New Hampshire Regional Haze SIP Revision
Responses to EPA's Comments

On June 26, 2009, the New Hampshire Department of Environmental Services (NHDES) received comments from the U.S. Environmental Protection Agency (EPA) on New Hampshire's draft final Regional Haze SIP, May 22, 2009. The following are NHDES's responses to EPA's comments. **Comments are written in *italics* and responses are written in regular font.**

General BART Comments

1. New Hampshire indicates it used the CALGRID model for assessing the visibility improvement expected from the installation of Best Available Retrofit Technology (BART) controls for its two BART sources, Merrimack station and Newington Station. The CALGRID modeling results indicated that the installation of a scrubber at Merrimack would only result in a visibility improvement of 0.1 deciview (dv) and switching to lower sulfur fuel at Newington would result in negligible visibility improvement. The reader is directed to Attachment X for additional discussion on this analysis. However, Attachment X does not provide any information regarding the performance or appropriateness of the CALGRID model for this type of application, the Attachment only discusses the use of CALGRID for ozone modeling purposes.

The MANE-VU modeling results indicate that both BART sources are among the top 167 stacks impacting a MANE-VU Class I area. Therefore, it does not seem to make sense that controlling SO_2 emissions by more than 90% at Merrimack would lead to a visibility improvement of only 0.1 dv and that 50% control of SO_2 at Newington would result in negligible visibility improvement. Please include an explanation of how the CALGRID and MANE-VU modeling relate to each other, especially in respect to pre-control visibility impacts.

Furthermore, New Hampshire may want to consider using CALPUFF to assess visibility impacts of potential BART controls. As noted in the BART Guidelines (40 CFR Part 51, Appendix V Section (IV)(D)(5D:

> *"Use CALPUFF, or other appropriate dispersion model to determine the visibility improvement expected at a Class I area from the potential BART control technology applied to the source."*

- ▶ NHDES Response: NHDES agrees with EPA that CALPUFF (or other appropriate dispersion model) is the recommended model for assessing maximum potential impacts of single sources to distant Class I areas. Consistent with that, CALPUFF is EPA's preferred model for assessing visibility impacts during PSD impact studies for permitting purposes. EPA has subsequently recommended application of CALPUFF to visibility screening of individual sources. Because CALPUFF's strength is in estimating maximum possible impacts, including visibility impairment, it is a preferred model for determining BART eligibility. In fact, New Hampshire and the other MANE-VU states used CALPUFF for BART eligibility screening because the model is conservative, effectively predicts potential worst case visibility impacts, and therefore represents the ideal scenario for BART inclusion analyses. NHDES believes that the BART guideline's preference for use of CALPUFF is rooted in the need to include all potentially significant sources of visibility degradation.

NHDES disagrees with EPA that CALPUFF provides the best and most useful predictions of the visibility benefit of BART controls. Because of how the model handles wind fields without regard to visibility conditions, CALPUFF's predictions can be very conservative and possibly oversensitive to changes in visibility conditions. When the modeling results are applied to calculate the benefits of emission controls, those benefits can be overstated by the inflation of deciview improvements and the calculated cost-per-deciview ($/dv) BART control metric. CALPUFF's handling of background pollutants is indirect and rather mechanical in nature. As a result, it does not track how its modeled impacts relate to background visibility, best visibility, and worst visibility days. Extra effort by the modeler is needed to present a realistic modeling result that aligns wind directions with appropriate, manually entered background conditions.

Unlike CALPUFF and other single-source dispersion models, regional grid models such as CALGRID excel at accounting for the impacts of widespread sources contributing to total visibility impairment. To that end, for the impact assessment of New Hampshire's BART-eligible sources, NHDES originally chose to use CALGRID, the sister model to CALPUFF. CALGRID includes much of the same chemistry as CALPUFF but uses gridded dispersion as opposed to the puff dispersion used in CALPUFF. In fact, CALGRID includes about 20 percent more enhanced aerosol chemistry than CALPUFF and is therefore considered to be the more advanced model. Moreover, CALGRID easily isolates the 20% worst visibility days to allow a direct, realistic result without the need for manual adjustments. It is important to isolate these 20% worst visibility days because it is possible (and perhaps probable) that a targeted BART facility will not actually contribute its maximum impact on those days. CALPUFF always assumes maximum emissions impact at Class I areas on both best and worst days – conditions that may or may not happen in reality. While the CALPUFF model's CALPOST post-processor has an option for application on 20% best visibility days, it does not isolate those 20% best days for analysis. It simply changes the background values used by the model to what is estimated to be appropriate background conditions. The post-processed results do not account for wind directions that may be preferentially included or excluded on such days.

The BART guidelines suggest that models be used in a "relative" way to estimate the expected visibility benefits of BART controls. As explained above, while CALPUFF is EPA's preferred model for visibility assessments of individual sources, it still has its weaknesses. The model is not designed to perform complex calculations in which a large number of emission sources are factored-in across several emission sectors. Compounding the problem is the fact that, in order to apply the model in a relative sense, the visibility assessment has to be done with a non-linear metric, the deciview. The guidance uses CALPUFF to estimate the benefits of BART controls on a single source under the conditions of 20% worst visibility days when, in fact, a multitude of sources actually contribute to visibility impact. The model can easily calculate the concentration benefits from the chosen source controls, but the conversion of the data into deciview units involves a non-linear estimation. A CALPUFF post-processor allows a simple selection of background visibility conditions and then performs deciview benefit calculations in a crude way.

Because both EPA and the FLMs filed comments expressing their preference for CALPUFF modeling results, NHDES performed a limited set of CALPUFF runs for the New Hampshire BART-eligible sources under controlled and uncontrolled conditions. Rather than use CALPOST's post-processing option for the 20% best and worst days, NHDES applied the CALPUFF modeling results in a relative way, in recognition of EPA's guidance for BART modeling. NHDES normalized the CALPUFF modeling results and then applied the predicted concentrations to a logarithmic best-fit equation of the actual observed $PM_{2.5}$-to-deciview relationship measured at Acadia NP, Great Gulf NW, and Lye Brook NW. Thus, CALPUFF was applied in a relative way using real observed data as the basis. At this point, a number of background visibility scenarios could be calculated from the resulting PM-mass-to-deciview equation. In accordance with BART guidance, the natural visibility condition (about 7 dv) was used for exemption purposes; and 20% worst visibility (22.8 dv) was used for assessment of BART control effectiveness.

Merrimack Station Unit MK2: BART Eligibility Modeling

The BART eligibility modeling conducted by MANE-VU used natural visibility conditions (about 7 dv) to produce the most conservative modeling results to minimize sources from modeling out of BART. Under these conditions, uncontrolled emissions from Unit MK2 produce theoretical CALPUFF worst-case impacts of 2.29 dv at Acadia National Park. EPA considers acceptable source exemptions when this form of conservative modeling indicates a source produces less than 0.5 dv of impact. MANE-VU considers an exemption level of 0.2 to 0.3 dv to be more appropriate but prefers, and has applied, a more conservative exemption level of 0.1 dv. CALPUFF modeling results for baseline emissions from Unit MK2 exceed all of these exemption levels.

Merrimack Station Unit MK2: BART Benefit Assessment Modeling

The BART assessment modeling provides a comparison of visibility impacts from current allowable emissions with those from the post-control emission level (or levels) being evaluated. In accordance with EPA guidance, NHDES used CALPUFF to estimate the magnitude of the source's impacts on visibility after implementation of BART controls. Results are tabulated for the average of the 20% worst visibility (in this case, about 22.8 dv) modeled days at each nearby Class I area. For any pair of control levels evaluated, the difference in the level of impairment predicted is the degree of improvement in visibility expected.

For Merrimack Station Unit MK2, the CALPUFF-predicted visibility benefits from BART controls on 20% worst visibility days are as follows:

CALPUFF Modeling Results for Merrimack Station Unit MK2:
Visibility Improvements from BART Controls on the 20% Worst Visibility Days

Pollutant	Control Technology	Control Level	Visibility Improvement (dv)		
			Acadia NP	Great Gulf NW	Lye Brook NW
SO_2	FGD	90%	0.28	0.22	0.03
NO_X	SCR Upgrade	89%	0.01	0.01	< 0.01*
PM	ESP Upgrade	99.4%	<0.01*	<0.01*	< 0.01*
	Baghouse	99%	-0.02	-0.02	-0.01

* below sensitivity limit of model

While Unit MK2 was predicted to have up to 2.29 dv impact at Acadia National Park under natural conditions, the basis of the BART assessment evaluation changes to 20% worst visibility days. On those days, a 90% reduction in sulfur emissions at Unit MK2 results in only a 0.28 dv visibility improvement. At first these results may appear to be incorrect; however, on further examination, it is found that CALPUFF predicts the same amount of sulfate from Unit MK2 reaching Acadia under both best and worst visibility conditions. The difference is that there is greater than an order of magnitude more sulfate coming from other sources on the 20% worst visibility days, raising the background concentrations to much higher levels. Because the deciview scale is logarithmic, the same mass reduction of 0.26 $\mu g/m^3$ of sulfate from this one source results wide differences in deciview impacts for different background visibility conditions at opposite ends of the range.

The above analysis indicates that CALPUFF and CALGRID have aligned better in their predictions than might be expected. This result may be attributed to the similar chemistry used in both models and to the specific circumstances of this case in which the prevailing wind direction on the 20% worst visibility days carries Unit MK2 emissions directly toward Acadia National Park. The big discrepancy occurs under best visibility days, when CALGRID (correctly) does not align the source to receptor, but CALPUFF (incorrectly) applies wind directions for worst visibility days to the best day calculations.

Newington Station Unit NT1: BART Eligibility Modeling

The BART eligibility modeling conducted by MANE-VU used natural visibility conditions (about 7 dv) to produce the most conservative modeling results to minimize sources from modeling out of BART. Under these conditions, uncontrolled emissions from Unit NT1 produce theoretical CALPUFF worst-case impacts of 1.22 dv at Acadia National Park. As in the case of Unit MK2, CALPUFF modeling results for baseline emissions from Unit NT1 exceed all of these exemption levels.

Newington Station Unit NT1: BART Benefit Assessment Modeling

For Newington Station Unit NT1, the CALPUFF-predicted visibility benefits from BART controls on 20% worst visibility days are smaller than those for Merrimack Station Unit MK2:

CALPUFF Modeling Results for Newington Station Unit NT1:
Visibility Improvements from BART Controls on the 20% Worst Visibility Days

Pollutant	Control Technology	Control Level	Visibility Improvement (dv)		
			Acadia NP	Great Gulf NW	Lye Brook NW
SO_2	1% S Fuel Oil	50%*	0.08	0.06	< 0.01**
	0.5% S Fuel Oil	75%*	0.12	0.09	0.01
	0.50 lb SO_2/MMBtu	77%*	0.12	0.09	0.01
	0.3% S Fuel Oil	85%*	0.13	0.10	0.01
	FGD	90%*	0.14	0.11	0.02
NOx	LNB	40%	< 0.01**	< 0.01**	< 0.01**
	LNB-OFA	50%	0.01	< 0.01**	< 0.01**
	SNCR	50%	0.01	< 0.01**	< 0.01**
	SCR	85%	0.03	0.02	< 0.01**
PM	Baghouse	99%	<0.01**	<0.01**	< 0.01**

* from maximum permitted level ** below sensitivity limit of model

Notes on CALGRID Model Performance

As noted in EPA comments, CALGRID has been accepted in the past by EPA for photochemical modeling of ozone for SIP purposes. Over the past several years, most regional models have evolved in use and performance since their original photochemical use and now effectively model $PM_{2.5}$ and visibility impacts. CMAQ and CAMx are two other regional grid models that are more commonly used than CALGRID; however, CALGRID has found a niche in the Northeast and in other parts of the world for use as a screening model.

Formal performance testing for CALGRID's ozone predictions was done prior to its use for $PM_{2.5}$ and regional haze modeling. Rigorous statistical performance testing for $PM_{2.5}$ was not done since CALGRID is only being used in a screening mode and simple comparative testing demonstrated that CALGRID performs reasonably in comparison to the REMSAD model. NHDES recognizes that EPA requires performance evaluations on a modeling platform before it can be applied to predicting SIP attainment of a NAAQS. Instead, CALGRID has been applied in SIP supportive and informational work.

CALGRID testing for $PM_{2.5}$ species was performed on a period of approximately two weeks that included high PM and poor visibility days as well as relatively clean days. Most focus of the testing was on the OTR; however, performance in upwind areas was also noted because it's an important source of emissions that transport into the OTR. As is typical for photochemical model performance, the models often did better on higher pollution days than on cleaner days, but overall performance we determined to be good and adequate for use.

While no formal documentation of this testing was completed, plots and graphs that were created for the work have been reviewed. NHDES concludes that CALGRID model performance for $PM_{2.5}$ and regional haze is good and is thus a reasonable modeling tool to use for screening modeling. The Delaware Department of Natural

Resources and Environmental Control similarly reviewed the model's performance and has accepted it for $PM_{2.5}$ and haze modeling.

It should also be noted that CALGRID predicts sulfates, nitrates, PM, and several organic species and reconstructs visibility according to the IMPROVE deciview equation. The CALPUFF processors do not predict organics and use a less refined process to predict visibility changes.

2. Implementation of the selected BART control strategies for each of the three pollutants (SO_2, NOx, and $PM_{2.5}$) at both BART facilities must be federally enforceable. The Regional Haze SIP must clearly indicate how this is being accomplished in each case. Specifically, the relevant rules or permits should be included as part of New Hampshire's Regional Haze SIP revision or the SIP revision should cite specific rules or permits conditions that are already federally enforceable.

▶ NHDES Response: The BART controls and enforceable provisions for Unit MK2 and Unit NT1 are summarized in the tables below:

PSNH Merrimack Station Unit MK2

Pollutant	BART Controls / Emission Limitations	Regulatory Citations*	Compliance Date
NO_X	SCR (existing); NOx emission limit of 0.30 lb/MMBtu, 30-day rolling average (proposed)	Draft Title V operating permit (TV-0055); Administrative Rule Env-A 2300 Mitigation of Regional Haze (proposed);	Rule: July 1, 2013
PM	Two ESPs in series (existing) TSP emission limit of 0.08 lb/MMBtu (proposed)	Draft Title V operating permit (TV-0055); Administrative Rule Env-A 2300 Mitigation of Regional Haze (proposed)	Rule: July 1, 2013
SO_2	Fuel sulfur limits (existing); Flue gas desulfurization (FGD), with required SO_2 percent reduction set at maximum sustainable rate, but not less than 90% as a calendar monthly average (proposed)	Administrative Rule Env-A 1606.01 Maximum Sulfur Content Allowable in Coal (existing); Temporary permit for FGD system (TP-0008); Draft Title V operating permit (TV-0055)	FGD: July 1, 2013

PSNH Newington Station Unit NT1

Pollutant	BART Controls / Emission Limitations	Regulatory Citations*	Compliance Date
NO_X	Overfire air and water injection (existing); NOx emission limits of 0.35 lb/MMBtu with oil and 0.25 lb/MMBtu with oil/gas, 24-hour calendar day average (existing)	Title V operating permit (TV-OP-054)	N.A (Existing controls are BART)
PM	Electrostatic precipitator (existing); TSP emission limit of 0.22 lb/MMBtu (existing)	Title V operating permit (TV-OP-054)	N.A (Existing controls are BART)
SO_2	SO_2 emission limit of 0.50 lb/MMBtu, 30-day rolling average, applicable to any fuel type or mix (proposed)	Administrative Rule Env-A 2300 Mitigation of Regional Haze (proposed)	Rule: July 1, 2013

BART Determination for PSNH Newington Station Unit NT1

3. For SO_2 New Hampshire determined that the BART level of SO_2 control for PSNH Newington Station unit NTI is to switch from 2% sulfur content by weight residual oil to 1% sulfur content by weight residual oil.

PSNH Newington Station unit NT1 is a tangentially-fired steam generating unit. The Title V permit indicates that NTI can burn crude oil or No. 6 fuel oil at no more than 2% sulfur content by weight, No. 2 fuel oil at no more than 0.4% sulfur content by weight, or natural gas. Based on recent data submitted to EPA's Clean Air Market Division, it appears that changing the enforceable sulfur-in-fuel limit from 2% sulfur No. 6 oil to 1% sulfur No. 6 oil will provide minimal reductions in SO_2 emissions since average SO_2 emission rates are near the levels emitted while burning 1% sulfur No. 6 oil. (See Table 1 below which contains 2007 data for PSNH Newington Station.) Thus, other fuel switching options should also be explored. These options include: (1) the use of natural gas, (2) the use of 0.3% sulfur No. 6 oil as recommended by the MANE-VU BART workgroup or (3) the use of No. 2 fuel oil at no more than 0.3% sulfur content by weight.

NHDES Response: EPA has suggested greater use of natural gas and/or low-sulfur distillate fuel oil in place of residual fuel oil. The substitution of No. 2 distillate fuel oil for No. 6 residual fuel oil would not be not be practical for this facility because of the high capital costs involved. Burner replacements to allow the boilers to combust distillate fuel oil could exceed $20 to $30 million in direct capital costs, not including the additional costs of engineering and any required auxiliary equipment. Please refer to the next response in reference to the use of natural gas versus residual fuel oil.

Reducing the permitted fuel sulfur limit to 1.0 % or 0.5 % would yield significant reductions in SO_2 emissions at Newington Station. Note that from 2002 to 2007, the average annual sulfur content of #6 fuel oil burned at Unit NT1 ranged between 0.93 and 1.53 percent by weight, with no discernable trend. For New Hampshire's BART analysis, the following fuel sulfur values were assumed:

Nominal %S (Permit Limitation)	Assumed Actual %S (Chemical Assay)
2.0	1.2
1.0	0.8
0.5	0.4

Under these assumptions, switching from 2.0 %S (nominal) to 1.0 %S (nominal) residual fuel oil would produce a one-third reduction in sulfur emissions, and switching to 0.5 %S (nominal) residual fuel oil would produce a two-thirds reduction in sulfur emissions at this facility. The use of 0.3 %S residual fuel oil was considered but not evaluated in detail because this fuel is in very limited use within the region, and its future availability and price are uncertain for northern New England. Its potential use will continue to be evaluated as the market for it in the region develops and supplies and prices can be better projected and assured.

Currently, the only consideration of natural gas as a primary fuel source shown in the proposal is the statement, "In recent years, there have been sudden and dramatic swings in the price of natural gas relative to fuel oil as supply/demand have shifted. The future price and availability of natural gas are difficult to discern."

Recent data from the Energy Information Administration, however, indicates the Average Cost of Natural Gas and Residual Oil are projected to remain comparable. (See Figure 1, "Historic and Projected Power generation Fuel Costs — National.") Therefore, EPA recommends that greater consideration be given to the use of natural gas as the primary fuel at Newington station, with No. 2 fuel oil and/or No. 6 fuel oil being used as the secondary fuel, with a constraint on the number of gallons burned per year.

- NHDES Response: Unit NT1 can be fired with either natural gas or liquid fuel (i.e., residual fuel oil or biofuel), or it can be co-fired with both types of fuel at the same time. However, because of physical limitations to the boiler design, the unit cannot operate at full capacity when fueled solely by natural gas. In order to reach maximum heat input, the boiler must either burn liquid fuel or be co-fired with both fuel types. (Unit NT1 can operate at up to approximately 50 percent of maximum heat input from natural gas, with no corresponding limitation on liquid fuel.) There is already a natural incentive for PSNH to operate Unit NT1 with natural gas (provided a reliable supply exists) whenever the price of natural gas is competitive with or less than the price of residual fuel oil.

  In recognition of the dual-fuel capability of this unit, NHDES has prepared a draft rule that will reduce sulfur dioxide emissions by imposing an SO_2 emission limit of 0.50 lb/MMBtu for this facility regardless of fuel type. The rule would allow the facility the flexibility to burn natural gas and/or fuel oil in any feasible ratio, depending on market conditions.

If, however, it is not possible to utilize natural gas as the primary fuel type for this unit, then New Hampshire should explain why 1% sulfur No. 6 oil was determined to be BART, rather than the MANE-VU BART workgroup recommended sulfur fuel oil limit of 0.3% sulfur content by weight. This limit is currently required of facilities in Connecticut pursuant to Connecticut's Section 22a-l74-19a regulation.

Additionally, New Hampshire should explain why 0.5% sulfur fuel oil is not BART as well. The proposal indicates that the cost effectiveness of using 1% versus 0.5% fuel oil is the same at $1900/ton. This argues fur the implementation of 0.5% sulfur fuel oil. Also, other facilities in New England are currently limited to 0.5% for No. 6 fuel oil. (See the Title V permit for Salem Harbor Unit #4.)

- NHDES Response: There is greater assurance today of the availability 0.5%-sulfur residual fuel oil than when the original BART determination was drafted. Maine, Massachusetts, New Jersey, and possibly other states within MANE-VU have already made commitments to require the use of 0.5%-sulfur residual fuel oil, thus ensuring the presence of a regional market for this commodity. The use of 0.3%-sulfur residual fuel oil in Connecticut does not guarantee the availability of this fuel in northern New England, which obtains its bulk oil shipments through different ports.

  New Hampshire's draft rule creating a sulfur dioxide emission limit of 0.50 lb/MMBtu for Unit NT1 will cause a substantial reduction in emissions of this pollutant without concern for relative fuel supplies and prices, which are largely unknown. For the first regional haze progress report, to be submitted circa 2013, NHDES will review fuel usage, fuel supplies, fuel prices, and plant utilization/ capacity factors to determine whether the proposed fuel sulfur limitation is still appropriate as BART control for Unit NT1. Should the review indicate a different

BART control level, the facility's Title V operating permit will be amended as necessary before its expiration date of March 31, 2012, fifteen months prior to the effective date of proposed BART control measures.

In table 1 below is a listing of all of the electric generating steam units in New England that were operational in 2007 and which use residual oil as their primary fuel. As illustrated in the table, most of the units have current SO_2 emissions rates well below the emission rate proposed as BART for PSNIH Newington Station.

- ▶ NHDES Response: The newly proposed sulfur dioxide emission limit of 0.50 lb/MMBtu would fall below many of the SO_2 emission rates listed in the table.

4. For NOx, New Hampshire has determined that BART is met for Newington Unit I through use of the current suite of NOx controls; low NOx burners, an overfire air system, and water injection. New Hampshire indicates that the current emission limits are a daily average of 0.35 lb/MMBtu when burning oil and 0.25 lb/MMBtu when burning a combination of oil and gas. The MANE-VU BART workgroup, however, recommended a level of NOx control for non-CAIR EGUs of 0.1 - 0.25 lb/MMBtu, depending on boiler and fuel type. Therefore, New Hampshire should analyze if a more stringent emission limit is appropriate for this unit.

- ▶ NHDES Response: The MANE-VU BART Workgroup draft presumptive control levels are found in Appendix C of NESCAUM's "Five-Factor Analysis of BART Eligible Sources: Survey of Options for Conducting BART Determinations," June 1, 2007 (special emphasis on *draft*). The presumptive limits are generally applicable to BART facilities having greater than 750 MW capacity and may not be representative of smaller EGUs like Unit NT1. Also, the workgroup's draft recommendations for non-CAIR EGUs do not take into account the effects of scale when a facility operates at very low utilization rates and capacity factors.

  In the case of Unit NT1, since 2006 the average annual capacity factor has been below 10 percent; and preliminary data for January through September of 2009 indicate that the plant was effectively offline for all but the first month of the year. Consequently, the capital costs associated with SCR or SNCR to achieve a control level of 0.1 - 0.25 lb/MMBtu cannot be justified for this EGU at this time, especially on a visibility benefit basis. NHDES finds that the existing NOx RACT limits reasonably represent the sustainable performance capabilities of this unit and are sufficient as BART control levels for NOx on a 30-day averaging basis.

In New England, there is a least one oil-fired electric generating steam unit with selective catalytic reduction installed (Unit #1 at Canal Electric in Sandwich, MA) and at least three oil-fired electric generating steam units with selective non-catalytic reduction installed (Units #1 and #2 at Norwalk Harbor Station in Norwalk, CT and Unit #3 at Middletown Station in Middletown, CT).

- ▶ NHDES Response: While SCR or SNCR may be appropriate for certain oil-fired EGUs elsewhere in New England, the particular circumstances of Newington Station do not support the implementation of either technology as BART for Unit NT1. It is difficult to justify any significant capital expenditure in the context of the plant's recent operating history and the limited visibility benefit that might be obtained.

5. For PM the proposal indicates that the currently installed electro-static precipitator (ESP) is sufficient for BART, yet only cites a 42% control efficiency. According to the BART analysis,

a rebuilt ESP can achieve collection efficiencies of more than 99%. Therefore, the BART determination should include an analysis of the feasibility of an upgraded or rebuilt ESP for this unit. Furthermore, the MANE-VU BART workgroup recommendation for non-CAIR EGUs is a PM emission rate of 0.02 - 0.04 lb/MMBtu. New Hampshire should provide greater detail as to why the state considers its current limit of 0.22 lb/MMBtu as sufficient for BART.

- NHDES Response: The 42 percent efficiency value was obtained by comparing the PM emission factor from a 2001 controlled stack test report with an AP-42 emission factor for uncontrolled PM, and is therefore a crude approximation of particulate removal efficiency. NHDES has located a 1971 performance specification for this unit from Buell Envirotech Corp. The efficiency is stated as 93 percent under normal operating conditions and a maximum of 98 percent under design conditions. It is unknown whether these higher control rates are representative of the unit's actual long-term performance. The emission rate calculated from the 2001 stack testing (the only data available) was 0.058 lb/MMBtu. This emission rate is within the expected range for a properly operating ESP at a plant like Newington and may be a better measure of performance than the stated efficiencies.

  The single stack test result is insufficient to support consideration of a BART performance level more restrictive than the current permit limit. The facility's Title V operating permit requires that a compliance stack test for PM emissions be performed on Unit NT1 before the permit expires on March 31, 2012. NHDES will review the stack test results, and may request additional information from the facility's owner, to ascertain the unit's performance. NHDES will then incorporate any new limit, as appropriate, into a permit amendment by the permit expiration date. The permit expiration date precedes the effective date of proposed BART control measures by fifteen months.

BART Determination for PSNH Merrimack Station Unit MK2

6. For SO_2, New Hampshire has determined that BART is the installation of flue gas desulfurization (FGD) controls and has issued a temporary permit to the facility which is included in Attachment EE of the submittal. EPA previously reviewed a draft of this permit and submitted comments to the DES in a letter dated March 3, 2009. We have reviewed the version of the permit included in the proposal and note that all of our previous comments have been adequately addressed.

7. For NOx, New Hampshire has determined the year round use of selective catalytic reduction (SCR) is considered BART for Unit MK2. This determination seems reasonable. New Hampshire, however, states that its current federally enforceable limit for this unit is 0.86 lb/MMBtu, while the MANE-VU recommended level of BART control for non-CAIR EGUs is 0.1 - 0.25 lb/MMBtu, depending on the boiler and fuel type. A review of the data in the CAMD database indicates that MK2 is achieving an emission rate well below 0.86 lb/MMBtu. For example, the highest monthly average emission rate in 2008 was 0.30 lb/ MMBtu. Therefore, New Hampshire should impose a more stringent emission limit for this unit.

- NHDES Response: Unit MK2 is required to meet a federal acid rain limit of 0.86 lb NOx/MMBtu, an additional NOx RACT Order limit of 15.4 tons per calendar day, and a NOx RACT Order limit of 29.1 tons per calendar day for Units MK1 and

MK2 combined. The 15.4 ton/day limit is more stringent than the acid rain limit: based on a gross heat input rating of 3,473 MMBtu/hr, the daily limit is equivalent to an emission rate of 0.37 lb/MMBtu (= 15.4 ton/day × 2,000 lb/ton ÷ 24hr/day ÷ 3,473 MMBtu/hr).

Since January 2001, the SCR on Unit MK2 has reduced NOx emissions to between 0.15 and 0.37 lb/MMBtu (calendar monthly average), with a few excursions outside this range. Data available from the period of 1993 to early 1995, prior to operation of the SCR, provide a baseline for uncontrolled NOx emissions in the range of 2.0 to 2.5 lb/MMBtu. Taken together, this information indicates that Unit MK2 achieves a control level greater than 85 percent most of the time.

The presumptive BART control level of 0.1 to 0.25 lb/MMBtu is applicable to power plants having greater than 750 MW capacity and may not be representative of smaller EGUs like Unit MK2. Because this unit's cyclone boiler has a relatively high uncontrolled NOx emission rate, it follows that the controlled emission rate, even as control efficiencies approach 90 percent, would frequently exceed the presumptive norm attributed to larger EGUs.

NHDES finds that a NO_X emission rate of 0.30 lb/MMBtu reasonably represents the sustainable performance capabilities of this unit and is also appropriate as a BART control level for NO_X on a 30-day rolling average basis.

8. For PM New Hampshire has determined that the use of two currently installed ESPs is considered BART for Unit MK2. This seems reasonable. The proposal, however, indicates that the current air permit imposes a 0.227 lb/MMBtu limit, while the MANE-VU recommended level of BART control for non-CAIR EGUs is 0.02-0.04 lb/MMBtu. Therefore, New Hampshire should analyze if a more stringent emission limit is appropriate for this unit.

▶ NHDES Response: The 0.227 lb/MMBtu limit derives from the formula established in Env-A 2002.06 and does not reflect the true capabilities of the ESPs serving Unit MK2 to control particulate emissions. Stack testing on three separate dates in 1999 and 2000 found actual TSP emissions to be 0.043, 0.041, and 0.021 lb/MMBtu after controls. The most recent test, in May 2009, produced an emission rate of 0.032 lb/MMBtu.

The volume of field data is insufficient to establish a conclusive, long-term BART performance level of 0.04 lb/MMBtu or lower for this unit. Accordingly, NHDES has developed a draft rule that will hold TSP emissions to no greater than 0.08 lb/MMBtu, but on a broader scope than required under BART: this standard will apply to Unit MK1 (not a BART-eligible facility) as well as Unit MK2. In the current draft Title V operating permit, Unit MK1 has a TSP emission limit of 0.27 lb/MMBtu, or more than three times the proposed limit of 0.08 lb/MMBtu. Including Unit MK2 in the rule has the effect of reducing the allowable combined TSP emissions from the two coal-fired units at Merrimack Station to less than the total emissions that would be allowed if the limit for Unit MK2 were set at 0.04 lb/MMBtu and the limit for Unit MK1 remained as is (377 lb/hr vs. 473 lb/hr).

Other Comments

9. We recommend the 5th paragraph on page 6 be revised as follows:

> *"About half of the worst visibility days in the New Hampshire Class I Areas occur in the summer when meteorological conditions are more conducive to the formation of sulfate from SO_2 and to the oxidations of organic aerosols. ~~In addition, winter and summer transport patterns are different, possibly leading to different contributions from upwind source regions. As a result, The~~ remaining worst visibility days are divided nearly equally among spring, winter and fall. In addition, winter and summer transport patterns are different, possibly leading to different contributions from upwind source regions."*

- ▶ NHDES Response: The recommended text revision has been made.

10. In Section 6.1.2, the Beyond-on-the way (BOTW) emissions scenario is described as "accounting for controls from potential regulations that may be necessary to meet attainment and other air quality goals, mainly for ozone." Based on the list of measures provided on page 123, it is unclear how New Hampshire expects to reduce area source emissions by 4,303 tons per year, as depicted in Table 6.3 2018 BOTW Emissions Inventory Summary for New Hampshire.

- ▶ NHDES Response: The 4,303 ton/year reduction in SO_2 emissions is attributable to the proposed BOTW control measure that reduces the sulfur content of residential and commercial distillate (heating) oil. The following description is taken from Part 5.2.6 of MANE-VU's Final Technical Support Document "Development of Emission Projections for 2009, 2012, and 2018 for NonEGU Point, Area, and Nonroad Sources in the MANE-VU Region" (Attachment N):

  > "The BOTW control measure for heating oil is based on NESCAUM's report entitled 'Low Sulfur Heating Oil in the Northeast States: An Overview of Benefits, Costs and Implementation Issues.' NESCAUM estimates that reducing the sulfur content of heating oil from 2,000 ppm to 500 ppm lowers SO_2 emissions by 75 percent, PM emissions by 80 percent, NOx emissions by 10 percent. The 500 ppm sulfur heating oil is not expected to [be] available on a widespread basis until 2012 at the earliest. These percent reductions were applied to residential distillate oil category (SCC 21-04-004-xxx) and commercial distillate oil category (SCC 21-03-004-xxx)."

  These SO_2 control measures would precede additional required reductions in fuel sulfur content as delineated in MANE-VU's low-sulfur fuel strategy. Such additional measures were included in the 2018 most recent emissions inventory ("best and final" scenario) as represented by the data in Table 6.4.

11. The MANE-VU "Ask" includes a low sulfur fuel oil strategy. With regard to this strategy, on page 141 of New Hampshire's proposal, the state indicates that it plans to revise its Env-A 1604 regulation and a draft of the revised rule is provided in Attachment FF. These revised provisions will need to be adopted and submitted to EPA as a SIP revision so they may become a federally enforceable part of New Hampshire's Regional Haze SIP. The proposal currently indicates that New Hampshire commits to revising this rule "at the earliest practicable date." New Hampshire should include a schedule for adoption of the revised regulation.

- NHDES Response: New Hampshire commits to introducing the MANE-VU low-sulfur fuel strategy as a bill into the New Hampshire legislature by January 2012. NHDES originally expected to implement the low-sulfur oil strategy by revision of

administrative rule Part Env-A 1604, Sulfur Content Limitations for Liquid Fuels. However, with the generally rising cost of fuels, including home heating oil, any NHDES rule that might further exacerbate fuel prices or create uncertainty regarding adequacy of supplies could be politically sensitive. This is therefore a matter more appropriately addressed by New Hampshire's elected lawmakers. A legislative approach towards implementing a low-sulfur fuel strategy is also preferable because New Hampshire regulations sunset every five years. Consequently, any fully adopted low-sulfur fuel regulation with a compliance date of 2017 included in this SIP would sunset prior to that date.

In addition, the discussion of the low sulfur fuel oil strategy in Section 10.2.3 (page 98) of the proposal notes a concern for potential supply disruptions for residual fuels in northern states. This discussion also states, "MANE-VU has identified several mechanisms that could be implemented to address disruptions, including seasonal averaging and emergency waivers. A seasonal averaging approach would reduce potential supply constraints by allowing the use of higher-sulfur during periods of peak demand." The proposal, however, does not further elaborate on whether or not New Hampshire plans to allow seasonal averaging and emergency waivers. If such provisions are allowed, then there should also be a mechanism to ensure that the use of higher-sulfur oil during peak demand times does not correspond with meteorological conditions leading to the 20% worst visibility days.

NHDES Response: New Hampshire would follow procedures established by EPA in the event of a fuel supply emergency. As described at EPA's fuel waivers website at http://www.epa.gov/compliance/resources/faqs/civil/fuelwaiver.html, the agency, with the concurrence of the Department of Energy, may temporarily waive a fuel or fuel additive requirement if doing so will alleviate the fuel supply emergency. Clean Air Act Section 211(c)(4)(C), which authorizes fuels waivers, specifies the criteria for granting a fuel waiver and the conditions that must be included in a fuel waiver. In the case of an emergency disruption of low-sulfur fuel supplies, NHDES would seek a short-term emergency waiver on fuel sulfur content. To the extent feasible, it would be the intent of any such waiver to moderate the degree of visibility degradation resulting from temporary use of higher-sulfur fuels in a supply disruption. The details would be worked out in response to the particulars of the emergency situation at the time of any waiver request.