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Revision to the

New Hampshire
State Implementation Plan

Regional Haze 5-Year Progress Report

DRAFT
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NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Air Resources Division

Mid-Atlantic/Northeast Visibility Union (MANE-VU)

ACKNOWLEDGEMENTS

The New Hampshire Department of Environmental Services would like to express appreciation to the many staff members of the NESCAUM, MARAMA, and OTC regional organizations and to staff members of the MANE-VU states for their invaluable assistance and timely contributions to analyses and supporting documents that made possible the preparation of New Hampshire's Regional Haze SIP 5-Year Progress Report.

ON THE COVER: Split-image view of Presidential Range and nearby valley from Conway, New Hampshire, on clear and hazy days.
http://hazecam.net/mtwash_gallery.aspx

EXECUTIVE SUMMARY

Section 169A of the Clean Air Act (CAA) provides for the protection of visibility at mandatory Class I federal areas. These designated areas include 156 national parks and wilderness areas located throughout the United States. Regional haze obscures vistas that are integral to the value of such areas. In 1999, the U.S. Environmental Protection Agency (EPA) adopted the Regional Haze Rule (published at 64 FR 35714 and codified at 40 CFR 51.300-309), which calls for state, tribal, and federal agencies to work together to improve visibility in all Class I areas. Two of these areas – Great Gulf Wilderness Area and Presidential Range-Dry River Wilderness Area – are located in New Hampshire's White Mountain National Forest.

States are required to revise their State Implementation Plans, or SIPs, in order to reduce the pollution that causes visibility impairment and regional haze.[1] These plans establish reasonable progress goals for visibility improvement and include strategies to reduce air pollutant emissions from sources contributing to visibility impairment at Class I areas.

Regional haze is caused by numerous and diverse air emission sources over a broad geographic area. The predominant cause of haze pollution in the Mid-Atlantic/Northeast region is sulfate particles (aerosols) present in, or formed from, emissions when coal or oil is burned. The largest sources of this pollution are electrical generating units (EGUs) located in the eastern half of the United States.

As a member of the Mid-Atlantic/Northeast Visibility Union (MANE-VU),[2] New Hampshire has committed to implementing a long-term strategy to improve visibility at MANE-VU's Class I areas. The defined long-term strategy covers the 10-year period ending in 2018 and includes:

- Timely implementation of Best Available Retrofit Technology (BART) at specified EGUs;
- Enforceable reductions in sulfur dioxide emissions from targeted EGUs;
- A request for emissions reductions from non-MANE-VU states whose emissions contribute to visibility impairment within our region, and
- Evaluation of other measures such as reducing the sulfur content of fuel oil, expanding the use of alternative clean fuels, increasing energy efficiency, and further reducing emissions from coal and wood combustion.

This document addresses 40 CFR 51.308(g), which requires periodic reports evaluating progress in carrying out New Hampshire's regional haze plan. The results to date indicate real progress: Control strategies in the SIP are being implemented, power plant emissions of sulfur dioxide (SO_2) have declined, and visibility measurements at mandatory Class I federal areas affected by New Hampshire's emissions are trending in the right direction. More specifically,

- Required sulfur dioxide control measures at New Hampshire's two BART units and a third, targeted unit are installed and operational; and both BART units are operating under new limits for nitrogen oxides (NOx) and particulate matter (PM);

[1] New Hampshire's regional haze SIP revision is available at http://des.nh.gov/organization/divisions/air/do/asab/rhp/index.htm.

[2] MANE-VU includes the following member states: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and the District of Columbia.

- From 2002 to 2013, total sulfur dioxide emissions declined by 95 percent for these three units and by 93 percent for all New Hampshire EGUs reporting to EPA's Clean Air Markets Division (CAMD);
- Similar reductions in SO_2 emissions are occurring throughout the MANE-VU region, the result of a major shift within the power production sector away from coal toward greater use of natural gas;
- Regional emissions of other haze-causing pollutants, particularly NOx and volatile organic compounds (VOC), are expected to continue on a downward trend;
- For the period 2009-2013 (the most recent 5 years of certified monitoring data at the time of this report), all Class I areas affected by New Hampshire's regional-haze-producing emissions showed visibility improvements relative to 2000-2004 on both best and worst visibility days. In fact, for all such areas, observed haze levels were already better than the 2018 reasonable progress goals (see table below).

Observed Visibility vs. Reasonable Progress Goals (all values in deciviews)

Class I Area IMPROVE* Site	2000-2004 5-Year Average	2009-2013 5-Year Average	2013 Annual Average	2018 Reasonable Progress Goal
20% Worst Days				
Acadia National Park	22.9	17.9	16.5	19.4
Moosehorn Wilderness Area**	21.7	16.8	15.9	19.0
Great Gulf Wilderness Area***	22.8	16.7	15.0	19.1
Lye Brook Wilderness Area	24.4	18.8	17.5	20.9
Brigantine Wilderness Area	29.0	23.8	21.5	25.1
20% Best Days				
Acadia National Park	8.8	7.0	6.3	8.3
Moosehorn Wilderness Area	9.2	6.7	6.4	8.6
Great Gulf Wilderness Area	7.7	5.9	5.4	7.2
Lye Brook Wilderness Area	6.4	4.9	5.4	5.5
Brigantine Wilderness Area	14.3	12.3	11.8	14.3

* IMPROVE = Interagency Monitoring of Protected Visual Environments program.
** The IMPROVE monitor for Moosehorn Wilderness also represents Roosevelt Campobello International Park.
*** The IMPROVE monitor for Great Gulf Wilderness also represents Presidential Range - Dry River Wilderness Area.

On the basis of the documented progress, NHDES declares that New Hampshire's Regional Haze SIP is sufficient in its current form to achieve the necessary emission reductions to meet the 2018 reasonable progress goals for visibility. Therefore, further revision of the existing implementation plan is not needed at this time. Achieving these goals represents the first major milestone toward restoring natural visibility conditions at all Class I areas by the regulatory target year of 2064.

MANE-VU'S CLASS I AREAS

Acadia National Park

People have been drawn to the rugged coast of Maine throughout history. Awed by its beauty and diversity, early 20th-century visionaries donated the land that became Acadia National Park, the first national park east of the Mississippi River. The park is home to the tallest mountain on the U.S. Atlantic coast. Today visitors come to Acadia to hike granite peaks, bike historic carriage roads, or relax and enjoy the scenery.

Roosevelt Campobello International Park

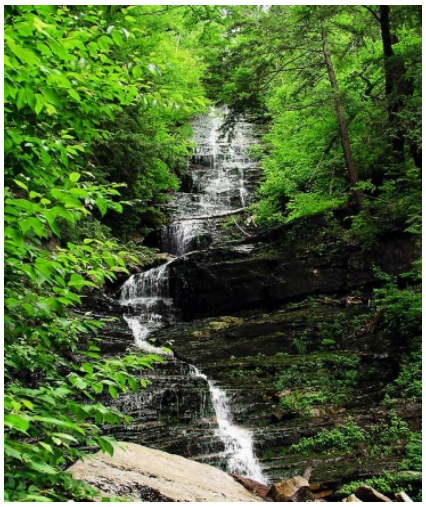
A memorial to Franklin Delano Roosevelt and symbol of Canadian-American friendship, Roosevelt Campobello International Park is a combination indoor/outdoor site renowned internationally. Its historic beauty contributes to the tourism in both the Province of New Brunswick and the State of Maine. Wooded paths and fields offer vistas of nearby islands, bays, and shores.

Brigantine Wilderness

This trailless area, a tidal wetland and shallow bay habitat along New Jersey's Atlantic coastline, is one of the most active flyways for migratory water birds in North America. Birdwatchers, binoculars in hand, have zoomed in on close to 300 species, including Atlantic Brant and American Black Duck.

Great Gulf Wilderness

Cradled within the rugged crescent of New Hampshire's Presidential Range lies the Great Gulf Wilderness. This steep-walled bowl begins at Mount Washington and is flanked by Mounts Jefferson, Adams, and Madison. Great Gulf is the largest cirque in the White Mountains of New Hampshire; the small and beautiful Spaulding Lake rests at its floor. From the cirque's low end, the West Branch of the Peabody River flows eastward.



Lye Brook Wilderness

The Lye Brook Wilderness is in the southern Green Mountains of Vermont. Lye Brook flows through the western half of this wilderness, which ranges from 900 feet to 2,900 feet above sea level. Most of the wilderness is above 2,500 feet, on a high plateau with several ponds and bogs. Waterfalls and rocky streams are found here as well as reflecting pools. The western section is extremely steep, facing west-northwest toward U.S. Route 7 and Manchester. Four-and-a-half miles of the Appalachian/Long Trail cross the northwest tip of the wilderness.

Moosehorn Wilderness

This wilderness is located within northern Maine's Moosehorn National Wildlife Refuge, a refuge and breeding ground for migratory birds, endangered species, and other wildlife. Scientists at Moosehorn have provided valuable information to stem the decline in the American Woodcock, also called Timberdoodle. Bald eagles frequent the refuge, and black bears and white-tailed deer are common. Ducks, geese, and loons congregate on more than 50 lakes.

Presidential Range/Dry River Wilderness

The large glacial cirque known as Oakes Gulf lies at the headwaters of the Dry River in New Hampshire. This river – and just to the east the Rocky Branch – carve sharply down through the heart of this Wilderness and offer contrast to the surrounding long, high ridgelines of the Southern Presidential Range and Montalban Ridge. The Dry River is something of a misnomer, as anyone who has tried to cross it after a period of even moderate rain can attest. The streams in this wilderness are flashy and swift and run cold and clear from snow that melts well into the summer.

Photo credits: National Park Service, US Fish and Wildlife Service, and wilderness.net

SIP SUBMITTAL

Pursuant to the requirements of 40 CFR 51.308(g), (h), and (i), New Hampshire submits this regional haze progress report as a SIP revision. New Hampshire has adopted this SIP revision in accordance with federal regulations at 40 CFR 51.102 and 51.103 and state administrative rule Env-A 204.

The following sections address requirements concerning the status of committed control measures, assessment of current emissions and emission reductions, visibility progress, adequacy of current monitoring strategy, and any impediments to visibility improvement. Lastly, NHDES asserts that the original regional haze SIP revision is adequate to achieve continued progress toward the goal of achieving natural visibility conditions by 2064 for mandatory Class I federal areas affected by sources in New Hampshire.

New Hampshire's Regional Haze SIP contains the emission reductions needed to achieve New Hampshire's share of emission reductions agreed upon through the regional planning process. Furthermore, the SIP ensures that regional-haze-causing emissions from New Hampshire will not interfere with the reasonable progress goals for neighboring states' Class I areas. It is noted that EPA approved New Hampshire's Regional Haze SIP because it meets the applicable visibility-related requirements of CAA section 110(a)(2) including, but not limited to 110(a)(2)(D)(i)(II) and 110(a)(2)(J).

Pursuant to 40 CFR 51.308(g) and 40 CFR 51.102, on August 22, 2014, New Hampshire published notice of a public hearing and a 30-day public comment period on the SIP revision. New Hampshire held a public hearing regarding the SIP revision on September 23, 2014. Comments by EPA, Federal Land Managers (FLMs), and the public were addressed and are incorporated into the final SIP. All comments are summarized and included in Attachment E.

In accordance with 40 CFR 51.308(i), New Hampshire provided Federal Land Managers an opportunity for consultation, in person, at least 60 days before holding any public hearing on this SIP revision. New Hampshire will continue to coordinate with FLMs on future revisions to New Hampshire's Regional Haze SIP. Section 12 of this document provides details of consultation with FLMs.

In summary, this 5-year progress report fulfills all requirements for SIP submittals and periodic progress reports as set forth in 40 CFR 51.102; 51.103; and 51.308 (g), (h), and (i).

5-Year Progress Report Submittal Checklist

Yes or No	Regulation Citation	Regulation Summary (*not verbatim*)	Location in Report	Comments
	51.308(g)(1)	Status of Control Strategies in the Regional Haze SIP: Does the report include a list of measures the state relied upon? *(all states)*	Sections 3, 4, 5	
	51.308(g)(2)	Emissions Reductions from Regional Haze SIP Strategies: Does the report include estimated reduction estimates for these measures? (*all states)*	Sections 6, 7	
	51.308(g)(3)	Visibility Progress: Does the report include the summaries of monitored visibility data as required by the Regional Haze Rule? (*states with Class I areas only)*	Section 2	
	51.308(g)(4)	Emissions Progress: Does the report provide emissions trends across the entire inventory for a 5-year period as required by the Regional Haze Rule? *(all states)*	Sections 6, 7	
	51.308(g)(5)	Assessment of Changes Impeding Progress: Does the report include an explicit statement of whether there are anthropogenic emissions changes impeding progress? (*all states)*	Section 8	
	51.308(g)(6)	Assessment of Current Strategy: Does the report include an assessment of whether the state's haze plan is on track to meet reasonable progress goals? *(all states)*	Section 9	
	51.308(g)(7)	Review of Monitoring Strategy: Does the report review the monitoring plan including any non-IMPROVE monitors the state is using? (*states with Class I areas only)*	Section 10	
	51.308(h)	Determination of Adequacy: Does the report (or the transmittal materials) provide the explicit determination required by the Regional Haze Rule? *(all states)*	Section 11	

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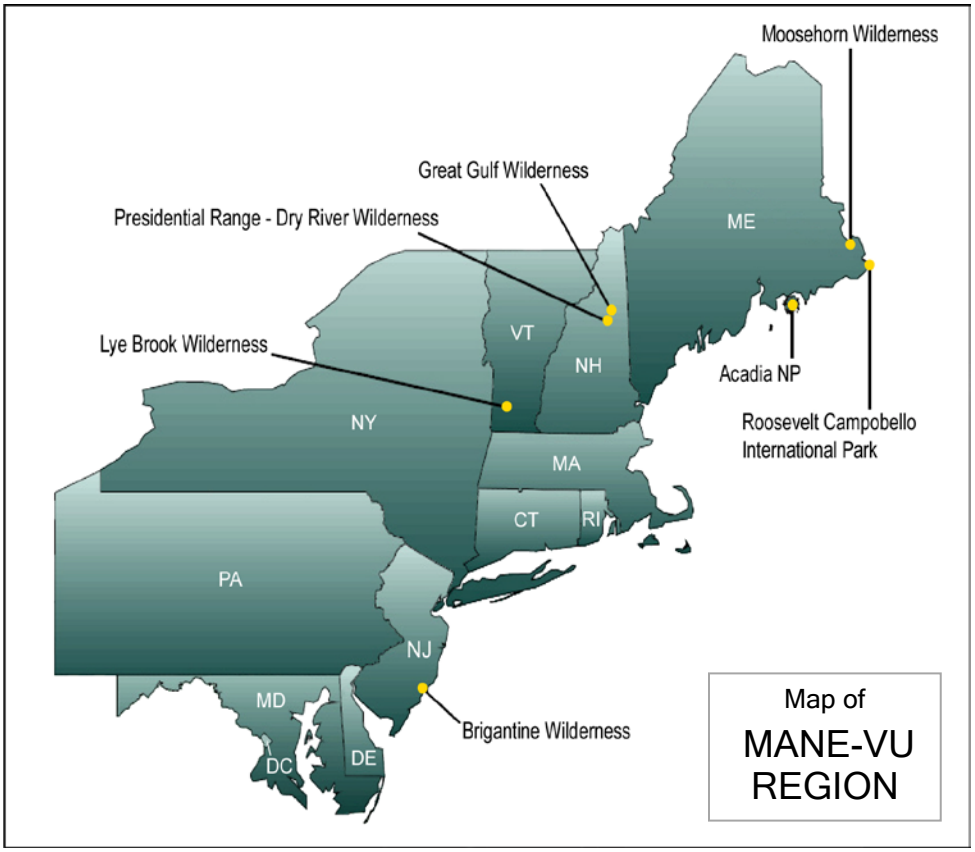
SECTION 1 – FEDERAL REGIONAL HAZE PROGRAM REQUIREMENTS

1.1 Background

The federal Clean Air Act (CAA) sets requirements to protect the air-quality-related values of national parks and wilderness areas. Specifically, Section 169A of the CAA requires the "prevention of any future, and the remedying of any existing, impairment of visibility in Class I areas which impairment results from manmade air pollution."

Areas protected by this portion of the law include national parks exceeding 6,000 acres, wilderness areas and national memorial parks exceeding 5,000 acres, and all international parks in existence on August 7, 1977. There are 156 mandatory Class I federal areas in the United States, of which seven are in the Mid-Atlantic and Northeast Region (Figure 1-1).

Figure 1-1. Nearby Class I Areas

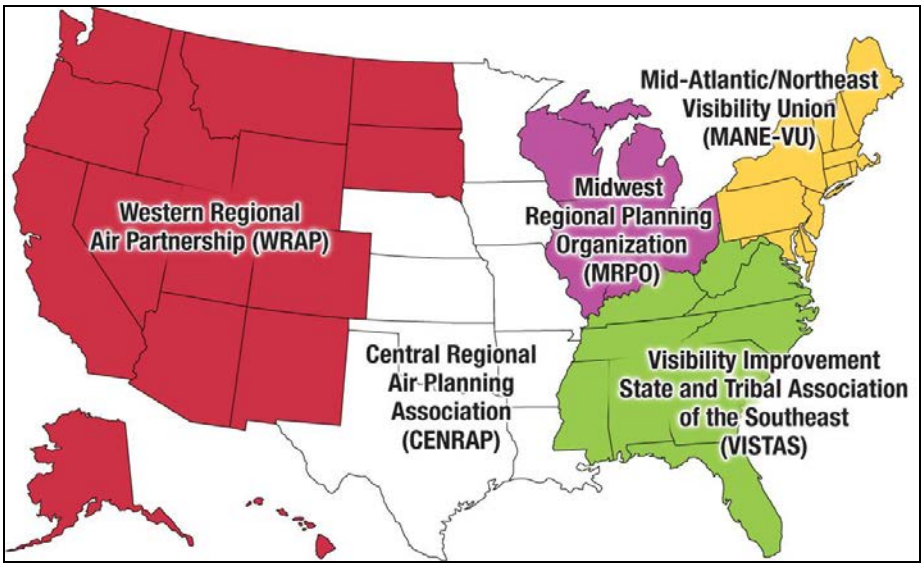


Section 169A of the CAA directed the U.S. Environmental Protection Agency (EPA) to promulgate regulations to assure reasonable progress toward meeting the national goal of improved visibility in Class I areas. On July 1, 1999, the EPA finalized the Regional Haze Rule (published at 64 FR 35714 and codified at 40 CFR 51.300-309). The rule calls for state, tribal, and federal agencies to work together to improve visibility.

Working with the states,[3] EPA designated five Regional Planning Organizations (RPOs) (Figure 1-2) to assist with the coordination and cooperation states needed to address the visibility issue. New Hampshire is a member of the Mid-Atlantic/Northeast Visibility Union (MANE-VU).

[3] From this point forward, as used in this report, "state" means either a state or a tribe.

Figure 1-2. U.S. Regional Planning Organizations



States in the Mid-Atlantic and Northeast region, along with Federal Land Managers (FLMs) and EPA, worked together through MANE-VU to develop strategies for reducing the haze that obscures natural vistas at mandatory Class I areas. A NESCAUM report[4] prepared for MANE-VU determined that the predominant cause of haze pollution in Northeast parks and wilderness areas is sulfate particles (aerosols) present in, or formed from, emissions when coal or oil is burned to provide heat and power to homes, businesses, and industries. Additional pollutants – especially oxides of nitrogen and organic carbon – contribute to regional haze. Sources of these other pollutants include emissions from power plants, boilers, furnaces, motor vehicles, and other fuel-burning equipment (including wood combustion devices), and natural sources such as forest fires.

EPA's Regional Haze Rule requires states to revise their State Implementation Plans, or SIPs, to reduce the pollution that causes visibility impairment. These plans establish reasonable progress goals and emission reduction strategies for various air pollution sources – including point sources, area sources, and mobile sources (both on-road and non-road) – whose emissions are harmful to visibility at Class I areas.

1.2 Summary of the Requirements for Periodic Progress Reports

40 CFR 51.308(g) requires New Hampshire to submit a report to EPA every 5 years that evaluates progress toward the reasonable progress goal for each mandatory Class I federal area located within the state and each mandatory Class I federal area located outside the state that may be affected by emissions from within the state. The 5-year progress report is intended to fulfill the requirements of 40 CFR 51.308(g), (h), and (i) and must be in the form of a SIP revision that complies with the procedural requirements of 40 CFR 51.102 and 51.103. The following paragraphs summarize those requirements.

[4] NESCAUM, "Contributions to Regional Haze in the Northeast and Mid-Atlantic United States," August 2006; available at http://www.nescaum.org/documents/contributions-to-regional-haze-in-the-northeast-and-mid-atlantic--united-states. NESCAUM is the Northeast States for Coordinated Air Use Management, a regional association which includes the 6 New England states (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont) plus New York and New Jersey.

1.2.1 General and Procedural Requirements

The submission of New Hampshire's first 5-year periodic progress report occurs more than half-way through the initial 10-year planning period from 2008 to 2018. Because EPA has accepted January 29, 2010, as the official submittal date of New Hampshire's first regional haze SIP, the actual regulatory deadline for this progress report is January 29, 2015.

This report was prepared and submitted in accordance with the following federal requirements:

- 40 CFR 51.102 – provide notice of SIP public comment periods and hearings;
- 40 CFR 51.103 – submit the SIP revision in accordance with specified requirements;
- 40 CFR 51.308(g) – evaluate progress toward the reasonable progress goals established in the initial SIP for each mandatory Class I federal area located within the state and each mandatory Class I federal area located outside the state which may be affected by emissions from within the state;
- 40 CFR 51.308(h) – determine the adequacy of the existing implementation plan; and
- 40 CFR 51.308(i) – provide continued coordination with other states with Class I areas impacted by New Hampshire and consult with FLMs at least 60 days prior to any public hearing in order to maintain and improve visibility in Class I areas.

1.2.2 Required Elements of the Progress Report

Pursuant to 40 CFR 51.308(g), periodic progress reports must contain at a minimum the following elements:

(1) A description of the status of implementation of all measures included in the implementation plan for achieving reasonable progress goals for mandatory Class I federal areas both within and outside the state.

(2) A summary of the emissions reductions achieved throughout the state through implementation of the measures described in paragraph (1).

(3) For each mandatory Class I federal area within the state, an assessment of the following visibility conditions and changes, with values for most impaired and least impaired days expressed in terms of 5-year averages of these annual values:

- the current visibility conditions for the most impaired and least impaired days;
- the difference between current visibility conditions for the most impaired and least impaired days and baseline visibility conditions; and
- the change in visibility impairment for the most impaired and least impaired days over the past 5 years.

(4) An analysis tracking the changes over the past 5 years in pollutant emissions contributing to visibility impairment from all sources and activities within the state. Emissions changes should be identified by type of source or activity. The analysis must be based on the most recent updated emissions inventory, with estimates projected forward as necessary and appropriate, to account for emissions changes during the applicable 5-year period.

(5) An assessment of any significant changes in anthropogenic emissions within or outside the state that have occurred over the past 5 years that have limited or impeded progress in reducing pollutant emissions and improving visibility.

(6) An assessment of whether the current implementation plan elements and strategies are sufficient to enable the state, or other states with mandatory Class I federal areas affected by emissions from the state, to meet all established reasonable progress goals.

(7) For any state with a Class I area, a review of the state's visibility monitoring strategy and any modifications to the strategy as necessary.

Each of these required elements is addressed in subsequent sections of this report.

1.2.3 Required State Actions

Based on the required calculations and assessments in the progress report, the state must take one of four actions as specified in 40 CFR 51.308(h):

(1) If the state determines that the existing implementation plan requires no further substantive revision at this time in order to achieve established goals for visibility improvement and emissions reductions, the state must provide to the EPA Administrator a negative declaration that further revision of the existing implementation plan is not needed at this time.

(2) If the state determines that the implementation plan is or may be inadequate to ensure reasonable progress due to emissions from sources in another state(s) which participated in a regional planning process, the state must provide notification to the EPA Administrator and to the other state(s) which participated in the regional planning process with the states. The state must also collaborate with the other state(s) through the regional planning process for the purpose of developing additional strategies to address the plan's deficiencies.

(3) Where the state determines that the implementation plan is or may be inadequate to ensure reasonable progress due to emissions from sources in another country, the state shall provide notification, along with available information, to the EPA Administrator.

(4) Where the state determines that the implementation plan is or may be inadequate to ensure reasonable progress due to emissions from sources within the state, the state shall revise its implementation plan to address the plan's deficiencies within one year.

1.3 MANE-VU Regional Course of Action

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 in two resolutions: "Statement of the Mid-Atlantic/Northeast Visibility Union (MANE-VU) Concerning a Course of Action within MANE-VU toward Assuring Reasonable Progress," and "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." These two resolutions are components of what is commonly known as the MANE-VU Ask.[5]

[5] Both statements may be found in Attachment E to New Hampshire's Regional Haze SIP at http://des.nh.gov/organization/divisions/air/do/asab/rhp/sip.htm.

MANE-VU modeling demonstrated that the control strategies for meeting the Reasonable Progress Goals would enable all MANE-VU Class I areas to meet their targets for visibility improvement in 2018. These control strategies included On-the-Books / On-the-Way (OTB/OTW) and Beyond-on-the-Way (BOTW) measures (see Section 7.2.1) as well as the additional control measures described in Sections 1.3.1 and 1.3.2, below.

1.3.1 Requested Action within MANE-VU

On June 20, 2007, the Mid-Atlantic and Northeast States agreed to pursue a coordinated course of action that would assure reasonable progress in reducing regional haze at mandatory Class I federal areas within the MANE-VU region. The coordinated effort would also leverage the multi-pollutant benefits that such measures may provide for the protection of public health and the environment. This course of action went beyond OTB/OTW and BOTW measures to include the adoption and implementation of the following emission control strategies by the MANE-VU states, as appropriate and necessary:

- Timely implementation of BART requirements.
- A 90% or greater reduction in sulfur dioxide (SO_2) emissions from each of the electric generating unit (EGU) stacks identified by MANE-VU as reasonably anticipated to cause or contribute to impairment of visibility in each mandatory Class I federal area in the MANE-VU region – comprising 167 stacks in total.[6] If it were determined to be infeasible for a state to achieve that level of reduction from a targeted unit, equivalent alternative measures would be pursued in such state.
- 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, of #4 residual oil to 0.25% sulfur by weight by no later than 2012, of #6 residual oil to 0.3 – 0.5% sulfur by weight by no later than 2012, and to further reduce the sulfur content of distillate oil to 15 ppm by 2016.
- 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, of #4 residual oil to 0.25 – 0.5% sulfur by weight by no later than 2018, and of #6 residual oil to no greater than 0.5% 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 availability.
- Continued evaluation of other control measures, including energy efficiency, alternative (clean) fuels, additional measures to reduce SO_2 and nitrogen oxide (NO_x) emissions from all coal-burning facilities by 2018, and new source performance standards for wood combustion. These and other measures would be evaluated during the consultation process to determine whether they were reasonable.

This long-term strategy to reduce and prevent regional haze would allow each state up to ten years to pursue adoption and implementation of reasonable NO_x and SO_2 control measures.

Note that NHDES did not include MANE-VU's low-sulfur fuel oil strategy in New Hampshire's initial regional haze SIP as an enforceable control measure but did include a commitment to evaluate this strategy further for possible implementation by 2018.

[6] The list of 167 stacks is available from the web address in the previous footnote.

1.3.2 Requested Action outside MANE-VU

Also on June 20, 2007, the MANE-VU states adopted a statement requesting that states outside the MANE-VU region identified as contributing to visibility impairment in the MANE-VU mandatory Class I federal areas pursue a course of action similar to that of the MANE-VU states. This course of action would assure reasonable progress toward preventing any future, and remedying any existing, impairment of visibility in those Class I areas. The requested course of action for the non-MANE-VU states called for the adoption and implementation of the following emission control strategies, as appropriate and necessary:

- Timely implementation of BART requirements.
- A 90% or greater reduction in sulfur dioxide (SO_2) emissions from each of the electric generating unit (EGU) stacks identified by MANE-VU as reasonably anticipated to cause or contribute to impairment of visibility in each mandatory Class I federal area in the MANE-VU region – comprising 167 stacks in total.[7] If it were determined to be infeasible for a state to achieve that level of reduction from a targeted unit, equivalent alternative measures would be pursued in such state.
- The application of reasonable controls on non-EGU sources resulting in a 28% reduction in non-EGU SO_2 emissions by 2018, relative to on-the-books/on-the-way 2018 projections used in regional haze planning – a reduction equivalent to that which would be achieved through MANE-VU's low-sulfur fuel oil strategy.[8]
- Continued evaluation of other control measures, including measures to reduce SO_2 and nitrogen oxide (NO_x) emissions from all coal-burning facilities by 2018, and promulgation of new source performance standards for wood combustion. These and other measures would be evaluated during the consultation process to determine whether they were reasonable.

This long-term strategy to reduce and prevent regional haze would allow each state up to ten years to pursue adoption and implementation of reasonable NO_x and SO_2 control measures.

[7] See footnote 6.

[8] MANE-VU requested the 28 percent reduction in emissions from non-EGU sources outside the MANE-VU region as being equivalent to the 2018 projected emission reductions that would result from implementation of the low-sulfur fuel oil strategy within the MANE-VU region. This request intentionally omitted reference to specific control measures, as the MANE-VU states thought that each contributing non-MANE-VU state should be allowed to determine the most reasonable way to achieve the requested reduction.

SECTION 2 – CHANGES IN VISIBILITY AT CLASS I AREAS IN THE STATE

2.1 Requirements to Track Visibility Progress

The ultimate goal of the Regional Haze Rule is to restore natural visibility conditions to each of the 156 Class I areas identified in the 1977 Clean Air Act Amendments by 2064. The regional haze SIPs must contain measures that make "reasonable progress" toward this goal by reducing anthropogenic emissions that cause haze. For each Class I area, there are three metrics of visibility that enter into the determination of reasonable progress: 1) baseline conditions, 2) natural conditions (in 2064), and 3) current conditions.

40 CFR 51.308(g)(3) of the Regional Haze Rule requires states with Class I areas to assess the current visibility conditions for the five years of most recent visibility data, compare those conditions to baseline visibility conditions for the 2000-2004 period, and assess the change in visibility impairment over the past five years for each area. To lessen the influence of year-to-year variability, the Regional Haze Rule mandates the use of 5-year average visibility values for the 20% best (least impaired) and 20% worst (most impaired) days in determining visibility progress.

Progress in improving visibility at Class I areas is measured via the IMPROVE (Interagency Monitoring of Protected Visual Environments) monitoring network. A coalition composed of the National Park Service (NPS), the Fish and Wildlife Service (FWS), the Bureau of Land Management (BLM), the Forest Service (FS) and the USEPA established the IMPROVE program in response to the 1977 CAA amendments. This monitoring network has collected speciated fine aerosol and related visibility data in or near Class I federal areas since 1988.

2.2 Visibility Progress – General Assessment

MANE-VU states with mandatory Class I federal areas adopted in their regional haze SIPs a set of goals for visibility improvement by 2018. These intermediate goals were approved by EPA as representing reasonable progress toward the restoration of natural visibility conditions at Class I areas by 2064. Table 2-1 presents observed visibility values, expressed in deciviews, for MANE-VU's Class I areas versus the corresponding short-term (2018) and long-term (2064) visibility goals. The 5-year average deciview values for the periods 2000-2004 and 2009-2013 are presented along with visibility improvements. The data indicate that all MANE-VU Class I areas have seen reduced haze levels since 2000-2004 and are, in fact, already surpassing their 2018 reasonable progress goals.

For the assessment of visibility progress, the Regional Haze Rule, at 40 CFR 51.308(g)(3), requires a determination of the change in visibility impairment for the most impaired and least impaired days over the past five years. This would involve a comparison of the 2009-2013 mean values against the 2004-2008 mean values for each Class I area. The comparison in Table 2-1 uses the 2000-2004 mean values, instead, to provide a better representation of visibility progress since the beginning of the current planning period. All sites have seen improvements of approximately 5-6 deciviews on the 20 percent worst days and approximately 1-2 deciviews on the 20 percent best days through 2013. The observed rates of improvement exceed prior projections and are mainly due to regional emission reductions of haze-causing pollutants in the past decade. While continued improvement is expected, past rates may not be indicative of future visibility progress.

Table 2-1. Observed Visibility vs. Established Visibility Goals (deciviews)

Class I Area IMPROVE* Site	2000-2004 5-Year Average	2009-2013 5-Year Average	Difference = Visibility Improvement	2013 Annual Average	2018 Reasonable Progress Goal	2064 Goal (Natural Visibility)
20% Worst Days						
Acadia National Park	22.9	17.9	5.0	16.5	19.4	12.4
Moosehorn Wilderness Area**	21.7	16.8	4.9	15.9	19.0	12.0
Great Gulf Wilderness Area***	22.8	16.7	6.1	15.0	19.1	12.0
Lye Brook Wilderness Area	24.4	18.8	5.6	17.5	20.9	11.7
Brigantine Wilderness Area	29.0	23.8	5.2	21.5	25.1	12.2
20% Best Days						
Acadia National Park	8.8	7.0	1.8	6.3	8.3	4.7
Moosehorn Wilderness Area	9.2	6.7	2.5	6.4	8.6	5.0
Great Gulf Wilderness Area	7.7	5.9	1.8	5.4	7.2	3.7
Lye Brook Wilderness Area	6.4	4.9	1.5	5.4	5.5	2.8
Brigantine Wilderness Area	14.3	12.3	2.0	11.8	14.3	5.5

* IMPROVE = Interagency Monitoring of Protected Visual Environments program.
** The IMPROVE monitor for Moosehorn Wilderness also represents Roosevelt Campobello International Park.
*** The IMPROVE monitor for Great Gulf Wilderness also represents Presidential Range - Dry River Wilderness Area.

2.3 Visibility Progress – Detailed Assessment

NESCAUM produced a comprehensive study for MANE-VU: "Tracking Visibility Progress, 2004-2011" (Attachment B). The analysis was performed to determine the extent of progress in meeting short-term and long-term visibility goals under the Regional Haze Rule. This technical document examined visibility data collected from IMPROVE's Class I area monitors, starting with the historic baseline period of 2000-2004 and ending with 2009-2011, the last 5-year period for which data were available at the time of the report.

The results of the NESCAUM analysis are summarized as following:

- There are definite downward trends in overall haze levels at the Class I areas in and adjacent to the MANE-VU region.[9]
- Based on 5-year rolling averages demonstrating progress since the 2000-2004 baseline period, the MANE-VU Class I areas appear to be on track to meet their 2018 reasonable progress goals (RPGs) for both best and worst visibility days.
- The trends in visibility improvement are mainly driven by large reductions in sulfate light extinction and, to a lesser extent, nitrate light extinction.
- Levels of organic carbon mass (OCM) and light absorbing carbon (LAC) appear to be approaching natural background levels on days of best visibility at most of the MANE-VU Class I areas.
- In some cases, the levels set by the 2018 reasonable progress goals have already been met, and progress beyond those goals appears achievable.

[9] New Hampshire's regional haze SIP has previously shown that sources in New Hampshire do not contribute significantly to visibility impairment in Class I areas outside the MANE-VU region. The same is true for visibility impairment at Brigantine Wilderness Area, for which New Hampshire's contribution to total sulfate aerosol is less than 1 percent. References to Brigantine and non-MANE-VU Class I areas are included for context only and do not signify any obligation on New Hampshire's part with respect to visibility at those locations.

- Although the Brigantine Wilderness Area in New Jersey is on track to meet its 2018 reasonable progress goals, challenges remain. Sulfate light extinction levels are higher at this site than at others across the region. Additional sulfate reductions would be effective in reducing overall haze levels at Brigantine.[10]

2.3.1 Graphical Analysis of Visibility Trends

Figures 2-1 through 2-5, taken from the NESCAUM study and updated with visibility values for 2012 and 2013, display the annual average deciview (haze index) levels on the 20 percent worst and 20 percent best visibility days for each MANE-VU Class I area. The observational data cover the period 2000-2013 and are shown in relation to established visibility goals to facilitate interpretation. The MANE-VU Class I areas are graphed individually and arranged in approximately north-to-south order. Corresponding numerical data (through 2011) are found in Table A-1 of the NESCAUM report (Attachment B).

The visibility graphs have been drawn using the following conventions:

- Blue and purple diamonds represent annual average deciview values for best and worst visibility days, respectively.
- Solid red (worst) and blue (best) lines represent 5-year-back rolling averages.
- Red (worst) and black (best) plus signs represent the 2018 reasonable progress goals established in New Hampshire's regional haze SIP.
- Red (worst) and black (best) dotted lines represent hypothetical glidepaths to meet the 2018 reasonable progress goals.
- Red (worst) and black (best) dashed lines represent hypothetical glidepaths to meet long-term natural visibility goals. The worst-day glidepath is also called the "uniform rate of progress" line, and the best-day glidepath is also called the "no degradation" line.[11]
- The grey region denotes the range of 20 percent best to 20 percent worst haze levels expected to occur under natural conditions. By design, the uniform rate of progress line intersects with the upper limit of the grey area in 2064.

These figures indicate that, from 2000 to 2013, haze levels declined on the best and worst days across the entire region. Visibility trends documented in the last NESCAUM report[12] for the period ending in 2008 largely continued through 2010. Most Class I areas experienced a relatively steep drop in deciview values for the 20 percent worst days between 2007 and 2010, followed by a brief uptick in haze levels before resumption of the downtrend. This somewhat irregular pattern may be explained by meteorological variability and changes in regional emissions in the period after 2007. The 5-year averaging of annual deciview values (represented by solid lines) smooths any short-term effects and validates the general trend toward improved visibility on both best and worst days over the period analyzed.

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[10] See footnote 9.

[11] For the Brigantine Wilderness Area, whose haze levels on the 20 percent best days during the 2000-2004 baseline period were higher than estimated natural conditions on the 20 percent worst days, the no degradation line (representing the long-term best-day goal) is higher than the uniform rate of progress line (representing the long-term worst-day goal) at dates approaching 2064. This nonsensical situation is an artifact of technical guidance and only represents stated visibility goals, not anticipated results.

[12] NESCAUM, "Tracking Visibility Progress, 2004-2008," MANE-VU Technical Memorandum, May 12, 2010; available at http://www.nescaum.org/documents/tracking-progress-final-05-12-10.pdf.

Figure 2-1. Visibility Progress at Acadia National Park

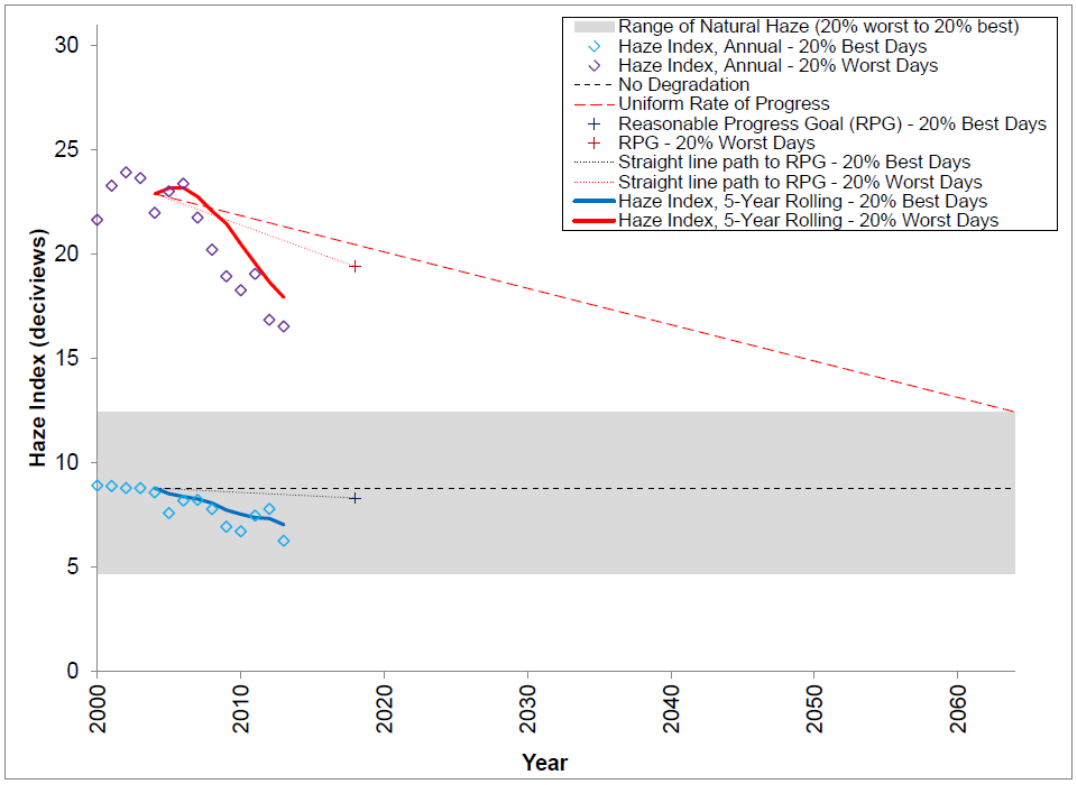


Figure 2-2. Visibility Progress at Moosehorn Wilderness Area

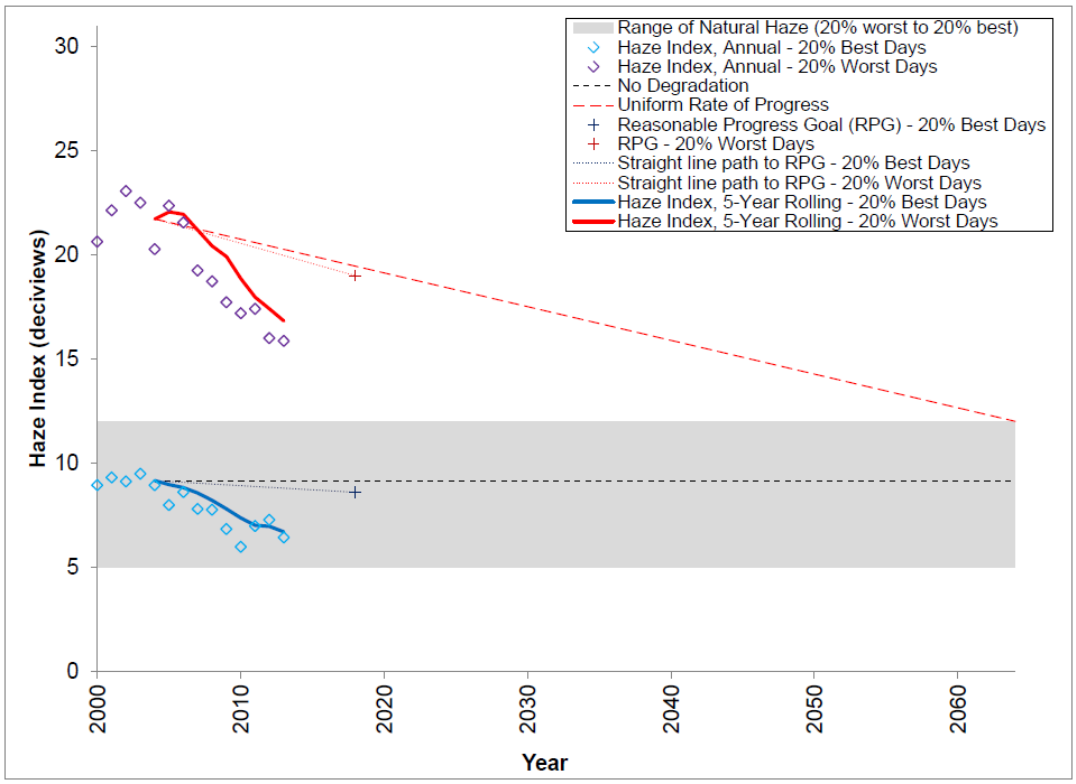


Figure 2-3. Visibility Progress at Great Gulf Wilderness Area

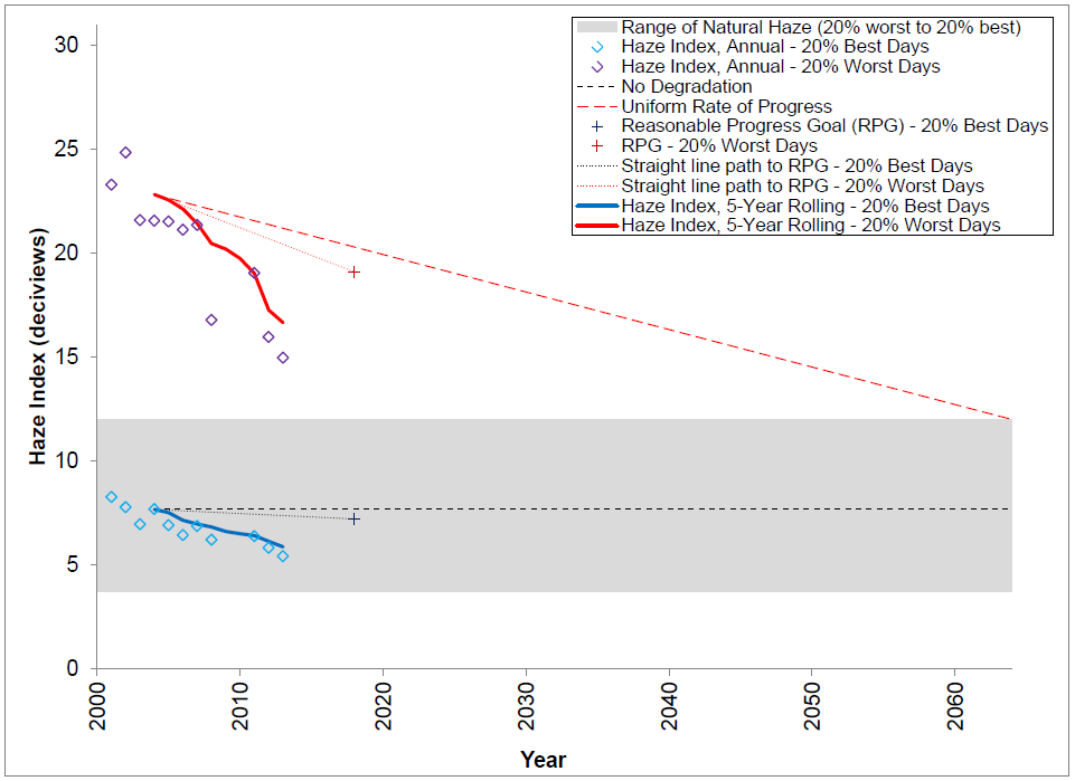


Figure 2-4. Visibility Progress at Lye Brook Wilderness Area

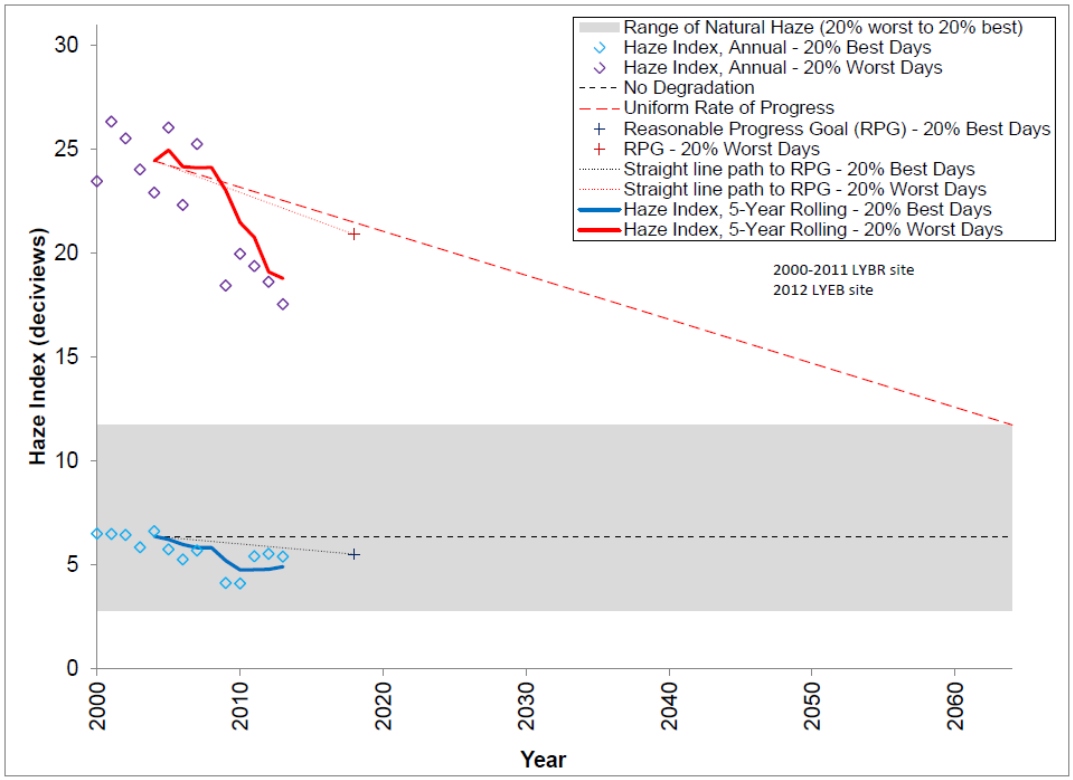
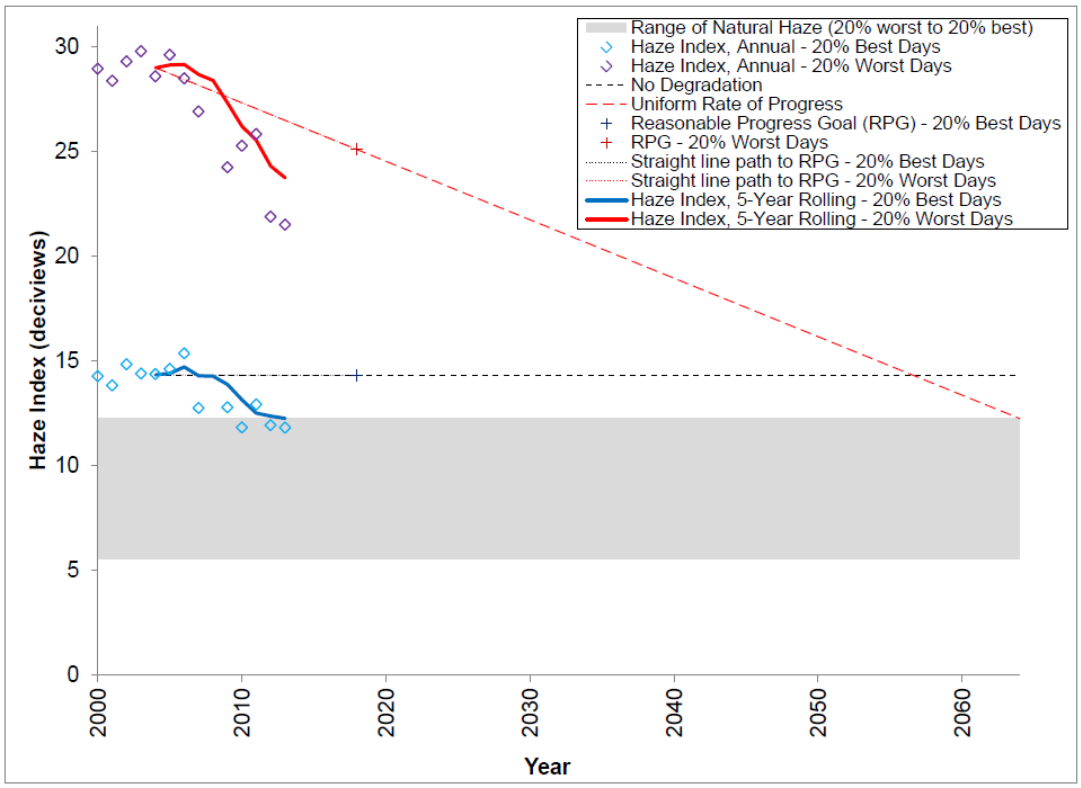


Figure 2-5. Visibility Progress at Brigantine Wilderness Area



2.3.2 Light Extinction Trends from Constituent PM

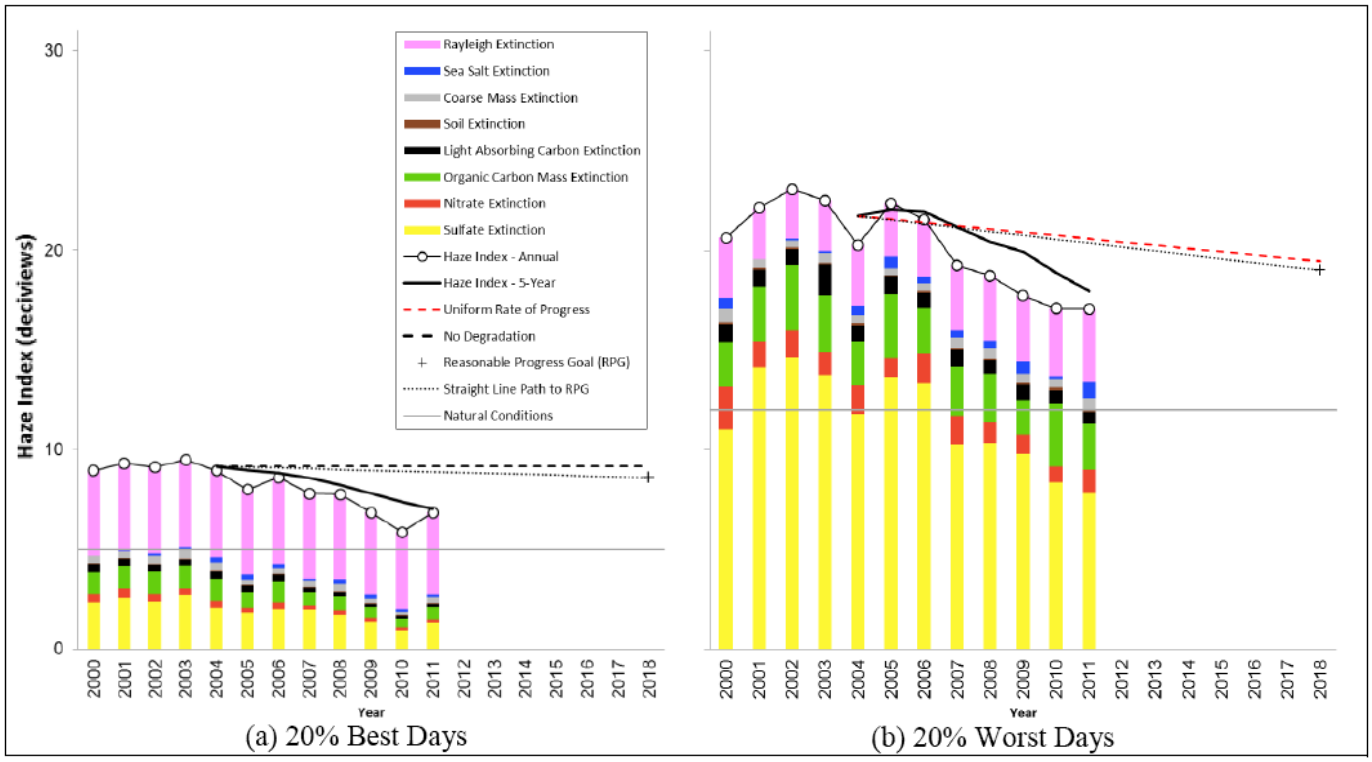
In addition to analyzing overall visibility trends at the Class I monitor sites, NESCAUM examined the underlying air quality data for changes in particulate matter (PM) constituent contributions to visibility impairment. The report "Tracking Visibility Progress, 2004-2011" (Attachment B) includes a series of figures depicting annual haze levels broken down by PM constituent contributions on the 20 percent best and 20 percent worst visibility days for each Class I area. Individual contributions are shown as stacked bar charts for sulfate, nitrate, OCM, LAC, soil, course mass, sea salt, and Rayleigh scattering (natural light extinction). The best- and worst-day charts for Acadia National Park, reproduced below in Figure 2-6, will serve to illustrate. Charts for the other Class I sites may be found in the attached report.

These graphical analyses confirm that improving visibility at MANE-VU Class I areas is due primarily to reductions in sulfate impacts on the most impaired days. At the same time, a general decline in sulfate, OCM, and nitrate impacts has resulted in improving visibility on the least impaired days.

NESCAUM's charts reveal that, for the two Class I area monitors in Maine (Acadia and Moosehorn), the average contribution from sulfate aerosol on the 20 percent worst days has fallen steadily since the baseline years of 2000-2004. At the other MANE-VU sites, a similar trend in sulfate contribution occurred until around 2008-2009, after which there were no notable changes in sulfate impact. Within the MANE-VU region overall, sulfate's contribution to total light extinction on the 20 percent worst days declined from about 60-75 percent to about 45-55 percent, depending on the Class I area location, over the period examined. As the absolute concentrations of sulfate aerosol have decreased, the other contributors to light extinction have assumed greater importance on a percentage basis.

In summary, sulfate continues to be the largest contributor to light extinction at all MANE-VU Class I areas, followed by OCM, nitrate, and light-absorbing carbon. Light extinction from soil and sea salt, which help indicate the extent to which natural processes contribute to overall haze levels, is relatively insignificant by comparison. Based on NESCAUM's analyses, reductions in sulfate and nitrate aerosols appear to be the main cause of trending improvements in best- and worst-day visibility. Additional details are available in the attached NESCAUM report.

Figure 2-6. PM Constituent Contributions to Haze Levels at Acadia National Park on Best and Worst Visibility Days



SECTION 3 – STATUS OF BART MEASURES IN THE REGIONAL HAZE SIP

3.1 Requirement to Track BART Implementation

In the 1977 Amendments to the CAA, the U.S. Congress directed EPA and the states to identify existing major stationary sources that had been in operation for no more than 15 years and that caused or contributed to visibility impairment in national parks and wilderness areas designated as mandatory Class I federal areas. Those sources were to install and operate best available retrofit technology (BART) to reduce their impacts on Class I areas.

40 CFR 51.308(g)(1) of the Regional Haze Rule requires that the state's 5-year progress report describe the implementation status of all measures included in the SIP for achieving reasonable progress goals for Class I areas within and outside the state. As noted in Section 1, New Hampshire and the other MANE-VU Class I states relied in part on the timely implementation of BART to meet these goals. Affected sources are required to comply with any BART determinations as expeditiously as practicable, but no later than five years after EPA's approval of the SIP. New Hampshire's regional haze SIP revision was more specific in that it required the state's two BART sources to implement BART control measures by July 1, 2013.

Thus, MANE-VU's Class I areas are already benefiting from implementation of BART controls in New Hampshire and elsewhere within the MANE-VU region. Further visibility benefits are likely to accrue from new emission controls at BART-eligible facilities located in states outside the MANE-VU region. However, the previously conducted MANE-VU modeling associated with the determination of reasonable progress goals did not account for BART control measures in the non-MANE-VU states. Consequently, the modeled visibility projections for MANE-VU's Class I areas do not include the additional visibility improvements that would result from such external efforts.

3.2 Status of BART Measures

EPA regulations and guidance allowed states to rely on the Clean Air Interstate Rule (CAIR) as satisfying BART requirements for SO_2 and NOx for certain electricity generating units. However, most CAIR states in the MANE-VU region made individual determinations for BART-eligible EGUs instead of more broadly relying on CAIR to meet the requirements of BART. CAIR was challenged in court and remanded to EPA for revision. In 2011, EPA replaced CAIR with the Cross-State Air Pollution Rule (CSAPR). CSAPR itself was challenged, then vacated, and finally reinstated following an appeal by EPA to the U.S. Supreme Court. (See Section 4.3.1 for details.) However, CAIR remains in place as EPA considers ways to implement CSAPR under a revised schedule. On November 19, 2012, EPA's then-Assistant Administrator Gina McCarthy provided guidance on the states' reliance on CAIR for purposes of implementing the Regional Haze Rule. This guidance is also the subject of ongoing legal challenges.

New Hampshire is not a CAIR state and, consequently, did not rely on this program to meet SIP requirements for in-state BART-eligible units. However, New Hampshire has counted on the emission reductions that BART would produce in upwind states and therefore has an interest in resolution of the CAIR/CSAPR rulemaking or other actions that would achieve equivalent results.

Attachment C is a memorandum from Paul Miller of NESCAUM to MANE-VU summarizing states' actions relative to the MANE-VU Ask, including synopses of the individual states' BART determinations and implementation status as of March 28, 2013. The memo includes a few instances in which states employed alternatives to BART to fulfill regional haze SIP requirements.

New Hampshire has two units subject to BART, both of which are EGUs owned and operated by Public Service of New Hampshire (PSNH): Merrimack Station Unit 2 and Newington Station Unit 1. The BART control measures for these units are enforceable through a combination of existing permit conditions and administrative rules, including New Hampshire administrative rule Env-A 2300: Mitigation of Regional Haze, which was adopted into the SIP with an effective date of September 21, 2012 (Table 3-1).

Table 3-1. New Hampshire BART Controls and Implementation Status (as of August 22, 2014)

Pollutant	BART Controls / Emission Limitations	NH Regulatory Citations	Compliance Deadline	Status
PSNH Merrimack Station Unit 2				
SO_2	Fuel sulfur limits	Administrative Rule Env-A 1604.01: Maximum Sulfur Content Allowable in Coal	N.A.	Pre-existing requirement
	Flue gas desulfurization (FGD), with required SO_2 percent reduction set at maximum sustainable rate, but not less than 90% as a calendar monthly average	Administrative Rule Env-A 2300: Mitigation of Regional Haze, paragraph 2302.01(b)(1); Temporary permit for FGD system (TP-0008)	July 1, 2013	FGD is currently operating with 90+ percent SO_2 reduction. Maximum sustainable rate is being evaluated. Findings are due in 2014 and will be incorporated as permit condition ~ 2015.
NOx	SCR (pre-existing); NOx emission limit of 0.30 lb/MMBtu, 30-day rolling average	Administrative Rule Env-A 2300: Mitigation of Regional Haze, paragraph 2302.01(b)(2)	July 1, 2013	Emission limit is in effect. Reference to Env-A 2300 will be included in facility's Title V operating permit (TV-0055) ~ 2015.
PM	Two ESPs in series (pre-existing); TSP emission limit of 0.08 lb/MMBtu	Administrative Rule Env-A 2300: Mitigation of Regional Haze, paragraph 2302.01(b)(3)	July 1, 2013	Emission limit is in effect. Reference to Env-A 2300 will be included in facility's Title V operating permit (TV-0055) ~ 2015.
PSNH Newington Station Unit 1				
SO_2	SO_2 emission limit of 0.50 lb/MMBtu, 30-day rolling average, applicable to any fuel type or mix	Administrative Rule Env-A 2300: Mitigation of Regional Haze, paragraph 2302.02(a)	July 1, 2013	Emission limit is in effect. Reference to Env-A 2300 will be included in facility's Title V operating permit (TV-0054) ~ 2015.
NOx	Low-NOx burners, overfire air, and water injection (pre-existing); NOx emission limits of 0.35 lb/MMBtu with oil and 0.25 lb/MMBtu with oil/gas, 24-hour calendar day average	Administrative Rule Env-A 2300: Mitigation of Regional Haze, paragraph 2302.02(b)	N.A. (Existing controls are BART.)	Emission limit is in effect. Reference to Env-A 2300 will be included in facility's Title V operating permit (TV-0054) ~ 2015.
PM	Electrostatic precipitator (pre-existing); TSP emission limit of 0.22 lb/MMBtu (existing); TSP emission limit of 0.04 lb/MMBtu (proposed)	Administrative Rule Env-A 2300: Mitigation of Regional Haze, paragraph 2302.02(c)	N.A. (Existing controls are BART.)	Existing TSP emission limit of 0.22 lb/MMBtu is in effect. Proposed TSP emission limit of 0.04 lb/MMBtu is in process, requiring revision to Env-A 2300. Final rule is expected by end of 2014. Reference to Env-A 2300 will be included in facility's Title V operating permit (TV-0054) ~ 2015.

40 CFR 51.308(e)(1)(v) requires that each source subject to BART maintain the required control equipment and establish procedures to ensure such equipment is properly operated and maintained. New Hampshire's SIP meets this requirement by including in the Title V operating permit for each BART source provisions to ensure proper operation and maintenance of the control equipment. Note that, because New Hampshire does not have a merged construction permitting and Title V permitting program, requirements related to BART first need to be placed into a state temporary permit (*i.e.*, construction permit) before they can be incorporated subsequently into a Title V operating permit.

SECTION 4 – STATUS OF CONTROL MEASURES FOR EGUs

4.1 Requirement to Track Implementation of EGU Control Measures

As noted in the preceding section, 40 CFR 51.308(g)(1) requires that the 5-year progress report describe the implementation status of all measures included in the SIP for achieving reasonable progress goals for Class I areas within and outside the state. Section 1 of this report outlines the strategy adopted by New Hampshire and the other MANE-VU states for achieving these goals. The MANE-VU strategy relies in part on emission reductions by 2018 from the top 167 (targeted) EGU sources or equivalent control measures in the states where those sources are located. This section describes the status of those and other EGU control measures, with emphasis on New Hampshire's actions. Note that there is some overlap between units subject to BART (see Section 3) and the EGUs covered in this section.

4.2 Focus on Sulfates and EGUs

The MANE-VU Contribution Assessment[13] produced a conceptual model of regional haze in which sulfate emerged as the most important constituent of haze-forming fine particle pollution and the principal cause of visibility impairment across the region. This model is supported by NESCAUM's more recent analysis of light extinction trends described in Section 2.3.2.[14]

The Contribution Assessment found that, in 2002, SO_2 emissions originating within MANE-VU were responsible for approximately 25 percent of total sulfate aerosol at MANE-VU Class I areas. Sources in the Southeast and Great Lakes regions were responsible for about 15 to 25 percent each. Sources in the Midwest and Canada were responsible for most of the remainder. Point sources dominated the inventory of SO_2 emissions. In response to these findings, MANE-VU designed its long-term strategy to include additional control measures on SO_2 sources within the MANE-VU region and in neighboring states that contribute significantly to regional haze at MANE-VU Class I Areas. Electrical generating units were identified as the largest source category contributing to these emissions, and EPA's Clean Air Interstate Rule was the strategy of choice for most states to reduce SO_2 emissions from EGUs by 2018.

4.3 EGU Control Measures Included in the SIP

Since 2002, various control measures to reduce emissions from EGUs have been realized through a number of mechanisms, including CAIR, individual state programs, federal consent agreements, and source-specific permitting actions. The EGU emissions used in MANE-VU's modeling to help determine reasonable progress goals are described in an August 2009 document.[15] Changes in emissions since 2002 are summarized in Sections 6 and 7 of this report. The following information describes the status of EGU control measures included in the SIP that have been effective in reducing regional-haze-causing emissions.

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[13] See footnote 4.

[14] Unlike NESCAUM's graphical analysis, the Contribution Assessment was based on particle mass. Light extinction and particle mass are two different ways of representing visibility impairment and do not yield identical results.

[15] Alpine Geophysics, LLC and MARAMA, "Documentation of 2018 Emissions from Electric Generating Units in the Eastern United States for MANE-VU's Regional Haze Modeling," final report, August 16, 2009; available at http://www.marama.org/publications_folder/EGU_Projections_Summary_Final_Aug_2009.pdf.

4.3.1 Clean Air Interstate Rule and Cross-State Air Pollution Rule

On May 12, 2005, the EPA promulgated CAIR, which required reductions in emissions of SO_2 and/or NO_X from large fossil-fuel-fired EGUs in 27 eastern states, including MANE-VU members Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Delaware, and Maryland, plus the District of Columbia. These emission reductions were among the many inputs to the MANE-VU 2018 modeling projections. The U.S. Court of Appeals for the D.C. Circuit ruled on petitions for review of CAIR and CAIR federal implementation plans, including their provisions establishing the CAIR NO_X annual, NOx ozone season, and SO_2 trading programs. On July 11, 2008, the court issued an opinion vacating and remanding these rules. However, parties to the litigation requested rehearing of aspects of the court's decision, including the vacatur. The court's subsequent ruling of December 23, 2008, to remand without vacatur left CAIR in place until EPA issued a new rule to replace CAIR in accordance with the July 11, 2008, decision.

In separate actions on July 6, 2011, and December 15, 2011, followed by a number of technical revisions and minor adjustments, the EPA finalized CSAPR as a replacement for CAIR. It was EPA's intention that, beginning in 2012, CSAPR would require 28 states in the eastern half of the United States to reduce power plant emissions: 20 states for annual SO_2, annual NOx, and ozone-season NOx; 3 states for annual SO_2 and annual NOx; and 5 states for ozone-season NOx only. The affected MANE-VU states were New York, New Jersey, Pennsylvania, and Maryland.

EPA estimated that CSAPR would reduce EGU emissions by 6,500,000 tons of SO_2 and 1,400,000 tons of NO_X annually from 2005 levels. These estimates represented a 71 percent reduction in SO_2 and a 52 percent reduction in NO_X in the covered states.

On August 17, 2012, the U.S. Court of Appeals for the D.C. Circuit vacated CSAPR. On October 5, 2012, EPA requested a rehearing *en banc* of the CSAPR vacatur. The court denied this request on January 24, 2013. The U.S. Supreme Court agreed to hear EPA's appeal of the lower court's ruling, and, on April 29, 2014, reversed the D.C. Circuit opinion vacating CSAPR. EPA is reviewing this latest decision before providing further direction to the states. Meanwhile, CAIR remains in effect.

4.3.2 State-Specific EGU Control Measures

As a complement to federal actions, the individual MANE-VU states adopted state-specific emission control measures beyond CAIR that will help to reduce emissions of haze-causing pollutants from EGUs. The regional modeling used to establish the MANE-VU reasonable progress goals included a large number of state control measures, including two New Hampshire regulations affecting local EGUs. These are listed in Table 4-1 along with brief descriptions of their current status.

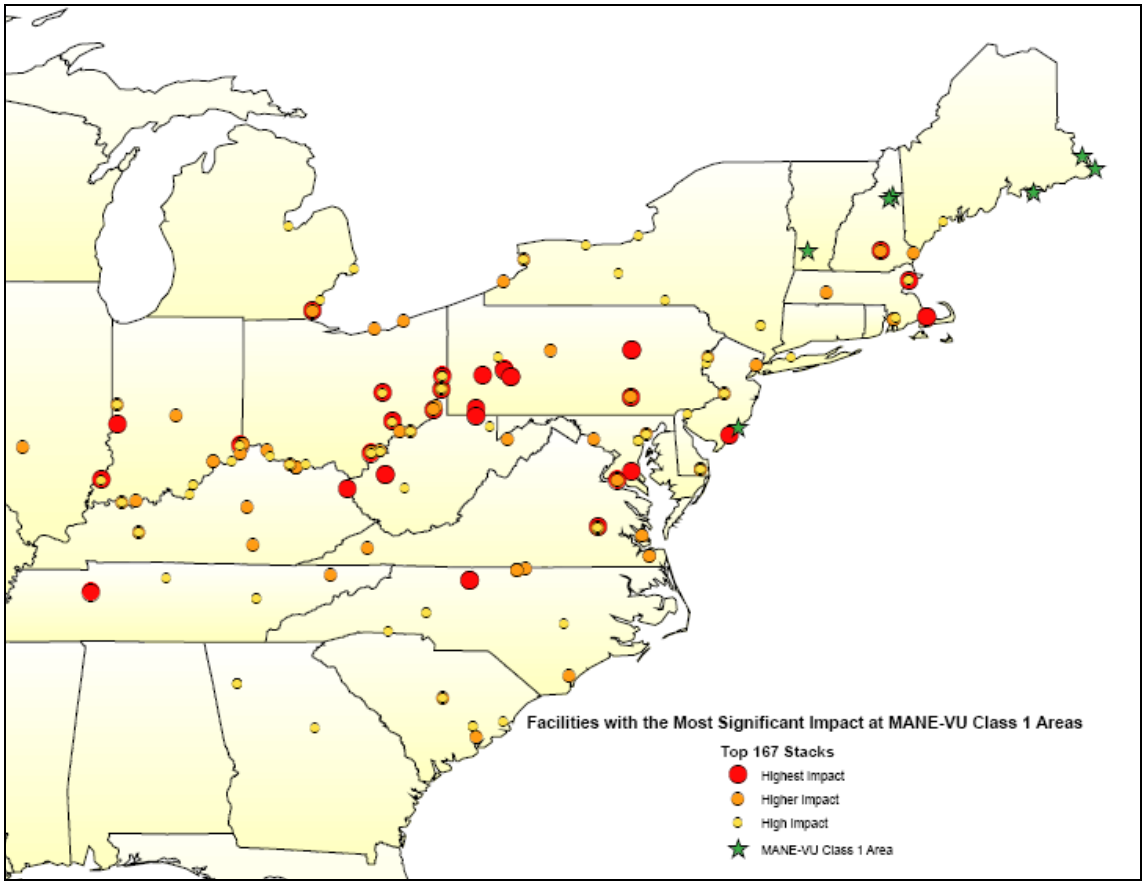
Table 4-1. Status of New Hampshire EGU Control Measures Included in MANE-VU Modeling

Control Measure	Status
Chapter Env-A 2900: Multiple Pollutant Annual Budget Trading and Banking Program, capping NO_X emissions at 3,644 tons per year, SO_2 emissions at 7,289 tons per year, and CO_2 emissions at 5,425,866 tons CO_2 per year for all existing fossil-fuel fired steam units by December 31, 2006.	Effective May 13, 2003; readopted October 1, 2011; not submitted to or approved by EPA as SIP revision.
Chapter Env-A 3200: *NO_X Budget Trading Program*, limiting ozone season NO_X emissions on all fossil-fuel-fired EGUs greater than 15 MW to 0.15 lb/MMBtu, effective November 2, 2007.	Effective July 17, 1998; readopted November 2, 2007; approved by EPA as SIP revision November 14, 2000.

4.3.3 Controls on Top 167 EGU Sources

With the focus on sulfate emissions and fossil-fuel-fired power plants, MANE-VU reasoned that large reductions in SO_2 could be obtained with the addition of cost-effective controls on the largest-contributing EGUs. Appendix D of MANE-VU's Contribution Assessment identified 167 EGU sources in the Northeast, Southeast, and Midwest whose 2002 emissions were most responsible for visibility impairment at MANE-VU Class I areas (Figure 4-1). Three New Hampshire EGUs were among the listed units: PSNH Merrimack Station Units 1 and 2, and PSNH Newington Station Unit 1. (Note that Merrimack 2 and Newington 1 are also BART units – see Section 3.) MANE-VU's long-term strategy called for a 90 percent reduction in SO_2 emissions from each of these sources, or equivalent measures where this level of reduction was infeasible for an identified unit.

Figure 4-1. Location of 167 EGU Stacks Contributing the Most to Visibility Impairment at MANE-VU Class I Areas



Note: Some facilities have more than one stack.

Emission controls such as SO_2 scrubbers have already been placed on many of the 167 targeted EGUs, while other units have seen lower utilization or been shut down entirely. As expected, measurable visibility improvements have occurred at Class I areas as a result of these actions. Attachment C includes summary descriptions of the actions taken by individual states within and outside MANE-VU to reduce SO_2 emissions from the targeted units. The status of New Hampshire's three sources is shown below (Table 4-2).

Table 4-2. Status of SO_2 Control Measures at Targeted EGUs in New Hampshire

Facility Name / Unit	Fuel Type	Control Method	BART Controls	Control Deadline	Control Status	2002-2013 Emission Reductions*
Merrimack Station (ORISPL 2364) Unit 1	coal	scrubber, 90% control (min.)	not required	July 1, 2013	implemented	9,390 tons/year (96%)
Merrimack Station (ORISPL 2364) Unit 2	coal	scrubber, 90% control (min.)	yes	July 1, 2013	implemented	19,866 tons/year (95%)
Newington Station (ORISPL 8002) Unit 1	fuel oil/ natural gas	0.50 lb/MMBtu SO_2 emission limit	yes	July 1, 2013	implemented	4,897 tons/year (94%)

* See Table 6-1 for details.

4.4 Additional Controls on EGUs Expected by 2018

New Hampshire's long-term strategy for regional haze did not identify additional controls on EGUs to reduce haze-causing emissions beyond those measures already described in Sections 3 and 4. However, it should be mentioned that the flue gas desulfurization system for Merrimack Station has its origins in state law RSA 125-O: Multiple Pollutant Reduction Program, which requires the reduction of mercury emissions by at least 80 percent from New Hampshire's fossil-fuel-fired power plants. The 90-percent-plus removal of SO_2 at Merrimack Station occurs as a co-benefit of FGD for mercury control that simultaneously fulfills New Hampshire's separate obligations under BART and the targeted EGU strategy.

More specifically, RSA 125-O set limits on the aggregate mercury emissions from PSNH's Merrimack and Schiller Stations.[16] Although Schiller has no post-combustion emission controls for either mercury or SO_2, the Merrimack Station scrubber, because of its size and performance, allows both plants to meet the statute's 80-percent reduction requirement on combined mercury emissions. Note that RSA 125-O: Sections 1 and 3, requiring an integrated, multi-pollutant reduction strategy for certain power plants, were submitted to EPA on September 13, 2013, as part of New Hampshire's infrastructure SIP for the 2010 SO_2 NAAQS.

Aside from this state standard, fossil-fuel-fired EGUs will be required to meet EPA's Mercury and Air Toxic Standards (MATS) for power plants by April 16, 2015, and the 2010 primary 1-hour NAAQS for SO_2. The method(s) of compliance for Schiller Station have not yet been determined but could further reduce SO_2 emissions in New Hampshire that contribute to regional haze.

4.5 EGU Retirements or Replacements

40 CFR 51.308(d)(3)(v)(D) of the Regional Haze Rule requires New Hampshire to consider source retirement and replacement schedules in its long-term strategy. Of particular interest is the future disposition of New Hampshire's fossil-fuel-fired EGUs. While recent developments in the oil and gas industry have forced rapid changes in the power production sector, and some generating units have experienced sharp reductions in utilization, no retirements or replacements of New Hampshire's EGUs have occurred or been announced since the regional haze SIP was first submitted in 2010.

[16] Schiller Station, which has two coal-fired units and one wood-fired unit, is a smaller plant than either Merrimack Station or Newington Station and is not listed among New Hampshire's BART units or targeted EGUs.

SECTION 5 – STATUS OF ADDITIONAL CONTROL MEASURES IN THE SIP

5.1 Requirement to Track Implementation of Other Control Measures

As previously described, the New Hampshire long-term strategy for visibility improvement includes the timely implementation of BART controls (Section 3), reductions in SO_2 emissions from key EGUs (Section 4), and consideration of additional control measures. In compliance with 40 CFR 51.308(g)(1), this section reports on the status of additional controls not covered in Sections 3 and 4.

5.2 Low-Sulfur Fuel Oil Strategy

In pursuing a regional course of action, the MANE-VU states developed a low-sulfur fuel oil strategy to be implemented within the region by 2018. As described in Section 1.3.1, this strategy would reduce the sulfur content of distillate and residual fuel oils, which are used mainly for domestic space heating and for powering industrial, commercial, and institutional boilers. Several MANE-VU states have already adopted statutes or regulations implementing this strategy. Summary descriptions of individual states' efforts in this regard are included in Attachment C.

New Hampshire did not commit to implementing the low-sulfur fuel oil strategy in its regional haze SIP but did commit to further evaluation of this strategy for possible implementation by 2018. Accordingly, New Hampshire maintains an interest in pursuing the low-sulfur fuel oil strategy and is monitoring progress in surrounding states. Incremental fuel costs and the assurance of fuel supplies for the various grades of low-sulfur oil are real, but diminishing, concerns as other states' programs ramp up. To be successful in New Hampshire, any low-sulfur fuel oil requirement would most likely be implemented via legislative action rather than NHDES rulemaking. The prospects for such action are being evaluated at the time of this progress report. A low-sulfur requirement could set fuel sulfur content limits at levels varying between 25 and 90 percent or more below current standards, depending on the fuel grade.

Whether or not New Hampshire implements the low-sulfur fuel oil strategy, there will be visibility benefits resulting from regional adoption of this strategy. Should all neighboring states implement this strategy in full, it is anticipated that New Hampshire's fuel oil supply would simply default to low-sulfur content in response to market conditions.

5.3 State-Specific Control Measures

This section discusses implementation of additional state-specific control measures relevant to New Hampshire's regional haze SIP.

5.3.1 Control Measures for NOx Sources

In 2010, New Hampshire readopted, with minor amendments, administrative rule Env-A 1300: Nitrogen Oxides (NOx) Reasonably Available Control Technology (RACT). Previously numbered and approved into the SIP as Env-A 1211, this rule establishes RACT standards for certain NOx-emitting stationary sources located in New Hampshire, to comply with sections 172(c)(1) and 182(b)(2) of the CAA. The rule is applicable to the following stationary source categories: utility boilers, steam electric boilers, industrial boilers, auxiliary boilers, combustion turbines, internal combustion engines, asphalt plant rotary dryers, incinerators, wallboard dryers, calcining mills, calciners, gypsum rock dryers, emergency generators, load shaving units, and miscellaneous stationary sources. The rule also establishes the criteria and procedures by which a source can

request alternative RACT emission limits and sets conditions for the use of NOx emission allowances. Env-A 1300 was readopted with an effective date of October 31, 2010, and was submitted to EPA as a SIP revision on March 31, 2011. EPA's approval of this SIP revision was signed on July 29, 2014.

5.3.2 Prevention of Significant Deterioration

Class I areas are protected under Title I, Part C of the CAA, which addresses Prevention of Significant Deterioration of Air Quality (PSD). In particular, section 160 of this part establishes the purpose "to preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic, or historic value." PSD is applicable to all major sources (or existing sources making a major modification) located in an area that is in attainment of the National Ambient Air Quality Standards. All areas of New Hampshire are subject to PSD.

Administrative rule Env-A 619: Prevention of Significant Deterioration, which was previously codified as Env-A 623 and approved as a SIP revision on December 27, 2002, spells out the PSD requirements of New Hampshire's statewide permit system. The PSD permitting process requires modeling analyses to assess the potential air quality impacts, including those to visibility, at Class I areas. PSD permit applicants may conduct such analyses in consultation with NHDES and the relevant FLM. The most recent revisions to Env-A 600: Statewide Permit System, including Env-A 619, were readopted with an effective date of September 1, 2012. NHDES submitted the amended rule to EPA for SIP approval on November 15, 2012.

New Hampshire has received and processed only one PSD permit application since the original regional haze SIP submission. On December 16, 2009, Laidlaw Berlin BioPower, LLC (a.k.a. Burgess BioPower), Berlin, NH, filed an initial application for a proposed wood-fired power plant. Following a change in project ownership and NHDES's detailed review of the application, a temporary permit was issued allowing construction to proceed.[17]

Visibility modeling was performed as part of the application process for the BioPower facility. Initial modeling showed that the potential existed for the biomass boiler's exhaust plume to cause a noticeable color difference when viewed against the sky from inside nearby Class I areas. Subsequent, more-refined modeling showed that the meteorological conditions that might produce this effect would persist for no more than three hours at a time. Based on the strongest wind speed in the modeled meteorological data set, it was estimated that the shortest transport time to the Class I areas was five hours. This would not be enough time for a visible plume to reach those areas before full dispersion. Thus it was concluded from the modeling results that the power plant would not impair visibility at New Hampshire's Class I areas.

5.3.3 Agricultural and Forestry Smoke Management

40 CFR 51.308(d)(3)(v)(E) requires each state to consider smoke management techniques related to agricultural and forestry management in developing the long-term strategy to improve visibility at Class I areas. MANE-VU's analysis of smoke management in the context of regional haze is documented in "Technical Support Document on Agricultural and Forestry Smoke Management in

[17] Permit No. TP-0054, issued on July 26, 2010; reissued on November 18, 2011, and November 30, 2012; viewable at http://www2.des.state.nh.us/OneStopPub/Air/330079013712-0175TypePermit.pdf.

the MANE-VU Region," September 1, 2006.[18] As that report notes, fires used for resource benefits are of far less significance to the total inventory of fine-particle pollutant emissions than other sources of wood smoke in the region. With respect to $PM_{2.5}$ emissions, the largest wood smoke source categories in the MANE-VU region are residential wood combustion (73 percent); open burning (15 percent); and industrial, commercial, and institutional wood combustion (9 percent). Fires that are covered under smoke management plans, including agricultural and prescribed forest burning, constitute less than one percent of total wood smoke emissions in the MANE-VU states.

Wildfires within the region are also relatively small and infrequent contributors to regional PM emissions. MANE-VU's Class I areas are occasionally affected by wildfire smoke emissions from other regions, such as occurred from lightning-induced forest fires in Quebec Province in July 2002 and May 2010. These natural wildfire smoke emissions are not considered controllable – and, in fact, are counted as part of natural background conditions. In any case, unplanned fires make up only a minor fraction of wood burning emissions.

Smoke from all sources accounts for only a small percentage of the fine-particle mass that is the cause of regional haze. As documented in MANE-VU's Contribution Assessment, elemental carbon, the main ingredient of smoke, contributed 3 to 4 percent of fine-particle mass on days of worst and best visibility. Additionally, elemental carbon absorbs light more readily than it scatters light. When all facts are considered, it is reasonable to conclude that smoke emissions from controlled agricultural and forestry burning contribute, on an average annual basis, only a small fraction of one percent to total light extinction on days of both good and poor visibility.

This is not to say that individual events, including prescribed burns, will not have short-term visibility impacts. Such impacts are addressed by the New Hampshire Prescribed Fire Council in its recommended standards[19] for planning and implementing prescribed burns. The U.S. Forest Service and NHDES are members of the council and assisted in the development of these standards. Chapter 10 of the standards, which covers smoke management and air quality, recommends as follows: "The burn plan will screen for all smoke sensitive features within one and five miles of the planned burn, and identify measures for minimizing negative impacts of smoke to these features." Class I areas are not specifically identified as smoke sensitive features. However, both of New Hampshire's Class I areas are within the White Mountain National Forest; thus, the FLM (in this case, the U.S. Forest Service) would be informed of any planned burn in nearby lands. For any prescribed fire within the WMNF, the burn plan would have to meet the FLM's own requirements for protection of Class I areas, which are more stringent than the New Hampshire Prescribed Fire Council's standards.

Chapter 13 of the Fire Council's recommended standards includes a section on air quality, with references to the CAA, the NAAQS, PSD, and the Regional Haze Rule. The two Class I areas in New Hampshire are identified by name, and the following recommendation is made: "If any prescribed fires take place that could affect Class I Airsheds, the New Hampshire Department of Environmental Services Air Resources Division should be contacted early in the planning process." Also, NHDES's real-time air quality monitoring website (http://www2.des.state.nh.us/airdata/) is listed as a resource to help prescribed fire planners determine optimal times to conduct burns.

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[18] Available as Attachment V to New Hampshire's Regional Haze SIP at http://des.nh.gov/organization/divisions/air/do/asab/rhp/documents/v.pdf.

[19] NH Prescribed Fire Council, "Planning for Prescribed Burning in New Hampshire," June 28, 2011; available at http://extension.unh.edu/resources/files/Resource001886_Rep2781.pdf.

5.3.4 Measures to Mitigate Impacts of Construction Activities

40 CFR 51.308(d)(3)(v)(B) of the Regional Haze Rule requires each state to consider measures to mitigate the impacts of construction activities on regional haze. Fugitive emissions caused by earth-moving activities and heavy vehicular traffic are the main concerns. However, MANE-VU's Contribution Assessment found that crustal material plays only a very minor role in visibility impairment at MANE-VU Class I areas. On the 20 percent best visibility days during the 2000-2004 baseline period, crustal material accounted for 6 to 11 percent of particle-related light extinction at MANE-VU Class I Areas. On the 20 percent worst-visibility days, however, the ratio was reduced to 2 to 3 percent. Furthermore, the crustal fraction is largely made up of pollutants of natural origin (e.g., soil or sea salt) that are not targeted under the Regional Haze Rule.

Nevertheless, the crustal fraction at any given location can be heavily influenced by the proximity of construction activities, and construction activities occurring in the immediate vicinity of MANE-VU Class I Areas could have a noticeable effect on visibility. NHDES does not perceive that construction activities are an ongoing or significant impediment to meeting the 2018 reasonable progress goals for Class I areas in the region. Consequently, no additional control measures tied directly to construction activities are proposed at this time.

Of relevance to construction activities is New Hampshire administrative rule Env-A 2800: Sand & Gravel Sources; Non-metallic Mineral Processing Plants; Cement & Concrete Sources, which was readopted with amendments, effective on October 1, 2010. NHDES sent the amended rule to EPA with a request for SIP approval on March 31, 2011. This rule establishes particulate matter, visible emissions, and fugitive dust standards for cement/concrete sources and sand/gravel sources. The rule revisions serve to 1) distinguish sources at which non-metallic minerals are subject to crushing or grinding from other sand and gravel sources, 2) separate the PM and visible emissions standards for non-metallic mineral processing plants from those for other sources, and 3) establish a permit-by-notification for non-metallic mineral processing plants to replace the General State Permit option. The permit-by-notification enables an operator to move a mobile crusher with only a notice to NHDES and the town, rather than undergoing a more extensive permit process each time. The amended rule requires emissions testing of all new equipment as well as existing equipment not previously tested.

5.3.5 Rule for Open Source Emissions

New Hampshire readopted administrative rule Env-A 1000: Prevention, Abatement, and Control of Open Source Air Pollution, with minor amendments, effective on May 1, 2011. It was submitted to EPA for SIP approval on Aug. 9, 2011. This rule establishes requirements for open burning, fugitive dust, and firefighter instruction and training activities. Although the rule does not make direct reference to visibility protection, the requirements it places on managing particulate emissions have, as one effect, that of protecting visibility. The open source rule aligns well with efforts to manage emissions from controlled agricultural and forestry burns and construction activities.

5.3.6 Miscellaneous Control Measures

New Hampshire is considering various other control measures that could be incorporated into the state's long-term strategy to mitigate regional haze but for which no commitment is made or implied at this time:

- Energy efficiency: A number of in-state energy efficiency programs are already reducing electric demand and, consequently, the power plants emissions that cause haze – mainly SO_2, NOx, and PM. The option exists to expand such programs and to make them a formal part of New Hampshire's SIP.

- Alternative clean fuels: New Hampshire has joined 10 other Northeast states in studying the possible implementation of a regional low-carbon fuel standard (LCFS) similar to the LCFS adopted by California. Such a measure would improve the efficiency of transportation fuels and reduce tailpipe emissions that contribute to regional haze. In the absence of a broader national program, interest in a low-carbon fuels standard remains high in many Northeast states, but support for a clean fuels program in New Hampshire is uncertain.

- Wood combustion standards: In addition to passage of a state law[20] regulating outdoor wood boilers, other measures to control particulate emissions from small wood combustion devices are under consideration. At the federal level, EPA has proposed new source performance standards (NSPS) for new residential wood heaters to reflect improvements in wood heater technologies and to broaden the range of devices covered by the regulation.[21]

[20] See HB 1405, Chapter 362, Laws of 2008; available at www.gencourt.state.nh.us/legislation/2008/HB1405.html.

[21] See 79 FR 6330.

SECTION 6 –EMISSION REDUCTIONS RESULTING FROM IMPLEMENTATION OF CONTROL MEASURES IN THE SIP

6.1 Requirement to Summarize Emission Reductions

40 CFR 51.308(g)(2) requires that the progress report summarize the emission reductions achieved throughout the state by implementation of the measures included in the SIP to meet reasonable progress goals for mandatory Class I federal areas.

6.2 Emissions Changes since 2002

Emissions reductions described in this section are constructed from emissions inventory data presented in Section 7. That section lists the 2002 and 2018 MANE-VU regional emissions estimates developed for the member states' regional haze SIPs and compares those values to the latest available estimates for the major categories of emissions sources. Although the estimates from one year to another are not always directly comparable because of differences in estimation methodology, rough approximations of emission reductions are still possible. From 2002 to 2007 (the most recent 5-year interval for which data are sufficiently complete to allow comparisons), the overall reductions in haze-causing pollutants throughout the MANE-VU region were approximately as follows: sulfur dioxide, 16%; nitrogen oxides, 13%; direct fine particulate matter, 7%; and volatile organic carbon, 33%.

The emissions estimates used to derive these regional emission reductions are found in Table 7-1 as the 2002 and 2007 category totals. Similar reductions, on a percentage basis, occur for emissions originating from New Hampshire sources (Table 7-2). The changes in both state and regional emissions during this period may be attributed to market forces in the power production sector and to emission control programs that were already on the books or on the way before the states' regional haze SIPs were completed, but not to control measures arising from those SIP revisions (which were completed after 2007). The emission reductions and attendant air quality benefits emanating from the regional haze SIPs have begun only recently and, for the most part, are not readily quantifiable thus far.

6.3 Emission Reductions from New Hampshire's EGUs

Electrical generating units are recognized as the largest group of SO_2 emitters and thus the leading contributors to regional haze. This source category is one for which emission reductions are more reliably determined than most because of federal reporting requirements for the power production sector. Several New Hampshire EGUs that participate in federally mandated air pollution control programs (such as the Acid Rain Program) are required to report to EPA's Clean Air Markets Division (CAMD). Table 6-1 lists the SO_2 and NOx annual emissions – along with heat input, gross load, and operating time – as recorded in the CAMD database for all reporting units in 2002 and 2013. The table is divided into two groups: units identified as being among the top 167 EGU sources affecting MANE-VU Class I areas (*i.e.*, targeted EGUs – see Subsection 4.4), and all other units. The total annual SO_2 and NOx emissions from New Hampshire EGUs are also shown graphically in Figure 6-1.

Table 6-1. SO_2 and NOx Emissions from New Hampshire EGUs in 2002 and 2013

Year	Facility Name	Facility ID (ORISPL)	Unit ID	SO_2 (tons)	NOx (tons)	Heat Input (MMBtu)	Gross Load (MW-hr)	Operating Time (hr)
TARGETED EGUs								
2002	Merrimack	2364	1	9,754.4	962.0	8,754,397	810,636	6,989
2002	Merrimack	2364	2	20,902.5	2,871.2	22,013,515	2,208,431	7,180
2002	Newington	8002	1	5,225.7	942.7	9,658,944	725,096	3,085
				35,882.6	**4,775.9**	**40,426,856**	**3,744,163**	
2013	Merrimack	2364	1	364.1	584.5	4,078,240	404,937	3,792
2013	Merrimack	2364	2	1,036.4	1,359.0	10,585,288	1,032,003	3,384
2013	Newington	8002	1	328.6	86.1	1,209,521	87,799	772
				1,729.1	**2,029.6**	**15,873,049**	**1,524,739**	
Emission Reductions, 2002-2013				34,153.5 *95.2%*	2,746.3 *57.5%*			
ALL OTHER UNITS								
2002	EP Newington Energy, LLC	55661	1	6. 1	151.1	4,302,511	318,729	3,391
2002	EP Newington Energy, LLC	55661	2	5.3	51.1	3,692,785	321,005	2,541
2002	Lost Nation	2362	CT1		5.7	21,580	768	83
2002	Merrimack	2364	CT1		7.4	23,711	1,149	99
2002	Merrimack	2364	CT2		6.6	21,447	964	90
2002	Schiller	2367	4	2,608.4	675.4	3,773,920	294,220	7,134
2002	Schiller	2367	5	2,796.5	598.7	3,936,700	318,110	7,538
2002	Schiller	2367	6	2,647.6	573.9	3,714,776	323,051	7,768
2002	Schiller	2367	CT1		19.2	47,477	2,047	168
2002	White Lake	2369	CT1		8.3	25,776	1,104	107
				8,063.9	**2,083.4**	**19,513,327**	**1,579,275**	
2013	EP Newington Energy, LLC	55661	1	1.2	17.6	2,288,855	308,832	1,451
2013	EP Newington Energy, LLC	55661	2	1.4	21.7	2,971,802	371,865	1,954
2013	Granite Ridge Energy	55170	1	4.0	55.4	13,290,207	1,149,716	6,371
2013	Granite Ridge Energy	55170	2	3.6	48.7	12,072,594	1,052,791	5,816
2013	Schiller	2367	4	804.2	165.2	1,233,100	104,242	3,041
2013	Schiller	2367	5	2.1	177.5	5,305,054	370,028	8,124
2013	Schiller	2367	6	621.1	143.3	1,066,811	89,975	2,418
				1,437.6	**629.4**	**38,228,423**	**3,447,449**	
Emission Reductions, 2002-2013				6,626.3 *82.2%*	1,468.0 *70.0%*			
ALL UNITS COMBINED								
2002				**43,946.5**	**6,873.3**	**59,987,539**	**5,325,310**	
2013				**3,166.7**	**2,659.0**	**54,101,472**	**4,972,188**	
Emission Reductions, 2002-2013				40,779.8 *92.8%*	4,214.3 *61.3%*			

Source: EPA CAMD, http://ampd.epa.gov/ampd/. The annual unit-level emissions data for this summary were downloaded on August 19, 2014.

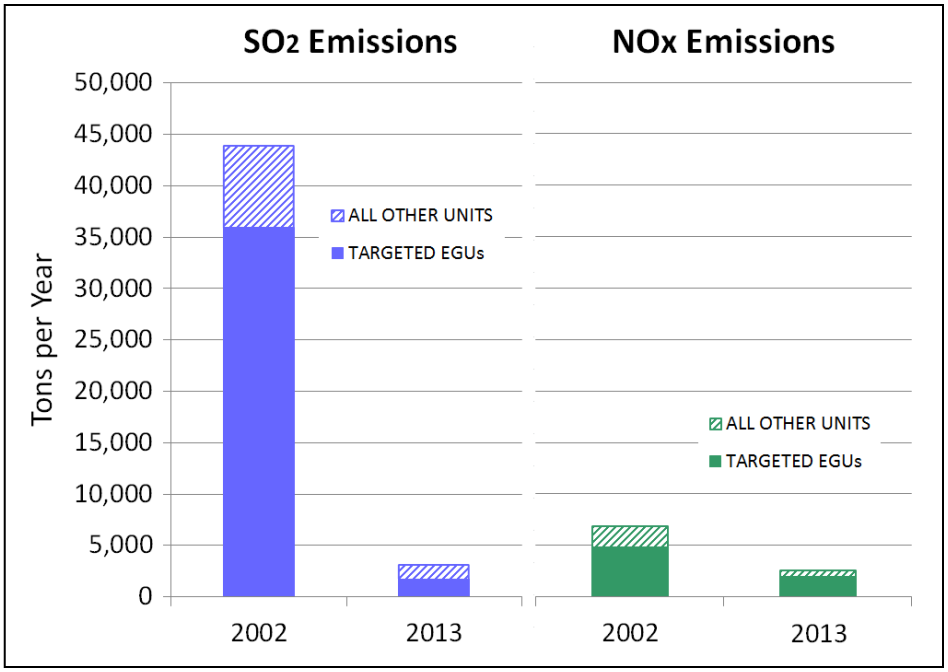
SO_2 and NOx emissions for all New Hampshire EGUs in the CAMD database were lower in 2013 than in 2002 by approximately 40,800 and 4,200 tons per year, respectively. These amounts equate to emission reductions of 93 and 61 percent. For the three targeted EGUs, the corresponding SO_2 and NOx reductions were approximately 34,200 and 2,700 tons per year, or 95 and 58 percent. The reductions in both pollutants occurred as gross load declined by 6.6 percent for all New Hampshire EGUs over the same interval. The major cause of the emission reductions was a

regional shift away from coal-fired power (Merrimack and Schiller Stations) and oil-fired power (Newington Station) to EGUs running on natural gas (EP Newington Energy). Another important factor was operation of the recently installed flue gas desulfurization system (FGD, or scrubber) at Merrimack Station.

The FGD system at Merrimack Station is required to remove 90 percent or more of sulfur dioxide emissions. The scrubber began operation well in advance of the July 1, 2013, control deadline (and was functional during most of 2012). The 2013 CAMD data show that the two units emitted 1,401 tons of SO_2 versus a gross heat input of 14,663528 MMBtu. This translates to an average annual emission rate of 0.19 lb/MMBtu with the emission controls in place. For comparison, the average SO_2 emission rate (calculated from the data in Table 6-1) was 2.0 lb/MMBtu in 2002, the baseline year, when the facility had no post-combustion controls for this pollutant. On this simple basis alone, the SO_2 removal efficiency of the new control equipment is estimated to be at least 90 percent.

This finding is supported by stack test data obtained in conjunction with a quality assurance audit of the continuous emissions monitoring system (CEMS) for Merrimack Station.[22] Unit 1 was tested on January 29, 2013, at an uncontrolled emission rate of 3.67 lb/MMBtu. Unit 2 was tested on January 25, 2013, at an uncontrolled emission rate of 3.45 lb/MMBtu. Controlled emissions from the common stack in the period from February 1 to March 13, 2013, were measured at 0.23 lb/MMBtu. Taken together, these results indicate an SO_2 removal efficiency in the vicinity of 94 percent.

Figure 6-1. SO_2 and NOx Emissions from New Hampshire EGUs in 2002 and 2013



[22] EPA requires certification of CEMS where the data are used to demonstrate compliance with emission standards on a continuous basis. The certification tests must be performed by an independent entity, which temporarily installs an independent CEMS to collect emissions data in parallel with the plant CEMS. This procedure is known as a Relative Accuracy Test Audit (RATA).

SECTION 7 – CHANGES IN EMISSIONS OF HAZE-CAUSING POLLUTANTS

7.1 Requirement to Analyze and Track Changes in Emissions

Section 40 CFR 51.308(g)(4) of the Regional Haze Rule requires each state to analyze and track changes over the past five years in pollutant emissions contributing to visibility impairment from all sources and activities within the state. Emissions changes are to be identified by type of source or activity. The analysis must be based on the most recent updated emissions inventory, with estimates projected forward as necessary and appropriate, to account for emissions changes during the applicable 5-year period.

7.2 Data Sources for Analysis of Emissions Trends

MARAMA recently analyzed the regional emissions trends in a technical support document developed for MANE-VU (Attachment D). This document compiled emissions estimates for the years 2002, 2007, 2010, 2017, 2018, and 2020 and was produced by integrating data from multiple sources, including the following:

- The 2002 baseline modeling inventory with a projection to 2018 (MANE-VU Version 3.3),
- The 2007 baseline modeling inventory with projections to 2017 and 2020 (MARAMA Version 3), and
- The 2010 US EPA CAMD actual emissions as reported by the emitting entities.

Exhibit 2.1 in the MARAMA document lists the specific data sources, by source category (EGU point, non-EGU point, mobile, area, non-road, and MAR[23]), that were used for developing the baseline and projection inventories identified above.

For this regional haze progress report, NHDES has rearranged the emissions summary tables from MARAMA's analysis and substituted 2013 CAMD data in place of the 2010 CAMD data. The results appear in Tables 7-1 and Tables 7-2 at the end of this section. The first table presents the MANE-VU regional emissions, and the second table presents New Hampshire's emissions.

Caution is advised in making direct comparisons among different data sources and across years. As described in the MARAMA document, for any pollutant or source category, there are variations among the data sources in the manner of accrual and treatment of the data. Inconsistencies from one data source to another arise from differences in the specific emissions sources included in the inventories, differences in calculation methodologies (e.g., assumptions about growth and control rates), changes in emissions factors, unanticipated shutdowns or new sources, and introduction of new control measures.

Note that two different EPA models were used to calculate mobile source emissions: the MOBILE6.2 model was used for the 2002 and 2018 emissions estimates; and MOVES was used for the 2007, 2017, and 2020 estimates. Estimates between models are not directly comparable.

[23] Includes commercial marine vessels, airports, and railroad locomotives.

7.2.1 2002 Modeling Inventory with Projections to 2018

MARAMA prepared the 2002-based modeling inventory suite and released it in final version in 2006. The future-year emission projections for 2009 and 2018 were developed from the 2002 baseline emissions inventory. The 2018 projections included two scenarios:

- *On-the-Books / On-the-Way (OTB/OTW)* – These projections accounted for all emission control measures that were fully adopted into federal or individual state regulations or SIPs. On-the-way controls included the CAIR. Modelers often refer to this scenario as the "future base case."

- *Beyond-on-the-Way (BOTW)* – These projections accounted for all emission control measures in the OTB/OTW scenario plus additional controls that states committed to adopt or pursue as part of the SIP process. Modelers often refer to this scenario as the "future control case."

The BOTW projection for 2018 was used for this emissions trends analysis. Several versions of the 2002-based inventory suite were prepared, with improvements made to the emissions estimates in each successive run. The last and best of these is MANE-VU Version 3.3. This is the version that was used to perform air quality modeling and is the one used for this emissions trends analysis.

Details on the methods and assumptions behind the 2002-based inventory suite are found in documentation for the base year inventory[24] and future projections.[25]

7.2.2 2007 Modeling Inventory with Projections to 2017 and 2020

The 2007-based inventory suite was prepared by MARAMA and finalized in 2012. Future-year projections for 2013, 2017, and 2020 were developed from the 2007 baseline emissions inventory for all source categories except electric generation and on-road mobile.

The MANE-VU states used the 2007-based inventory suite to perform air quality screening modeling in 2011 through 2013. (This is known as the Ozone Transport Commission (OTC) Levels 1, 2, and 3 modeling.) For those runs, future-year EGU projections had not yet been completed. Therefore, for modeling purposes, provisional EGU estimates for year 2020 were prepared that were based on the CSAPR emission caps (as then established). Improved future-year modeling inventories for electric generating units are being developed in a separate effort lead by the Eastern Regional Technical Advisory Committee (ERTAC)[26] and are not included here.

On-road emissions were available only for base year 2007 and future year 2020. Use of the MOVES model proved so resource-intensive that no funds were available to develop a 2017 on-road inventory projection. In a separate effort, NESCAUM developed a 2007 on-road inventory using the MOVES model to support air quality modeling. Those runs were further revised by Virginia to adjust for the

[24] E.H. Pechan & Associates, Inc., "Technical Support Document for 2002 MANE-VU SIP Modeling Inventories, Version 3," November 2006; available at http://www.marama.org/technical-center/emissions-inventory/2002-inventory-and-projections/mane-vu-2002-emissions-inventory.

[25] MACTEC Federal Programs, Inc., "Development of Emission Projections for 2009, 2012, and 2018 for NonEGU Point, Area, and Non-road Sources in the MANE-VU Region," February 2007; available at http://www.marama.org/technical-center/emissions-inventory/2002-inventory-and-projections/mane-vu-future-year-emissions-inventory.

[26] Information on the Electric Generating Utility Growth Model is available at http://www.ertac.us/index_egu.html.

altitude at which temperature was measured. This adjusted MOVES run was used by the OTC for its Level 3 screening modeling and also for this analysis.

Two scenarios for each projection year, 2017 and 2020, were prepared:

- *On-the-Books / On-the-Way (OTB/OTW)* – These projections accounted for all emission control measures that were fully adopted into federal or individual state regulations or SIPs. Modelers often refer to this scenario as the "future base case."
- *OTC Control Measures* – These projections accounted for all emission control measures in the OTB/OTW scenario plus the application of various control measures for which the OTC had developed model rules. Note that, at the time, states had not fully committed to adopting these measures through the SIP process.

The 2017 and 2020 OTB/OTW projections were used for this emissions trends analysis. Several versions of the 2007-based inventory suite were prepared, with improvements made to the emissions estimates in each successive run. The last and best of these is MARAMA Version 3. This is the version that was used for OTC's Level 3 modeling and for this emissions trends analysis.

The methods and assumptions employed in preparing the 2007-based inventory suite are described in documentation for the base year inventory[27] and future projections.[28]

7.2.3 CAMD Reported Emissions

EPA's CAMD is responsible for implementing 40 CFR 75, which requires hourly emissions monitoring and reporting by any major source that participates in an emissions cap-and-trade program under the Acid Rain Control Program, the NO_X Budget Trading Program, or CAIR. All sources participating in the CAMD programs are required to submit unit-level emissions of NOx, SO_2, and other information such as heat input, periodically to EPA. The agency reviews and certifies the submitted information before posting it at http://www.epa.gov/airmarkets/. Most of the sources reporting to CAMD are traditional power plants that sell electricity to the electrical grid. Other source types, such as petroleum refineries and cement kilns, are also required to report hourly emissions data to CAMD. Only the EGU data were used in this analysis of emissions changes.

7.3 Summary of Regional Emissions Changes

For this progress report, NHDES has identified trends in the emissions that cause regional haze by comparing emissions data from the referenced 2002 and 2007 baseline inventories and the 2013 CAMD database against projected emissions data from the 2017, 2018, and 2020 future inventories.

Table 7-1 provides a summary of emissions for the entire MANE-VU region for the four major pollutants of interest: NOx, SO_2, $PM_{2.5}$ and VOC. Emissions in tons per year (TPY) are listed by source category and inventory year. Notes and color coding have been added to distinguish among

[27] AMEC Environment & Infrastructure and SRA International, Inc., "Technical Support Document for the Development of the 2007 Emissions Inventory for Regional Air Quality Modeling in the Northeast / Mid-Atlantic Region, Version 3.3," January 23, 2012; available at http://www.marama.org/technical-center/emissions-inventory/2007-emissions-and-projections/version-3-2007-emissions-inventory.

[28] AMEC Environment & Infrastructure and SRA International, Inc., "Technical Support Document for the Development of the 2017/2020 Emission Inventories for Regional Air Quality Modeling in the Northeast / Mid-Atlantic Region, Version 3.3," January 23, 2012; available at http://www.marama.org/technical-center/emissions-inventory/2007-emissions-and-projections/future-year-inventory-version-3.

the three data sources used for the analysis. The blue columns are from the 2002-based inventory suite, the tan columns are from the 2007-based inventory suite, and the gray column is from the 2013 CAMD database. The following are some general observations on regional emissions trends as revealed by the data presented.

7.3.1 Sulfur Dioxide

Regional SO_2 emissions are dominated by the EGU sector, accounting for about three-fourths of all such emissions in 2002 and 2007, but projected to be reduced to half by 2018. SO_2 emissions from EGUs were markedly lower in 2013 than in either of the baseline years. The decline from 2002 to 2007 was about 10 percent, but from 2002 to 2013 exceeded 80 percent. Actual 2013 emissions from the EGU sector were already below the projected 2018 emissions.

As regional efforts to reduce EGU emissions come to fruition, the contributions from other sectors will assume a growing proportion of the total SO_2 inventory. Note that there is negligible effect from any changes in methodologies for the calculation of SO_2 emissions among the two inventory suites and CAMD. (This is one exception in which the comparison of values between one dataset and another may be reasonable.) All evidence indicates that the observed SO_2 emission reductions are not a temporary phenomenon, and the downward trend in regional SO_2 emissions is expected to continue.

7.3.2 Oxides of Nitrogen

Regional NOx emissions are dominated by two source categories – on-road mobile and EGU point – with the former category representing half of all NOx in the baseline years. As with SO_2 emissions, tabulated values for the EGU sector indicate sizeable decreases in NOx emissions from 2002 to 2007 (by about one-quarter) and from 2002 to 2013 (by about one-half). The 2018 projection anticipates a further decline in NOx emissions from EGUs.

With respect to the on-road mobile category, EPA introduced a major revision in calculation methodology when it switched from MOBILE6 to MOVES as the preferred on-road emissions model. This change occurred between completion of the two different inventory suites. As a result, direct comparison of the 2002-based and 2007-based on-road mobile datasets complicates the analysis of emission trends within this sector. However, when examined separately, each dataset projects a decrease in NOx emissions in the range of 40-60 percent between base year and future year.

Despite any uncertainties arising from an incomplete EGU inventory suite and a revision in mobile emissions calculation methodology, there is a clear trend toward lower NOx emissions from all sources in the MANE-VU region.

7.3.3 Fine Particulate Matter

Directly emitted fine particulate matter is regionally dominated by area sources, in particular by residential wood combustion, in all years inventoried. For the residential wood combustion subcategory, changes in both estimation methodology and emission factors for direct $PM_{2.5}$ occurred between completion of the two inventory suites. This resulted in generally lower emissions estimates for the 2007 inventory suite. The methodologies used to estimate $PM_{2.5}$ emissions from the lesser contributing sectors – namely EGUs and mobile sources – also changed, making straight comparisons of the datasets difficult.

Overall, the trend for directly emitted fine particulate matter is not well-defined. Emissions from some source categories remain largely unchanged, while others, especially those dominated by engines, are projected to show reductions. Net changes in direct $PM_{2.5}$ emissions are anticipated to be small and of limited consequence to regional haze; total annual emissions of fine $PM_{2.5}$ are the lowest among the four pollutants analyzed and represent no more than 5-10 percent of the total inventory of emissions in any year.

7.3.4 Volatile Organic Compounds

Most regional VOC emissions originate from biogenic sources, which will remain largely unchanged over the foreseeable future. The summarized inventories in Table 7-1 include only anthropogenic emissions and thus do not count biogenic emissions in the category totals.

For anthropogenic emissions, the area source sector is the largest contributor to VOC, with much of that coming from residential wood combustion. As in the case of direct $PM_{2.5}$, changes occurred in both VOC estimation methodology and VOC emission factors for the residential wood combustion subcategory. These technical adjustments resulted in generally lower emissions estimates for the 2007-based inventory suite than for the 2002-based version. The calculation methodology also changed for mobile sources, which are next after area sources in emissions contributions to regional VOC. All of these changes make direct comparisons of VOC emissions between inventory suites difficult. However, when examined separately, each inventory suite shows declining emissions for the most important VOC source categories and substantial reductions in VOC emissions for all source categories combined.

Table 7-1. Annual Air Pollutant Emissions in the MANE-VU Region, 2002-2020 (tons/year)

Category Data Source:	2002 (1)(a)	2007 (1)(b)	2013 (1)(c)	2017 (1)(b)	2018 (1)(a)	2020 (1)(b)
Sulfur Dioxide						
Point EGU(2)	1,670,176	1,546,335	315,675	---	365,024	---
Point Non-EGU(3)	239,400	129,615	---	112,784	201,478	112,828
Area(4)	316,287	212,471	---	119,215	190,437	116,511
On-road Mobile(4)	40,092	8,974	---	---	8,756	7,202
Non-road MAR(4)	32,123	30,318	---	4,870	8,172	4,183
Non-road NMIM(4)	24,774	14,167	---	420	466	443
Total	**2,322,851**	**1,941,879**	---	---	**774,333**	---
Oxides of Nitrogen						
Point EGU(2)	453,395	338,488	185,672	---	168,268	---
Point Non-EGU(3)	213,414	174,043	---	169,188	174,218	169,668
Area(4)	266,747	207,054	---	194,832	263,954	194,868
On-road Mobile(4)	1,308,235	1,175,916	---	---	303,956	471,558
Non-road MAR(4)	137,733	173,855	---	127,391	111,425	118,025
Non-road NMIM(4)	289,392	263,931	---	153,553	158,843	135,962
Total	**2,668,916**	**2,333,286**	---	---	**1,180,664**	---
Direct $PM_{2.5}$						
Point EGU(2)	20,670	44,921	---	---	51,109	---
Point Non-EGU(3)	33,948	29,881	---	29,659	38,393	29,868
Area(4)	332,676	259,938	---	262,887	339,518	264,959
On-road Mobile(4)	22,108	45,616	---	---	9,189	28,365
Non-road MAR(4)	7,929	7,430	---	3,906	7,927	3,503
Non-road NMIM(4)	27,922	24,701	---	16,536	15,952	14,421
Total	**445,253**	**412,486**	---	---	**462,087**	---
Volatile Organic Compounds						
Point EGU(2)	11,943	4,975	---	---	4,344	---
Point Non-EGU(3)	92,562	68,003	---	68,099	103,727	68,005
Area(4)	1,366,735	784,233	---	702,289	1,334,175	696,125
On-road Mobile(4)	789,560	600,638	---	---	269,979	269,647
Non-road MAR(4)	14,026	19,066	---	17,057	14,962	16,962
Non-road NMIM(4)	557,536	412,890	---	244,126	364,980	222,226
Total	**2,832,364**	**1,889,805**	---	---	**2,092,168**	---

(1) This summary is assembled from three sources – see Section 7.2 of report:
- (a) 2002 MANE-VU V3.3, with projection to 2018 (blue columns);
- (b) 2007 MARAMA V3, with projections to 2017 and 2020 (tan columns); and
- (c) CAMD actual 2013 emissions as reported to EPA (gray column). Data for this summary were downloaded from http://ampd.epa.gov/ampd/ on August 18, 2014.

(2) Data meet or exceed target of 90% completeness across all years for most states. Datasets for units with incomplete data have been completed by states or units have been removed so that consistency of data is maintained across all years.

(3) Data do not meet target of 90% completeness across all years. Total represents data for all units completed by states.

(4) Data are identical to modeled inventory and TSD for most states. No revisions were made to correct inconsistent methodologies. Non-road MAR includes commercial marine vessels, airports, and railroad locomotives. Non-road NMIM (National Mobile Inventory Model) includes equipment in EPA's NMIM/NON-ROAD model.

7.4 Summary of New Hampshire Emissions Changes

Presented in the same format as the tabulation of regional emissions above, Table 7-2 summarizes data from New Hampshire's annual emissions inventories for SO_2, NOx, $PM_{2.5}$ and VOC. Note that the column labeled 2013 shows the aggregated annual SO_2 and NOx emissions for that year for all New Hampshire EGUs participating in the CAMD programs. Both the aggregated and unit-level emissions for New Hampshire's EGUs appeared earlier with additional details in Table 6-1.

To a large degree, emission changes in New Hampshire mirror those within the entire MANE-VU region. Some general observations on statewide emissions trends are as follows:

- Historically, most of New Hampshire's SO_2 emissions originated from the EGU source category. There was little change in EGU emissions between 2002 and 2007, but SO_2 emissions from this sector in 2013 were more than 90 percent below the baseline – easily surpassing projected reductions. As projected for 2018, SO_2 emissions from all sources in New Hampshire would be less than one-third of baseline emissions.

- On-road mobile sources represent about half of baseline NOx emissions in New Hampshire, as in the entire MANE-VU region. Both the state and regional inventories project that, by 2018, on-road mobile NOx will be reduced by more than three-fourths and NOx from all sources will be reduced by more than one-half from 2002 levels. Area sources of NOx play a somewhat larger role in New Hampshire than they do in the region as a whole, but for point sources of NOx the opposite is true.

- As in the regional trends analysis of particulate matter emissions, little change is projected for emissions of direct $PM_{2.5}$ in New Hampshire. The area source category will continue to dominate emissions for this pollutant.

- Area sources and mobile sources (on- and non-road combined) each account for roughly half of total VOC emissions in New Hampshire and the MANE-VU region. VOC emissions from area sources are not projected to change much by 2018, but new emission controls on engines will have the intended effect of reducing VOC emissions from mobile sources. Largely because of emission reductions in the mobile source categories, total VOC emissions in New Hampshire and the region are projected to decline by 20 percent or more between 2002 and 2018.

***Note on mobile emissions*:** The 2020 MOVES analyses produced anomalous results for on-road mobile emissions for several states, including New Hampshire. Extensive review by NESCAUM / MARAMA was unable to determine the cause of these anomalies. Subsequently, NHDES performed an independent series of MOVES runs to obtain more reliable projections of on-road mobile emissions for New Hampshire in the year 2020. These adjusted values are the ones which appear in the last column of Table 7.2. The original, uncorrected on-road mobile values for New Hampshire were as follows: SO_2, 542 tons/year; NOx, 30,342 tons/year; $PM_{2.5}$, 3,010 tons/year; VOC, 14,629 tons/year.

Table 7-2. Annual Air Pollutant Emissions in New Hampshire, 2002-2020 (tons/year)

Category	2002	2007	2013	2017	2018	2020
Data Source:	(1)(a)	(1)(b)	(1)(c)	(1)(b)	(1)(a)	(1)(b)
Sulfur Dioxide						
Point EGU(2)	43,962	42,524	3,167	---	10,766	---
Point Non-EGU(3)	5,607	2,743	---	2,655	3,086	2,658
Area(4)	7,076	5,283	---	4,176	3,123	3,991
On-road Mobile(4)	777	275	---	---	537	105*
Non-road MAR(4)	220	545	---	81	226	46
Non-road NMIM(4)	668	440	---	16	16	18
Total	**58,310**	**51,810**	---	---	**17,753**	---
Oxides of Nitrogen						
Point EGU(2)	6,894	4,754	2,659	---	3,089	---
Point Non-EGU(3)	3,576	2,694	---	3,388	1,086	3,467
Area(4)	10,992	4,737	---	4,152	12,243	4,111
On-road Mobile(4)	33,283	33,923	---	---	7,671	10,523*
Non-road MAR(4)	1,776	1,454	---	1,306	1,723	1,286
Non-road NMIM(4)	8,104	8,548	---	5,521	4,558	5,268
Total	**64,625**	**56,110**	---	---	**30,369**	---
Direct $PM_{2.5}$						
Point EGU(2)	1,973	602	---	---	2,156	---
Point Non-EGU(3)	426	499	---	1,169	940	1,179
Area(4)	17,534	8,623	---	8,598	18,089	8,633
On-road Mobile(4)	562	1,424	---	---	263	459*
Non-road MAR(4)	95	62	---	46	98	45
Non-road NMIM(4)	868	798	---	558	534	493
Total	**21,459**	**12,008**	---	---	**22,080**	---
Volatile Organic Compounds						
Point EGU(2)	101	110	---	---	73	---
Point Non-EGU(3)	1,815	768	---	1,445	998	1,431
Area(4)	65,374	22,343	---	20,894	62,687	20,807
On-road Mobile(4)	16,762	13,599	---	---	6,564	5,085*
Non-road MAR(4)	142	195	---	175	158	178
Non-road NMIM(4)	22,231	17,105	---	11,028	14,807	9,783
Total	**106,425**	**54,120**	---	---	**85,288**	---

(1) This summary is assembled from three sources – see Section 7.2 of report:
- (a) 2002 MANE-VU V3.3, with projection to 2018 (blue columns);
- (b) 2007 MARAMA V3, with projections to 2017 and 2020 (tan columns); and
- (c) CAMD actual 2013 emissions as reported to EPA (gray column). Data for this summary were downloaded from http://ampd.epa.gov/ampd/ on August 18, 2014.

(2) Data meet or exceed target of 90% completeness across all years for most states. Datasets for units with incomplete data have been completed by states or units have been removed so that consistency of data is maintained across all years.

(3) Data do not meet target of 90% completeness across all years. Total represents data for all units completed by states.

(4) Data are identical to modeled inventory and TSD for most states. No revisions were made to correct inconsistent methodologies. Non-road MAR includes commercial marine vessels, airports, and railroad locomotives. Non-road NMIM (National Mobile Inventory Model) includes equipment in EPA's NMIM/NON-ROAD model.

* Adjusted value – see note on mobile emissions in Section 7.4 of report.

SECTION 8 – ASSESSMENT OF SIGNIFICANT EMISSIONS CHANGES THAT HAVE IMPEDED VISIBILITY PROGRESS

8.1 Requirement to Assess whether Emissions Changes Have Impeded Progress

Section 40 CFR 51.308(g)(5) of the Regional Haze Rule requires an assessment of any significant changes in anthropogenic emissions within or outside the state that have occurred over the past 5 years that have limited or impeded progress in reducing pollutant emissions and improving visibility.

8.2 Assessment

The Regional Haze Rule provides no specific definition of what constitutes a significant change in emissions that would hinder progress in reducing regional haze. It is reasonable to assume that a significant change in emissions that impedes visibility progress could come about in any of three ways: 1) an unanticipated increase in emissions from one or more existing sources, 2) the unanticipated addition of one or more new sources, and 3) failure of one or more existing sources to adhere to expected emission reductions in accordance with the applicable SIP.

With respect to the first two possibilities, there are no new major sources or existing sources in New Hampshire that have significantly increased emissions of haze-causing pollutants. The noteworthy exception is gas-fired power plants, whose output has replaced electrical generation by coal-fired units. However, the net effect of this realignment among EGUs has been a *reduction* in the total emissions of the major pollutants that impair visibility, especially sulfur dioxide. (See Section 6.3.) Similar changes in the power sector have occurred in upwind states, to the benefit of visibility in New Hampshire. It is uncertain whether such benefit will be permanent. NHDES knows of no significant emission changes attributable to new or existing sources in other states that are impeding visibility progress at New Hampshire's Class I areas.

As to the third possibility, all of New Hampshire's major sources included in the regional haze plan (*i.e.*, the BART units and targeted EGUs) already have control measures in place that are operating to reduce emissions as required in the SIP. (See Sections 3, 4, and 6.) NHDES is not in a position to certify that all other states that contribute to visibility impairment at New Hampshire's Class I areas have adhered to the scheduled emission reductions as promised in their respective regional haze SIPs. Many of the emission reductions included in states' SIPs were scheduled to occur in a stepwise fashion (*e.g.*, in 2010 or 2014 or 2018) rather than in a continuous manner. Therefore, not all control measures will have been implemented in the earliest years of the planning period. As described elsewhere in this report, haze-causing emissions have been on a general decline throughout the MANE-VU region since 2002.

The following additional observations are relevant to the assessment of visibility progress as planned under New Hampshire's regional haze SIP:

- The regional transport of air pollutants, especially SO_2 and NOx, is an ongoing issue that CSAPR, the replacement rule for CAIR, was intended to address. The implementation of MATS and the revised SO_2 NAAQS may help to mitigate the delay in the implementation of CSAPR, at least for the control of SO_2 emissions. However, any setback in implementing a comprehensive regional or national program to address air pollution transport would slow the rate of visibility progress throughout MANE-VU.

- Some EGUs in upwind states are either not operating or are limiting operation of their existing air pollution control devices, and are electing instead to achieve compliance with federal requirements through the purchase of CAIR allowances. While lawful, this practice has caused NOx emissions from some EGUs to exceed past levels, resulting in higher levels of NOx in portions of the Ozone Transport Region, which includes all of the MANE-VU states. This finding was the subject of a recent statement[29] from the OTC requesting that EPA take corrective action.

- NHDES anticipates that neither of these situations will impede visibility improvement to such an extent as to prevent Class I areas in New Hampshire and other states affected by New Hampshire's emissions from meeting their near-term visibility objectives. However, over the longer term, the statutory goal of re-establishing natural visibility conditions by the 2064 target date will demand that such impediments to visibility progress be resolved. Visibility tracking thus far indicates that all five MANE-VU Class I areas affected by New Hampshire's emissions are on course or ahead of schedule to achieve their reasonable progress goals for 2018. (See Section 2.)

[29] Ozone Transport Commission, "Statement from The Ozone Transport Commission Requesting the Use and Operation of Existing Control Devices Installed at Electric Generating Units," June 13, 2013.

SECTION 9 – SUFFICIENCY OF SIP TO MEET REASONABLE PROGRESS GOALS

9.1 Requirement to Assess Sufficiency of Plan

Section 40 CFR 51.308(g)(6) of the Regional Haze Rule requires an assessment of whether the current implementation plan elements and strategies are sufficient to enable the state, or other states with mandatory Class I federal areas affected by emissions from the state, to meet all established reasonable progress goals.

9.2 Assessment

On the basis of the analyses described in this report, NHDES asserts that the New Hampshire Regional Haze SIP, as most recently amended on August 26, 2011, is sufficient to meet the 2018 reasonable progress goals established for the two mandatory Class I federal areas in the state and for the five other Class I areas in the MANE-VU states affected by emissions originating in New Hampshire. Visibility improvements to date indicate that New Hampshire is on track to meet these interim progress goals toward the national goal of restoring natural visibility conditions by 2064 as promulgated under the Regional Haze Rule.

SECTION 10 – MONITORING STRATEGY REVIEW

10.1 Requirement to Review Monitoring Strategy

Section 40 CFR 51.308(g)(7) of the Regional Haze Rules requires that each state with a mandatory Class I federal area review the state's visibility monitoring strategy and the need for any modifications to it. The original visibility monitoring strategy for New Hampshire's Class I areas is described in detail in Section 5 of the regional haze SIP.

10.2 Strategy Review

New Hampshire's visibility monitoring strategy relies upon participation in the Interagency Monitoring of Protected Visual Environments (IMPROVE) network.[30] The IMPROVE monitor for the Great Gulf Wilderness (GRGU1) is located at Camp Dodge, approximately 1 mile east of the wilderness boundary, in New Hampshire's White Mountain National Forest (Table 10-1). This monitor also serves as the monitor for the Presidential Range - Dry River Wilderness, whose northern-most limit lies only 5 miles southwest of the monitor location. It should be mentioned that New Hampshire has two other (recently added) IMPROVE sites, located at NHDES's monitoring stations at Pack Monadnock and Londonderry; but neither is considered representative of the Class I areas.

Table 10-1. IMPROVE Network Site for New Hampshire's Class I Areas

Site Name	Site Code	Latitude	Longitude	Elev. (m)	Dates of Operation
Great Gulf Wilderness	GRGU1	44.31°	-71.22°.	454	June 10, 1995 - present

As the central component of New Hampshire's visibility monitoring strategy, the IMPROVE network monitor GRGU1 has been in service since 1995. This monitor was deemed adequate in the SIP to meet EPA's Regional Haze Program requirements for the state's two mandatory Class I federal areas. Section 2 of this report provides a summary of visibility data developed from air quality measurements gathered by this monitor since 2000.

For this progress report, New Hampshire has evaluated the monitoring network for any needed changes from the original network described in the regional haze SIP. In reviewing the record, NHDES notes that the visibility database contains gaps in the data for GRGU1 in both 2009 and 2010. These gaps rendered the data incomplete for those years, in accordance with established protocol. While NHDES regularly reviews the IMPROVE data, this agency has no direct involvement in the operation and maintenance of the IMPROVE network. GRGU1 is operated under the management of the U.S. Forest Service.

The USFS has advised that the data gaps for GRGU1 were due to temporary problems with electricity delivery to the IMPROVE shed, which is located on an unmaintained road, during winter conditions. In periods when GRGU1 has had continuous functionality, it has shown itself to be adequate for assessing reasonable progress toward visibility goals at New Hampshire's Class I areas. There is no indication of a need for additional monitoring sites or equipment, unless redundancy is the purpose.

[30] A description of the IMPROVE program is available at http://vista.cira.colostate.edu/improve/.

SECTION 11 – ADEQUACY OF CURRENT REGIONAL HAZE SIP

11.1 Requirement to Determine Adequacy of Current SIP

Section 40 CFR 51.308(h) of the Regional Haze Rule requires the state to determine the adequacy of its regional haze SIP on the basis of the information presented in its 5-year progress report.

11.2 Determination of SIP Adequacy: Negative Declaration

Based on the evaluations conducted for this report, NHDES declares that the existing SIP is adequate for continued reasonable progress towards natural visibility conditions at all mandatory Class I federal areas affected by emissions from New Hampshire. Further revision of the existing implementation plan is therefore not needed at this time**.** This conclusion is supported by several and various findings, which may be summarized as follows:

- The Visibility Record: Since 2000-2004, visibility has improved at all locations in the MANE-VU region, including New Hampshire's Class I areas. The 5-year average deciview values indicate a general trend toward improved visibility on both best and worst days, and all areas appear to be on track to meet or surpass their 2018 reasonable progress goals.

- Sulfate Emissions: Sulfate accounted for one-half to two-thirds of total fine particle mass on the haziest days at MANE-VU Class I areas in 2000-2004. Reductions in emissions of this pollutant appear to be the biggest reason for trending improvements in visibility. It is projected that SO_2 emissions from all sources in the region will decrease by two-thirds or more over the period from 2002 to 2018, with most of those reductions coming from the EGU sector. Between 2002 and 2013, New Hampshire's EGUs reduced SO_2 emissions by 93 percent in the aggregate. Seismic changes in the industry have caused a shift away from coal-fired power production, the source of most SO_2 emissions in the region.

- Controls on EGUs: Emission controls have already been implemented to control SO_2, NOx, and particulate matter emissions at New Hampshire's two BART units and a third, targeted unit. A flue gas desulfurization system is operational and currently reducing SO_2 emissions by more than 90 percent at PSNH's Merrimack Station, where two of the three units are located. PSNH's Newington Station is using lower-sulfur fuels.

- NOx Emissions: A regional reduction in NOx emissions has been the second-largest factor in visibility improvements in the MANE-VU region thus far. Federal programs for mobile sources, which contribute the most to NOx emissions across the region, will further reduce NOx emissions and help to improve visibility in the years ahead.

- Other Emissions: Total emissions of fine particulate matter do not appear to be increasing, and emissions of VOC are projected to decline. Current controls and management practices for construction activities and prescribed agricultural and forestry burns serve to mitigate visibility impacts. Any impacts from these activities are likely to be short-lived and of relatively minor consequence for nearby Class I areas.

- Impediments to Progress: Possible impediments to continued visibility progress – especially unresolved aspects of interstate air pollution transport – do not appear to be great enough at this time to prevent Class I areas affected by New Hampshire's emissions from meeting their respective 2018 reasonable progress goals.

SECTION 12 – CONSULTATION WITH FEDERAL LAND MANAGERS

12.1 Requirement to Consult Federal Land Managers

The Regional Haze Rule at 40 CFR 51.308(i) requires that the state provide the FLMs responsible for Class I areas affected by emissions originating within the state an opportunity for consultation, in person, at least 60 days prior to any public hearing on the 5-year progress report SIP revision.

12.2 Consultation Process

NHDES sent a preliminary draft of the SIP revision to the FLMs and EPA for review purposes on May 22, 2014. After receiving comments from the FLMs and EPA, NHDES revised the preliminary draft and reissued the document as a proposed SIP revision in keeping with EPA's usual requirements for public review.

NHDES notified the FLMs and EPA of a public hearing to be held on September 23, 2014, and sent the proposed SIP revision to the FLMs and EPA as part of the public review and comment period, which closed on October 1, 2014. During this period, NHDES received additional comments from _____ on <date>.

NHDES considered and incorporated the FLMs' and EPA's comments, along with other comments received on the proposed SIP revision, before making final revisions to the document and submitting it to EPA for approval. All comments received from the FLMs on the preliminary draft and proposed SIP, and all other comments received during the public review period, are included in Attachment E with NHDES's responses.

New Hampshire will continue to coordinate and consult with the FLMs on future regional haze SIP revisions and on the implementation of programs having the potential to affect visibility at the state's mandatory Class I federal areas.