The State of New Hampshire
Department of Environmental Services

NHDES

Clark B. Freise, Assistant Commissioner

January 31, 2017

H. Curtis Spalding, Regional Administrator
U.S. Environmental Protection Agency, Region I
5 Post Office Square, Suite 100
Boston, MA 02109-3912

RE: New Hampshire Nonattainment Area Plan for the 2010 Primary 1-Hour Sulfur Dioxide NAAQS

Dear Administrator Spaulding,

As Governor Sununu's designee, I am submitting for your review and approval New Hampshire's Nonattainment Area Plan for the 2010 Primary 1-Hour Sulfur Dioxide National Ambient Air Quality Standard (NAQS) for the Central New Hampshire SO_2 Nonattainment Area. This State Implementation Plan (SIP) amendment satisfies the requirements of the Clean Air Act (CAA) Sections 172, 175A, 191 and 192 to show attainment and maintenance of the 2010 SO_2 NAAQS.

EPA designated as nonattainment most areas in which existing monitoring data from 2009 - 2011 indicated violations of the revised 1-hour sulfur dioxide (SO_2) National Ambient Air Quality Standard (NAAQS) in its first round of designations on August 3, 2013 (78 FR 47191). The Central New Hampshire SO_2 Nonattainment Area was established in this round of designations.

In accordance with the Clean Air Act (CAA), any state containing an area designated as nonattainment for the 2010 SO_2 NAAQS is required to develop and submit a nonattainment area SIP meeting the requirements of Title I, Part D, subparts 1 and 5 of the CAA, providing for attainment of the NAAQS by the applicable statutory attainment date. For areas designated nonattainment on August 5, 2013, with an effective date of October 4, 2013, SIPs were due by April 4, 2015. New Hampshire failed to meet this due date and on March 18, 2016 was cited in a Findings of Failure Final Rule (81 FR 14736) with 11 other states. With this SIP amendment, New Hampshire is both remedying the delay in submission and responding to the Findings of Failure.

As the Governor's designee, my signature on this letter is evidence that the State of New Hampshire has adopted this revision to the State Implementation Plan (SIP). The only state requirement for SIP submittals is that at least 30 days prior to the date of any public hearing related to SIP revisions, public notice shall be published in a newspaper of general daily statewide circulation.

This submission meets the completeness criteria of Appendix V to 40 CFR 51 Section 2.1 by including:

- Enclosure A: Central New Hampshire Nonattainment Area Plan for the 2010 Primary 1-hour Sulfur Dioxide NAAQS
- Enclosure B: New Hampshire Statute Title X, Chapter 125-C:4, 6, 11, 12 and 13 that provide authority for Air Pollution Control

- Enclosure C: Public Participation Documentation
  - Notice of Public Hearing and Comment Period
  - Certification of Public Hearing
  - Comments received and responses thereto.

If you have any questions, please contact me at (603)271-1088, or Michele Roberge of my staff at (603) 271-6793.

Sincerely,

Craig A. Wright
Director
Air Resources Division

Enclosures

Ecc: David Conroy, US EPA Region I
Donald Dahl, US EPA Region I

Enclosure A: Central New Hampshire Nonattainment Area Plan for the 2010 Primary 1-hour Sulfur Dioxide NAAQS

CENTRAL NEW HAMPSHIRE NONATTAINMENT AREA PLAN FOR THE 2010 PRIMARY 1-HOUR SULFUR DIOXIDE NAAQS

January 20, 2017

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

R-ARD-16-05

Revision to the

New Hampshire
State Implementation Plan

Central New Hampshire Nonattainment Area Plan for the 2010 Primary 1-Hour Sulfur Dioxide NAAQS

January 20, 2017

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NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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Central New Hampshire SO_2 Nonattainment Area Plan

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1. INTRODUCTION / STATEMENT OF PURPOSE

On August 5, 2013, EPA published a final rule designating the attainment status of certain areas of the country for the 2010 sulfur dioxide (SO_2) primary National Ambient Air Quality Standard (78 FR 47191). The Central New Hampshire Nonattainment Area is a portion of the state that was designated as nonattainment for the revised standard.

This document is submitted as a revision to the State Implementation Plan (SIP) in fulfillment of the statutory requirements of the Clean Air Act (CAA) for SO_2 nonattainment areas. Specifically, this SIP submittal is intended to satisfy the requirements of sections 172, 175A, 191 and 192 of the CAA to show how the Central New Hampshire Nonattainment Area will provide for attainment and maintenance of the 2010 SO_2 National Ambient Air Quality Standard.

A SIP is a compilation of regulations and programs that a state uses to carry out its responsibilities under the CAA, including the attainment, maintenance, and enforcement of the National Ambient Air Quality Standard (NAAQS). States' air agencies – including the New Hampshire Department of Environmental Services Air Resources Division (NHDES-ARD) – use the SIP process to identify the emissions sources that contribute to nonattainment problems in a particular area and to select the most appropriate emissions reduction measures to attain the NAAQS in the affected area as expeditiously as practicable. A SIP may take into consideration emission reductions resulting from national control programs or from regional, state, or local programs when such control measures are included as enforceable provisions of the SIP.

2. REGULATORY FRAMEWORK

2.1 National Ambient Air Quality Standards

The Clean Air Act, last amended in 1990, requires EPA to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. The CAA identifies two types of NAAQS - *primary standards,* which provide public health protection, including the health of sensitive populations such as persons with asthma, children and the elderly and *secondary standards,* which provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation and buildings.

To date, EPA has set NAAQS for six principal pollutants, called "criteria" pollutants: sulfur dioxide, ozone, carbon monoxide, lead, fine particulate matter and nitrogen dioxide, codified at 40 CFR Part 50. Effective on August 23, 2010, EPA revised the primary NAAQS for oxides of sulfur, as measured by SO_2 (75 FR 35520). The new 1-hour standard of 75 parts per billion (ppb) was established to ensure requisite protection of public health with an adequate margin of safety. At an ambient air quality monitoring site, compliance with the standard is achieved when the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations is less than or equal to 75 ppb. In setting the new NAAQS, EPA also revoked both the existing 24-hour and annual primary SO_2 standards, subject to certain conditions.

2.2 Area Designations

When EPA establishes a new NAAQS or revises an existing NAAQS, it sets in motion a series of actions to ensure that air quality throughout the country meets those standards. One of the earliest actions is for EPA to delineate areas of compliance or noncompliance with the NAAQS. Pursuant to section 107(d)(1) of the CAA, after the promulgation of a new or revised NAAQS, EPA is required to designate areas as "nonattainment," "attainment" or "unclassifiable."

EPA established air quality designations for certain areas of the U.S. for the revised primary SO_2 standard on August 5, 2013 (78 FR 47191). This initial round of designation identified areas, on the basis of recorded air quality monitoring data, that do not meet the NAAQS or that contribute to SO_2 air pollution in nearby areas that do not meet the NAAQS. EPA designated as nonattainment most areas in which existing monitoring data from 2009 - 2011 indicated violations of the 1-hour SO_2 standard. The Central New Hampshire SO_2 Nonattainment Area was established in this round of designations.

2.3 SIP Submittals and Attainment Dates

Under the CAA, states are directed to develop and submit, for EPA's approval, SIPs that provide for the implementation, attainment, maintenance and enforcement of the NAAQS through control measures directed at sources of criteria pollutant emissions. In particular, any state containing an area designated as nonattainment for the 2010 SO_2 NAAQS is required to develop and submit a nonattainment area SIP meeting the requirements of Title I, Part D, subparts 1 and 5 of the CAA, providing for attainment of the NAAQS by the applicable statutory attainment date. EPA in April 2014 issued guidance on SIP submissions for 1-hour SO_2 nonattainment areas.[1]

All components of the SO_2 nonattainment area SIPs are to be submitted to the EPA within 18 months of the effective date of an area's designation as nonattainment. To be approved by EPA, the SIPs must provide for future attainment of the NAAQS as expeditiously as practicable, but no later than 5 years from the effective date of designation as nonattainment. (See section 192(a) of the CAA.) For areas designated nonattainment on August 5, 2013, with an effective date of October 4, 2013, SIPs were due by April 4, 2015. New Hampshire failed to meet this due date and on March 18, 2016 was cited in a Findings of Failure Final Rule[2] with 11 other states. With this SIP amendment, New Hampshire is both remedying the delay in submission and responding to the Findings of Failure.

As described in this submission, almost 90% of the SO_2 emissions contributing to the nonattainment designation were attributable to single source, Eversource Energy's Merrimack Station. Emissions from Merrimack Station were significantly reduced following implementation of SO_2 control measures completed in 2011. By the SIP due date of April 2015, Central New Hampshire SO_2 Nonattainment Area monitoring was meeting the NAAQS – the SO_2 design value for 2014 was 23 ppb, well below the 75 ppb standard. Representatives of the State, Merrimack Station and the EPA collaborated on interpretation of the modeling protocol and establishment of enforceable emission limits, thus ensuring continued attainment into the future.

In addition to the CAA provisions specific to nonattainment areas, section 110(a)(2) of the CAA directs states to develop and maintain comprehensive air quality management infrastructure programs applicable to each newly promulgated NAAQS, including the following: an ambient air quality monitoring program; air quality modeling capability; a stationary source permitting program; adequate personnel, resources, and legal authority; an enforcement program; and enforceable emission limitations. On September 13, 2013, EPA issued guidance on such "infrastructure SIPs" that addresses SIP submittals for the 2010 SO_2 NAAQS.[3]

3. NONATTAINMENT AREA DESIGNATION

The CAA defines a nonattainment area as one that does not meet the NAAQS or that contributes to poor air quality in a nearby area that does not meet the NAAQS. Table 3-1 identifies the portions of three contiguous counties in the Central New Hampshire Area that EPA has designated as a primary 1-hour

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[1] "Guidance for 1-Hour SO_2 Nonattainment Area SIP Submissions," April 2014, available at http://www.epa.gov/airquality/sulfurdioxide/pdfs/20140423guidance.pdf.

[2] 81 FR 14736

[3] "Guidance on Infrastructure State Implementation Plan (SIP) Elements Under Clean Air Act Sections 110(a)(1) and 110(a)(2)," September 13, 2013, available at http://www.epa.gov/airquality/urbanair/sipstatus/infrastructure.html.

SO_2 nonattainment area based on monitored air quality violations. Designation of other areas in New Hampshire with respect to the primary 1-Hour SO_2 NAAQS will be completed in accordance with the schedule specified in the *Data Requirements Rule for the 2010 1-Hour Sulfur Dioxide (SO_2) Primary National Ambient Air Quality Standard (NAAQS)*[4] issued by EPA on August 10, 2015.

Table 3-1. Primary 1-Hour SO2 Nonattainment Designations for New Hampshire

Geographic Area	NH's Recommended Designation of Areas/Counties[5]	EPA's Designation of Areas/Counties[6]
Central New Hampshire		
Hillsborough County (partial) Goffstown	Nonattainment	Nonattainment
Merrimack County (partial) Allenstown, Bow, Chichester, Concord, Dunbarton, Epsom, Hooksett, Loudon, Pembroke Pittsfield	Nonattainment	Nonattainment
Rockingham County (partial) Candia Deerfield, Northwood	Nonattainment	Nonattainment
All other portions of State	Unclassifiable	Undesignated

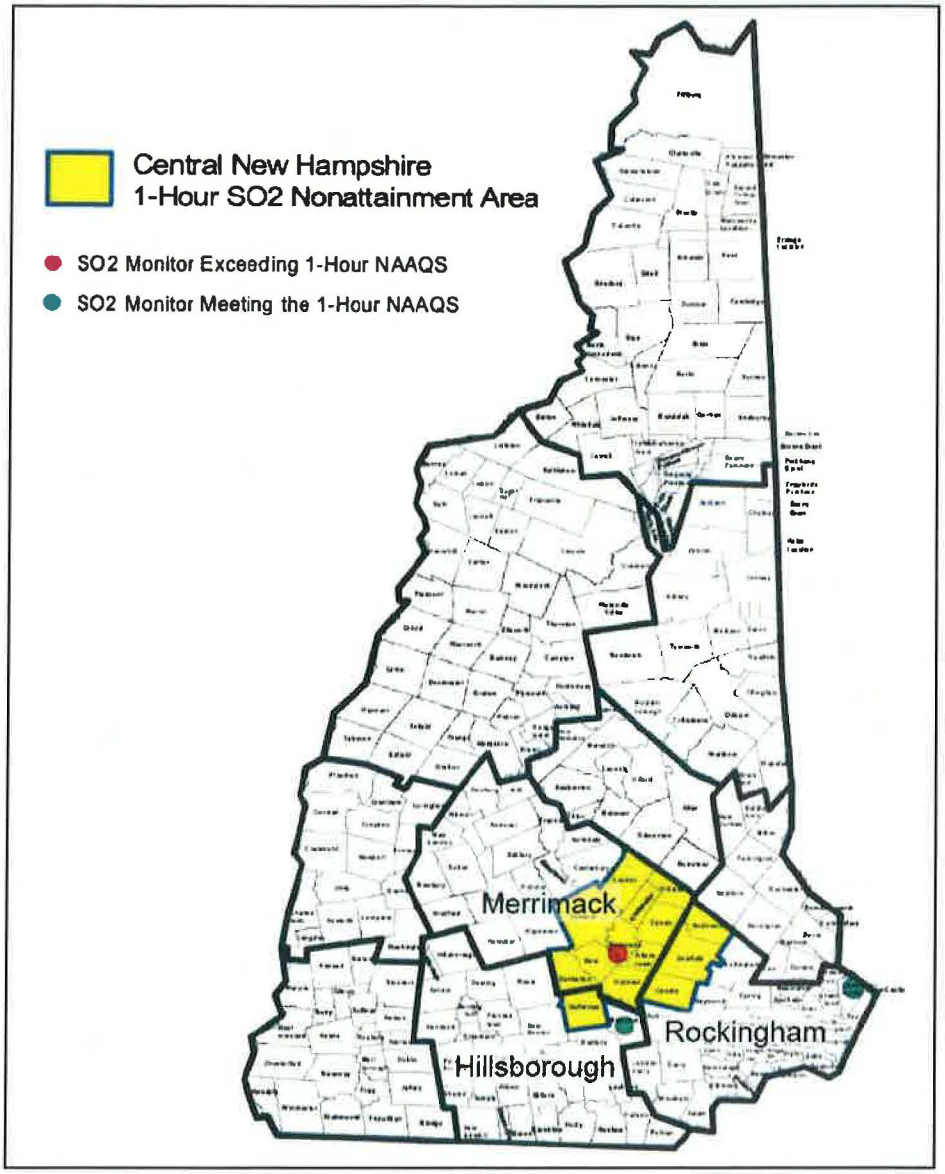
Figure 3-1 is a map showing the location of the nonattainment area and existing SO_2 monitors in New Hampshire.

[4] Data Requirements Rule for the 2010 1-Hour Sulfur Dioxide (SO_2) Primary National Ambient Air Quality Standard (NAAQS) published in the Federal Register on August 21, 2015, at 80 FR 51052.

[5] New Hampshire submitted area designation recommendations to EPA on July 6, 2011.

[6] 78 FR 47191

Figure 3-1. Location of SO_2 Nonattainment Area and Monitors



3.1 Overview of Designation Procedure

Section 107(d) of the CAA provides that, not later than one year after promulgation of a new or revised NAAQS, a state's governor may submit recommendations for area designations and boundaries to EPA. Section 107(d) also requires EPA to provide a notification to states no less than 120 days prior to promulgating an initial area designation that is a modification of a state's recommendation.

New Hampshire made recommendations that certain partial counties be designated as "nonattainment" for the 2010 SO_2 NAAQS and submitted them to EPA in a letter signed by Governor John Lynch dated July 6, 2011. New Hampshire's recommendations were based on monitored air quality data from 2008-2010 and a technical analysis that included air quality data, emissions data, geography and topography, meteorology and transport patterns, and jurisdictional boundaries. EPA indicated concurrence with New Hampshire's recommendations in a letter signed by the Regional Administrator[7].

3.2 EPA's Technical Analysis

In making its initial area designations for the 2010 SO_2 NAAQS, EPA considered New Hampshire's analysis and recommendations as well as established guidance[8]. EPA's guidance identifies five factors to be used in determining boundaries for areas designated nonattainment: 1) air quality data; 2) emissions and emissions-related data (location of sources and potential contribution to ambient SO_2 concentrations); 3) meteorology (weather/transport patterns); 4) geography/topography (mountain ranges or other air basin boundaries); and 5) jurisdictional boundaries (e.g., counties, air districts, pre-existing nonattainment areas, reservations, metropolitan planning organization), among any other relevant information.

Based on EPA's technical analysis[9], the agency designated 13 towns and one city in three different counties in New Hampshire as an area of nonattainment for the 2010 SO_2 NAAQS. These town and city constitute the Central New Hampshire Nonattainment Area. A summary of EPA's analysis supporting this designation is provided in subparts 3.2.1 through 3.2.6, below. EPA considered emissions and monitoring in a four-county area even though the final designation included only portions of three counties. (New Hampshire NEI data indicated that Turnkey Recycling and Environmental Enterprises in Strafford County emitted 150 tons of SO_2 in 2008.)

3.2.1 Air Quality Data

Key to the analysis is a single SO_2 monitor located on Exchange Street in Pembroke, Merrimack County, New Hampshire, where the historical data record showed exceedances of the 2010 SO_2 NAAQS and violation of the standard. An *exceedance* is any monitored value that exceeds the numerical value of the standard, in this case 75 ppb, on an hourly basis. A *violation* occurs only when the *design value* is greater than the numerical value of the standard. For the 2010 SO_2 NAAQS, the design value is defined as the 3-year average of the 99th percentile of the annual distribution of daily maximum 1-hour average concentrations. EPA's analysis examined air quality data for the county in which the violating monitor was located and evaluated the risk that air quality in nearby cities and towns in different counties could also be above the standard. EPA considered the SO_2 air quality monitoring data, including the calculated design values (in ppb) for all air quality monitors in central New Hampshire and the surrounding area, for the period 2009-2011. Table 3-2 gives the SO_2 design values for Merrimack, Hillsborough and Rockingham Counties.

[7] New Hampshire's letter containing recommended area designations and EPA's 120-day response letter may be viewed at https://www.epa.gov/sulfur-dioxide-designations/so2-designations-round-1-new-hampshire-state-recommendation-and-epa. EPA's response letter is accompanied by a technical support document, or TSD, available as an attachment.

[8] Guidance on designations was issued by EPA through a March 24, 2011, memorandum from Stephen D. Page, Director, U.S. EPA, Office of Air Quality Planning and Standards, to Air Division Directors, U.S. EPA Regions I-X.

[9] See TSD described in footnote 5.

Table 3-2. 1-Hour SO_2 Design Values for Merrimack, Hillsborough and Rockingham Counties, 2009-2011

County	Monitor Name	Monitor Air Quality System ID	Monitor Location	2009-2011 SO_2 Design Value (ppb)
Merrimack	Pembroke Exchange St	330131006	Pembroke	221
Hillsborough	Manchester	330110020	Manchester	56
Rockingham	Portsmouth	330150014	Portsmouth	41

Note: The Pembroke Exchange St Monitor has the highest 2009-2011 design value in the state.

The 221 ppb design value at the Pembroke monitor is a violation of the 2010 SO_2 NAAQS. This finding made it necessary that EPA designate for nonattainment some areas in Merrimack County and possibly additional areas in surrounding counties. EPA evaluated this regional area based on the weight of evidence of the five factors.

3.2.2 Emissions and Emission Sources

Evidence of SO_2 emission sources in the vicinity of a violating monitor is an important factor in determining whether a nearby area is contributing to a monitored violation. For the analysis of SO_2 emissions, EPA used National Emissions Inventory (NEI) data for 2008 (2008NEIV3). EPA evaluated county-level emissions of SO_2 and any growth in SO_2-emitting activities since the date represented by the emissions data.

Table 3-3 shows total SO_2 emissions (in tons per year) for sources emitting or potentially emitting more than 100 tons per year within the three counties with towns or cities identified in the Central New Hampshire Nonattainment Area.

Table 3-3. Sources Emitting More Than 100 Tons of SO_2 in 2008[10]

County	City/Town	Facility Name	2008 SO_2 Emissions (tons)	Percent of Three County SO_2 Point Source Emissions
Merrimack	Bow	Eversource[11] Merrimack Station	31,306	83%
Rockingham	Portsmouth	Eversource Schiller Station	4,987	13%
Rockingham	Newington	Eversource Newington Station	595	1.6%
Hillsborough	Bennington	Monadnock Paper Mills, Inc.	133	0.36%

Note: Portions of these three counties are within the Central NH Nonattainment Area for the 2010 SO_2 NAAQS. The Town of Bow is one of the 14 contiguous towns and cities comprising the aforementioned nonattainment.

The largest emitter of SO_2 emissions is Eversource Energy's (Eversource) Merrimack Station located in Bow, New Hampshire. This source was the principal contributor to the 2009-2011 design value exceedance as shown on Table 3-2. However, emissions from Merrimack Station have been reduced dramatically following implementation of SO_2 control measures completed in 2011. These control measures are discussed in subsection 3.3.

[10] Data from emission reports submitted to New Hampshire by facilities.

[11] Eversource Energy (Eversource), formerly Public Service Company of New Hampshire

3.2.3 Meteorology and Air Pollution Transport

Evidence of source-receptor relationships between specific emission sources and high SO_2 concentrations at violating monitors is another important factor in making area designations. Identification of such relationships is helpful in determining areas of contributing emissions and in setting appropriate nonattainment area boundaries.

For the analysis of the Central New Hampshire Nonattainment Area, EPA considered recent hourly or sub-hourly meteorological data from the site nearest to the violating Pembroke monitor to determine which wind vectors were associated with exceedances of the 1-hour SO_2 NAAQS. Specifically, EPA reviewed wind frequency data gathered at Merrimack Station in 1994 and at Concord Municipal Airport in 2000-2004 and 2006-2011. The wind rose patterns for these locations show that the prevailing wind direction is from the northwest (Figure 3-2). Merrimack Station is situated approximately 0.75 miles northwest of the Pembroke monitor.

Figure 3-2. Wind Direction Summaries (Wind Roses) – On-site and Concord, NH

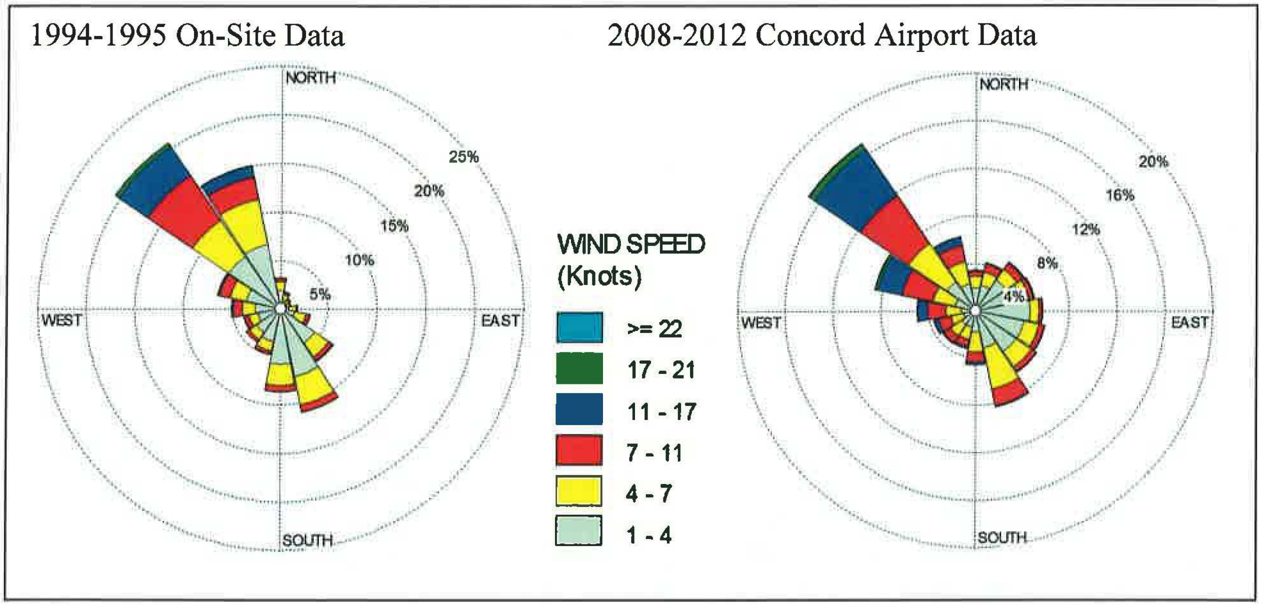
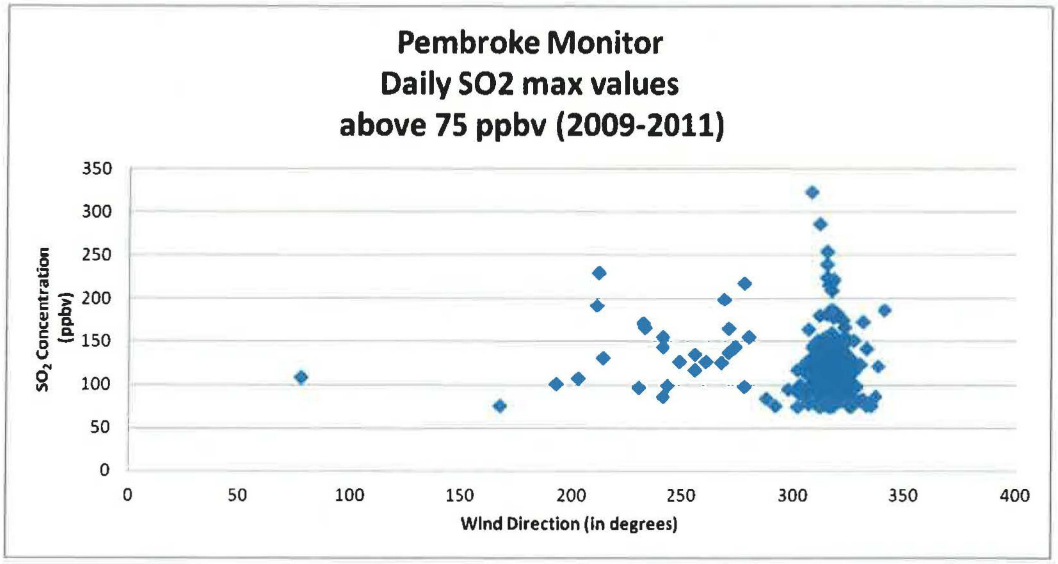


Figure 3-3 depicts the relationship between wind direction and exceedances recorded at the Pembroke monitor over the period 2009-2011. Most of the exceedances occurred when the wind direction was northwesterly – when wind out of the northwest would carry the plume from Merrimack Station across the Pembroke monitor.

The wind roses also demonstrate the low probability that emissions from other large sources of SO_2 would contribute to the Pembroke monitor's high design value. Two of these sources are east of the nonattainment area and at least 10 miles away (Eversource Schiller and Newington Stations). The other source is 20 miles west of the nonattainment area (Monadnock Paper Mill). Given that the predominant wind direction is from the northwest, the emissions from the two facilities east of the nonattainment area would have a greater influence on the Portsmouth monitor than on the Pembroke monitor. The Portsmouth monitor's design value of 41 ppb is well below the standard.

Figure 3-3. SO_2 Exceedances vs. Wind Direction at Pembroke Monitor, 2009-2011



3.2.4 Geography / Topography

Merrimack Station and the Pembroke monitor are located in a river valley surrounded by rolling hills that reach 1,000 feet above sea level. These hills are approximately 10 miles from Merrimack Station. Plume heights from the two coal-fired units at Merrimack Station are generally stable at around 800 to 1,000 feet. NHDES used the terrain data, coupled with air quality data and air dispersion modeling, to determine an appropriate boundary for the Central New Hampshire Nonattainment Area shown in Figure 3-1. EPA concurred with New Hampshire's boundary recommendation.

3.2.5 Jurisdictional Boundaries

The Central New Hampshire Nonattainment Area is based on city and town boundaries rather than county boundaries and is therefore not restricted to the county in which the violating monitor is located (Merrimack County). The designated nonattainment area includes cities and towns in three partial counties: Merrimack, Hillsborough, and Rockingham (see Table 3-1).

3.3 Changes in Nonattainment Area Since Designation

More than five years have passed since the last of the air quality data were collected leading to the designation of the Central New Hampshire SO_2 Nonattainment Area. In the intervening period, three additional years of air quality data have become available, major emission control measures have been implemented, and a shift in the electric power sector has occurred. All of this is accompanied by new or proposed regulations applicable to electrical generating units (EGUs) in the state. While none of these changes will alter New Hampshire's nonattainment area designation, together they represent significant reductions in contributing SO_2 emissions and provide essential context for this nonattainment area plan. Subsections 3.3.1 through 3.3.4 briefly examine these changes.

3.3.1 Air Quality Data / Clean Data

As shown in Table 3-4, ambient 1-Hour SO_2 concentrations, when reported as 99th percentile annual maxima and 3-year design values, have dramatically improved at the Pembroke monitor. The 2013-2015 design value of 20 ppb is well within the current NAAQS and 90% below the 2009-2011 design value of 221 ppb that signified a violation.

Table 3-4. 1-Hour SO_2 Annual 99th Percentile and 3-Year Design Values at Pembroke Air Quality Monitor (330131006), 2009-2015 (all values in ppb)

	2009	2010	2011	2012	2013	2014	2015
Annual 99th Percentile Value	219	220	225	27	17	26	17
3-Year Design Value (year ending)	212	192	221	157	89	23	20

The sudden drop-off in SO_2 levels after 2011 is visible in the trend line of annual 99th percentile values shown in Figure 3-4. This decline is associated with known emission reductions in the contributing area (see 3.3.2).

The Pembroke monitoring data for 2012-2014 and 2013-2015 (Table 3-4 and Figure 3-5) indicate that New Hampshire's nonattainment area may have already achieved three years of "clean data," defined as three consecutive years without a violation of the standard, and thus may be able to demonstrate attainment for the SO_2 NAAQS.

Figure 3-4. Trend in 1-Hour SO_2 Annual 99th Percentile Values

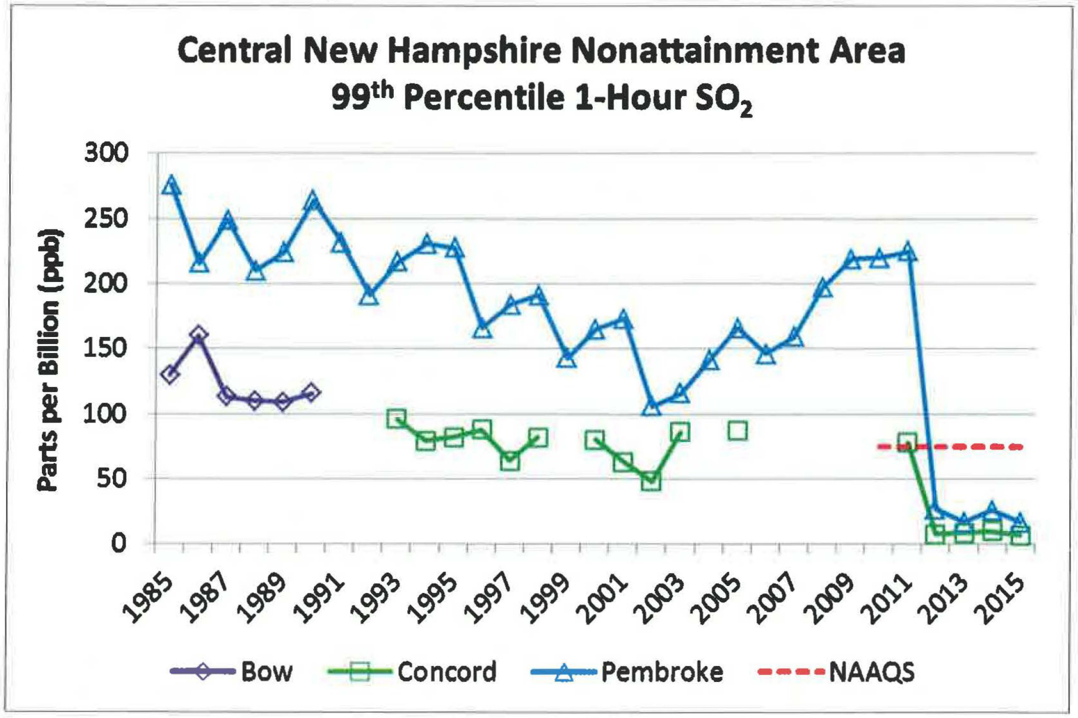
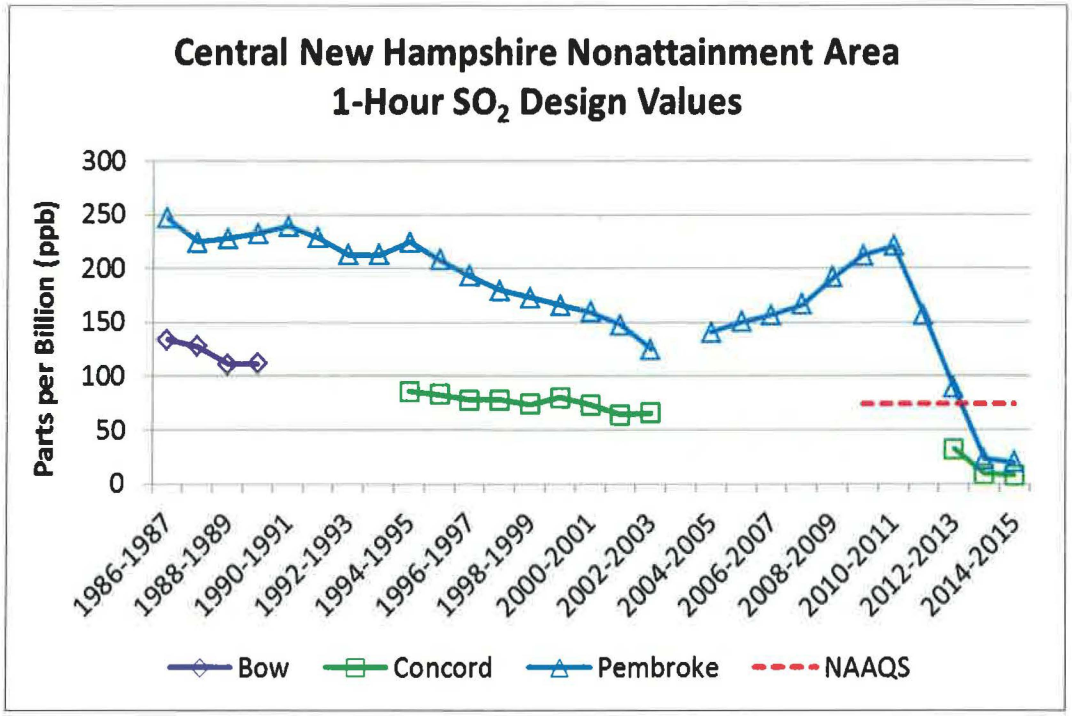


Figure 3-5. Trend in 1-Hour SO_2 3-Year Design Values



EPA determines attainment status based on a) air quality monitoring data (when available); b) air quality dispersion modeling information; and/or c) evidence that the control strategy in the SIP has been fully implemented[12]. In order for EPA to use air quality monitoring data in the attainment determination, the data must be complete, quality assured, certified and entered into the EPA's Air Quality System (AQS) database. If EPA has determined that the air quality monitors are located in the *area of maximum concentration*, EPA may be able to use the data from these monitors to make the determination of attainment without the use of air quality modeling data.

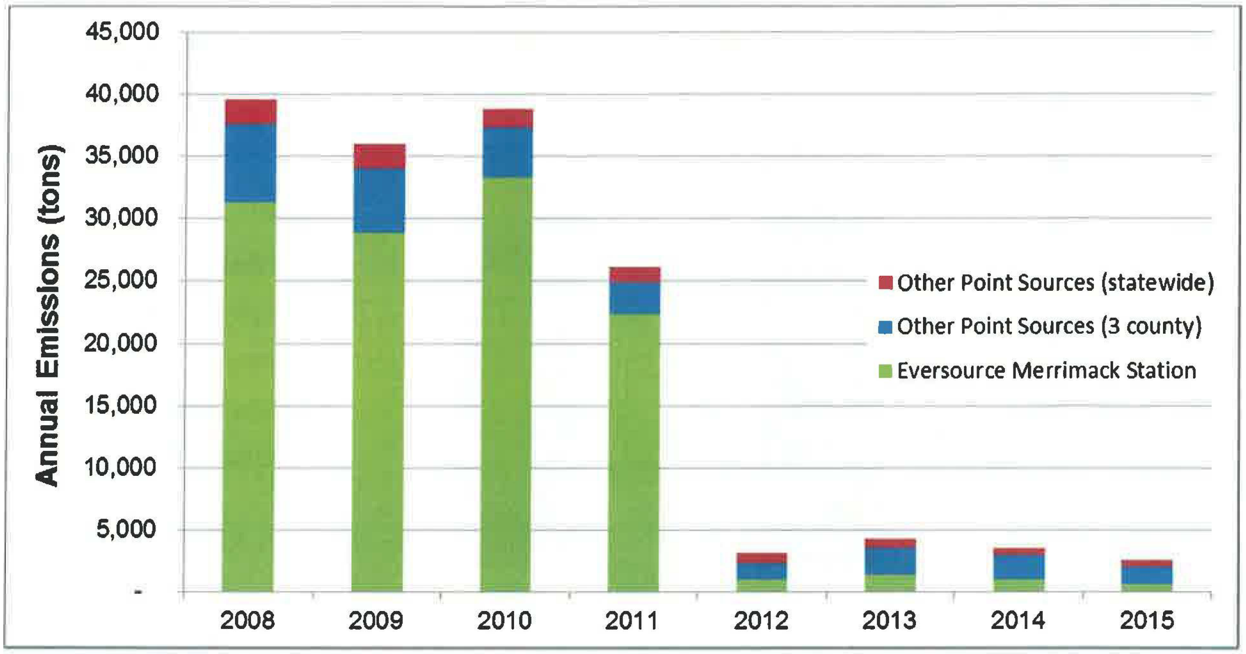
3.3.2 Emissions and Emission Reductions

Recent improvements in SO_2 design values at the Pembroke monitor are reflected in regional and statewide reductions in SO_2 emissions (see Figure 3-6). In 2008, Eversource Merrimack Station emitted 31,306 tons of SO_2, representing almost 80 percent of state-wide SO_2 emissions and 83 percent of all point source SO_2 emissions in the three counties containing portions of the Central New Hampshire Nonattainment Area. By 2015, Merrimack Station's SO_2 emissions were reduced to 636 tons (32 percent all point source SO_2 emissions in the three counties). Overall statewide point source SO_2 emissions were down from 39,588 tons in 2008 to 2,559 tons in 2015 – a 94 percent reduction.

Of particular note is the abrupt decrease in both SO_2 emissions and ambient SO_2 concentrations that occurred in 2012. This was the first full year in which Merrimack Station's flue gas desulfurization (FGD) system provided sustained operation. SO_2 emissions in 2016 were 98 percent below average emissions from 2008-2010 resulting in ambient SO_2 measurements at the Pembroke monitor that are well below the NAAQS.

[12] Memorandum from Sally L. Shaver, "Attainment Determination Policy for Sulfur Dioxide Nonattainment Areas." January 26, 1996.

Figure 3-6. State-wide Point Source SO_2 Emissions, 2008-2015[13]



3.3.3 Changes in Electric Power Sector

Estimates provided by the U.S. Energy Information Administration show that energy consumption by New Hampshire's electric power sector fell by 27.4 trillion BTUs between 2008 and 2014 (Figure 3-7). This decline is almost entirely attributable to reduced coal usage. The replacement of coal-fired power with cleaner energy resources has lowered SO_2 emissions in the nonattainment area, as indicated by the data.

3.3.4 Environmental Regulations Affecting EGUs

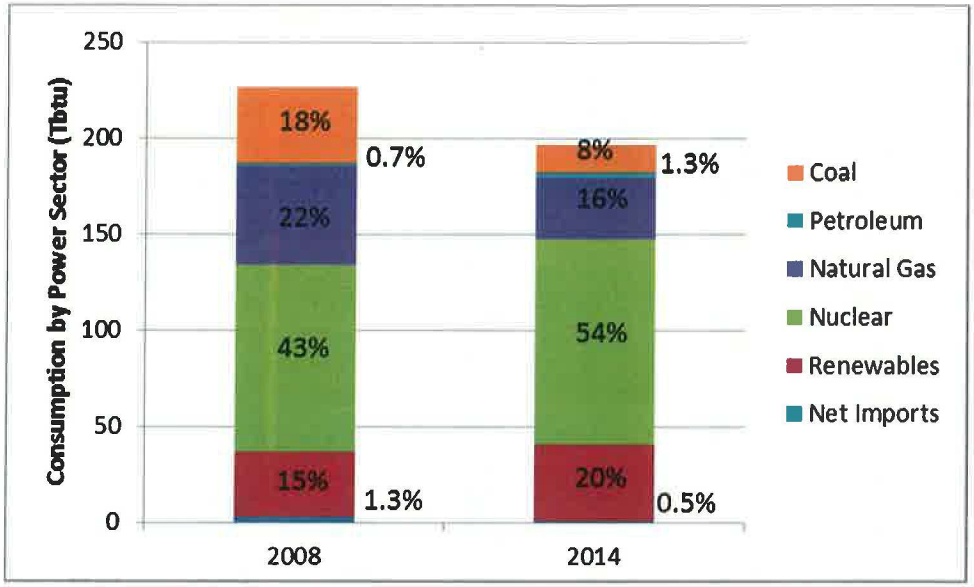
The wet, limestone-based flue gas desulfurization system (FGD) for Merrimack Station has its origins in state law RSA 125-O, *Multiple Pollutant Reduction Program*, which requires the reduction of mercury emissions by at least 80 percent from New Hampshire's fossil-fuel-fired power plants. Sections 1 and 3 of RSA 125-O, requiring an integrated, multipollutant 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[14].

The removal of SO_2 at Merrimack Station occurs as a co-benefit of the FGD system primarily used for the control of mercury emissions from Units MK1 and MK2. Operation of the FGD system also fulfills this facility's requirements for Best Available Retrofit Technology (BART) under EPA's Regional Haze Rule (64 FR 35714). BART emission limits are specified in New Hampshire administrative rule Env-A 2300, Mitigation of Regional Haze, submitted to EPA as a SIP revision on January 29, 2010 and approved by EPA on August 22, 2012 (77 FR 50602).

[13] Data from NHDES annual emissions summaries, developed from individual source reports.

[14] Proposed conditional approval of New Hampshire's 2010 1-Hour SO_2 NAAQS Infrastructure SIP was published in the Federal Register on August 27, 2015 at 80 FR 42446.

Figure 3-7. Electric Power Sector Consumption Estimates, New Hampshire, 2008 and 2014 (trillion BTUs and percent)[15]



In addition to these existing, enforceable control measures, Eversource's fossil-fuel-fired EGUs were required to meet EPA's Mercury and Air Toxic Standards (MATS) by April 16, 2015 for Merrimack and Newington Stations and April 16, 2016[16] for Schiller Station. It is anticipated that continuous operation of Merrimack Station's FGD will enable the facility to comply with the emission limitations prescribed by MATS while also ensuring future control of SO_2 emissions.

4. BASIC ELEMENTS OF PLAN

Section 172 of the CAA addresses the general requirements for areas designated as nonattainment for any NAAQS pollutant. Section 172(c) requires any state with a nonattainment area to submit a SIP showing how the affected area will attain the relevant standard as expeditiously as practicable, but no later than the applicable statutory attainment date (in this case, October 4, 2018). Section 172(c) and the 2014 EPA guidance document[17] identifies the essential elements of a nonattainment area SIP.

- *An accurate* ***emissions inventory*** *of current emissions.* Section 172(c)(3) requires a comprehensive, accurate, current inventory of actual emissions for all sources (i.e., point, area, and mobile sources) of SO_2 within the nonattainment area. Per EPA guidance, this baseline emissions inventory should also include emissions from sources outside the nonattainment area that may affect attainment in the area. In addition, EPA guidance calls for submission of a projected emissions inventory for the year in which the area is expected to attain the standard. The emissions inventories provide the foundation for modeling and other analyses to assess

[15] Data source: U.S. Energy Information Administration, State Energy Data 2013: Consumption, Table CT8; http://www.eia.gov/state/seds/sep_use/total/pdf/use_NH.pdf

[16] Eversource Schiller Station received a one-year extension to the MATS deadline to April 15, 2016 in accordance with 40 CFR 63.6(i) and Temporary Permit (TP-0157) issued on April 15, 2015, for the installation and operation of a Dry Sorbent Injection (DSI) and Activated Carbon Injection (ACI) system on SR4 and SR6 for the purposes of complying with 40 CFR 63 Subpart UUUUU.

[17] See footnote 1.

impacts to air quality and potential improvements that may result from implementation of pollution control measures.

- *An **attainment demonstration** using an EPA-approved air quality dispersion model.* EPA guidance interprets section 172(c) as directing any state with a nonattainment area to submit an attainment demonstration as a part of the nonattainment area SIP. An approvable attainment demonstration would include air quality dispersion modeling based on allowable emissions, and supplemental analyses as appropriate, to show that the emission limits in the plan will suffice to provide for attainment of the NAAQS by the applicable attainment date. If the necessary emission limits included in the attainment demonstration have not previously been made a part of the SIP, or have not otherwise become federally enforceable, the plan must include the necessary enforceable limits in adopted form suitable for incorporation into the SIP.

- *A **control strategy**, including RACM/RACT.* Section 172(c)(1) requires that a nonattainment area plan provide for the implementation of all reasonably available control measures (RACM) as expeditiously as practicable, including emission reductions from existing sources in the area as may be obtained through the adoption of reasonably available control technology (RACT). The state should consider all RACM/RACT that can be implemented in light of the attainment needs for the affected area. Control measures used for attainment of the NAAQS should be permanent and enforceable. EPA has promulgated a number of national and regional control programs that may assist states in planning for attainment of the 2010 SO_2 NAAQS – including the Mercury and Air Toxics Standards (MATS) and the Cross-State Air Pollution Rule (CSAPR). However, state-promulgated emission control measures will be of greater importance to achieving the NAAQS in New Hampshire's SO_2 nonattainment area.

- *Provisions for **Reasonable Further Progress (RFP)**.* Section 172(c)(2) of the CAA requires that the nonattainment area plan provide for reasonable further progress. Section 171(1), defines RFP as "such annual incremental reductions in emissions of the relevant air pollutant as are required by [part D] or may reasonably be required by the EPA for the purpose of ensuring attainment of the applicable NAAQS by the applicable attainment date." However, EPA guidance states that such incremental reductions are generally of less relevance to pollutants like SO_2 that usually have a limited number of sources affecting areas which are relatively well defined. For the 2010 SO_2 NAAQS, EPA considers "adherence to an ambitious compliance schedule" as ensuring reasonable progress, i.e., affected sources must implement appropriate control measures as expeditiously as practicable in order to ensure attainment by the specified attainment date.

- *Adequate **contingency measures** for the affected area.* Section 172(c)(9) of the CAA requires the state to include contingency measures in the SIP that would be implemented automatically in the event that the nonattainment area fails to make reasonable further progress or fails to attain the NAAQS by the applicable attainment date. Because it would be unlikely for an area to implement the necessary emission controls yet fail to attain the NAAQS, EPA guidance explains that contingency measures for SO_2 programs can mean that the state has a comprehensive program to identify sources of any violations of the 2010 SO_2 NAAQS and to undertake aggressive follow-up for compliance and enforcement of the standard. This approach would not prevent a state from requiring additional, enforceable contingency measures that are not included in the control strategy for the nonattainment area SIP.

- *A **New Source Review (NSR)** permit program.* The nonattainment area SIP must include the nonattainment NSR permitting requirements established in sections 172(c)(5) and 173 of the CAA. States such as New Hampshire with existing nonattainment NSR programs should review their programs to ensure that they meet EPA requirements for the permitting of major stationary sources of SO_2 locating in a nonattainment area under the 2010 SO_2 NAAQS.

- ***Conformity.*** General and transportation conformity are required under CAA section 176(c). In nonattainment and maintenance areas, rule, federal agencies must estimate if certain federal actions, including federally supported highway and transit projects, are consistent with the SIP, that is, that they do not cause new air quality violations, worsen existing violations, or delay timely attainment of the relevant NAAQS.

These planning elements are addressed in detail in sections 5 through 11.

5. EMISSIONS INVENTORY

Emissions inventory and source emission rate data serve as the foundation for modeling and other analyses that enable air agencies to 1) estimate the degree to which different sources within a nonattainment area contribute to violations within the affected area and 2) assess the expected improvement in air quality within the nonattainment area due to the adoption and implementation of control measures. Emissions inventories developed for this nonattainment area plan includes a current emissions inventory (2014) and a projected emissions inventory (2018) for all source categories: EGU point, non-EGU point, area, on-road mobile, and non-road mobile. Also provided is a listing of major contributing point sources and actual emissions reported for the most recent few years (2011-2015).

As previously described in Section 3, the current emissions inventory is dominated by a single point source: Eversource Merrimack Station. All other emissions are, in the aggregate, relatively minor in magnitude and low in annual variability. It is therefore reasonable to say that New Hampshire's SO_2 nonattainment area functions as a single-source nonattainment area, and controlling SO_2 emissions from this one source will effectively reduce emissions for the entire nonattainment area and result in attainment of the NAAQS. This conclusion is supported by the attainment demonstration presented in Section 6.

5.1 Current Emissions Inventory (2011-2015)

The inventory of current emissions serves as a baseline for evaluating future emissions and emission reductions. For planning purposes, the inventory should be a comprehensive, accurate, and current inventory of actual emissions from all sources of SO_2 emissions in the nonattainment area as well as any sources located outside the nonattainment area that may affect attainment in the area. This inventory should be consistent with the EPA's most recent emissions inventory data requirements as codified at 40 CFR Part 51, Subpart A.

New Hampshire reports emissions annually to EPA and triennially to the National Emissions Inventory (NEI). The annual data include emissions for major point-source emissions only. The data reported to NEI every third year provide a comprehensive inventory of emissions for sources of all types. NHDES-ARD used the NEI 2014 data as providing the most complete and representative record of annual SO_2 emissions.

Annual emissions data are routinely aggregated at the county level and are generally not available for smaller subdivisions. Operating within this practical constraint, emissions in Hillsborough, Merrimack, and Rockingham counties will be most representative of official emission inventories in the nonattainment area, which includes portions of all three counties. Estimates of SO_2 emissions for the Central New Hampshire Nonattainment Area are also provided based on calculations using location, population, and vehicle miles traveled (VMT) data for towns and cities included in the nonattainment area portion of the three county area.

Tables 5-1 (A and B) present recent SO_2 emissions inventory information for the three county area and for the Central New Hampshire Nonattainment Area. These figures are based on the 2014 NEI Version 1 for New Hampshire. Figure 5-1 shows annual SO_2 emissions for major point sources for the three county area and for the Central New Hampshire Nonattainment Area for the years 2011-2015.

Table 5-1A. Baseline Inventory of Annual SO_2 Emissions in Hillsborough, Merrimack, and Rockingham Counties, 2014[18] (tons)

County/Area	EGU Point	Non-EGU Point	Area	On-Road Mobile	Non-Road Mobile	Total
Hillsborough	0	188	986	29	3	**1,206**
Merrimack	1,044	63	417	18	1	**1,543**
Rockingham	1,575	6	1,106	32	3	**2,722**
3-County Area	**2,619**	**257**	**2,509**	**79**	**7**	**5,471**

Table 5-1B. Estimated Inventory of Annual SO_2 Emissions in the Central New Hampshire SO_2 Nonattainment Area, 2014[19] (tons)

County/Area	EGU Point	Non-EGU Point	Area	On-Road Mobile	Non-Road Mobile	Total
Hillsborough (Part)	0	0	43	1	0	**44**
Merrimack (Part)	1,044	62	270	11	1	**1,388**
Rockingham (Part)	0	0	46	2	0	**48**
Estimated for Central NH Nonattainment Area	**1,044**	**62**	**359**	**14**	**1**	**1,480**

The estimates given in Table 5-1B were derived by apportioning the county-wide values in Table 5-1A based on the population (for area & non-road mobile) and VMT (for on-road mobile) of the individual towns and cities in the Central New Hampshire Nonattainment Area. Because much of the area source SO_2 emissions are the result of activities such as residential fuel combustion, human population is an appropriate surrogate for apportioning these types of emissions to a sub-county level. Similarly, human population is an appropriate surrogate for certain non-road mobile categories such as residential lawn & garden equipment. There is less certainty in using human population to apportion other types of non-road categories; however, SO_2 emissions from these types of sources are negligible in the Central New Hampshire Nonattainment Area. The 2014 population and VMT figures that were used to do the apportioning are shown in Appendix C (note: this methodology also applies to the projected 2018 emissions that are discussed in Section 5.2 below). EGU and Non-EGU point source emissions are simply applied to the towns in which each source is located. In both scenarios, point source emissions from the Merrimack Station EGU are a large contributor – almost 20% in the three county area and over 70% in the Central New Hampshire Nonattainment Area.

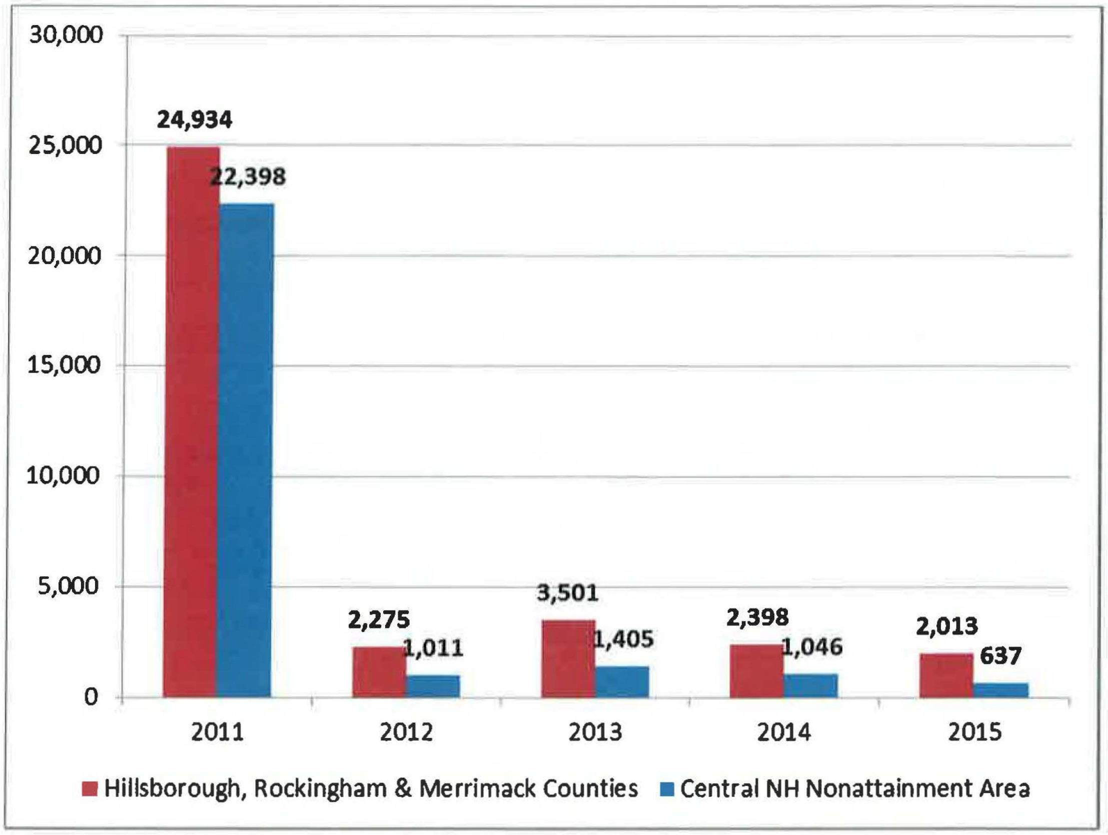
Figure 5-1 illustrates the impact of this large contributor among other major point sources in the three county area as well as the Central New Hampshire Nonattainment Area. Of the major point sources, Merrimack Station accounted for 86% of the emissions in the three county area in 2011, down to 32% in 2015. Although this source comprises 100% of the major point sources in the Central New Hampshire

[18]2014 Final NEI V1 11NEIV2

[19] Estimated from 2014 Final NEI V111NEIV2

Nonattainment Area by 2015, overall emissions from this sector are reduced over 94%, and air quality monitoring data (see section 3.3.1) indicates no violations of the 2010 SO_2 NAAQS.

Figure 5-1. Annual Emissions for Major Point Sources of SO_2 in Three County Area and in the Central New Hampshire Nonattainment Area, 2011-2015 (tons)[20]



5.2 Projected Emissions Inventory (2018)

As stated in EPA guidance[21], the nonattainment area SIP submittal should include a projected attainment year inventory that provides emissions estimates for all SO_2 emission sources affecting air quality in the nonattainment area for the year in which attainment of the NAAQS is expected. This inventory should account for any emission changes that are expected after the base year, including emission reductions from 1) existing control measures, 2) any new measures that may be adopted as part of the local area attainment plan, or 3) any expected source shutdowns, provided that these control measures or shutdowns are enforceable. The projected inventory should also account for any emission increases due to new sources or growth by existing sources.

NHDES compiled a 2018 projected inventory - shown in Tables 5-2A and B - for the three counties and the Central New Hampshire Nonattainment Area. The year 2018 was chosen because that is the latest year by which modeling and/or actual air quality data should show attainment of the standard. The projected inventory includes non-EGU point, area, on-road mobile and non-road mobile emissions, and is based on EPA's future 2018 projections from its 2011 Version 6.0 modeling platform. The 2018 EGU emissions are based on a projection performed with the Mid-Atlantic Regional Air Management

[20] Data from NHDES annual emissions summaries, developed from individual source reports.

[21] See footnote 1.

Association (MARAMA)/Eastern Technical Advisory Committee (ERTAC) EGU forecasting tool run version 2.3 (except for Schiller unit 5 included in the emissions for Rockingham county, which was projected with the Integrated Planning Model (IPM) version 5.13). The ERTAC v2.3 2018 projections for Merrimack Station assumed 90% control efficiency for the FGD unit. The permitted limits for Merrimack Station that are incorporated in this SIP are more stringent than this assumption, therefore the actual 2018 emissions will likely be lower than those shown in Tables 5-2 A and B

Table 5-2A. Projected Inventory of Annual SO_2 Emissions in Hillsborough, Merrimack, and Rockingham Counties, 2018 (tons)

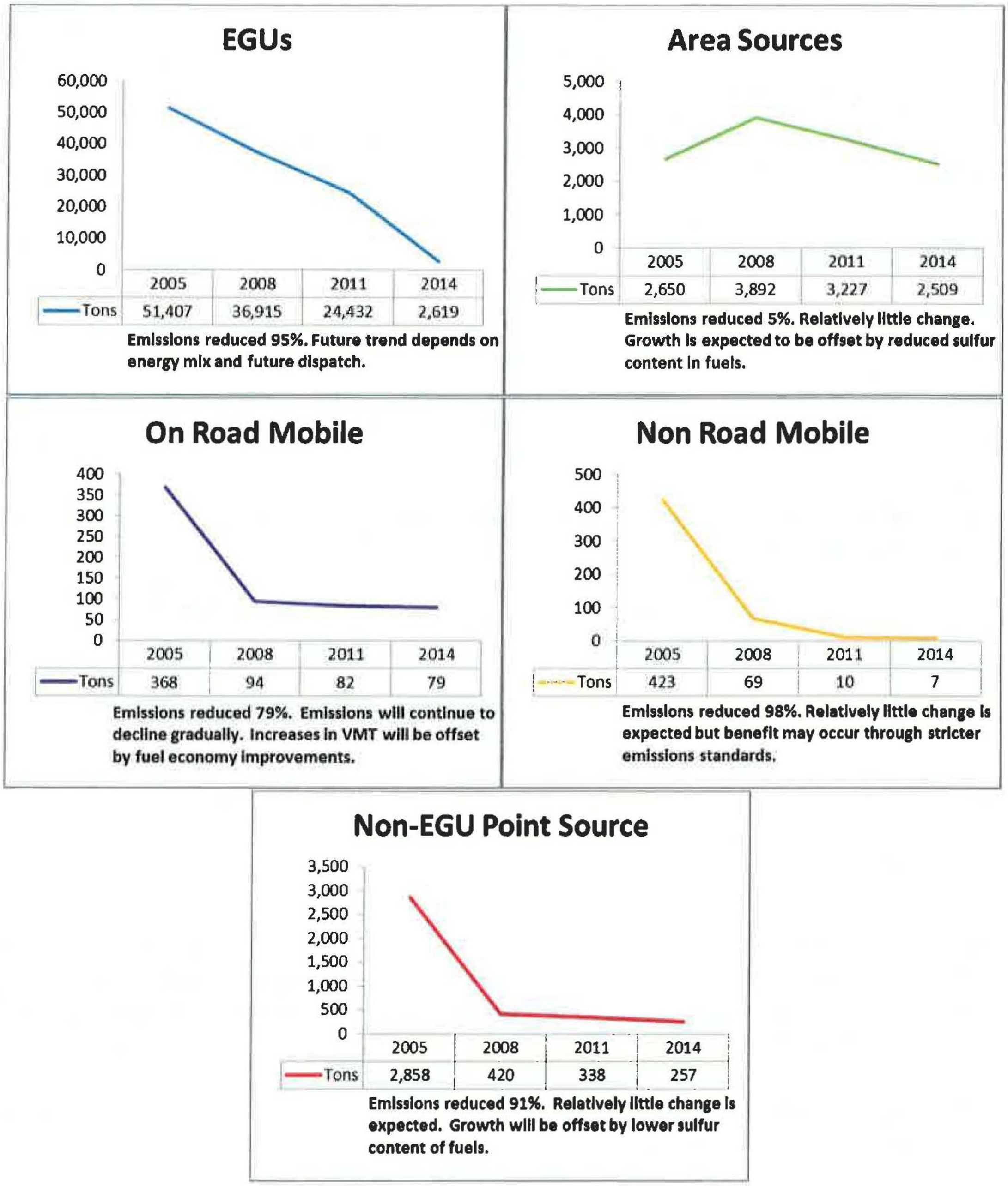
County/Area	EGU Point	Non-EGU Point	Area	On-Road Mobile	Non-Road Mobile	Total
Hillsborough	-	180	1,186	11	2	1,379
Merrimack	1,927	115	506	7	1	2,556
Rockingham	1,907	33	1,077	12	2	3,031
3-County Area	3,834	328	2,769	30	5	6,966

Table 5-2B. Estimated Projected Inventory of Annual SO_2 Emissions in the Central New Hampshire SO_2 Nonattainment Area, 2018 (tons)

County/Area	EGU Point	Non-EGU Point	Area	On-Road Mobile	Non-Road Mobile	Total
Hillsborough (Part)	0	0	52	0	0	52
Merrimack (Part)	1,927	115	328	4	1	2,375
Rockingham (Part)	0	0	45	1	0	46
Estimated for Nonattainment Area	1,927	115	425	5	1	2,473

New Hampshire SO_2 emission inventories for all source sectors have been decreasing for years (Figure 5-2) and are anticipated to continue to decline. The new 1-hour SO_2 NAAQS will result in further reductions from EGUs and large point sources beyond 2011 levels. In addition, with the phase-in of low sulfur fuel oils and the federal Tier 3 rule, further decreases in SO_2 emissions are expected from the area, on-road and non-road source sectors by 2018 and beyond. New Hampshire is currently adopting a low sulfur fuel standard that includes residential heating, which will be in place July 2018. This is not yet reflected in projected emission inventories.

Figure 5-2. Trends in Annual SO_2 Emissions in Hillsborough, Merrimack, and Rockingham 2005-2014 (NEI data)



5.3 Plan Changes in Allowable Emissions

The sections above demonstrate a marked decrease in actual SO_2 emissions for the Central New Hampshire Nonattainment Area between the current emissions inventory (2011-2015) and the projected attainment year inventory (2018). In addition, NHDES has quantified the change in allowable emissions that are expected to result from implementation of the nonattainment area plan. Table 5-3 shows the estimated annual allowable SO_2 emissions for Merrimack Station units MK1 and MK2. This table compares the allowable emissions for the 2014 baseline with those that are expected under the nonattainment area plan. For comparison purposes, the table also shows the estimated annual allowable SO_2 emissions before the FGD system was operational at Merrimack Station (this is labeled "Pre-Scrubber" in the table). The last row of the table (labeled "NAA Plan") reflects the estimated annual allowable emissions once the limit specified under the nonattainment area plan is in place (specifically, a limit of 0.39 lb of SO_2 per MMBtu on a 7-boiler operating day rolling average, see Sections 6.7.2 and 7.7 below). Table 5-3 shows that this limit results in a reduction of over 200 tons compared with 2014 baseline levels and a reduction of well over 70,000 tons compared with pre-scrubber levels.

Table 5-3. Estimated Changes in Plan Allowable SO_2 Emissions (Tons per Year)

	Total MK1 and MK2	NAA Plan Reduction from Pre-Scrubber	NAA Plan Reduction from 2014 Baseline
Pre-Scrubber	82,537		
2014 Baseline	8,254		
NAA Plan	8,047	-74,489	-206

6. ATTAINMENT DEMONSTRATION

Air quality dispersion modeling, in accordance with EPA guidance, has been used to demonstrate that SO_2 levels in the Central New Hampshire Nonattainment Area will meet the NAAQS by the required attainment date and that compliance with the standard will be maintained. This section summarizes key areas of the modeling protocol developed to document the modeling approach used in this attainment demonstration. Additional detail can be found in the full modeling protocol in Appendix A. It should be noted that two distinct modeling exercises were conducted. First, a comprehensive modeling analysis was performed to evaluate a wide range of operating scenarios, including "transient emergency" scenarios. The results of this analysis are documented in Table 6-5, Figure 6-4, and Table 6-6, and the predicted impacts for all of the scenarios evaluated were found to be below the NAAQS. Second, a modeling analysis was performed to specifically derive the enforceable emissions conditions to ensure protection of the NAAQS. The results of this modeling are documented in Tables 6-7 and Tables 6-9A and B, and these are the results that support the demonstration of attainment. The technical methodologies described in the sub-sections below (and presented in further detail in Appendix A) are generally applicable to both sets of modeling analyses.

The modeling methodology and data inputs applied in this analysis are consistent with the recommendations provided in the following EPA guidance documents:

- *Guidance for 1-Hour SO_2 Nonattainment Area SIP Submissions*, April 23, 2014 (http://www.epa.gov/airquality/sulfurdioxide/pdfs/20140423guidance.pdf)
- *Updated Guidance for Area Designations for the 2010 Primary Sulfur Dioxide National Ambient Air Quality Standard,* March 20, 2015 (https://www.epa.gov/sites/production/files/2016-04/documents/20150320so2designations.pdf
- *Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard*, March 1, 2011 (http://www.epa.gov/ttn/scram/guidance/clarification/Additional_Clarifications_AppendixW_Hourly-NO2-NAAQS_FINAL_03-01-2011.pdf, parts of which are also applicable to the 1-hour SO_2 standard)
- *Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard*, August 23, 2010

(http://www.epa.gov/ttn/scram/guidance/clarification/ClarificationMemo_AppendixW_Hourly-SO2-NAAQS_FINAL_08-23-2010.pdf)

6.1 Models

AERMOD version 15181 was used to perform a refined dispersion modeling analysis using 23 months of meteorological data collected on-site at Merrimack Station (note: December 1995 Concord Airport data was used so that a complete two year meteorological period could be modeled). Rural dispersion coefficients and model default options were used in the analysis. In addition, AERMET version 15181 was used to process the on-site meteorology used in the analysis and BPIP-PRIME was used to develop direction-specific building dimensions for facility structures used in the dispersion modeling.

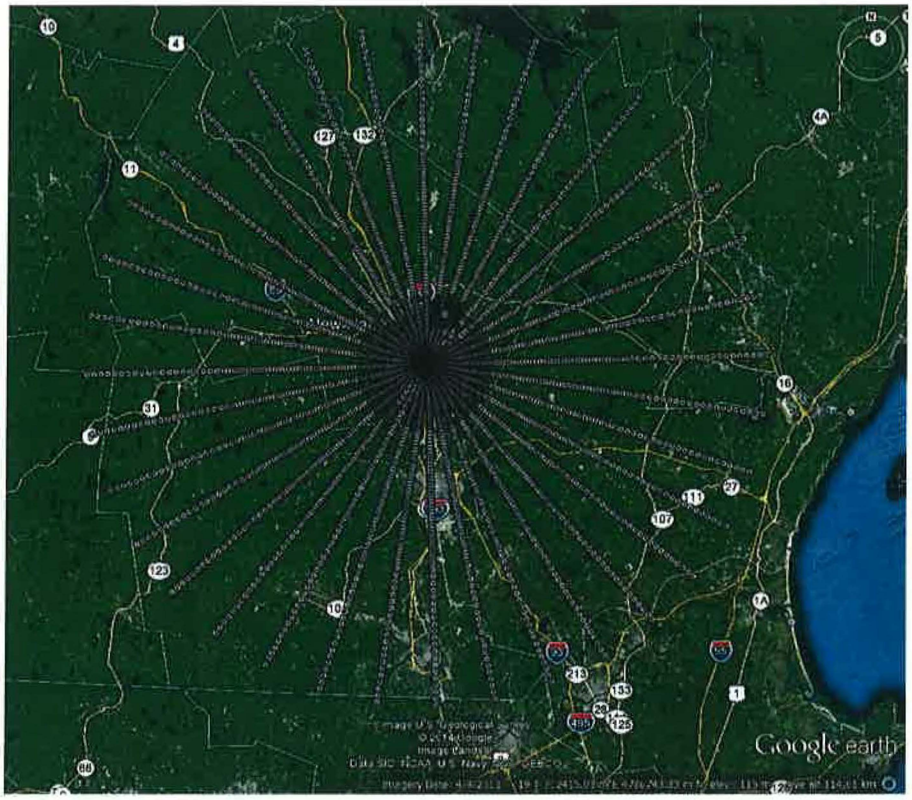
6.2 Receptor Grid

The receptor grid used in the SIP modeling includes a network previously developed for modeling the facility. The network consists of a polar grid that is centered on Merrimack Station and extends to a distance of 50km in all directions. Polar grid radii were spaced at 10 degree intervals and inner receptor rings were sufficiently dense such that the area of maximum impact was accurately captured. Receptors were located every 20 meters along the facility property line, but not within the property itself. The details of the polar receptor grid are summarized below:

- Centered on Merrimack Station
- Radii interval = every 10 degrees from 0 to 350 degrees
- Ring spacing = 20m from 20 to 200m
- Ring spacing = 50m from 200 to 500m
- Ring spacing = 100m from 500 to 2,000m
- Ring spacing = 250m from 2,000 to 10,000m
- Ring spacing = 500m from 10,000 to 30,000m
- Ring spacing = 1,000m from 30,000 to 50,000m

At EPA's request, additional receptors were added in dense arrays over areas of expected maximum predicted concentrations. Figures 6-1 and 6-2 show the full receptor grid superimposed over a Google Earth map.

Figure 6-1. Modeling for 1-hour SO_2 SIP, Full Polar Receptor Grid



6.3 Emissions Inventory and Source Parameters

Emission sources applied to the AERMOD dispersion modeling included the two main boilers at Merrimack Station (MK1 and MK2). There are additional emission units at Merrimack Station, including two combustions turbines (CT1 and CT2), an emergency boiler, and an emergency generator. Each of these units are infrequently operated (less than 110 hours per year over the past four years, and according to the EPA March 1, 2011 "Additional Clarification" Memorandum, do not need to be included in the modeling as part of normal operations. The operating hours for these devices for the previous four years (2011 through 2014) are shown in Table 6-1.

Table 6-1. Operating Hours for Additional Emissions Units at Merrimack Station

	Operating Hours (% of the year in parentheses)				
Emissions Unit	**2011**	**2012**	**2013**	**2014**	**2011-2014 Average**
Peak Turbine 1	9 (0.10%)	5 (0.06%)	53 (0.61%)	114 (1.30%)	45 (0.52%)
Peak Turbine 2	7 (0.08%)	4 (0.05%)	36 (0.41%)	113 (1.29%)	40 (0.46%)
Emergency Generator	15 (0.17%)	11 (0.13%)	24 (0.27%)	18 (0.21%)	17 (0.20%)
Emergency Boiler	-	109 (1.24%)	13 (0.15%)	50 (0.57%)	43 (0.49%)
Fire Pump	3 (0.03%)	3 (0.03%)	3 (0.03%)	2 (0.02%)	3 (0.03%)

Figure 6-2. Modeling for 1-hour SO_2 SIP, Boundary Receptor Network and Inner Polar Grid

Normal operating conditions at Merrimack Station include operation of Unit 1 (MK1) and Unit 2 (MK2) together or individually, in conjunction with the use of a Flue Gas Desulfurization (FGD) system for mercury and SO_2 emission control. No other conditions would be considered for planned operations. However, should the FGD malfunction, a transient event condition may occur where the residual combustion gases in the MK1 boiler would be exhausted through the former MK2 stack (emergency stack STMK2). In this exceptional event, fuel to MK1 would automatically shut off and the damper to the emergency stack would open allowing residual combustion gases to exhaust from the boiler. Eversource has made changes to the safety control logic for MK1 boiler that will initiate a master fuel trip, immediately stopping the fuel supply to the boiler furnace prior to directing residual combustion gases through the emergency stack STMK2. Such a scenario would only last a period of minutes until the residual combustion gases are exhausted through the emergency stack. It should be noted that since the FGD installation in 2011, this emergency scenario as described here has never occurred at Merrimack Station and therefore is not expected to be a frequent event. While EPA provided clarification in the March 1, 2011 Memorandum[22] regarding modeling requirements for intermittent sources (such as this), this modeling exercise conservatively includes this transient emergency scenario event. Under this assessment, it is assumed that the condition would last no longer than 10 minutes while the remainder of that hour consists of MK1 operating normally through the FGD.

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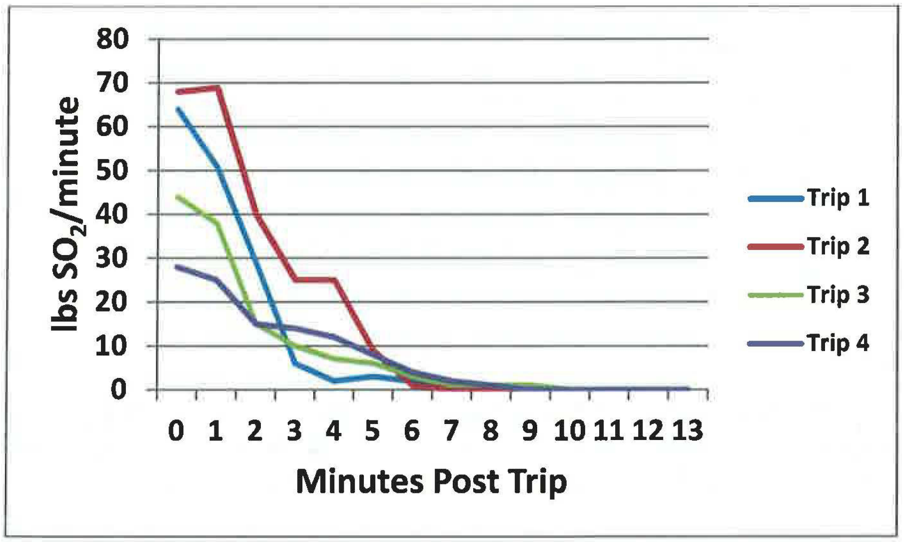
22 "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO2 National Ambient Air Quality Standard" March 1, 2011 -- (U.S. EPA, 2011b)

To assess the magnitude and duration of the emissions associated with the transient emergency event scenario, operating data was reviewed to examine the behavior of the emissions when fuel feed to MK1 is shut off during full load conditions (such an event is referred to as a "trip" in the discussion below). As noted above, the emergency scenario event has not occurred since the installation of the FGD so all emissions associated with the MK1 full load trips were actually directed to the FGD control device. In each event, the residual combustion gases remaining in the boiler were exhausted within approximately 6 minutes and the emission rate dropped fairly linearly toward zero during that period (Figure 6-3). Therefore, modeling full fuel emissions for 10 minutes in combination with 50 minutes of normal operations during each hour is a very conservative approach. Transient event scenario emissions are estimated to be overstated by a factor of 5 or more for a worst-case hour.

There are no other SO_2 emission sources in the Central New Hampshire Nonattainment Area that have exceeded 100 tons per year in the past three years. Additionally, the only other sources of SO_2 exceeding 100 tons per year within 50 kilometers include Schiller and Newington Stations, located just about 50 kilometers to the east of Merrimack Station. These and all other SO_2 sources within the region are reasonably captured in the background monitoring data included in the modeling assessment.

Merrimack Station emissions for units MK1 and MK2 are represented by three normal operating scenarios in combination with the FGD. SO_2 emission rates and stack parameters for these scenarios are shown in Table 6-2. Stack parameters are reflective of the operating conditions at those emission rates.

Figure 6-3. SO_2 Emission Rates by Minute after Fuel Feed Shutoff (MK1)



Transition Event Scenarios A through E are designed to be overly conservative for modeling purposes to ensure compliance with the 1-hour SO_2 NAAQS. Transition Event Scenario A includes full combined FGD operations for MK1 and MK2. Events B and C consider standalone events for MK1 and MK2, respectively, and Events D and E are similar to Events A and C except with a lower exhaust flow bounding (Table 6-3). All Event scenarios transition to a full shut down. As discussed above, this transition scenario has never happened since the installation of the FGD, however for modeling, it is assumed that the event happens for the last 10 minutes of every hour throughout the full year. Thus each hour's emissions contain 50 minutes of a normal operating condition (0.83 x normal emission rate) and 10 minutes of transition emissions. A transition of 10 minutes is in itself very conservative.

Table 6-2. Normal Operations Emission Rates and Stack Parameters

Parameter	Normal Operating Scenarios		
Scenario	Scenario 1	Scenario 2	Scenario 3

Units in Operation	MK1 + MK2 w/FGD	MK1 w/FGD	MK2 w/FGD
SO_2 Emission Rate (lb/hr)	2,110	555	1,556
Stack Height (ft)	445	445	445
Stack Diameter (ft)	21.5	21.5	21.5
Exhaust Flow (acfm)	1,304,420	379,831	924,589
Exhaust Temp (F)	130	127	130

Table 6-3. Exceptional Event Condition Emission Rates and Stack Parameters

Parameter	Event Operating Scenarios						
Scenario	Event A			Event B		Event C	
Units in Operation	MK1 + MK2 w/FGD	MK1 Emergency	MK2 Emergency	MK1 w/FGD	Emergency Shut Down	MK2 w/FGD	Emergency Shut Down
SO_2 Emission Rate (lb/hr)	1,759	1,155	259	462	1,155	1297	259
Stack Height (ft)	445	317	445	445	317	445	445
Stack Diameter (ft)	21.5	14.5	21.5	21.5	14.5	21.5	21.5
Exhaust Flow (acfm)	1,304,420	475,647	924,589	379,831	475,647	924,589	924,589
Exhaust Temp (F)	130	343	130	127	343	130	130

Parameter	Event Operating Scenarios				
Scenario	Event D			Event E	
Units in Operation	MK1 + MK2 w/FGD	MK1 Emergency	MK2 Emergency	MK2 w/FGD	Emergency Shut Down
SO_2 Emission Rate (lb/hr)	1,759	1,155	259	1297	259
Stack Height (ft)	445	317	445	445	445
Stack Diameter (ft)	21.5	14.5	21.5	21.5	21.5
Exhaust Flow (acfm)	1,304,420	475,647	750,000	924,589	750,000
Exhaust Temp (F)	130	343	130	130	130

6.4 Meteorology

The meteorological data used for the 1-hr SO_2 SIP modeling included a 23-month period of on-site data collected at Merrimack Station during 1994 and 1995. These data were supplemented with corresponding 1994 and 1995 surface observations from Concord Airport and upper air soundings from Portland and Gray, ME. As noted in Section 6.1, December 1995 Concord data was used so that a full two-year meteorological period could be modeled. On-site meteorological data has been reprocessed from earlier versions to be consistent with current modeling guidance. This revised data set was used in the SIP modeling for the Central New Hampshire Nonattainment Area.

NHDES also considered the use of more recent (2008 to 2012) National Weather Service (NWS) data collected at Concord Airport. This data is significantly newer than the on-site data described above and it takes advantage of the 1-minute ASOS data that AERMET has been recently coded to handle along with its associated processor, AERMINUTE. Despite these advantages, NHDES has found that the 1994-1995 on-site met data is more appropriate than the NWS data for modeling emissions from Merrimack Station and their impact on the Central New Hampshire Nonattainment Area. NHDES has come to this conclusion for the following reasons:

- The on-site data was collected at tower heights up to 100m (as well as by SODAR to heights of 600m). The NWS data at Concord Airport is collected at an anemometer height of 26ft (8m).

Therefore, the on-site data is more indicative of the wind conditions at stack top and plume height for the relatively tall stacks at Merrimack Station.

- The on-site wind direction data is more representative of the channeling effect caused by Merrimack Station's location in a valley area along the Merrimack River.
- The on-site data has been previously approved for permit-related modeling at Merrimack Station, most notably for the permit for the FGD system.

6.5 Background Air Quality for Modeling

The closest ambient SO_2 monitor to Merrimack Station is located at Exchange Street in Pembroke (ID #33-013-1006). However, the 99th percentile for Pembroke is dominated by the emissions from Merrimack Station. Adding the 99th percentile monitoring data from Pembroke to modeled concentrations from Merrimack Station would double count the estimated impacts for many meteorological hours and would yield overly conservative results. Further, isolating source contributions based on wind directions falling within a 90 degree sector centered on the source was not appropriate for this analysis. Due to the river valley location of the source, low wind speeds and swirling winds would lead to double-counting of power plant emissions even for some meteorological hours when winds were outside of this sector.

Eliminating the Pembroke monitor completely from the analysis used for determining ambient background levels would avoid the potential double counting of emissions from Merrimack Station but would adversely affect the determination of regional background levels of SO_2. This is because, other than for hours of impact by Merrimack Station, the Pembroke monitor is a good representation of background in nearby areas. Thus another method for estimating background SO_2 concentrations was applied, as described below.

The methodology developed used the two SO_2 monitors located in the Central New Hampshire 1-hour SO_2 Nonattainment Area that continuously monitor SO_2 concentrations. These are the Pembroke monitor (33-013-1006) on Exchange Street, located less than 1 mile southeast of Merrimack Station, and the Concord monitor (33-013-1007) on Hazen Drive, located approximately 6 miles north-northwest of Merrimack Station. Both sites are affected by Merrimack Station under certain weather conditions, but both are also surrounded by similar residential and light industrial SO_2 sources. The Concord monitor may be slightly more affected by local emissions due to its location within a larger urban area, but neither is heavily influenced by individual SO_2 sources other than Merrimack Station. Both monitors appear to track within a couple of parts per billion of each other when not being affected by Merrimack Station. When not being affected by the power plant, both sites show increased SO_2 background concentrations during colder months.

The method applied for determining SO_2 background was to select the lowest available monitored concentration from Concord and Pembroke for each hour of the most recent complete three-year period. Once compiled, background values were added to the AERMOD model input based on the distribution of concentrations by season and hour-of-day in accordance with recommendations in the EPA March 1, 2011 "Additional Clarification" memo. Values used for modeling are shown in Table 6-4.

Table 6-4. One Hour SO2 Background by Season and Hour of the Day (2012-2014)

Hour Beginning	Winter	Spring	Summer	Fall
0	9.68	4.36	1.22	3.57
1	9.33	3.92	1.05	3.31
2	9.24	3.92	1.22	3.31
3	7.93	3.66	0.96	3.84
4	8.63	3.31	1.05	4.45
5	9.16	3.14	1.13	4.62
6	9.33	3.92	2.53	4.80
7	9.50	4.88	2.79	6.02
8	10.29	4.10	2.96	5.41
9	11.33	4.80	7.24	4.71
10	12.82	5.32	3.92	4.27
11	11.60	4.45	2.79	5.06
12	10.38	4.45	2.35	4.62
13	10.46	4.36	2.79	4.45
14	10.46	3.40	2.88	4.27
15	10.81	3.84	2.44	3.75
16	11.07	3.92	2.09	4.01
17	11.16	3.49	1.83	4.71
18	10.11	3.92	1.74	4.36
19	11.60	4.88	2.09	4.97
20	9.77	5.41	1.66	4.36
21	8.89	4.45	1.22	4.45
22	8.81	4.80	1.31	3.92
23	9.68	4.62	1.13	3.49

6.6 Results

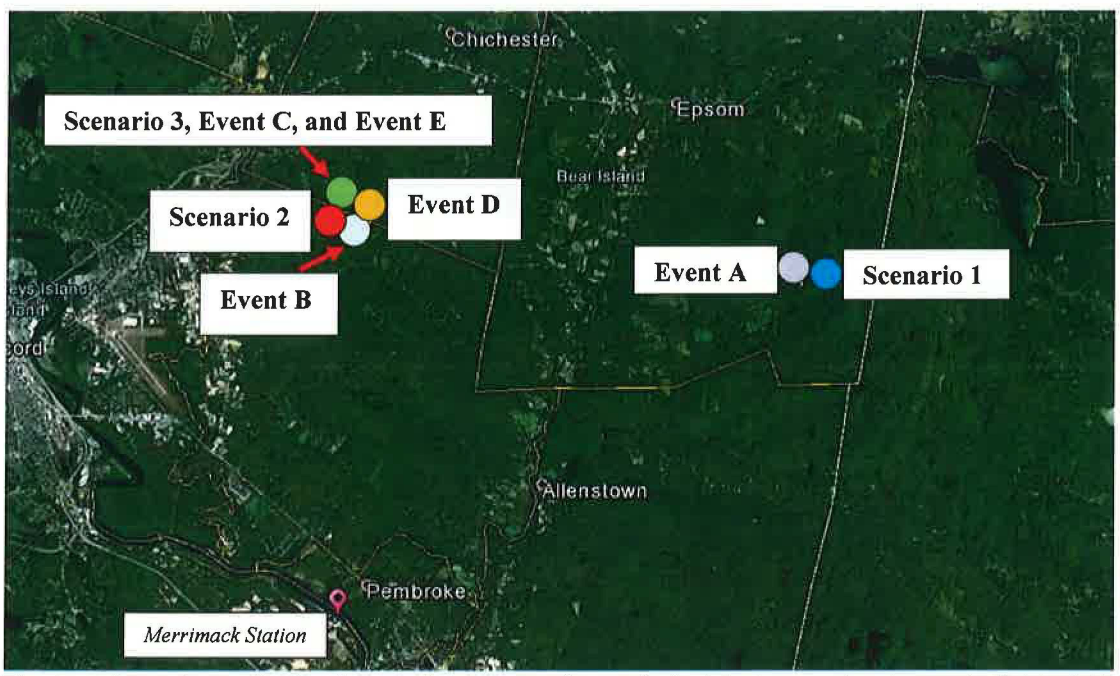
Modeling results for each of the conditions and emissions described above show compliance with the 1-hour SO_2 NAAQS of 0.075 parts per million. Highest predicted 1-hour SO_2 concentrations in the form of the standard are located about 5 to 8 miles to the north and northeast of Merrimack Station. Table 6-5 provides a summary of modeled concentration and location of highest impact and Figure 6-4 provides a map of maximum concentrations. Modeled 4^{th} maximum values represent the 99^{th} percentile of 365 day years.

Table 6-5. Modeling Results with Locations

Scenario	Modeled 4th Maximum with Background (ppb)	Location (UTM)
Scenario 1 (MK1, MK2, FGD)	60.5	311470 4783400
Scenario 2 (MK1, FGD)	26.4	301700 4788000
Scenario 3 (MK2, FGD)	50.7	302300 4788100
Event A (MK1, MK2, FGD, Bypass)	65.0	310970 4783800
Event B (MK1, FGD, Bypass)	59.2	301800 4787700
Event C (MK2, FGD, Shut down)	50.7	302300 4788100
Event D (MK1, MK2, FGD, Bypass Low Flow)	64.2	302400 4787900
Event E (MK2, FGD, Shut down Low Flow)	50.4	302300 4788100

Each scenario modeled above demonstrates that predicted facility concentrations plus background monitoring will be below the 1-hour SO_2 NAAQS of 75ppb.

Figure 6-4. Location of Modeled 4th Maximum 1-Hour SO_2 Impacts



Note: The locations shown in the figure above are color coded with the results shown in Table 6-5.

6.7 Demonstration of Attainment

Demonstration of attainment is broken into two parts: monitoring and modeling. In the case of the Central New Hampshire 1-Hour SO_2 Nonattainment Area, SO_2 emissions leading to the nonattainment designation were dominated by a single source, Merrimack Station. As discussed earlier, this source constructed a flue gas desulfurization (FGD) system to comply with NH state law, RSA 125-O and the FGD system became operational in September of 2011.

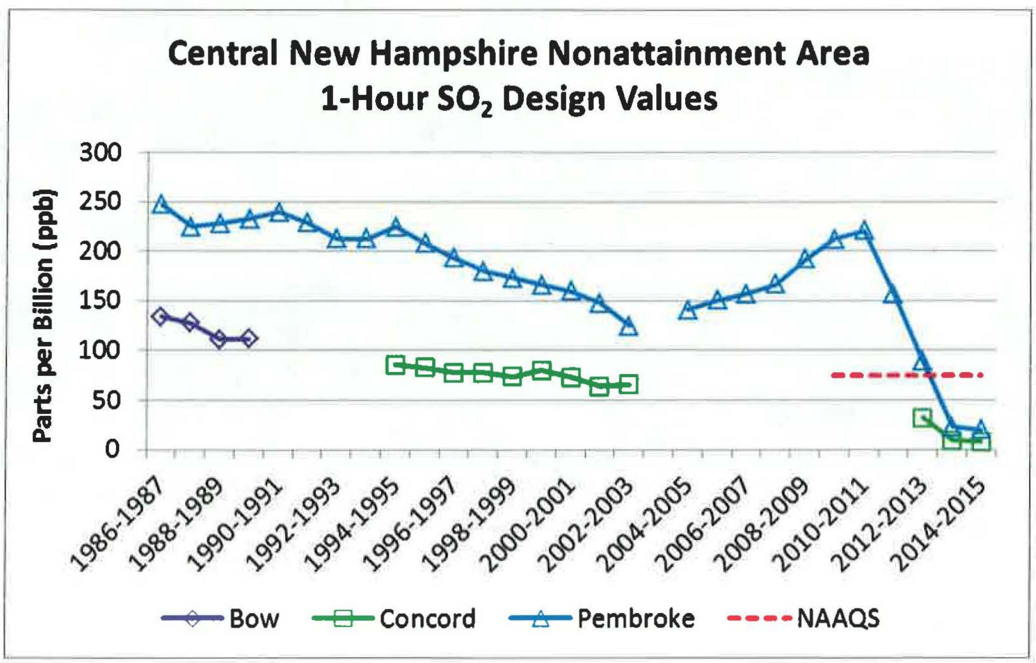
Operation of the FGD served multiple air pollution control purposes, including the mercury emission reductions for which it was originally constructed. While efficient for removing mercury emissions, FGD is more commonly used to reduce SO_2 emissions. These types of systems have consistently achieved SO_2 emissions reductions of 90% or more. Since the FGD at Merrimack Station became operational in 2011, 1-hour SO_2 monitoring data from the Central New Hampshire 1-Hour SO_2 Nonattainment Area has demonstrated significant reductions in ambient SO_2 concentrations. In fact, based on the most recent monitoring data for the area, both the Pembroke and Concord monitoring stations are now significantly below the 1-hour SO_2 NAAQS.

The construction of the FGD at Merrimack Station required that a new stack be built. The new stack is taller than the previous facility stacks and thus the location of maximum ambient air SO_2 concentrations may have moved. Previously, the Pembroke monitor was considered to be located near the point of maximum impact. Since this is no longer a certainty, SO_2 dispersion modeling needs to supplement monitoring in the attainment demonstration.

6.7.1 Monitoring Meets NAAQS

The most recent 1-hour SO_2 monitoring for the Central New Hampshire 1-Hour SO_2 Nonattainment Area demonstrates compliance with the 2010 1-hour SO_2 NAAQS. For the first time since SO_2 monitoring began in Pembroke, the three-year 1-hour SO_2 design value has dropped below 75 ppb. The 2012 to 2014 1-hour SO_2 design value was 23.3 ppb for Pembroke and 8.6 ppb for Concord. These values are well below the 1-hour SO_2 NAAQS of 75 ppb. Figure 6-5 shows calculated 1-hour SO_2 design value trends since 1986 for monitors located within the geographic borders for the current nonattainment area. Further, there continues to be reductions in SO_2 emissions from other source sectors throughout the Northeast that should lead to further declining background SO_2 concentrations.

Figure 6-5. Trend in 1-Hour SO_2 Design Values



6.7.2 Modeling Meets NAAQS

Demonstration of attainment by modeling is also necessary to ensure that locations without monitoring also meet attainment criteria. Methodology for this modeling is summarized in above sections and a full modeling protocol may be found in Appendix A.

In short, normal operations of Merrimack Station were modeled, consisting of Units MK1 and MK2 firing individually and simultaneously and exhausting through the FGD. Five transient emergency shutdown conditions were also modeled to ensure certain exceptional events would not cause a violation for the 1-hour SO_2 NAAQS. AERMOD was the model used as specified by EPA guidance.

As indicated in Tables 6-5 and 6-6, modeling for each of the three normal operating scenarios, plus five potential transient emergency scenarios, indicate compliance with the NAAQS throughout the modeling domain. These predicted impacts include representative background SO_2 concentrations.

Table 6-6. Modeling Results

Scenario	Modeled 4th Maximum with Background (ppb)	NAAQS (ppb)	Below NAAQS?
Scenario 1 (MK1, MK2, FGD)	60.5	75	Yes
Scenario 2 (MK1, FGD)	26.4	75	Yes
Scenario 3 (MK2, FGD)	50.7	75	Yes
Event A (MK1, MK2, FGD, Bypass)	65.0	75	Yes
Event B (MK1, FGD, Bypass)	59.2	75	Yes
Event C (MK2, FGD, Shut down)	50.7	75	Yes
Event D (MK1, MK2, FGD, Bypass Low Flow)	64.2	75	Yes
Event E (MK2, FGD, Shut down Low Flow)	50.4	75	Yes

In addition to the modeling that has been described thus far to demonstrate that normal operations and exceptional events at Merrimack Station will meet the NAAQS, modeling was performed to derive "critical emission rates" for inclusion in this SIP submittal. These critical emission rates will also become an enforceable condition of Merrimack Station's operating permit. Critical emission rates were derived following the recommendations in EPA's April 23, 2014 memorandum, *Guidance for 1-Hour SO_2 Nonattainment Area SIP Submissions*. The general steps that were used in the analysis are described below.

The first step in deriving the critical emission rates was to define an appropriate target concentration threshold. In this case, the 1-hr SO_2 NAAQS minus the background concentration was used. A single maximum background contribution of 12.8 µg/m3 was used which corresponds to the highest by-hour, by-season background value in the 2012-2014 dataset (see Table 6-4). Subtracting this single maximum hourly background to obtain the threshold is a very conservative assumption because, for the purposes of calculating the critical emission rate, it effectively means that this maximum background value occurred for every modeled hour. The resulting threshold used in this analysis is shown below:

1-hr SO_2 NAAQS = 196 $\mu g/m^3$
Highest by-hour by-season background value = 12.8 $\mu g/m^3$
Target threshold = 196 – 12.8 = 183.2 $\mu g/m^3$

The second step in the analysis was to perform the modeling at a unitized emission rate (1 lb/hr) for each of the normal operating scenarios described earlier. Except for the unitized emission rates, all other parameters were the same as those used in the NAAQS modeling (see Table 6-2). Similarly, the modeling for the critical emission rates utilized all of the same methodologies, models, meteorology, and receptors that were used in the NAAQS modeling. Note, however, that this unit rate modeling did not include the hourly background data described in Section 6.5 above.

The third step was to use the target threshold and the maximum predicted unitized results to back-calculate the emission rate that would meet the threshold. This was done using the following formula:

$$\textbf{Critical Emission Rate (lb/hr)} = \frac{\textbf{Threshold } (\mu g/m^3)}{\textbf{Max. Predicted Unitized Impact } (\mu g/m^3 \textbf{ per lb/hr})}$$

The maximum predicted unit rate impacts and resulting critical emission rates for each of the three operating cases are shown in Table 6-7.

Table 6-7. Maximum Predicted Unit Rate Impacts and Back-Calculated Hourly Critical Emission Rates

Parameter	Normal Operating Scenarios		
Scenario	Scenario 1	Scenario 2	Scenario 3
Units in Operation	MK1 + MK2 w/FGD	MK1 w/FGD	MK2 w/FGD
Max. Predicted Unitized 1-hr SO_2 impact ($\mu g/m^3$)	0.072	0.117	0.082
1-hr Average Critical Emission Rate (lb/hr)	2,544	1,566	2,234

Note: The higher unit rate impact associated with MK1 alone is the result of the lower exhaust flow (and therefore lower exit velocity) associated with this scenario.

The critical emission rates described above are based on a 1-hr averaging period. Using guidance in Appendix C of the 2014 guidance document[23], emission limits for other averaging periods were calculated. A summary of the steps used in this procedure is provided below:

Step 1: Hourly SO_2 emissions data for Merrimack Station were downloaded from EPA's Air Markets Program Data (AMPD) database. The dataset that was downloaded and used in this analysis covers the period from 7/4/13 to 3/30/15. Prior to conducting the analysis, erroneous AMPD data points were removed from the dataset as per information that was provided to NHDES by PSNH.

Step 2: For each of the three normal operating cases (MK1 & MK2 together, MK1 alone, and MK2 alone), the hourly emissions data were sorted and the 99th percentile hourly value was obtained.

Step 3: For each of the three operating cases, the emissions dataset was used to calculate emission rates averaged over other time periods: rolling 24-hr average, 7-day average, and 30-day average. For each one of these averaging periods, the data was ranked and the 99th percentile value was obtained.

Step 4: For each operating case and averaging period, the ratio of the 99th percentile emissions value for the applicable averaging period to the 99th percentile hourly emissions value was calculated. For example, for MK1 operating alone, the 99th percentile hourly emissions value was 324.27 lb/hr. For the 7-day averaging period, the 99th percentile value was 236.48 lb/hr. The ratio of the 7-day to 1-hour averages was 236.48/324.27 = 0.73. Table 6-8 shows the 99th percentile hourly emissions values, the

[23] See footnote 1

99th percentile emissions values for the other averaging periods, and the resulting ratios for each of the three operating scenarios.

Table 6-8. 99th Percentile Hourly Emissions Values and 99th Percentile Values for Other Averaging Periods

Scenario	Parameter	Hourly	24-Hour	7-Day	30-Day
MK1 + MK2	99th % (lb/hr)	1186.90	1041.90	860.82	716.68
	Ratio to Hourly	--	0.88	0.73	0.60
MK1	99th % (lb/hr)	324.27	287.07	236.48	208.76
	Ratio to Hourly	--	0.89	0.73	0.64
MK2	99th % (lb/hr)	902.55	790.45	658.66	584.54
	Ratio to Hourly	--	0.88	0.73	0.65

Note: Emissions values taken from 7/4/13 to 3/30/15 AMPD data downloaded on 6/17/15 (with corrections provided by Eversource on 7/23/15).

Step 5: The ratios calculated in Step 4 were multiplied by the 1-hr average critical emission rates derived with the modeling. This yielded emissions limits for other averaging periods. The resulting emissions limits for each of the averaging periods and operating cases is shown in Table 6-9 (Table 6-9A in lb/hr, Table 6-9B in lb/MMBtu). Based on these results, PSNH has agreed to an emissions limit of 0.39 lb/MMBtu, on a 7-day average basis, to be met at all times. This limit is being presented here for inclusion in New Hampshire's SIP. As mentioned earlier, this limit will also become an enforceable condition of Merrimack Station's operating permit.

Table 6-9A. Merrimack Station, Calculated Emissions Limits Expressed as lb/hr

Parameter	Normal Operating Scenarios		
Scenario	Scenario 1	Scenario 2	Scenario 3
Units in Operation	MK1 + MK2 w/FGD	MK1 w/FGD	MK2 w/FGD
1-hr Averaging Period	2,544	1,566	3,473
24-Hour Rolling Average	2,239	1,394	1,966
7-Day Average	1,857	1,143	1,631
30-Day Average	1,527	1,002	1,452

Table 6-9B. Merrimack Station, Calculated Emissions Limits Expressed as lb/MMBtu

Parameter	Normal Operating Scenarios		
Scenario	Scenario 1	Scenario 2	Scenario 3
Units in Operation	MK1 + MK2 w/FGD	MK1 w/FGD	MK2 w/FGD
Max. Gross Heat Input Rating (MMBtu)	4,711	1,238	3,473
1-hr Averaging Period	0.54	1.26	0.64
24-Hour Rolling Average	0.48	1.12	0.56
7-Day Average	0.39	0.92	0.47
30-Day Average	0.32	0.81	0.42

Further details regarding the critical emission rate modeling and the analysis for deriving emissions limits for other averaging periods can be found in Appendix A.

In summary, NHDES-ARD performed a modeling analysis to derive hourly emission rates that meet the 1-hour SO_2 NAAQS (see Table 6-7 above). NHDES-ARD then used available EPA guidance to calculate a longer term average limit that has a comparable level of stringency as an hourly based limit. As described in the paragraphs above, NHDES-ARD has determined that an emissions limit of 0.39 lb/MMBtu based on a 7-day averaging period ensures attainment with the NAAQS based on the modeling analysis. The specifics of how this enforceable permit limit will be applied are discussed in more detail in Section 7.7 below.

7. CONTROL STRATEGY

New Hampshire's primary control strategy is the federally enforceable temporary permit issued to Merrimack Station, the single stationary source of SO_2 emissions that was responsible for the nonattainment designation. Temporary permit TP-0189[24] issued September 1, 2016, establishes operational conditions and limitations on SO_2 emissions for the purposes of attaining and maintaining the SO_2 NAAQS and fulfills the requirements of CAA sections 172(c)(1) for reasonably available control measures (RACM) in a nonattainment area, section 112 maximum achievable control technology (MACT) regulations for coal-and oil-fired EGUs, known as the Mercury and Air Toxics Standards (MATS), and the regional haze rule's best available retrofit technology (BART) for power plants.

As a result of New Hampshire law RSA 125-O that mandated the installation of a wet, limestone-based flue gas desulfurization system (FGD) at Merrimack Station to reduce mercury emissions by 80%[25], SO_2 emissions have decreased by 94%. This control strategy also helps to improve visibility conditions in fulfillment of the State's reasonable progress goals for regional haze.

7.1 RACT/RACM Requirements

Section 172(c)(1) of the Clean Air Act states that a state's nonattainment plan shall, "provide for the implementation of all reasonably available control measures as expeditiously as practicable (including such reductions in emissions from existing sources in the area as may be obtained through the adoption, at a minimum, of reasonably available control technology [RACT]) and shall provide for attainment of the primary ambient air quality standards." New Hampshire has essentially implemented RACT through the implementation of RSA 125-O:11 – O:18, installation of the wet flue gas desulfurization (FGD) and the operational and emission limitations contained in TP-0189. Additionally, FGD technology employed by Merrimack Station is the basis of compliance with Best Available Control Technology (BACT) for seven EGUs across the country that utilize FGD for SO_2 control, according to the EPA's RACT/BACT/LAER Clearinghouse[26]. BACT by definition is more stringent that RACT. The FGD technology was specified via consultation with the operator, state and federal environmental agencies, and the NH legislature.

7.2 Regional Haze

EPA's Regional Haze Rule (64 FR 35714) when applied to stationary sources requires Best Available Retrofit Technology (BART) for power plants built between 1962 and 1977, with the option to substitute participation in the Cross-State Air Pollution Rule (CSAPR), an emission reduction program that sets emission caps for the individual affected states, or any other alternative plan which achieves greater emission reductions than the implementation of BART. New Hampshire elected to rely on BART for the

[24] Certain conditions contained in TP-0189 issued on September 1, 2016 are incorporated in this SIP revision for inclusion into NH's SIP and are included in Appendix B.
[25] Coal-fired utility boilers - Merrimack Station – MK1 and MK2 and Schiller Station Units 4 and 6.
[26] https://cfpub.epa.gov/RBLC/

state's major stationary sources subject to BART. This included added controls on Merrimack Station in Bow that have dramatically reduced SO_2 emissions.

Maximum sustainable rates (MSR) of SO_2 emission reductions from units MK1 (which was assessed for additional controls to ensure reasonable progress toward New Hampshire's visibility goals) and MK2 (which is subject to BART) were established to minimize emissions that contribute to regional haze. Based on the operational data, it is anticipated that the FGD system can achieve a SO_2 removal efficiency of 94.0% or higher for the majority of time, as determined on a 30-boiler operating day rolling average basis. Item 2 in Table 4 of Temporary Permit TP-0189 issued on September 1, 2016, established the following SO_2 limitation for the purpose of mitigation of regional haze:

a) Except as provided in b) below, actual SO_2 emissions from MK1 & MK2 combined shall be reduced by at least 94.0% based on a 30-boiler operating day rolling average basis. The SO_2 percent reduction shall be calculated at the end of each boiler operating day in accordance with Table 5, Item 2 of the permit.

b) If the SO_2 percent reduction of 94.0% (as calculated on a 30-boiler operating day rolling average basis) is not met on a boiler operating day, compliance shall alternatively be achieved if on the same day:

    i. The actual combined SO_2 emissions from MK1 and MK2 are less than or equal to 0.24 lb/MMBtu, as calculated on a 30-boiler operating day rolling average basis; and

    ii. The actual combined SO_2 emissions from MK1 and MK2 are reduced by at least 93.4%, as calculated on a 30-boiler operating day rolling average basis.

c) The facility is limited to utilizing the alternate compliance option listed in b) above to no more than 7 boiler operating days during any consecutive 30-boiler operating day period.

Given the variability in daily SO_2 removal rates, the range of various operational scenarios (units MK1 and MK2 operated individually or combined, operated at various loads, and at various coal sulfur contents), as well as the significant change in Merrimack Station's operating profile since the scrubber was originally designed (i.e., it no longer regularly operates as a base load facility and now undergoes more frequent startups/shutdowns), DES has determined that an alternative compliance option outlined in conditions b) and c) above are appropriate in this case.

Operation of the FGD system and the corresponding permit conditions fulfill Merrimack Station's BART emission limits requirements specified in New Hampshire administrative rule Env-A 2300, Mitigation of Regional Haze, submitted to EPA as a SIP revision on January 29, 2010 and approved by EPA on August 22, 2012 (77 FR 50602). NH strengthened the BART emission limit in accordance with Item 6 of Table 4 of Temporary Permit (TP-0008)[27] initially issued in March 9, 2009. These new strengthened conditions are referenced above and contained in Item 2 in Table 4 of TP-0189. In addition, TP-0189 establish procedures to ensure the FGD system is properly operated and maintained in accordance with 40 CFR 51.308 (e)(1)(v).

7.3 Mercury and Air Toxics Standards (MATS)

Stationary source mercury metallic, non-mercury metallic and acid gas hazardous air pollutants (HAPs) emissions are limited by the national emission standards for hazardous air pollutants under section 112 of the CAA. Pursuant to section 112, maximum achievable control technology (MACT) regulations for coal- and oil-fired electric generating units (EGUs), known as the Mercury and Air Toxics Standards (MATS)[28],

[27] TP-0008 Issued on 3/9/2009: http://www4.des.state.nh.us/OneStopPub/Air/3301300026FY07-0103TypePermit.pdf

[28] Further information on the MATS rule is available at http://www.epa.gov/mats.

were promulgated on February 16, 2012 (77 FR 9304). These regulations target reductions of emissions of HAPs including hydrochloric acid (HCl) at affected EGUs. Merrimack Station elected to meet the Utility MATS by meeting 0.002 lbs/MMBtu Hydrochloric Acid (HCl) or 0.001 lbs/MMBtu to meet low-emitting EGU (LEE) status. Monitoring will include quarterly HCl stack testing for 3 threes to determine LEE applicability, then stack testing every three years in LEE is achieved, or annually if it is not. Merrimack Station has agreed to maintain records including: notifications and reports submitted to comply with utility MATS; fuel type and amount; number, duration, and corrective actions related to malfunctions; startup and shutdown information; HCl emission records; and other recordkeeping in compliance with all application regulations. Reporting will include compliance summary reports for compliance with emission limitations and/or work practice standards and deviations, results of performance tune-ups, stack test notifications and the results of all required certification, recertification and quality-assurance tests prior to or concurrent with quarterly reports. The compliance date for Merrimack Station was April of 2015. These requirements will be incorporated into the facility's Title V Operating Permit TV-0055.

7.4 CAA Title V Permit Program

Title V of the Clean Air Act requires major sources of air pollutants, and certain other sources, to obtain and operate in compliance with a Title V operating permit. Sources with Title V permits are required by the Act to certify compliance with the applicable requirements of their permits at least annually. EPA rules for Title V permits are found at 40 CFR 70, and are administered by the State under Env-A 609, Title V Operating Permits, approved by EPA on November 24, 2001. Permit TP-0055 issued to Merrimack Station establishes enforceable emission limitations as well as operational requirements. Requirements that are established in Temporary Permits in accordance with Env-A 607 are eventually incorporated into the facility's Title V Operating Permit in accordance with Env-A 612.05, Minor Permit Modifications: Title V Operating Permits. Merrimack Station's Title V Operating Permit (TV-0055) will be updated to incorporate the requirements of TP-0189 which specifically address federally enforceable operational and SO_2 emissions limitations for the purposes of attainment of the 2010 SO_2 NAAQS.

7.5 Cross-State Air Pollution Rule (CSAPR)

Although it is not a participating CSAPR state, New Hampshire anticipates air quality improvements that interstate transport measures associated with CSAPR are certain to yield. EPA has estimated that CSAPR will cut EGU emissions of SO_2 in the covered states by 6,400,000 tons annually from 2005 levels – a 73 percent reduction. Implementation of CSAPR will help to ensure that background SO_2 levels in New Hampshire (which depend greatly on transported air pollutants) will be lower in future years than in the recent past.

7.6 NEW HAMPSHIRE PROGRAMS

7.6.1 Multiple Pollutant Reduction Program.

Chief among the state control measures for attainment of the 2010 SO_2 NAAQS is the requirement for the installation and operation of a flue gas desulfurization system for Merrimack Station. The FGD system has its origins in RSA 125-O, *Multiple Pollutant Reduction Program*, which requires the reduction of mercury emissions by at least 80 percent on an annual basis from the baseline mercury input from all affected sources beginning in July of 2013. The 94-percent removal rate[29] for SO_2 emissions at Merrimack Station occurs as a co-benefit of FGD for mercury control.

More specifically, RSA 125-O sets limits on the aggregate mercury emissions from Merrimack and Schiller Stations. Sections 1 and 3 of this statute, requiring an integrated, multi-pollutant reduction strategy for

[29] See footnote 10.

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.

7.6.2 Other State Rules

Other provisions of New Hampshire's SIP are also relevant to the SO_2 nonattainment area control strategy. These include, but are not limited to, the following administrative rules:

- Env-A 600: Statewide Permit System[30]
  - Env-A 607: Temporary Permits
  - Env-A 608: State Permits to Operate
  - Env-A 618: Nonattainment New Source Review
- Env-A 1600: Fuel Specifications[31]
- Env-A 2300: Mitigation of Regional Haze[32]
- Specified Permit Conditions of Temporary Permit (TP-0189)[33] issued September 1, 2016 and contained in Appendix B.

7.7 Operational Limits, Emission Limits and Averaging Times

NHDES conducted ambient air dispersion modeling analyses, as described in section 6, to derive a 1-hour "critical emission value" from which to calculate an emission limit for Units MK1 and MK2 at Merrimack Station. First, adjustment ratios were calculated using the procedure described in Appendix C of *Guidance for 1-Hour SO_2 Nonattainment Area SIP Submissions*. To arrive at the ratios, and in accordance with this EPA guidance, NHDES used actual hourly emissions data (for the period July 4, 2013 through March 30, 2015) for MK1 and MK2 as reported by Eversource to EPA's Clean Air Markets Program. The purpose of multiplying the critical emission value with the adjustment ratio is to obtain a longer term average emission limit which is comparably as stringent as the 1-hour limit. For example, the hourly critical emission value for MK1 and MK2 combined is 2,544 lb/hr. This hourly value was converted to a 7-boiler operating day rolling average using the following calculation:

7-boiler operating day rolling avg. SO_2 emission limit = 2,544 lbs/hr x 0.73 (adjustment ratio) = 1,857 lbs/hr

The emission limit (expressed as lb/MMBtu) = (1,857 lb/hr) ÷ (4,711 MMBtu/hr) = 0.39 lb/MMBtu, where 4,711 MMBtu is the combined maximum heat input of MK1 and MK2. This SO_2 emission limit is specified in Item #1 of Table 4 of Temporary Permit TP-0189 issued on September 1, 2016, which is contained in Appendix B.

MK1 and MK2 experience hourly operational variability in fuel sulfur content, individual unit load conditions, and single unit/two unit operations. Eversource requested a longer term average emission

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[30] NH amended Env-A 600: Statewide Permit Systems, effective September 1, 2012. NHDES submitted the amended rule, including updates to Env-A 618, 619, as a SIP revision for EPA's approval on November 15, 2012. NH received conditional approval of Env-A 618 and 619 on September 9, 2015.

[31] NH adopted Env-A 1600: Fuel Specifications (formerly numbered Env-A 400), effective December 24, 1990. EPA approved this rule into the SIP. NHDES submitted the 1997 rule on November 14, 2003, and the 2005 rule on September 14, 2005, as SIP revisions for EPA's approval. Both versions were withdrawn on June 11, 2015. NH is again readopting this rule which will include a limit on the SO_2 content of fuel effective July 2018.

[32] NH adopted revisions to Env-A 2300: Mitigation of Regional Haze, effective on 1-8-2011.

[33] Eversource Merrimack Station filed an application for a Temporary Permit in accordance with Env-A 607.03, Application for Temporary Permits, on September 15, 2015 to establish permit limitations for SO_2 emissions from MK1 and MK2 for attainment with the NAAQS and to establish the maximum sustained rate of SO_2 reductions for the FGD system. See Appendix B for TP-0189 Permit Conditions.

limit to comply with the 1-hour SO_2 NAAQS to allow for FGD system stabilization in response to variability in hourly operations and fuel sulfur content parameters. Specifically, Eversource requested a single emission limit as calculated on a 7-boiler operating day[34] rolling average. Therefore, to establish a single emission limit that is based on 7-day average and protective of the 1-hr SO_2 NAAQS for all of the various operating scenarios identified in the modeling analysis, the lowest limit of 0.39 lb/MMBtu was selected. This limit is considerably lower (and therefore more stringent) than the limits that would be protective of the 1-hr SO_2 NAAQS under the scenarios where MK1 and MK2 operate individually (i.e. 0.92 and 0.47 lb/MMBtu, respectively). To this end, the Temporary Permit establishes a SO_2 emissions limit of 0.39 lb/MMBtu calculated on a 7-boiler operating day rolling average to be applied at all times (including periods of startup and shutdown) and includes all emissions to the atmosphere from units MK1 and MK2 (i.e., emissions from MK1 and MK2 as measured by the CEMS located at the FGD outlet and any emissions from MK1 vented through the emergency stack (STMK2)). Emissions through STMK2 are only allowed during emergency situations as necessary to prevent severe damage to equipment or injury to personnel. Continuous emission monitoring (CEM), recordkeeping of emergency stack operation and SO_2 emission rates and percent reduction, and quarterly and semi-annual reporting will ensure that the operational and emission limitations are being met at all times (Attachment B, TP-0189, Tables 5, 6 and 7).

7.8 Enforceability of Control Measures

Section 172(c)(6) of the CAA requires that nonattainment area SIPs "include enforceable emission limitations, and such other control measures means or techniques...as well as schedules and timetables for compliance, as may be necessary or appropriate to provide for attainment of such standard in such area by the applicable attainment date specified in this subpart." In terms of general programmatic requirements, the following New Hampshire regulations provide for the permitting and enforcement of operational and emission limitations for all sources of SO_2 across the state:

- RSA 125:90-93 (recodified as RSA 125-C:11), provides for a statewide permit program.
- RSA 125:82 (recodified as RSA 125-C:15,) authorizes the agency to issue orders to correct violations.
- RSA 125:85 (recodified as RSA 125-C:15, II) authorizes the agency to obtain injunctive relief to prevent violations.
- RSA 125:86 (recodified as RSA 125-C:15, I-b) authorizes the agency to impose fines for violations of statutes and rules.
- Portions of TP-0189 (Appendix B) are submitted into the state implementation plan as part of this nonattainment plan.

7.9 Determination of Compliance

For operational and emission limitations established in the SIP to be enforceable, the SIP must identify methods for determining compliance with those limits. Emissions testing and monitoring are essential to this task. New Hampshire administrative rule Env-A 800: Testing and Monitoring Procedures, establishes minimum testing and monitoring procedures, calculation procedures, standards, and other requirements that are applicable to showing compliance with the SO_2 NAAQS. Relevant parts of this chapter include, but are not limited to, the following:

[34] Boiler operating day means a 24-hour period that begins at midnight and ends the following midnight during which any fuel is combusted at any time in the boiler. It is not necessary for the fuel to be combusted the entire 24-hour period.

- Env-A 802: Compliance Stack Testing for Stationary Sources
- Env-A 806: Sulfur Content Testing of Fuels
- Env-A 808: Continuous Emission Monitoring
- Env-A 810: Air Pollution Control Equipment Monitoring Plan; Additional Testing and Monitoring

When emissions are tested for compliance purposes, the New Hampshire rules specify that EPA-approved analytical reference methods shall be used. The most common reference method for evaluating compliance with SO_2 emission limits is known as Method 6 (including Methods 6, 6A, 6B, and 6C) in 40 CFR 60 Appendix A. However, many sources subject to emission limits in SO_2 nonattainment plans are required to operate continuous emission monitoring systems (CEMS) under other regulatory requirements. This is true for Merrimack Station. EPA considers reliable data obtained by a CEMS to represent credible evidence as to whether a source is complying with its SO_2 emission limits (40 CFR 51.212(c) and CAA section 113(a)(l)). Thus, for Merrimack Station, compliance with its SO_2 emission limits contained in Items #1 and #2 of Table 4 in Temporary Permit TP-00189 will be demonstrated by the use of certified CEMS data in accordance with Item #1 of Table 5 in Temporary Permit TP-0189. Recordkeeping and reporting requirements are described in Item #1 of Tables 6 and 7, respectively, also in the permit.

8. REASONABLE FURTHER PROGRESS

Section 172(c)(2) of the CAAA requires areas designated as nonattainment for criteria pollutants include a demonstration of Reasonable Further Progress (RFP) in nonattainment area plans.

Further, section 171(1) of the CAA defines reasonable further progress as "such annual incremental reductions in emissions of the relevant air pollutant as are required by this part (part D) or may reasonably be required by the EPA for the purpose of ensuring attainment of the applicable NAAQS by the applicable attainment date." EPA guidance explains that this definition is most appropriate for pollutants that are emitted by numerous and diverse sources, where the relationship between any individual source and the overall air quality is not explicitly quantified and where the emission reductions necessary to attain the NAAQS are inventory-wide. Conversely, the definition is generally less pertinent to pollutants like SO_2, where the sources affecting an area are usually limited in number and where emissions control measures for such sources can produce swift and dramatic improvement in air quality. That is, for SO_2, there is usually a single step between pre-control nonattainment and post-control attainment. Therefore, for SO_2, with its discernible relationship between emissions and air quality, and the ability to effect significant and immediate air quality improvements, RFP is best construed as "adherence to an ambitious compliance schedule" in order to ensure attainment of the NAAQS by the applicable attainment date (57 FR 13547, April 16, 1992).

New Hampshire has demonstrated an ambitious compliance schedule through the early implementation of the main control strategy – specifically, the continuous operation of the FGD system that became operational in September of 2011 at Merrimack Station in accordance with NH RSA 125-O, *Multiple Pollutant Reduction Program.* Indeed, this action has already achieved the desired effect of reducing SO_2 levels below the 2010 NAAQS as demonstrated in Section 6 of this plan. Further, the issuance of TP-0189 establishes federally enforceable SO_2 emission limitations and operational conditions that ensure continuous operation of the FGD and continued attainment of the NAAQS. This control strategy and compliance schedule meet EPA's criteria for reasonable further progress as outlined above, so no additional action related to RFP for the 2010 SO_2 NAAQS is required at this time.

9. CONTINGENCY MEASURES

Section 172(c)(9) of the CAA requires that the SIP provide for specific contingency measures to be implemented if a nonattainment area fails to make reasonable further progress or fails to meet the NAAQS by the applicable attainment date. Such contingency measures are to become effective without further action by the state or EPA. They are to consist of available control measures not already included in the control strategy for the nonattainment area SIP.

As EPA has previously explained[35], SO_2 presents special considerations stemming from the fact that control efficiencies for SO_2 control measures are well understood. On the other hand, the analytical tools for quantifying the relationship between reductions in precursor emissions and resulting air quality improvements remains subject to significant uncertainties. For example, reductions in VOC as a precursor to ozone formation will have inherently greater uncertainty in controlling for ozone. Because SO_2 control measures are based on what is directly and quantifiably necessary to attain the SO_2 NAAQS, it would be unlikely for an area to implement the necessary emission controls yet fail to achieve attainment. Therefore, for control of SO_2, contingency measures, the state will continue to operate a comprehensive program to identify sources of violations of the SO_2 NAAQS and will undertake aggressive compliance and enforcement actions, including expedited procedures for establishing consent agreements pending the adoption of the revised SIP. This is consistent with the approach for the implementation of contingency measures to address the 2010 SO_2 NAAQS as described in EPA guidance[36].

This comprehensive program to identify violations of the 2010 SO_2 NAAQS and undertake aggressive compliance and enforcement actions is embodied in New Hampshire's SIP revision entitled "Certification of State Implementation Plan Adequacy Regarding Clean Air Act Section 110(a)(1) and (2) for the 2010 Primary 1-Hour Sulfur Dioxide NAAQS." This document was submitted to EPA on September 13, 2013, and received proposed conditional approval on August 17, 2015 (80 FR 42446). Certain elements of this "infrastructure" SIP have specific relevance to the requirement to provide contingency measures in the nonattainment area plan and are listed here for reference:

- Subsection 110(a)(2)(B): Ambient Air Quality Monitoring/Data System;
- Subsection 110(a)(2)(C): Program for Enforcement of Control Measures;
- Subsection 110(a)(2)(F): Stationary Source Emissions Monitoring and Reporting;
- Subsection 110(a)(2)(G): Emergency Power.

10. NEW SOURCE REVIEW

Part D of title I of the CAA prescribes the procedures and conditions under which a new major stationary source or major modification at an existing major stationary source may obtain a preconstruction permit in an area designated nonattainment for any criteria pollutant. The nonattainment New Source Review (NSR) permitting requirements in section 172(c)(5) and 173 of the CAA are a required component of a nonattainment area SIP. Beginning on the effective date of nonattainment designation for the 2010 SO_2 NAAQS, proposed new major stationary sources and major modifications of existing SO_2 sources must obtain a NSR permit prior to the commencement of construction.

New Hampshire has an existing nonattainment NSR program, codified in administrative rule Env-A 618, Nonattainment New Source Review, that contains the applicable statutory requirements including, but not limited to:

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[35] *See* SO_2 Guideline Document, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N.C. 27711, EPA-452/R-94-008, February 1994; available at http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=2000H22J.txt).

[36] *Id.*

- The installation of Lowest Achievable Emissions Rate (LAER) control technology;
- The acquisition of emissions reductions to offset new emissions of nonattainment pollutant(s);
- Certification that all major sources owned and operated in the state by the same owner are in compliance with all applicable requirements under the CAA;
- A demonstration via an analysis of alternative sites, sizes, production process, and environmental control techniques shows that the benefits of a proposed source significantly outweigh the environmental and social costs imposed as a result of its location, construction, or modification; and
- An opportunity for a public hearing and written comment on the proposed permit.

In general, a state's nonattainment NSR program should ensure that the construction and modification of major stationary sources of SO_2 emissions will not interfere with reasonable further progress toward the attainment of the 2010 SO_2 NAAQS. The nonattainment NSR requirements apply to any source that has the potential to emit a nonattainment pollutant in amounts greater than the applicable major source threshold for the pollutant, i.e., in major amounts (40 CFR 51.165(a)(I)(iv)). For new sources, in areas that are designated nonattainment for the 2010 SO_2 NAAQS, the major source threshold is defined as 100 tons per year or more of SO_2 emissions. Similarly, nonattainment NSR requirements apply to any existing major stationary source of SO_2 emissions that proposes a major modification, i.e., a physical change or change in the method of operation that results in a significant net emissions increase, defined as 40 tons per year or more, of SO_2 emission increase (40 CFR 51.165(a)(I)(x)(A)).

As noted above, New Hampshire has an existing nonattainment NSR program. This amended rule, effective on September 1, 2012, hinges on the area attainment status established in 40 CFR 81.330 – [see Env-A 602.02(a)(1)]. Because the Central New Hampshire Nonattainment Area is incorporated into 40 CFR 81.330, and because the referenced rule was previously adopted, New Hampshire has the requisite nonattainment NSR program for the 2010 SO_2 NAAQS. New Hampshire submitted the amended version of Env-A 618 (Nonattainment NSR Program) along with an amended version of Env-A 619, Prevention of Significant Deterioration (PSD Program) for SIP approval on November 15, 2012. EPA has granted conditional approval of New Hampshire's Nonattainment New Source Review and Prevention of Significant Deterioration Programs as published in the Federal Register on September 25, 2015 (80 FR 57722). New Hampshire submitted a SIP amendment relative to these programs in November 2016.

11. CONFORMITY

General conformity, as set forth in section 176(c) of the CAA, requires that actions by federal agencies do not cause new air quality violations, worsen existing violations, or delay timely attainment of the relevant NAAQS. General conformity applies to any federal action (e.g., funding, licensing, permitting, or approving), other than certain highway and transportation projects, if the action takes place in a nonattainment or maintenance area (i.e., an area which submitted a maintenance plan that meets the requirements of section 175A of the CAA and has been redesignated to attainment) for any NAAQS. Projects that are Federal Highway Administration (FHWA)/Federal Transit Administration (FTA) projects as defined in 40 CFR §93.101, are generally not subject to general conformity requirements and are instead subject to transportation conformity. However, per 40 CFR §93.101, general conformity requirements do apply to a federal highway and transit project that does not involve title 23 or title 49 funding but requires FHWA or FTA approval, such as is required for a connection to an Interstate highway or for a deviation from applicable design standards.

EPA's General Conformity Rule (40 CFR 93.150 to 93.165) establishes the criteria and procedures for determining if a federal action conforms to the SIP. With respect to the 2010 SO_2 NAAQS, federal agencies are expected to continue to estimate emissions for conformity analyses in the same manner as they estimated emissions for conformity analyses under the previous NAAQS for SO_2. The General Conformity Rule includes the basic requirement that a federal agency's general conformity analysis be based on the latest and most accurate emission estimation techniques available (40 CFR §93.159(b)). General conformity imposes requirements on federal agencies and federally funded projects, but it does not require any particular actions by state air agencies and has no direct implications for SO_2 nonattainment area plans. New Hampshire addresses General Conformity under state rules at Env-A 1500.

Transportation conformity is required under CAA section 176(c) to ensure that federally supported highway and transit project activities are consistent with ("conform to") the purpose of the SIP. Transportation conformity applies to areas designated nonattainment and to areas redesignated to attainment after 1990 (i.e., "maintenance areas" with plans developed under CAA section 175A) for transportation-related criteria pollutants. Because of the relatively small and decreasing, amounts of sulfur in gasoline and diesel fuel, EPA's transportation conformity rules do not apply to SO_2 unless either the EPA Regional Administrator or the director of the state air agency has found that transportation-related emissions of SO_2, as a precursor to particulate matter, are a significant contributor to $PM_{2.5}$ nonattainment, or unless the SIP has established an approved or adequate budget for such emissions as part of the attainment, maintenance, or RFP strategy (40 CFR 93.102(b)(1), (2)(v)). Because none of these conditions is present with respect to New Hampshire's plan for SO_2 attainment, transportation conformity is not relevant to this SIP submittal.

Appendix A

Modeling Protocol

Central New Hampshire Nonattainment Area
Modeling Protocol for the 1-Hour SO_2 National Ambient Air Quality Standard

June 5, 2015 *****Revised September 28, 2016*****

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

INTRODUCTION

EPA has established a new 1-hour SO_2 national ambient air quality standard (NAAQS) of 75 parts per billion (or 196 micrograms per cubic meter) based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations. On August 5, 2013, EPA designated portions of Hillsborough, Merrimack, and Rockingham Counties as a nonattainment area for the 1-hour SO_2 NAAQS (see 78 FR 47191). The New Hampshire Department of Environmental Services (NHDES) must submit a State Implementation Plan (SIP) for this nonattainment area (the "Central New Hampshire Nonattainment Area"). This SIP must include a plan for attaining the 1-hour SO_2 NAAQS in this area by no later than October 4, 2018. NHDES intends to submit a request to EPA to re-designate the Central New Hampshire Nonattainment Area to attainment along with the Central New Hampshire Nonattainment Area SO_2 SIP. For both of these efforts, an air quality dispersion modeling analysis will be used to demonstrate that SO_2 levels will meet the NAAQS by the required attainment date and that compliance with the standard will be maintained, thereby warranting a re-designation to attainment status. The purpose of this modeling protocol is to outline the methods, inputs, and assumptions that will be used in the dispersion modeling analysis for the Central New Hampshire Nonattainment Area attainment demonstration.

It should be noted that the SO_2 environment in the Central New Hampshire Nonattainment Area is almost entirely characterized by emissions from PSNH Merrimack Station. PSNH was required by state statute (RSA125-O:11-18) to install a flue gas desulfurization (FGD) system to control mercury and SO_2 emissions at Merrimack Station. Installation of this system was required by July 1, 2013, and the system was operational by September 28, 2011, almost two years ahead of the deadline. It should be further noted that once the FGD began operations, the 99th percentile 1-hour maximum daily SO_2 values measured at the Pembroke monitor were well below the level of the NAAQS. Accordingly, the 3-year design value for 1-hour SO_2 (2012, 2013, and 2014) now meets the NAAQS at the Pembroke and Concord SO_2 monitoring stations, both located within the nonattainment area.

The following sections of this modeling protocol outline the methodology, data inputs, and assumptions that NHDES intends to use in the air quality dispersion modeling analysis to demonstrate current and future attainment of the 1-hour SO_2 NAAQS in the Central New Hampshire Nonattainment Area. The analysis will follow the recommendations provided in the following EPA guidance documents:

- *Guidance for 1-Hour SO_2 Nonattainment Area SIP Submissions*, April 23, 2014 (http://www.epa.gov/airquality/sulfurdioxide/pdfs/20140423guidance.pdf)
- *Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard*, March 1, 2011 (http://www.epa.gov/ttn/scram/guidance/clarification/Additional_Clarifications_AppendixW_Hourly-NO2-NAAQS_FINAL_03-01-2011.pdf, parts of which are also applicable to the 1-hour SO_2 standard)
- *Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard*, August 23, 2010 (http://www.epa.gov/ttn/scram/guidance/clarification/ClarificationMemo_AppendixW_Hourly-SO2-NAAQS_FINAL_08-23-2010.pdf)

MODELING METHODOLOGY

Per the above guidance documents, as well as Appendix W, *Guideline on Air Quality Models* (http://www.epa.gov/ttn/scram/guidance/guide/appw_05.pdf), AERMOD is the preferred model for performing the type of analysis required to demonstrate attainment with the 1-hour SO_2 NAAQS. Therefore, NHDES intends to use AERMOD to perform a refined dispersion modeling analysis using 23 months of meteorological data that was collected at Merrimack Station (plus one month of Concord meteorological data such that a full two meteorological years are modeled). The most recent model versions will be used (i.e. AERMOD and AERMET versions 15181). Rural dispersion coefficients and model default options will be used in the analysis. The modeling will encompass eight operating scenarios for Merrimack Station and will determine if permitted emissions will show compliance with the 1-hour SO_2 NAAQS. If not, additional modeling will be conducted to determine the "critical emission value", i.e., the maximum level of emissions for which predicted concentrations will meet the NAAQS. The inputs that will be used, including emissions inventory, meteorology, background air quality, and receptor grid are discussed in detail in the following sections.

EMISSIONS INVENTORY AND SOURCE PARAMETERS

As mentioned earlier, the SO_2 environment in the Central New Hampshire Nonattainment Area is almost entirely characterized by emissions at PSNH Merrimack Station. Therefore, the modeled emissions inventory will include the maximum permitted 1-hour SO_2 emission rates for Merrimack Station units MK1 and MK2. It is anticipated that the maximum permitted emission rates will show compliance with the 1-hour SO_2 NAAQS. If not, iterative modeling will be used to determine an appropriate enforceable emissions limit that will demonstrate compliance with the NAAQS.

Eight scenarios will be modeled, representing three normal operating scenarios and five exceptional events/shutdown scenarios. The five exceptional events conditions proposed for modeling include 10 minute bypass events in combination with 50 minutes (0.83 x emission rate) of normal operations of Scenarios 1, 2 or 3. The preliminary emission rates and stack parameters for these scenarios are shown in Table 1. As mentioned above, final emission rates will include the maximum permitted hourly rates. Stack parameters are reflective of the operating or expected conditions at those emission rates.

Table 1A. Normal Operations Emission Rates and Stack Parameters

Parameter	Normal Operating Scenarios		
Scenario	Scenario 1	Scenario 2	Scenario 3
Units in Operation	MK1 + MK2 w/FGD	MK1 w/FGD	MK2 w/FGD
SO_2 Emission Rate (lb/hr)	2,110	555	1,556
Stack Height (ft)	445	445	445
Stack Diameter (ft)	21.5	21.5	21.5
Exhaust Flow (acfm)	1,304,420	379,831	924,589
Exhaust Temp (F)	130	127	130

Table 1B. Exceptional Event Condition Emission Rates and Stack Parameters

Parameter	Event Operating Scenarios						
Scenario	Event A			Event B		Event C	
Units in Operation	MK1 + MK2 w/FGD	MK1 Emergency	MK2 Emergency	MK1 w/FGD	Emergency Shut Down	MK2 w/FGD	Emergency Shut Down
SO_2 Emission Rate (lb/hr)	1,759	1,155	259	462	1,155	1297	259
Stack Height (ft)	445	317	445	445	317	445	445
Stack Diameter (ft)	21.5	14.5	21.5	21.5	14.5	21.5	21.5
Exhaust Flow (acfm)	1,304,420	475,647	924,589	379,831	475,647	924,589	924,589
Exhaust Temp (F)	130	343	130	127	343	130	130

Parameter	Event Operating Scenarios				
Scenario	Event D			Event E	
Units in Operation	MK1 + MK2 w/FGD	MK1 Emergency	MK2 Emergency	MK2 w/FGD	Emergency Shut Down
SO_2 Emission Rate (lb/hr)	1,759	1,155	259	1297	259
Stack Height (ft)	445	317	445	445	445
Stack Diameter (ft)	21.5	14.5	21.5	21.5	21.5
Exhaust Flow (acfm)	1,304,420	475,647	750,000	924,589	750,000
Exhaust Temp (F)	130	343	130	130	130

Note: Events D and E are similar to Events A and C except with a lower exhaust flow bounding.

Other emissions units at Merrimack Station (peak combustion turbines, emergency generator, emergency boiler, and fire pump) do not operate frequently enough to contribute to the annual distribution of daily maximum 1-hour concentrations. The operating hours for these devices for the previous four years (2011-2014) are shown in Table 2.

Modeled source inputs will include direction-specific estimates of projected building height and width for evaluating the effects of building downwash. Building downwash inputs for AERMOD will be derived with BPIP-PRIME.

Table 2
Operating Hours for Additional Emissions Units at Merrimack Station

	Operating Hours (% of the year in parentheses)				
Emissions Unit	**2011**	**2012**	**2013**	**2014**	**2011-2014 Average**
Peak Turbine 1	9 (0.10%)	5 (0.06%)	53 (0.61%)	114 (1.30%)	45 (0.52%)
Peak Turbine 2	7 (0.08%)	4 (0.05%)	36 (0.41%)	113 (1.29%)	40 (0.46%)
Emergency Generator	15 (0.17%)	11 (0.13%)	24 (0.27%)	18 (0.21%)	17 (0.20%)
Emergency Boiler	-	109 (1.24%)	13 (0.15%)	50 (0.57%)	43 (0.49%)
Fire Pump	3 (0.03%)	3 (0.03%)	3 (0.03%)	2 (0.02%)	3 (0.03%)

It should be noted that there are no other emissions sources within the Central New Hampshire Nonattainment area that have emitted more than 100 tons per year of SO_2 in the past three years. In addition, the only other sources near the proposed 1-hour SO_2 modeling domain with emissions greater than 100 tons per year are PSNH Schiller and Newington Stations. These sources are located just beyond the outer limit of the modeling domain, approximately 55 km to the east-southeast of Merrimack Station. They are not expected to contribute significantly to maximum predicted impacts in the Central New Hampshire Nonattainment Area. Therefore, all SO_2 emissions not from Merrimack Station MK1/MK2, including emissions from mobile sources, distant sources, and smaller nearby sources, will be represented by the background air quality (please see the section on background air quality below).

METEOROLOGY

The meteorological data to be used for the 1-hour SO_2 SIP modeling includes a 23-month period of on-site data collected at Merrimack Station during 1994 and 1995. These data were supplemented with corresponding 1994 and 1995 surface observations from Concord Airport and upper air soundings from Portland and Gray, ME. In addition, one month of Concord-based meteorology was added to the 23-month period of on-site data in order to provide two complete years for modeling. This on-site meteorology data has been reprocessed in a manner consistent with current modeling guidance. This revised data set will be used in the SIP modeling for the Central New Hampshire Nonattainment Area.

The meteorological data were processed using AERMET (v15181). All five tower measurement levels and fifteen SODAR levels were included. A minimum wind speed of 0.3 m/s was set for the tower wind speeds. AERMET requires additional data (surface observations of sky cover, ceiling height, and surface pressure and upper air observations of wind and temperature) that were not available from the on-site measurements. Surface observations from Concord Municipal Airport (station #14745) in Concord, NH were used to supplement the on-site surface data. Concord Municipal Airport observations were also used to substitute for any missing on-site wind and temperature observations. Only 51 of the 17,520 hours (approximately 0.3%) during the 23-month period had missing on-site wind speed or direction (0.3%), and no on-site hourly temperature measurements were missing. Soundings from Portland, ME (station #14764) and Gray, ME (station #54762) were obtained to provide the upper air data. These data were available from Portland until September 21, 1994 and from Gray thereafter. AERMET also requires land cover data to determine the roughness length, albedo, and Bowen ratio which are used for atmospheric boundary layer scaling in AERMOD. The "new_hampshire_NLCD_erd031600.tif" file was used for these data. The most recent version of the EPA program AERSURFACE (version 13016) was used to provide these parameters for use in AERMET. AERSURFACE was run with the EPA-recommended 1 km radius around the meteorological tower location and with twelve, 30-degree wind sectors. Monthly seasonal assignments were specified for December, January, February, and March as winter with snow; November as winter without snow; April and May as spring; June, July, and August as summer; and September and October as autumn. Roughness length, albedo, and Bowen ratio were specified for the on-site meteorological tower and the Concord Municipal Airport data and were input to AERMET.

Table 3
Tower data (2-100m) and SODAR data (120m-600m)

Height (m)	Temperature (degrees C)	Wind Speed (m/s)	Wind Direction (degrees)	Sigma-Theta (degrees)	Sigma-w (m/s)
2	X				
10	X	X	X	X	X
40	X				
70	X	X	X	X	X
100	X	X	X	X	X
120-600 at 30m intervals		X	X		

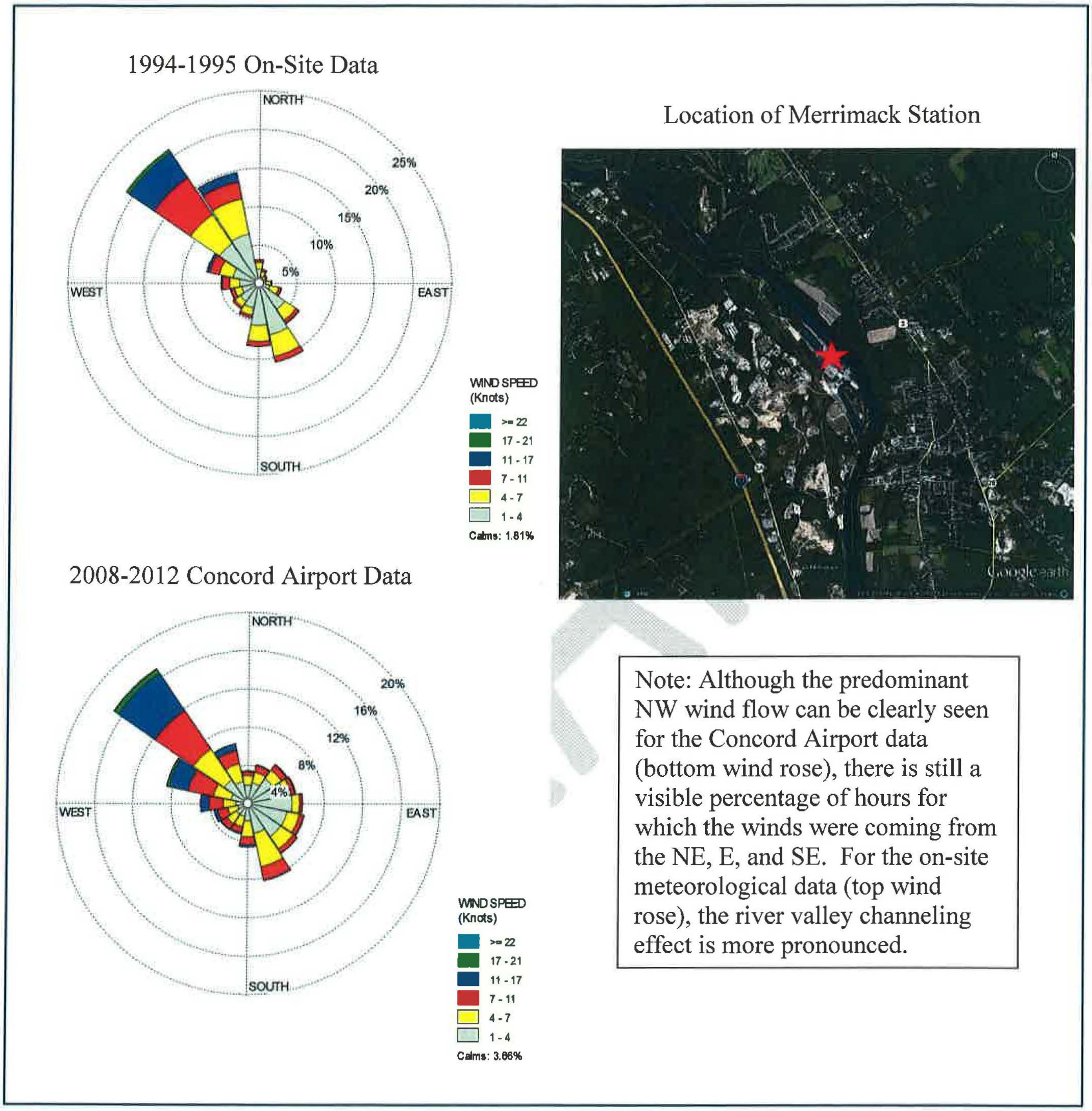
NHDES also considered the use of more recent (2008 to 2012) NWS data collected at Concord Airport. This data is significantly newer than the on-site data described above and it takes advantage of the 1-minute ASOS data that AERMET has been recently coded to handle along with its associated processor, AERMINUTE. Despite these potential advantages, NHDES has found that the 1994-1995 on-site meteorological data is more appropriate than the NWS data for modeling emissions from Merrimack Station and their impact on the Central New Hampshire Nonattainment Area. NHDES has come to this conclusion for the following reasons:

- The on-site data was collected at tower heights up to 100m (as well as by SODAR to heights of 600m). The NWS data at Concord Airport is collected at an anemometer height of 26ft (8m). Therefore, the on-site data is more indicative of the wind conditions at stack top and plume height for the relatively tall stacks at Merrimack Station.
- The on-site wind direction data is more representative of the channeling effect caused by Merrimack Station's location in a valley area along the Merrimack River (Figure 1).
- The on-site data has been previously approved for permit-related modeling at Merrimack Station, most notably for the permit for the FGD system.

BACKGROUND AIR QUALITY

The closest ambient SO_2 monitor to Merrimack Station is located at Pleasant Street in Pembroke (ID #33-013-1006). However, as mentioned in earlier sections, SO_2 air quality relevant to the 99^{th} percentile in this area is dominated by the emissions at Merrimack Station. To add measured values from the Pembroke monitor to modeled concentrations from Merrimack Station would

Figure 1
Wind Roses for 1994-1995 On-Site Data and 2008-2012 Concord NWS Data



double count the estimated impacts for many meteorological hours and would yield overly conservative results.

For attainment modeling, monitoring data is intended to represent background concentrations attributable to sources that will not be explicitly modeled, such as distant sources of SO_2, mobile sources, and small stationary and area sources. For this analysis, representative background concentrations will be added to the impacts predicted from Merrimack Station. Currently, there are only two monitors in central New Hampshire that continuously monitor 1-hour SO_2 concentrations. These are the Pembroke monitor (33-013-1006) on Pleasant Street, located less than 1 mile southeast of Merrimack Station, and the Concord monitor (33-013-1007) on Hazen Drive, located approximately 6 miles north-northwest of Merrimack Station. Neither of these monitors was sited with the objective of measuring regional background, and each monitor is considered to represent population exposure on a local scale. Both monitors reflect impacts attributable to emissions from Merrimack Station. Because there is no SO_2 monitoring station intended to collect regional background concentrations in central New Hampshire, a combination of data from these two monitoring sites will be used to estimate regional background. The use of data from these sites can be considered conservative relative to use of a purely regional site, since the data from these sites will include impacts from local sources, including Merrimack Station to some degree.

Appendix W (Section 8.2.2) and EPA's March 1, 2011 memorandum "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard," outline an approach to minimize double-counting of contributions from sources included in the modeled background. The guidance recommends using a 90-degree downwind sector to determine a source's area of impact. In other words, if the wind direction is within 45 degrees of the direction from the modeled source to the monitor, the hour can be excluded from those used to determine ambient background concentrations. However, a review of the Pembroke monitoring data shows that this method will not work as intended. There are many hours, including some with the highest measured SO_2 concentrations, for which the measured impact at either of the two monitors is clearly attributable to Merrimack Station, but where the wind direction is outside of the assumed 90-degree source impact sector. As a result, these impact hours would not be excluded with this approach, even though the impacts are clearly due to emissions from Merrimack Station. This is especially true for the Pembroke monitor. The wind direction at Pembroke is measured at about 30 feet above the ground while the plume from Merrimack Station is typically several hundreds of feet above the ground. Wind direction is not constant with height, especially in a winding river valley. Therefore, the wind direction measured at the Pembroke monitor is not necessarily representative of winds at the plume transport level for Merrimack Station. Historically, many of the highest 1-hour SO_2 concentrations at the Pembroke monitor were measured during hours when the wind direction at the monitor was outside of the assumed 90 degree exclusion sector spanning 277 degrees to 7 degrees. The result of the wind sector exclusion guidance would be to include these hours in the monitored background even though they are clearly being affected by emissions from Merrimack Station.

Completely eliminating the Pembroke monitor from the ambient background data would avoid the potential double counting of emissions from Merrimack Station but would adversely affect the determination of regional background levels of SO_2. This is because, other than for hours of impact by Merrimack Station, the Pembroke monitor is obviously representative of background in nearby areas.

The Pembroke monitor is generally affected by Merrimack Station during hours with northwesterly and northerly winds while the Concord monitor is affected by Merrimack Station during hours with southerly winds. It is unlikely they would both be impacted by Merrimack Station during the same hour. Therefore, a reasonable and simple method of determining SO_2 background is to select the lowest available monitored concentration for each hour of the most recent complete 3-year period from these two monitors. Once compiled, background values will be added to the modeling based on the distribution of concentrations by season and hour-of-day in accordance with recommendations in the EPA modeling Additional Clarification Memo. This approach has the best chance of excluding monitored data that are affected by the significant SO_2 sources that are being explicitly modeled while still making use of data that may be representative of regional background levels.

It is felt that this methodology accurately characterizes the contribution from background sources of SO_2 and adequately excludes the influence of Merrimack Station. AERMOD version 15181 is coded to directly accept a table of background values by hour by season as input. The background data to be used in the 1-hour SO_2 SIP modeling is shown below in Table 4.

RECEPTOR GRID

The receptor grid to be used in the SIP modeling will be based on a network that was used in the modeling for the FGD permit. This polar grid is centered on Merrimack Station and extends to a distance of 50 km in all directions. Therefore, this receptor grid adequately covers the entire Central New Hampshire Nonattainment Area. Polar grid radii are spaced at 10 degree intervals, and inner receptor rings are sufficiently dense such that the area of maximum impact will be accurately captured. The details of the polar receptor grid are summarized below:

- Centered on Merrimack Station
- Radii interval = every 10 degrees from 0 to 350 degrees
- Ring spacing = 20 m from 20 to 200 m
- Ring spacing = 50 m from 200 to 500 m
- Ring spacing = 100 m from 500 to 2,000 m
- Ring spacing = 250 m from 2,000 to 10,000 m
- Ring spacing = 500 m from 10,000 to 30,000 m
- Ring spacing = 1,0000 m from 30,000 to 50,000 m

Table 4
One Hour SO_2 Background by Season and Hour of the Day (2012-2014)

Hour Beginning	Winter	Spring	Summer	Fall
0	9.68	4.36	1.22	3.57
1	9.33	3.92	1.05	3.31
2	9.24	3.92	1.22	3.31
3	7.93	3.66	0.96	3.84
4	8.63	3.31	1.05	4.45
5	9.16	3.14	1.13	4.62
6	9.33	3.92	2.53	4.80
7	9.50	4.88	2.79	6.02
8	10.29	4.10	2.96	5.41
9	11.33	4.80	7.24	4.71
10	12.82	5.32	3.92	4.27
11	11.60	4.45	2.79	5.06
12	10.38	4.45	2.35	4.62
13	10.46	4.36	2.79	4.45
14	10.46	3.40	2.88	4.27
15	10.81	3.84	2.44	3.75
16	11.07	3.92	2.09	4.01
17	11.16	3.49	1.83	4.71
18	10.11	3.92	1.74	4.36
19	11.60	4.88	2.09	4.97
20	9.77	5.41	1.66	4.36
21	8.89	4.45	1.22	4.45
22	8.81	4.80	1.31	3.92
23	9.68	4.62	1.13	3.49

At EPA's request, additional receptors were added in dense arrays over areas of expected maximum predicted concentration. Figure 2 shows the full polar receptor grid superimposed over a Google Earth map.

It should be noted that receptors will be not be placed in areas where public access is precluded. The Merrimack Station property is bounded by fencing, storage piles, wetlands, and the Merrimack River. For the FGD permit modeling, a receptor network was set up to represent this boundary and receptors were not placed within this boundary. The boundary receptor network consisted of receptors placed at 20 meter intervals around the entire boundary perimeter. This boundary network was approved for use in the modeling for the FGD permit, and its use is proposed for the 1-hour SO_2 SIP modeling. The boundary receptors and the inner polar receptor grid are shown in Figure 3.

SUMMARY

In summary, NHDES proposes to model maximum hourly permitted SO_2 emissions from Merrimack Station using the most recent version of AERMOD. Emissions from units MK1 and MK2 will be addressed, and three normal operating cases and five exceptional events/shutdown scenarios will be analyzed. Since the SO_2 environment in the Central New Hampshire Nonattainment area is almost entirely characterized by emissions from Merrimack Station, the emissions inventory for MK1 and MK2 alone will be adequate as input for the modeling analysis. Emissions from other sources will be characterized using background concentrations that vary by season and hour of day based on monitored SO_2 data that excludes the influence of emissions from Merrimack Station. Twenty three months of on-site meteorological data collected during 1994 and 1995 have been reprocessed using the most recent version of AERMET and will be used in the modeling analysis (along with one month of Concord data such that a full two years are modeled). Should the maximum permitted emissions not be sufficient to demonstrate attainment with the 1-hour SO_2 NAAQS, iterative modeling will be used to find the critical emission value which will, in turn, form the basis of an enforceable limit that will assure attainment. The results of the modeling analysis will be clearly documented. The analysis results and documentation will be suitable for inclusion in the 1-hour SO_2 SIP submission for the Central New Hampshire Nonattainment Area as well as for the request for re-designation to attainment.

Figure 2
Modeling for 1-hour SO_2 SIP, Full Polar Receptor Grid

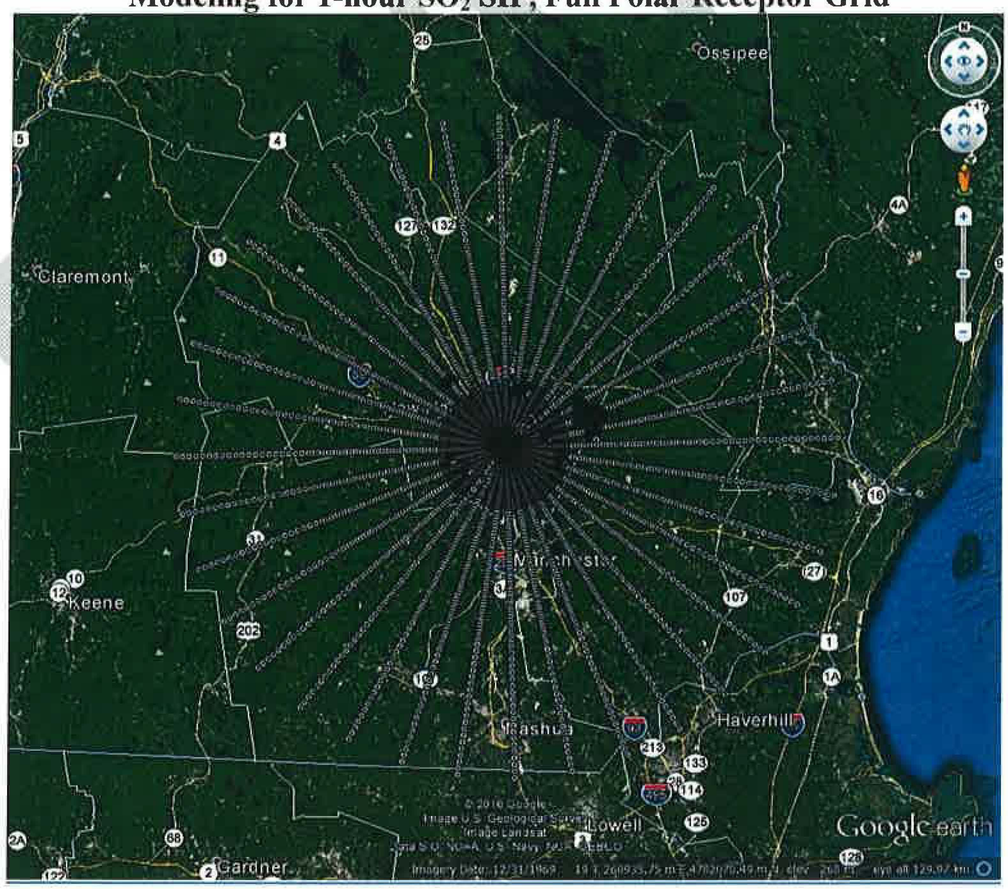


Figure 3
Modeling for 1-hour SO_2 SIP, Boundary Receptor Network and Inner Polar Grid

Appendix B

Eversource Merrimack Station Temporary Permit T-0189

State of New Hampshire
Department of Environmental Services
Air Resources Division

Temporary Permit

Permit No: TP-0189
Date Issued: September 1, 2016

This certifies that:

Public Service of New Hampshire d/b/a Eversource Energy
780 North Commercial Street
Manchester, NH 03101

has been granted a Temporary Permit for:

Two Utility Boilers

at the following facility and location:

Merrimack Station
431 River Road
Bow, NH 03304

Facility ID No: **3301300026**
Application No: **15-0500**, received September 18, 2015 - Temporary Permit, with additional information received on February 8, 2016, April 22, 2016 and June 6, 2016.

which includes devices that emit air pollutants into the ambient air as set forth in the permit application referenced above which was filed with the New Hampshire Department of Environmental Services, Air Resources Division (Division) in accordance with RSA 125-C of the New Hampshire Laws. Request for permit renewal must be received by the Division at least 90 days prior to expiration of this permit and must be accompanied by the appropriate permit application forms.

This permit is valid upon issuance and expires on **March 31, 2018**.

Craig Wright
COPY

Director
Air Resources Division

VI. Operating and Emission Limitations

The Owner or Operator shall be subject to the operating and emission limitations identified in Table 4:

Table 4 - Operating and Emission Limitations

Item #	Requirement	Applicable Emission Unit	Regulatory Basis
1.	*NAAQS Attainment Demonstration - SO_2 Emission Limitation* Sulfur dioxide emissions from MK1 and MK2 combined shall not exceed 0.39 lb/MMBtu on a 7-boiler operating day[7] rolling average.	MK1 & MK2	RSA 125-C:11 IV
2.	*The following condition supersedes conditions contained in Table 4, Items 6.a & 8.a of TP-0008* *SO_2 Emission Limitation for Mitigation of Regional Haze* a.) Except as provided in b.) below, actual SO_2 emissions from MK1 & MK2 combined shall be reduced by at least 94.0% based on a 30-boiler operating day rolling average basis. The SO_2 percent reduction shall be calculated at the end of each boiler operating day in accordance with Table 5, Item 2. b.) If the SO_2 percent reduction of 94.0% (as calculated on a 30-boiler operating day rolling average basis) is not met on a boiler operating day, compliance shall alternatively be achieved if on the same day: i. The actual combined SO_2 emissions from MK1 and MK2 are less than or equal to 0.24 lb/MMBtu, as calculated on a 30-boiler operating day rolling average basis; and ii. The actual combined SO_2 emissions from MK1 and MK2 are reduced by at least 93.4%, as calculated on a 30-boiler operating day rolling average basis. c.) The facility is limited to utilizing the alternate compliance option listed in b.) above to no more than 7 boiler operating days during any consecutive 30-boiler operating day period.	MK1 & MK2	Env-A 2302

7 Boiler operating day means a 24-hour period that begins at midnight and ends the following midnight during which any fuel is combusted at any time in the boiler. It is not necessary for the fuel to be combusted the entire 24-hour period.

Table 4 - Operating and Emission Limitations			
Item #	**Requirement**	**Applicable Emission Unit**	**Regulatory Basis**
3.	*The following condition supersedes the condition contained in Table 4, Item 10 of Temporary Permit TP-0008* <u>*Emergency Stack Operation*</u> a.) Emissions from MK1 shall be vented through the emergency stack (STMK2) only during emergency situations as necessary to prevent severe damage to equipment or potential injury to personnel. b.) No fuel shall be supplied to MK1 while emissions are vented through the emergency stack. c.) Emergency stack may also be used for ventilation during maintenance activities when the boiler is offline.	MK1	RSA 125-C:11 IV

VII. Monitoring and Testing Requirements

The Owner or Operator shall be subject to the monitoring requirements identified in Table 5:

Table 5 - Monitoring and Testing Requirements

Item #	Parameter	Method of Compliance	Frequency	Applicable Unit	Regulatory Basis
1.	SO_2	*Determination of Compliance with SO_2 Emission Limitations* a.) Compliance with the SO_2 lb/MMBtu emission limitations shall be determined as the sum of **all** SO_2 emissions from MK1 and MK2, i.e., emissions from MK1 and MK2 as measured by the CEMS located at the FGD outlet and any emissions from MK1 venting through the emergency stack (STMK2). b.) Demonstrate compliance by using all valid, quality-assured hourly data recorded by the CEMS and any emergency stack emissions to calculate the average emissions rate in lb/MMBtu on a 7- (or 30-) boiler operating day rolling average basis, updated at the end of each new boiler operating day.	Each boiler operating day	MK1 & MK2	Env-A 604.01
		c.) For each boiler operating hour[8], calculate the hourly SO_2 emission rate (lb/MMBtu) as follows: $Her = \frac{FGD\ Outlet\ SO_2 + Emergency\ Stack\ SO_2}{MK1HI + MK2HI}$ - (Eq. 1a) Where, FGD Outlet SO_2 = Controlled SO_2 emission rate[9] (lb/hr) from FGD stack (STMK3) monitor Emergency Stack SO_2 = Uncontrolled MK1 SO_2 emissions rate in lb/hr from the emergency stack (STMK2), calculated as per Table 6, Item 1.c MK1HI = MK1 boiler hourly heat input rate (MMBtu/hr)[10] MK2HI = MK2 boiler hourly heat input rate (MMBtu/hr)			
		d.) At the end of each boiler operating day, calculate the 7-(or 30-) boiler operating day rolling averages using Eq. 1b. Average SO_2 emission rate = $\frac{\sum_{i=1}^{n} Her_i}{n}$ - (Eq. 1b) Where: Her_i is the hourly emission rate in lb/MMBtu for hour i and n is the number of hourly emissions rate values collected over the averaging period.			

8 Boiler operating hour means a clock hour during which a boiler combusts any fuel, either for part of the hour or for the entire hour.

9 Hourly SO_2 mass emission rates $MK1SO_2$, $MK2SO_2$ and FGD $OutletSO_2$ shall be calculated using 40 CFR 75, Appendix F, Eq. F-1.

10 Hourly heat input rates shall be calculated using 40 CFR 75, Appendix F, Eq. F-15

Table 5 - Monitoring and Testing Requirements					
Item #	**Parameter**	**Method of Compliance**	**Frequency**	**Applicable Unit**	**Regulatory Basis**
2.	SO_2	*Determination of Compliance with SO_2 Percent Reduction* a.) Compliance with the percent reduction requirement shall be determined by comparing the sum of uncontrolled SO_2 emission rates for MK1 and MK2 (as measured by CEMS located in the respective boiler duct) **and** the sum of controlled SO_2 emission rate (as measured by CEMS located at the FGD outlet) and any MK1 SO_2 emissions venting through the emergency stack. b.) For each boiler operating hour, calculate the average emission rate in lb/hr for each measurement location by using all valid, quality-assured hourly data recorded by each CEMS.	Each boiler operating day	MK1 & MK2	Env-A 604.01
		c.) Hourly percent reduction (Hpr) shall be calculated as follows: $Hpr = \frac{(MK1SO_2 + MK2SO_2) - (FGD\ Outlet\ SO_2 + Emergency\ Stack\ SO_2)}{(MK1SO_2 + MK2SO_2)} X\ 100$ - (Eq. 2) Where, $MK1SO_2$ = Uncontrolled SO_2 emission rate in lb/hr for MK1 boiler $MK2SO_2$ = Uncontrolled SO_2 emission rate in lb/hr for MK2 boiler FGD Outlet SO_2 = Controlled SO_2 emission rate in lb/hr from FGD stack (STMK3) monitor Emergency Stack SO_2 = Uncontrolled MK1 SO_2 emissions rate in lb/hr vented through emergency stack (STMK2)			
		d.) At the end of each boiler operating day, calculate the 30- boiler operating day rolling average percent reduction using Equation 3: Average percent reduction = $\frac{\sum_{i=1}^{n} Hpr_i}{n}$ - (Eq. 3) Where: Hpr_i is the hourly percent reduction for hour i and n is the number of hourly percent reduction values collected over 30-boiler operating days.			

VIII. Recordkeeping Requirements

The Owner or Operator shall be subject to the recordkeeping requirements identified in Table 6:

Table 6 - Recordkeeping Requirements				
Item #	**Requirement**	**Duration/ Frequency**	**Applicable Unit**	**Regulatory Basis**
1.	*The following condition supersedes the condition contained in Table 7, Item 5.b of Temporary Permit TP-0008* *Emergency Stack Operation* Maintain records of emergency stack (STMK2) operation including: a.) Date(s) and time(s) during which MK1 emissions were discharged through the emergency stack; b.) Description of the reason for emergency stack operation, corrective action taken (if applicable), and estimates of emissions released during the emergency stack venting operation. c.) MK1 boiler's uncontrolled SO_2 emissions vented through the emergency stack as per Table 4, Item 3 must be quantified using the following methodology: i. Use MK1 CEM[11] data during the venting period, if it is available. ii. If CEM data during emergency stack venting is not available, use CEM data from the last valid hour prior to the emergency stack venting to estimate the emissions. The emission rate may be prorated for the length of time that the emergency venting actually occurred. iii. If current emission data from MK1 CEMS is not available, then estimate the emissions by using historic CEM data, compliance stack tests or AP-42 emission factors, whichever yields the highest emissions.	For each use of emergency stack STMK2	MK1	Env-A 906
2.	*SO_2 Emission Rate Limitation Monitoring Records*: Maintain monitoring records specified in Table 5, Items 1 and 2 including the following information: a.) Operating status (operating/not operating) for MK1 and MK2 for each calendar hour b.) The following emissions data for each boiler operating hour: i. Uncontrolled SO_2 emission rate in lb/hr for MK1; ii. SO_2 emission rate in lb/hr for MK1 emergency	Hourly and daily, as specified	MK1 & MK2	Env-A 906

[11] MK1 CEM located in the boiler duct measures uncontrolled SO_2 emissions.

Table 6 - Recordkeeping Requirements				
Item #	**Requirement**	**Duration/ Frequency**	**Applicable Unit**	**Regulatory Basis**
	stack venting (if applicable); iii. Uncontrolled SO_2 emission rate in lb/hr for MK2; and iv. Controlled SO_2 emission rate in lb/hr & lb/MMBtu at the FGD outlet; c.) The following SO_2 emission rates and percent reduction rates, for each boiler operating day; i. 7-boiler operating day rolling average SO_2 emission rate in lb/MMBtu; ii. 30-boiler operating day rolling average SO_2 emission rate in lb/MMBtu; and iii. 30-boiler operating day rolling average SO_2 percent reduction.			

IX. Reporting Requirements

The Owner or Operator shall be subject to the reporting requirements identified in Table 7:

Table 7 - Reporting Requirements				
Item #	**Requirement**	**Frequency**	**Applicable Emission Unit**	**Regulatory Basis**
1.	Include the information recorded in Table 6, Item 1 in the semi-annual permit deviation/monitoring report required by Table 9, Item 17 of TV-0055.	Semi-annual	MK1	Env-A 910
2.	*Quarterly Emission Reports* Include the following data in the quarterly emissions report required by Table 9, Item 6 of TV-0055: a.) Average SO_2 emission rates and percent reduction rates recorded in accordance with Table 6, Item 2 for each boiler operating day.	Quarterly	MK1 & MK2	Env-A 808.14 & Env-A 910

Appendix C

2014 Population and VMT used to Apportion 3-County Emissions Estimates to the Central New Hampshire Nonattainment Area

Location	2014 Pop.		2014 VMT	
Goffstown	17,752		292,271	
Total NAA Portion	17,752	4.41%	292,271	3.10%
Hillsborough Co.	**402,946**		**9,414,536**	
Allenstown	4,312		60,455	
Bow	7,638		685,941	
Chichester	2,555		136,069	
Concord	42,748		1,496,880	
Dunbarton	2,777		56,410	
Epsom	4,667		153,930	
Hooksett	14,499		927,009	
Loudon	5,375		143,096	
Pembroke	7,077		138,388	
Pittsfield	4,084		57,276	
Total NAA Portion	95732	64.78%	3,855,454	61.11%
Merrimack Co.	**147,778**		**6,309,196**	
Candia	3,911		494,676	
Deerfield	4,385		88,008	
Northwood	4,222		132,961	
Total NAA Portion	12518	4.19%	715,645	6.83%
Rockingham Co.	**298,573**		**10,474,060**	

Notes:

1) 2014 population estimates were taken from the NH Office of Energy & Planning, http://www.nh.gov/oep/data-center/population-estimates.htm.

2) 2014 VMT by town were provided by the NH Department of Transportation.

3) The towns listed in the table above reflect those that are in the Central New Hampshire Nonattainment Area (NAA).

4) Example calculation:

4.41% of Hillsborough County's population is in the Hillsborough portion of the NAA, 64.78% of Merrimack County's population is in the Merrimack portion of the NAA, and 4.19% of Rockingham County's population is in the Rockingham portion of the NAA.

For 2014 Area Source SO_2 emissions, Hillsborough County = 986 tons, Merrimack County = 417 tons, and Rockingham County = 1,106 tons (see Table 5-1A).

Estimated NAA Area Source SO_2 emissions = (986 * 4.41%) + (417 * 64.78%) + (1,106 * 4.19%) = 360 tons (see Table 5-1B, numbers may differ slightly due to rounding).

The State of New Hampshire
Department of Environmental Services

NHDES

Robert R. Scott, Commissioner

November 29, 2017

Deborah Szaro, Acting Regional Administrator
U.S. Environmental Protection Agency, Region I
5 Post Office Square, Suite 100
Boston, MA 02109-3912

RE: Correction to the Central New Hampshire SO_2 Nonattainment Area Plan for the 2010 Primary 1-Hour Sulfur Dioxide NAAQS Submission

Dear Acting Administrator Szaro:

New Hampshire submitted a Nonattainment Area Plan for the 2010 Primary 1-Hour Sulfur Dioxide National Ambient Air Quality Standard (NAAQS) for the Central New Hampshire SO_2 Nonattainment Area in January 2017. This State Implementation Plan (SIP) amendment satisfied the requirements of the Clean Air Act (CAA) Sections 172, 175A, 191 and 192 to show attainment and maintenance of the 2010 SO_2 NAAQS.

The submission included a summary of public comments received and New Hampshire Department of Environmental Services' (NHDES) responses thereto (Enclosure C). In its response to pre-draft comments received from the United States Environmental Protection Agency (USEPA) in November 2016, NHDES indicated that it had removed the phrase "...and thus may be able to demonstrate attainment for the SO_2 NAAQS" on page 9 of the SIP. This change was in response to USEPA's statement "...the proposed NSIP also incorrectly suggests that an attainment demonstration can be made based on monitor readings alone." However, in the final version of the SIP, the phrase had not been removed. We therefore submit the enclosed replacement for page 9 of the January 2017 Central New Hampshire SO_2 Nonattainment Area Plan.

If you have any questions, please contact me at (603)271-1088, or Michele Roberge of my staff at (603) 271-6793.

Sincerely,

Craig A. Wright
Director
Air Resources Division

Enclosure

Ecc: David Conroy, US EPA Region I
Leiran Biton, US EPA Region I

Table 3-4. 1-Hour SO_2 Annual 99th Percentile and 3-Year Design Values at Pembroke Air Quality Monitor (330131006), 2009-2015 (all values in ppb)

	2009	2010	2011	2012	2013	2014	2015
Annual 99^{th} Percentile Value	219	220	225	27	17	26	17
3-Year Design Value (year ending)	212	192	221	157	89	23	20

The sudden drop-off in SO_2 levels after 2011 is visible in the trend line of annual 99^{th} percentile values shown in Figure 3-4. This decline is associated with known emission reductions in the contributing area (see 3.3.2).

The Pembroke monitoring data for 2012-2014 and 2013-2015 (Table 3-4 and Figure 3-5) indicate that New Hampshire's nonattainment area may have already achieved three years of "clean data," defined as three consecutive years without a violation of the standard.

Figure 3-4. Trend in 1-Hour SO_2 Annual 99^{th} Percentile Values