sub> and VOC limits for light-duty gasoline vehicles (LDGVs) and light-duty gasoline trucks (LDGTs). These standards began to be phased in starting in 1994. Evaporative VOC emissions were also reduced in gasoline-powered cars starting with model year (MY) 1998.

In 1998, under the authority of section 177 of the CAA, the Department adopted the Pennsylvania Clean Vehicles Program. (28 Pa. B. 5873, Dec. 5, 1998.) The

Pennsylvania Clean Vehicles Program incorporates certain California Low Emission Vehicle emission standards for passenger cars and light-duty trucks by reference. As required under Section 177 of the CAA, these provisions are identical to the low emission standards adopted by California, except that the regulation does not incorporate by reference the California zero emissions vehicle (ZEV) or emissions control warranty systems statement provisions.

In the same rulemaking, the Department adopted the National Low Emission Vehicle (NLEV) program as a compliance alternative to the Pennsylvania Clean Vehicles Program. The NLEV program became effective in the Ozone Transport Region in 1999. Pennsylvania's New Motor Vehicle Emissions Control Program regulations (25 Pa. Code Subchapter 126.401-126.441) allowed automobile manufacturers to comply with NLEV instead of the California Low Emission Vehicle (CA LEV) program through model year 2005. These regulations affected vehicles 6,000 pounds and less and were the regulations in effect for new motor vehicles in the baseline year, 2002.

In 1999, EPA promulgated regulations more stringent than NLEV (Tier 2), starting with MY 2004. In order to participate in NLEV, the Department had been required to adopt language that extended its "commitment" to NLEV until MY 2006. In practical terms, the NLEV program was replaced for MY 2004 and later by the more stringent Federal "Tier 2" vehicle emissions regulations, 65 F.R. 6698 (Feb. 10, 2000), and vehicle manufacturers operating under the NLEV program became subject to the Tier 2 requirements.

The Department amended the former New Motor Vehicle Control Program (which includes the Pennsylvania Clean Vehicles Program) in 2006. The Clean Vehicles Program continues to incorporate the California Low Emission Vehicle Program (CA LEV II) by reference. As amended, the program affects MY 2008 and newer passenger cars and light-duty trucks vehicles. 36 Pa B. 7424 (December 9, 2006).

Emissions for milestone years were estimated based on compliance with the Pennsylvania Clean Vehicles Program according to the methodology described in section 7.4.1 of the "Technical Guidance on the Use of MOBILE6.2 for Emissions Inventory Preparation" published by EPA's Office of Transportation and Air Quality (OTAQ) in January 2002. The Department is assuming in its MOBILE modeling that the federal Tier 2 program applies to subject vehicles sold in Pennsylvania from MY 2004 through MY 2007 and the Pennsylvania Clean Vehicles Program applies to subject vehicles sold in model year 2008 and beyond.

**Heavy-Duty Diesel Control Programs.** EPA promulgated more stringent national regulations for heavy-duty engines and vehicles (vehicles over 14,000 pounds) starting with MY 2004. In addition, consent decrees with seven of the largest heavy-duty engine manufacturers required, among other terms, that diesel engines made by these companies comply with these 2004 standards two model years early, in MY 2002. The Department includes these programs as provided in the MOBILE model.

In 2002, the Department adopted the Heavy-Duty Diesel Emissions Control Program for model years starting after May 2004. The program incorporates California standards by reference and requires MY 2005 and subsequent new heavy-duty diesel highway engines to be those certified by California. California standards are more stringent than federal standards for the two model years between expiration of the consent decrees discussed above and the implementation of more stringent federal standards affecting MY 2007 and beyond. However, EPA's MOBILE model already assumes that the engines would comply with consent decree standards, even without an enforcement mechanism. The Department has used MOBILE defaults to calculate emissions from MY 2005 and 2006 highway engines.

EPA adopted new emission standards for heavy-duty engines and vehicles for MY 2007 and subsequent. For diesel engines, the standards will be phased in from 2007 to 2010 for NOx and VOCs. For gasoline engines, the standards will be phased in during MY 2008 and MY 2009. Federal and California standards are virtually identical for MY 2007. For MY 2008, California adopted requirements for anti-idling engine programming which will be required in Pennsylvania by virtue of the Department's incorporation by reference. However, there is no EPA-approved methodology to estimate emission reductions from this requirement. Therefore, the emission estimates use assumptions of the federal rule for these years.

Because the new engine standards are adversely affected by sulfur in fuel, EPA also required most highway diesel fuel to contain no more than 15 parts per million (ppm) of sulfur, as of the fall of 2006. There is a temporary compliance option allowing refiners to continue to produce up to 20 percent of their highway diesel fuel at 500 ppm fuel until 2010. The Department uses MOBILE defaults to estimate the effects of the phase-in provision.

### **Vehicle Emission Inspection/Maintenance Programs in Pennsylvania.**

Philadelphia region (Bucks, Chester, Delaware, Montgomery, Philadelphia):

In early 2004, the Department implemented its revised Vehicle Emission Inspection/Maintenance (I/M) Program in the Philadelphia Area. The program applies to gasoline-powered vehicles 9,000 pounds and under, MY 1975 and newer. For vehicles 1996 and newer, the program consists of an annual on-board diagnostics test and a gas cap pressure test. For most subject vehicles MY 1995 and older, the program consists of a tailpipe test, visual inspection of pollution control devices to ensure they are present, connected and the proper type for the vehicle and a gas cap pressure test. For vehicles older than 25 years, the program is a visual inspection and gas cap test. These regulations can be found in 67 Pa. Code Chapter 177. The Department submitted the revised emissions program as a SIP revision on December 1, 2003. EPA approved the SIP revision on October 6, 2005.

Pittsburgh Region (Allegheny, Beaver, Washington, Westmoreland):

In early 2004, the Department implemented its revised I/M Program in the four applicable counties (Allegheny, Beaver, Washington and Westmoreland) in the Pittsburgh Area. The program applies to gasoline-powered vehicles 9,000 pounds and under, MY 1975 and newer. For vehicles 1996 and newer, the program consists of an annual on-board diagnostics test and a gas cap pressure test. For subject vehicles MY 1995 and older, the program consists of an annual two-speed idle test, visual inspection of pollution control devices to ensure they are present, connected and the proper type for the vehicle and a gas cap pressure test. For vehicles older than 25 years, the program is a visual inspection and gas cap test. These regulations can be found in *67 Pa. Code* Chapter 177. The Department submitted the revised emissions program as a SIP revision on December 1, 2003. EPA approved the SIP revision on October 6, 2005.

South Central Region (Berks, Cumberland, Dauphin, Lancaster, Lebanon, Lehigh, Northampton, York):

In early 2004, the Department expanded its I/M Program into Berks County. The program applies to gasoline-powered vehicles 9,000 pounds and under, MY 1975 and newer. For vehicles 1996 and newer, the program consists of an annual on-board diagnostics test and a gas cap pressure test. For subject vehicles MY 1995 and older, the program consists of an annual visual inspection of pollution control devices to ensure they are present, connected and the proper type for the vehicle and a gas cap pressure test. These regulations can be found in *67 Pa. Code* Chapter 177. The Department submitted the expanded emissions program as a SIP revision on December 1, 2003. EPA approved the SIP revision on October 6, 2005.

Northern Region (Blair, Cambria, Centre, Erie, Lackawanna, Luzerne, Lycoming, Mercer):

In early 2004, the Department expanded its I/M Program into these counties. The program applies to gasoline-powered vehicles 9,000 pounds and under, MY 1975 and newer. The program consists of an annual visual inspection of pollution control devices to ensure they are present, connected and the proper type for the vehicle and a gas cap pressure test. These regulations can be found in *67 Pa. Code* Chapter 177. The Department submitted the expanded vehicle emissions inspection program as a SIP revision on December 1, 2003. EPA approved the SIP revision on October 6, 2005 (70 FR 58313).

All other counties:

In December 2003, the Department amended its vehicle safety inspection program to include a visual inspection of certain pollution control components in the 42 counties for which a separate vehicle emissions inspection program is not required. These regulations can be found in *67 Pa. Code* Chapter 175. The Department submitted that portion of the

amended safety inspection program as a revision to its State Implementation Plan on December 1, 2003. EPA approved the SIP revision on October 6, 2005 (70 FR 58313).

**Low sulfur gasoline.** Simultaneously with publication of the Tier 2 program, EPA published a regulation requiring the reduction of sulfur in gasoline beginning in 2004, with full implementation in 2006. Sulfur levels are capped at 80 parts per million (ppm) per gallon and annual refinery averages must be no more than 30 ppm. This analysis uses the default assumptions provided in MOBILE6 to account for the implementation of the federal sulfur standard rule in an area in which reformulated gasoline is required.

**Additional programs related to motor vehicles.** The Department's Stage II requirements were adopted in February 1992. The Stage II requirements apply to five counties in the Philadelphia area (Bucks, Chester, Delaware, Montgomery and Philadelphia counties) and seven counties in the Pittsburgh-Beaver Valley area (Allegheny, Armstrong, Beaver, Butler, Fayette, Washington, and Westmoreland counties). This program requires vapor recovery nozzles on gasoline pumps that ensure that the gasoline vapors from the filling of motor vehicle gasoline tanks are collected and returned to the service station's storage tanks. Emission reductions from this strategy primarily come from vehicles without the federally required on-board vapor recovery controls phased in between 1998 and 2000 model years, although the requirement provides some additional reductions from the newer vehicles as well.

Gasoline sold in the Philadelphia Area is required by the CAA to be the cleaner-burning reformulated gasoline meeting standards established in Section 211 of the CAA. This federally enforced program has been in place since January 1995.

Gasoline sold in the seven county Pittsburgh-Beaver Valley area from May 1 through September 15 of each year must be no greater than 7.8 psi Reid Vapor Pressure. This state-enforced regulation was adopted in October 1997 and amended in October 1999.

**The Diesel-Powered Motor Vehicle Idling Act, Act 124 of 2008**

On October 9, 2008, Act 124 (also called the Diesel-Powered Motor Vehicle Idling Act), was signed into law in Pennsylvania. The act became effective February 6, 2009. The purpose of Act 124 is to reduce unnecessary idling of the main propulsion engine in diesel-powered motor vehicles. The Act applies to drivers or owners of a diesel-powered motor vehicle engaged in commerce with a gross weight of 10,001 pounds or more and an owner or operator of a location where the aforementioned subject vehicles load or unload, or a location that supplies 15 or more parking spaces. Act 124 requires that all diesel-powered motor vehicles that weigh 10,001 pounds or more, engaged in commerce, limit idling to no more than five minutes in any continuous 60-minute period (with some exceptions). Reducing main engine idling in diesel vehicles will lead to significant reductions in particulate pollution and other air pollutants all across Pennsylvania.

#### **10.5.1.4. Nonroad Sources**

EPA has adopted a series of regulations affecting new diesel-powered (“compression ignition”) and gasoline-powered (“spark ignition”) nonroad engines of various sizes (horsepower) and applications. Information on these federal rules, including their implementation dates, can be found at [www.epa.gov/nonroad](http://www.epa.gov/nonroad). The Department used the assumptions built into the nonroad model (NONROAD2005) to estimate emissions for all milestone years.

No new national or international regulations are expected to be applicable to aircraft by the ozone season of 2009. While EPA has published a notice of proposed rulemaking for more stringent standards for locomotives and large commercial marine diesel engines, the agency has not finalized any new standards.

EPA will also require diesel fuel used in most nonroad applications to contain less sulfur. The sulfur will prevent damage to the more advanced emission control systems needed to meet the engine standards; it will also reduce fine particulate emissions from diesel engines. In 2007, fuel sulfur levels were limited to 500 parts per million (ppm) for nonroad applications other than ocean-going marine vessels. In 2010, fuel sulfur levels will be reduced to the same sulfur concentration as in highway fuel, 15 ppm; this requirement applies in 2012 to locomotive and marine diesel fuel.

#### **10.5.2. Measures to Mitigate the Impacts of Construction Activities**

Section 51.308(d)(3)(v)(B) of EPA’s RHR requires the Department to consider measures to mitigate the impacts of construction activities. According to the EPA, construction activities are sources of fugitive dust and air pollutants from the use of diesel powered equipment. A description of MANE-VU’s consideration of measures to mitigate the impacts of construction can be found in the MANE-VU Construction Activities Technical Support Document (TSD) entitled, *Technical Support Document on Measures to Mitigate the Visibility Impacts of Construction Activities in the MANE-VU Region*, October 2006, Appendix T.

The MANE-VU Construction Activities TSD reports that “small dust particles, especially particles smaller than 10 micrograms (PM10) can persist in the atmosphere, possibly contributing to diminished visibility.” The Construction Activities TSD also reports “dust from construction activities is unlikely a large component of PM2.5 concentrations measured in MANE-VU Class I areas.” The Conclusion on page 13 in the Construction Activities TSD provided the following information:

“The following statements summarize the main points of this technical support document.

- Although a temporary source, fugitive dust and diesel emissions from construction activities can have an effect on local air quality.



- While construction activities are responsible for a relatively large fraction of direct PM<sub>2.5</sub> and PM<sub>10</sub> emissions in the Region, the impact on visibility is less because dust settles out of the air relatively close to the sources.
- Ambient air quality data shows that soil dust makes up only a minor fraction of the PM<sub>2.5</sub> measured in MANE-VU Class I Areas, and impacts of diesel emissions in these rural areas are also a small part of total PM<sub>2.5</sub>.
- The use of measures such as clean fuels, retrofit technology, best available technology, specialized permits, and truck staging areas (to limit the adverse impacts of idling) can help decrease the effects of diesel emissions on local air quality.
- MANE-VU States have rules in place to mitigate potential impacts of construction on visibility in Class I Areas.”

The Department’s existing regulations in 25 Pa. Code, Section 123.1 (relating to prohibition of certain fugitive emissions) state that persons responsible for construction activities “shall take all reasonable actions to prevent particulate matter from becoming airborne.” Section 123.2 (relating to fugitive particulate matter), states that persons responsible for construction activities “may not permit fugitive particulate matter to be emitted into the outdoor atmosphere...if the emissions are visible at the point the emissions pass outside the person’s property.” These regulations are SIP-approved as follows: Section 123.1 (a) through (c) was approved by EPA on December 17, 1979 (44 FR 73031), and Section 123.2 was approved by EPA on July 27, 1984 (49 FR 30183).

The Department does not have regulations to control emissions from diesel equipment at construction sites. However, permits are required for the operation of diesel and nonroad engines. Section 2 of both the General Plan Approval and/or General Operating Permit (BAQ-GPA/GP 9) and the General Plan Approval and/or General Operating Permit (BAQ-GPA/GP 11), states that nonroad and diesel engines must have the best available technology (BAT) installed and in operation so that the engine is in compliance with regulated emissions standards; these general permits are federally enforceable. Both general permits require the permittee to maintain accurate records of the amount of time the engine is in operation per month and the amount of fuel used. The Department’s BAT requirement in these general permits is authorized under the Pennsylvania Air Pollution Control Act, Section 6.6, 35 P.S. Section 4006.6 and under 25 Pa. Code, Sections 127.1 and 127.12(a)(5). The Department also requires a General Plan Approval and/or General Operating Permit (BAQ-GPA/GP – 5) for natural gas, coal bed methane or gob gas production or recovery facilities. This General Permit authorizes construction and/or operation of a natural gas, coal bed methane or gob gas production or recovery facility. This permit authorizes the construction of internal combustion engine(s); dehydrator(s) and associated equipment that meet the best available technology (BAT) required under 25 Pa. Code §§ 127.1 and 127.12(a)(5). Once authorization to use GP – 5 is granted, construction of the natural gas, coal bed methane or gob gas production or recovery facility designated in the application may proceed.

### **10.5.3. Source Retirement and Replacement Schedules**

Section 51.308(d)(3)(v)(D) of EPA's RHR requires the Department to consider source retirement and replacement schedules in developing its long-term strategy. Retirement and replacement will be managed in conformance with existing SIP requirements pertaining to PSD and NSR.

A federally-enforceable settlement agreement signed October 10, 2003, and filed with the Commonwealth of Pennsylvania Environmental Hearing Board between New Jersey Department of Environmental Protection, Appellant, on the one hand, and Commonwealth of Pennsylvania, Department of Environmental Protection, Appellee, and Lower Mount Bethel Energy, Permittee, on the other hand, required PPL Martins Creek to permanently cease operations of the boilers serving Units 1 and 2 by September 15, 2007. In 2002, Units 1 and 2 combined emitted 17,100 tons of SO<sub>2</sub> and 2800 tons of NO<sub>x</sub>.

### **10.5.4. Agricultural and Forestry Smoke Management**

Section 51.308(d)(3)(v)(E) of EPA's RHR requires the Department to consider smoke management techniques for the purposes of agricultural and forestry management in developing its long-term strategy.

A description of MANE-VU's analysis of smoke management in the context of regional haze SIPs can be found in the MANE-VU Smoke Management TSD entitled, *Technical Support Document on Agricultural and Forestry Smoke Management in the MANE-VU Region* in Appendix U. The TSD comes to the following conclusion:

“Smoke Management Programs are only required when smoke impacts from fires managed for resource benefits contribute significantly to regional haze. The results of the emissions inventory indicate that emissions from agricultural, managed, and prescribed burning are very minor source categories. Although source apportionment results show that wood smoke is a moderate contributor to visibility impairment at some Class I Areas in the MANE-VU Region, most of the wood smoke is attributable to residential wood combustion. It is unlikely that fires for agricultural or forestry management cause large impacts on visibility in any of the Class I Areas in the MANE-VU Region. On rare occasions, smoke from major fires degrades the air quality and visibility in the MANE-VU Area. However, these fires are generally unwanted wildfires that are not subject to Smoke Management Programs.”

Fires in Pennsylvania do not significantly contribute to visibility impairment in Class I areas. Therefore, the Department has not implemented a smoke management program.

### **10.5.5. Share of Emission Reductions**

Section 51.308(d)(3)(ii) of the RHR requires the Department to demonstrate that its implementation plan includes all measures necessary to obtain Pennsylvania's share of emission reductions needed to meet reasonable progress goals for the area.

The visibility modeling for 2018 that is described in Section 10.3 demonstrated that the Department’s long-term strategy, when coordinated with other state and tribes’ strategies, is sufficient to meet or exceed the reasonable progress goals for affected Class I Areas. The ‘Ask’ Statement agreed to by MANE-VU on June 20, 2007, (Appendix M), provided that each state will have up to 10 years to pursue adoption and implementation of reasonable and cost-effective NOx and SO2 control measures, as appropriate and necessary. The Department will pursue these measures, as appropriate and necessary, and in five years at the time of Pennsylvania’s first periodic SIP report expects to report on progress toward adoption of these measures by 2018.

Table 10.5.5-1 below shows that the average SO2 emissions totals from the 2002 baseline year to the 2018 projected year from all of the MANE-VU states are reduced by 73.5 percent. Table 10.5.5-2 shows that the SO2 emissions reduction from Pennsylvania’s sources from the 2002 baseline year to the 2018 projected year is 71 percent. Table 10.5.5-2 also shows that all source categories in Pennsylvania meet or exceed the projected average SO2 reduction of 73.5 percent for all of MANE-VU, with the exception of the stationary area source category.

**Table 10.5.5-1 SO2 Emissions Inventory in MANE-VU (tons/year)**

<b>Source Category</b>	<b>Baseline 2002</b>	<b>2018 (with additional measures for RPG)</b>	<b>Percent Reduction</b>
Area	286,921	129,656	
Non-EGU Point	264,377	91,438	
EGU Point	1,643,257	368,717	
On-Road Mobile	40,090	8,757	
Non-Road Mobile	57,257	8,643	
<b>TOTAL</b>	<b>2,291,902</b>	<b>607,211</b>	<b>73.5%</b>

**Table 10.5.5-2 SO2 Emissions Inventory from Pennsylvania Sources**  
(Tons Per Year)

<b>Source Category</b>	<b>2002 Baseline</b>	<b>2018 Projected</b>	<b>Reduction</b>
Stationary Point Sources	995,175	266,455	<b>73.3%</b>
Stationary Area Sources	63,679	42,072	<b>33.9%</b>
Highway Mobile Sources	10,882	1,436	<b>86.8%</b>
Nonroad Mobile Sources	7,915	607	<b>92.4%</b>
<b>TOTAL</b>	<b>1,077,651</b>	<b>310,570</b>	<b>71.2%</b>

## **10.6. Estimated Impacts of Long Term Strategy on Visibility**

In accordance with 40 CFR § 51.308(d)(3)(v)(G), the Department must address the net effect on visibility resulting from changes projected in point, area and mobile source emissions by 2018. The emissions inventory for Pennsylvania projects changes to point,

area and mobile source inventories by the end of the first implementation period resulting from population growth; industrial, energy and natural resources development; land management; and air pollution control. NESCAUM has conducted modeling for MANE-VU to document the impacts of the long-term strategy on visibility at affected Class I areas. (See *2018 Visibility Projections, NESCAUM, March 2008, Appendix L.*) Additional detailed information is provided in the following reports:

*Development of Emissions Projections for 2009, 2012, and 2018 for Non-EGU Point, Area, and Non-road Sources in the MANE-VU Region (MACTEC, February 2007) (Appendix V), and*

*Documentation of 2018 Emissions from Electric Generation Units in the Eastern U.S. for MANE-VU's Regional Haze Modeling (Alpine Geophysics, March 2008) (Appendix W).*

The Class I states affected by emissions from within Pennsylvania have established or are expected to establish reasonable progress goals for each of their Class I areas. The control measures included in this SIP revision represent the reasonable efforts of Pennsylvania, in conjunction with the efforts of the other MANE-VU states, toward achieving the reasonable progress goals established by the Class I states by 2018.

The starting point for indicating progress achieved by measures included in this SIP and other MANE-VU-member SIPs is the 2000-2004 baseline visibility at affected Class I areas. To calculate the baseline visibility for affected Class I areas, using 2000-2004 IMPROVE monitoring data, the deciview value for the 20 percent best days in each year were averaged together, producing a single average deciview value for the best days. Similarly, the deciview values for the 20 percent worst days in each year were averaged together, producing a single average deciview value for the worst days.

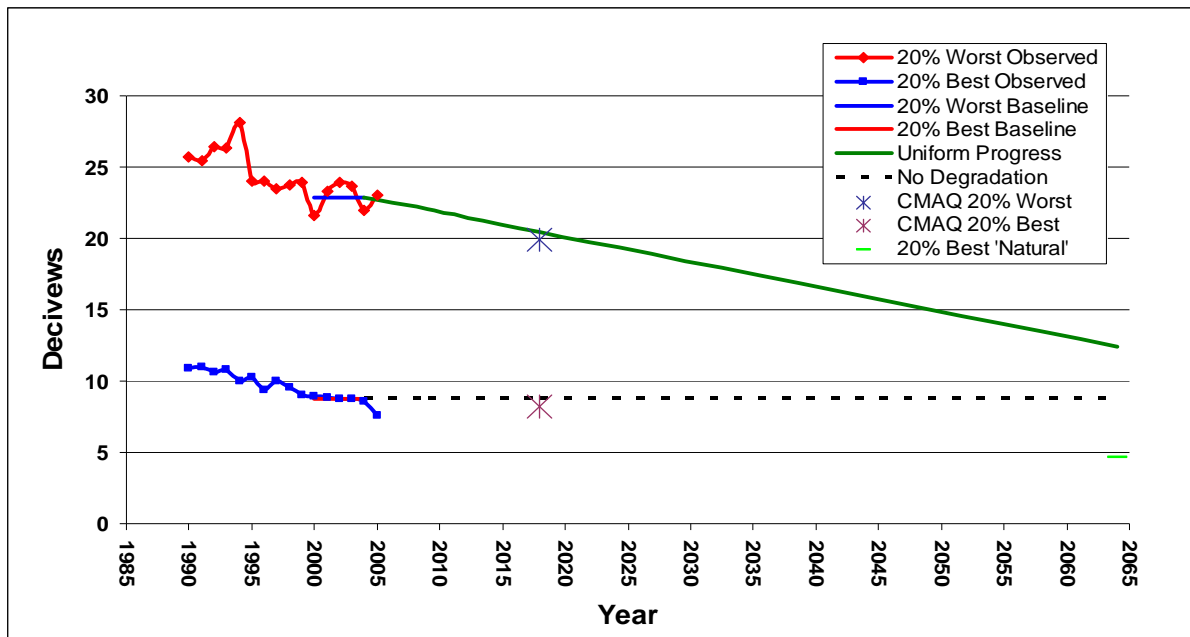
Initial modeling to assess the impact of potential control measures is documented in *MANE-VU Modeling for Reasonable Progress Goals: Model Performance Evaluation, Pollution Apportionment, and Control Measure Benefits*, (NESCAUM, February 2008, Appendix S). Results of the reasonable progress modeling showed that sulfate aerosol – the dominant contributor to visibility impairment in the Northeast's Class I areas on the 20 percent worst visibility days – has significant contributions from states throughout the eastern United States that are projected to continue in future years from all three of the eastern RPOs. An assessment of potential control measures identified a number of promising strategies that would yield significant visibility benefits beyond the uniform rate of progress and, in fact, significantly beyond the projected visibility conditions that would result from OTB/OTW air quality protection programs. These additional measures include the adoption of low sulfur heating oil, implementation of BART requirements, and additional EGU controls on select sources.

Final modeling was conducted after consultation with states in and outside of MANE-VU. Final modeling is documented in *2018 Visibility Projections* (NESCAUM, March 2008, Appendix L). Emissions inventory adjustments were made for this modeling in

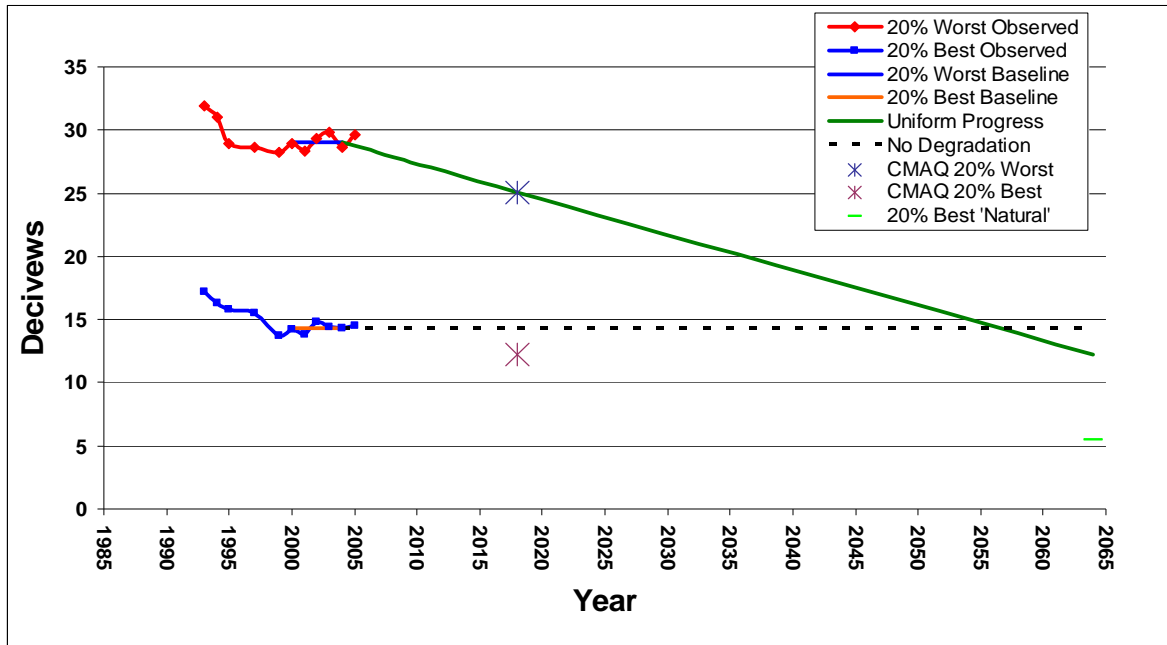
order to better represent the likely outcome of efforts to pursue the BART, low sulfur fuel, and EGU control measures included in the MANE-VU June 20, 2007, 'Ask' Statement and described above in Section 10.4.1.

Figure 10.6-1 through Figure 10.6-5 illustrates the predicted visibility improvement by 2018 resulting from the implementation of the MANE-VU regional long-term strategy. The visibility improvements will result, in part, from the efforts identified in this SIP revision to reduce emissions from sources in Pennsylvania. This improvement is compared to the uniform rate of progress for affected Class I areas. All Class I Areas in MANE-VU are projected to meet or exceed the uniform rate of progress goal for 2018. In addition, no site anticipates increases in best day visibility relative to the baseline.

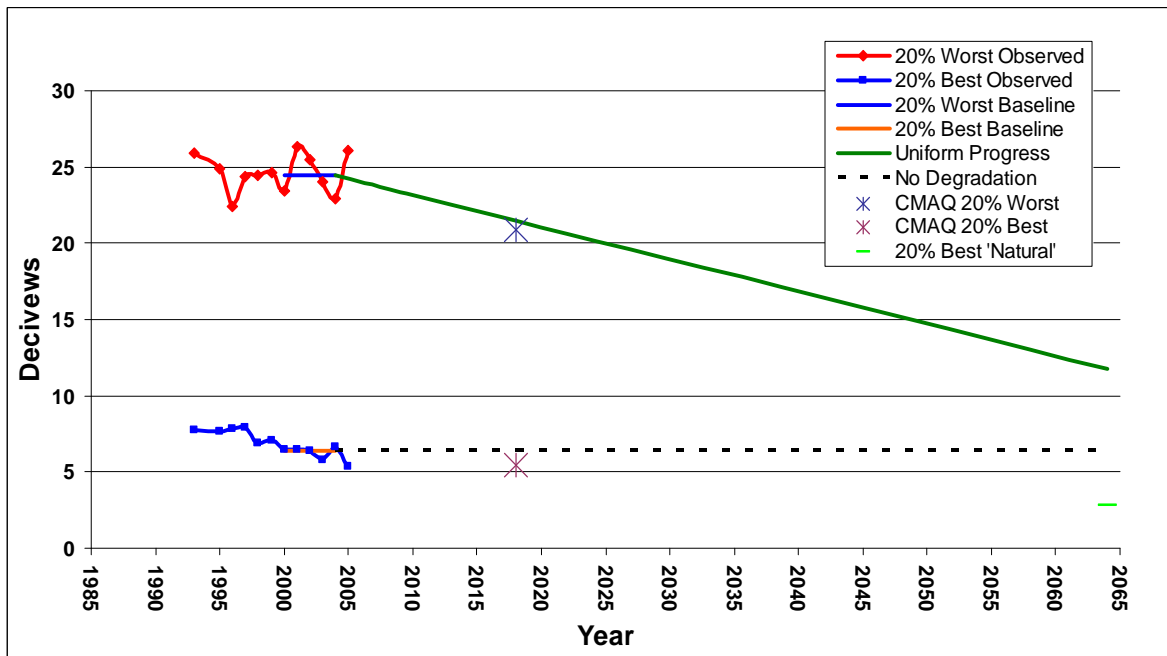
**Figure 10.6-1 Projected Visibility Improvement at Acadia National Park Based on Final Modeling**



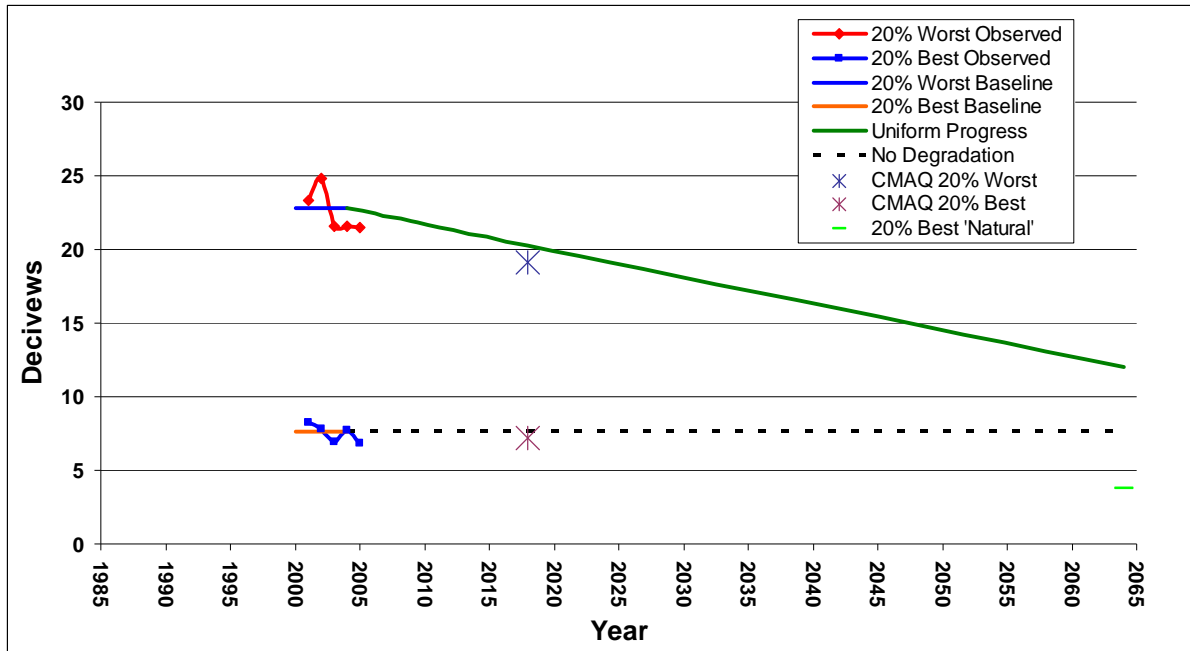
**Figure 10.6-2 Projected Visibility Improvement at Brigantine National Wildlife Refuge Based on Final Modeling**



**Figure 10.6-3 Projected Visibility Improvement at Lye Brook Wilderness Area Based on Final Modeling**

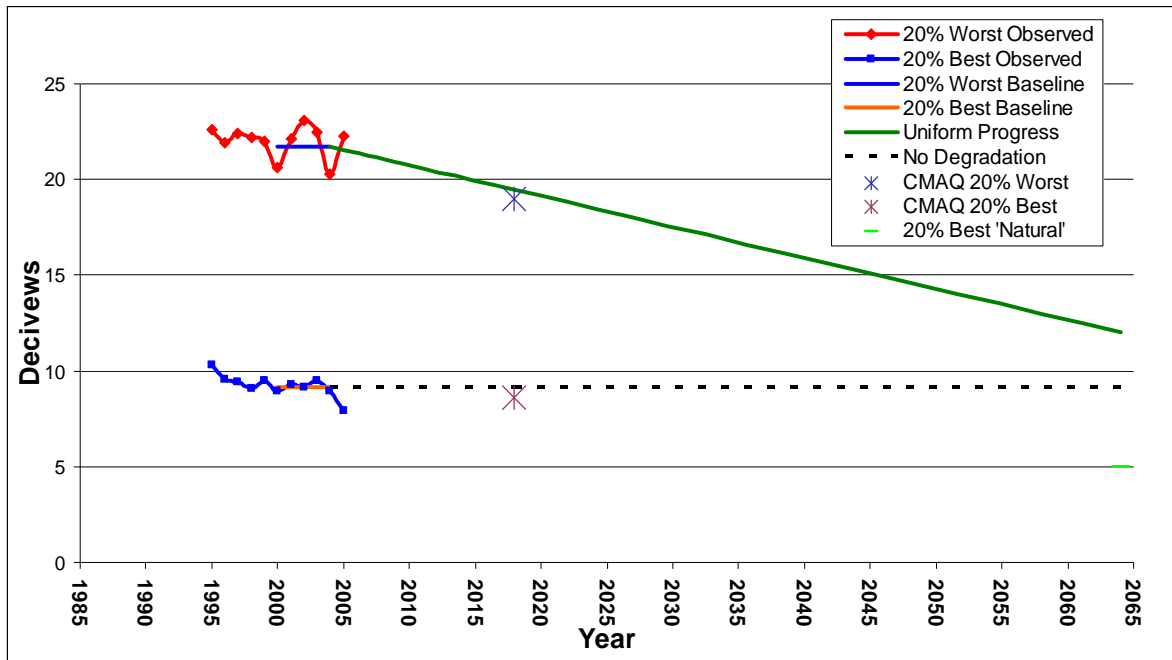


**Figure 10.6-4 Projected Visibility Improvement at Great Gulf Wilderness Area Based on Final Modeling<sup>16</sup>**



<sup>16</sup> The estimate for Great Gulf Wilderness Area also serves to provide an estimate for the Presidential Range/Dry River Wilderness Area.

**Figure 10.6-5 Projected Visibility Improvement at Moosehorn Wilderness Area  
Based on Final Modeling <sup>17</sup>**



<sup>17</sup> The estimate for Moosehorn Wilderness Area also serves to provide an estimate for Roosevelt/Campobello International Park.



## **10.7. Emission Limitations and Compliance Schedules**

Pursuant to 40 CFR § 51.308(d)(3)(v)(C), the Department is required to consider, in development of its long term strategy, emissions limitations and schedules for compliance to achieve the reasonable progress goals. Emission limitations and compliance schedules are in place for the Department's control measures listed in subsections 10.5.1.1-10.5.1.3 of this section. For the additional reasonable control measures described in subsections 10.4.1-10.4.4 of this section, certain emission limitations and compliance schedules may need to be established in Pennsylvania's air pollution control regulations. These additional measures include:

1. Low-sulfur fuel oil requirements,
2. Emission reductions from specific EGUs,
3. Additional measures determined to be reasonable after consultation with other MANE-VU states.

On September 25, 2010, the Pennsylvania Environmental Quality Board (EQB) proposed the Commonwealth's statewide low-sulfur heating and distillate oil regulation, in response to the MANE-VU 'Ask' low-sulfur fuel oil strategy. The proposed rulemaking amends § 123.22 (relating to combustion units) to lower the allowable sulfur content of commercial fuel oil for use in combustion units and replace the existing area-specific sulfur content limits for commercial fuel oils with statewide sulfur limits (40 *Pa.B* 5456, September 25, 2010). The public comment period closed on November 29, 2010. The proposed regulation would reduce the allowable sulfur content limits of commercial fuel oil to 15 parts per million (ppm) for Number (No.) 2 and lighter commercial fuel oils and to 0.25% sulfur content by weight for No. 4 commercial fuel oil, and 0.5% sulfur content by weight for No. 5, 6 and heavier commercial fuel oils beginning May 1, 2012. Certain commentators oppose the stringency of the proposed rulemaking and compliance dates. Consideration of the final-form regulation will proceed in accordance with applicable provisions of the Pennsylvania Regulatory Review Act, the APCA and procedures established by the EQB and the Department.

The Department will continue to evaluate additional measures to ascertain whether they are reasonable for Pennsylvania to implement by 2018 and will formalize that determination in the first regional haze SIP progress report. Pennsylvania intends to pursue all reasonable control measures as expeditiously as practicable, in a manner consistent with state law, so that they may be in place by the end of the ten-year planning period.

## **10.8. Enforceability of Emission Limitations and Control Measures**

40 CFR § 51.308(d)(3)(v)(F) requires the Department to consider, in development of its long term strategy, the enforceability of emissions limitations and control measures. Any control measures incorporated into law or codified in rules will be enforceable. Any facility subject to state or federal permit requirements, including BART-eligible and Title

V facilities, will be required to comply with the specific permit conditions that reference the applicable provisions of those laws and rules.

The Pennsylvania rules provide for enforceable emission control measures and compliance schedules to meet the applicable requirements of the CAA and rules promulgated by the EPA. In Pennsylvania, the authority to create rules, issue permits and enforce laws related to regional haze are established in the Pennsylvania Air Pollution Control Act (APCA) and in the provisions of the Pennsylvania Code Title 25, Environmental Protection, Article III, Chapters 121-145 (*25 Pa. Code* Chapters 121-145). Section 4(1) of the APCA, 35 P.S. § 4004(1), gives the Department the authority and duty to implement the provisions of the CAA in this Commonwealth. Section 12 of the APCA authorizes only two local air pollution control programs in the Commonwealth, which are administered by the Philadelphia AMS and the ACHD. Authority for AMS is provided by Title 3, Air Management Code and for ACHD by Article XXI and County Ordinance 16782. The regulations in the Pennsylvania Code are duly adopted by the Environmental Quality Board. The regulations adopted by the two local air agencies, namely ACHD and Philadelphia AMS, are duly adopted by the county Board of Health, enacted by the County Council and approved by the Chief Executive and the Air Pollution Control Board, respectively, pursuant to section 12 of the APCA (35 P.S. § 4012).

The Pennsylvania rules that define the permit program and the fee structure for stationary sources, and that are of relevance to this regional haze SIP revision are as follows:

The Commonwealth's enforceable emission limitations and other control measures are covered in the APCA and applicable provisions in 25 Pa. Code Chapters 121-145 and Title 67, Chapters 175-177 that are incorporated in the SIP codified in 40 CFR § 52.2020(c)(1); those provisions of ACHD Regulations, Parts A through I to Articles XX and XXI that are listed in 40 CFR § 52.2020(c)(2); those provisions of Philadelphia Title 3 Air Management Code and Philadelphia AMS Regulations I, II, III, IV, V, VII, VIII, XI, and XIII that are listed in 40 CFR § 52.2020(c)(3); and source specific provisions codified at 40 CFR § 52.2020(d)(1).

The Commonwealth has an EPA-approved air permitting program for both major and minor facilities, which ensures that all applicable requirements are included in the permit. Sections 4 and 8 of the APCA, 35 P.S. §§ 4004 and 4008, provide adequate authority for the Department to enforce appropriate limitations and other control measures. Section 6.1(k) of the APCA, 35 P.S. § 4006.1(k), provides that the Department shall require revisions to any permit to incorporate applicable standards and regulations promulgated under the CAA after issuance of a Title V permit. Section 9.1 of the APCA, 35 P.S. § 4009.1, provides that the Department may assess civil penalties for violations of the APCA, regulations adopted under the APCA, Department orders or terms, and conditions of plan approvals and operating permits. Additionally, Section 7.1 of the APCA, 35 P.S. § 4007.1, authorizes the Department to withhold plan approvals, state operating permits, or Title V permits where an applicant or related party has shown a lack of ability or intention to comply with the APCA.

Section 6.3 of the APCA (35 P.S. § 4006.3) authorizes the Department to establish fees sufficient to cover the indirect and direct costs of administering the plan approval and operating permit program including Title V and costs of administering certain committees. The implementing regulations in 25 Pa. Code § 127.701 impose fees to cover the direct and indirect costs of administering the air pollution control planning process, implement and operate the permit program, enforce the terms and conditions of any such permit, certain committee operations and to support the air pollution control program authorized by state statute.

### **10.9. Consultation on the Long-Term Strategy**

In accordance with 40 CFR § 51.308(d)(3)(i), the Department consulted with other States and tribes by participation in the MANE-VU and inter-RPO processes that developed technical information necessary for development of coordinated strategies.

On May 10, 2006, MANE-VU adopted the Inter-RPO State/Tribal and FLM Consultation Framework (See Appendix X). That document set forth the following principles:

- 1) All State, Tribal, RPO, and Federal participants are committed to continuing dialogue and information sharing in order to create understanding of the respective concerns and needs of the parties.
- 2) Continuous documentation of all communications is necessary to develop a record for inclusion in the SIP submittal to EPA.
- 3) States alone have the authority to undertake specific measures under their SIP. This inter-RPO framework is designed solely to facilitate needed communication, coordination and cooperation among jurisdictions but does not establish binding obligation on the part of participating agencies.
- 4) There are two areas which require State-to-State and/or State-to-Tribal consultations (“formal” consultations): (i) development of the reasonable progress goal for a Class I area, and (ii) development of long-term strategies. While it is anticipated that the formal consultation will cover the technical components that make up each of these policy decision areas, there may be a need for the RPOs, in coordination with their State and Tribal members, to have informal consultations on these technical considerations.
- 5) During both the formal and informal inter-RPO consultations, it is anticipated that the States and Tribes will work collectively to facilitate the consultation process through their respective RPOs, when feasible.
- 6) Technical analyses will be transparent, when possible, and will reflect the most up-to-date information and best scientific methods for the decision needed within the resources available.
- 7) The State with the Class I area retains the responsibility to establish reasonable progress goals. The RPOs will make reasonable efforts to facilitate the development of a consensus between the State with a Class I area and

other States affecting that area. In instances where the State with the Class I area can not agree with such other States that the goal provides for reasonable progress, actions taken to resolve the disagreement must be included in the State's regional haze implementation plan (or plan revisions) submitted to the EPA Administrator as required under 40 CFR § 51.308(d)(1)(iv).

- 8) All States whose emissions are reasonably anticipated to contribute to visibility impairment in a Class I area, must provide the Federal Land Manager ("FLM") agency for that Class I area with an opportunity for consultation, in person, on their regional haze implementation plans. The States/Tribes will pursue the development of a memorandum of understanding to expedite the submission and consideration of the FLM's comments on the reasonable progress goals and related implementation plans. As required under 40 CFR Section 51.308(i)(3), the plan or plan revision must include a description of how the State addressed any FLM comments.
- 9) States/Tribes will consult with the affected FLMs to protect the air resources of the State/Tribe and Class I areas in accordance with the FLM coordination requirements specified in 40 CFR Section 51.308(i) and other consultation procedures developed by consensus.
- 10) The consultation process is designed to share information, define and document issues, develop a range of options, solicit feedback on options, develop consensus advice if possible, and facilitate informed decisions by the Class I States.
- 11) The collaborators, including States, Tribes and affected FLMs, will promptly respond to other RPO's/States'/Tribes' requests for comments.

The document also describes a process primarily applicable to formal consultation with states in other RPOs concerning regional haze SIP elements. Although other RPOs did not formally adopt the same process, in general, the process was followed and provided significant opportunities for consultation with other states concerning the long term strategy as well as reasonable progress goals.

MANE-VU consultation meetings and conference calls included those held on the following dates:

- MANE-VU Intra-Regional Consultation, March 1, 2007
  - At this meeting, MANE-VU members reviewed the requirements for regional haze plans, preliminary modeling results, the work being done to prepare the MANE-VU report on reasonable progress factors, and control strategy options under review.
- MANE-VU Intra-State Consultation, June 7, 2007
  - At this meeting, the MANE-VU Class I states adopted a statement of principles, and all MANE-VU members discussed draft statements concerning reasonable controls within and outside of MANE-VU. Federal

Land Managers also attended the meeting, which was open to stakeholders.

- MANE-VU Conference Call, June 20, 2007
  - On this call, the MANE-VU states concluded discussions of statements concerning reasonable controls within and outside MANE-VU and agreed on the statements called the MANE-VU “Ask,” including a statement concerning controls within MANE-VU, a statement concerning controls outside MANE-VU, and a statement requesting a course of action by the U.S. EPA. Federal Land Managers also participated in the call. The “Ask” statement concerning controls within MANE-VU list “emission management” strategies, as appropriate and necessary, that the MANE-VU states agreed to pursue. Upon approval, all statements as well as the statement of principles adopted on June 7 were posted and publicly available on the MANE-VU web site.
- MANE-VU Class I States’ Consultation Open Technical Call, July 19, 2007
  - On this call, the MANE-VU “Ask” was presented to states in other RPOs, RPO staff, and Federal Land Managers, and an opportunity was provided to request further information. This call was intended to provide information to facilitate informed discussion at follow-up meetings.
- MANE-VU Consultation Meeting with MRPO, August 6, 2007
  - This meeting was held at LADCO offices in Chicago, Illinois and was attended by representatives of both MANE-VU and MRPO states as well as staff. The meeting provided an opportunity to formally present the MANE-VU “Ask” to MRPO states and to consult with them regarding the reasonableness of the requested controls. Federal Land Manager agencies also attended the meeting.
- MANE-VU Consultation Meeting with VISTAS, August 20, 2007
  - This meeting was held at State of Georgia offices in Atlanta and was attended by representatives of both MANE-VU and VISTAS states as well as staff. The meeting provided an opportunity to formally present the MANE-VU “Ask” to VISTAS states and to consult with them regarding the reasonableness of the requested controls. Federal Land Manager agencies also attended the meeting.
- MANE-VU – Midwest RPO Consultation Conference Call, September 13, 2007
  - This call was a follow-up to the meeting held on August 6 in Chicago and provided an opportunity to further clarify what was being asked of the MRPO states. The flexibility in the Ask was explained. Both MRPO and MANE-VU staff agreed to work together to facilitate discussion of further controls on ICI boilers and EGUs.
- MANE-VU Air Directors’ Consultation Conference Call, September 26, 2007
  - This call allowed MANE-VU members to clarify their understanding of the “Ask” and to provide direction to modeling staff as to how to interpret

the “Ask” for purposes of estimating visibility impacts of the requested controls.

- MANE-VU Air Directors’ Conference Call, March 31, 2008
  - On this call, NESCAUM presented the results of the final 2018 modeling and described the methods used to represent the impacts of the measures agreed to by the Class I States. The Class I area states on the call confirmed they would rely on the modeling results to set their reasonable progress goals. Federal Land Manager agencies also attended this call.

Appendix Y of this SIP revision contains detailed summaries of the key meetings and calls the MANE-VU states conducted to develop and accept the final MANE-VU 'Ask' resolution and statements (Appendix M), as well as some follow up calls regarding modeling and determining the reasonable progress goals.

## **11.0. Comprehensive Periodic Implementation Plan Revisions and Progress Reports**

Section 51.308(f) of EPA's RHR requires the Department to revise its regional haze implementation plan and submit a plan revision to EPA by July 31, 2018 and every ten years thereafter. In accordance with the requirements listed in Section 51.308(f) of EPA's RHR, the Department will revise its regional haze implementation plan and submit the SIP revision by July 31, 2018 and every ten years thereafter.

In addition, Section 51.308(g) requires periodic reports evaluating progress towards the reasonable progress goals established for each Class I area. In accordance with the requirements listed in Section 51.308(g) of the RHR, the Department will submit a report on reasonable progress to EPA every five years following the initial submittal of the SIP revision. The report will be submitted to EPA in the form of a SIP revision. The reasonable progress report will evaluate the progress made toward the reasonable progress goal for each Class I area located outside Pennsylvania that may be affected by emissions from within Pennsylvania. All requirements listed in Section 51.308(g) shall be addressed in the SIP revision for reasonable progress. The reasonable progress report will include a summary of the emissions reductions achieved throughout Pennsylvania through implementation of measures, including the Department's CAIR regulation. The Department's CAIR regulation was approved by the EPA as a SIP revision effective December 10, 2009 (74 FR 65446). The EGUs in the Commonwealth are now required to reduce emissions according to the Department's CAIR regulation. As a result of the Court's remand of the federal CAIR to EPA, it is reasonable to expect that a revised CAIR will be in place to evaluate the Commonwealth's emissions controls by the time the first regional haze progress report is due. By the due date of the first periodic reasonable progress report, in 2015, the first phase of the Department's CAIR regulation for EGUs should be fully implemented and the Department can assess the adequacy of the 2018 projections of emissions reductions.

## **12.0. Determination of the Adequacy of the Existing Plan**

At the same time the Department submits a five-year progress report, the Department will make a determination of the adequacy of the existing implementation plan.

Based on the findings of the five-year progress report, the Department will take one of the following appropriate actions in accordance with the requirements in 40 CFR § 51.308(h):

- 1) If the Department in its five-year progress report determines that the existing SIP requires no further substantive revision in order to achieve established goals, the Department will provide to the EPA Administrator a negative declaration that further revision of the SIP is not needed at this time.
- 2) If the Department in its five-year progress report determines that the existing SIP is or may be inadequate to ensure reasonable progress due to emissions from another States which participated in the regional planning process, the Department will provide notification to the EPA Administrator and the other States that participated in the regional planning process and will collaborate with the other states through the regional planning process to address the SIP's deficiencies.
- 3) If the Department in its five-year progress report determines that the existing SIP is or may be inadequate to ensure reasonable progress due to emissions from another country, the Department will provide notification and available information to the EPA Administrator.
- 4) If the Department in its five-year progress report determines that the existing SIP is or may be inadequate to ensure reasonable progress due to emissions from sources within Pennsylvania, the Department will revise its SIP within one year to address the plan's deficiencies.



## **13.0. Public and FLM Comment Process**

### **13.1. Public Comment Period**

Requirements for a public comment process are set forth in Section 110(a)(2) of the CAA and 40 CFR § 51.102(d). The Department provided public notice of the opportunity to comment on the SIP revision and provided public notice of public hearing on October 9, 2010. The Department held public hearings regarding the SIP on November 9<sup>th</sup> and November 10<sup>th</sup>, 2010. The Department did not receive any comments during the public comment period; therefore a Comment and Response document is not included in this final SIP revision.

### **13.2. FLM Comments**

Comments the Department received from the FLMs on the draft proposed Regional Haze SIP revision during the mandated 60-day consultation period were addressed. The FLM's comments and the Department's responses are included in Appendix AA.