The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES

Thomas S. Burack, Commissioner

November 29, 2011

VIA E-MAIL AND FIRST-CLASS MAIL

Mr. John MacDonald
Vice President – Generation
Northeast Utilities
Public Service of New Hampshire
780 North Commercial Street
Manchester, NH 03101

Re: Preliminary Determination of Baseline Mercury Emissions and Notice of Record Hearing

Dear Mr. MacDonald:

The New Hampshire Department of Environmental Services, Air Resources Division (DES) has prepared a preliminary determination of the baseline mercury emissions pursuant to RSA 125-O:14, II. A public notice announcing the issuance of the preliminary determination and the availability of a record hearing will be published in the *Union Leader,* the *Concord Monitor*, and the *Portsmouth Herald* on November 30, 2011. The public comment period will end on January 6, 2012.

A copy of the preliminary determination and public notice are enclosed. If you have any questions regarding this preliminary determination, please contact Pamela Monroe of the Air Resources Division, Compliance Bureau at (603) 271-0882.

Sincerely,

Robert R. Scott
Director
Air Resources Division

cc: William Smagula, PSNH
Lynn Tillotson, PSNH

STATE OF NEW HAMPSHIRE
DEPARTMENT OF ENVIRONMENTAL SERVICES
AIR RESOURCES DIVISION
CONCORD, NEW HAMPSHIRE

NOTICE OF PRELIMINARY DETERMINATION AND RECORD HEARING

Pursuant to RSA 125-O:14, *Measurement of Baseline Mercury Input and Emissions,* and Env-C 205, *Non-Adjudicative Proceedings,* notice is hereby given that the Director of the New Hampshire Department of Environmental Services, Air Resources Division, has made a preliminary determination of the baseline mercury emissions for the affected sources, including Public Service of New Hampshire's (PSNH) Merrimack Station Units 1 and 2 and Schiller Station Units 4, 5 and 6 and will hold a record hearing on the preliminary determination. The purpose of the record hearing is to provide PSNH and the public with an opportunity to present information, in writing or by e-mail, for the Director to consider in making a final decision.

RSA 125-O:14, II specifies the methodology for determining the baseline mercury emissions. Based upon the information provided, DES has made a preliminary determination that the baseline mercury emissions are 309 pounds per year.

The preliminary determination and related materials are on file with the Director, New Hampshire Department of Environmental Services, Air Resources Division, 29 Hazen Drive, P.O. Box 95, Concord, NH 03302-0095, (603) 271-1370. Information may be reviewed at the office during working hours from 8 a.m. to 4 p.m., Monday through Friday or via the DES website at http://des.nh.gov . Written comments filed with the Director and mailed to the address listed above, or via e-mail at **baseline.mercuryemissions@des.nh.gov** and received no later than 4:00 p.m. on **January 6, 2012,** shall be considered by the Director in making a final decision.

Robert R. Scott
Director
Air Resources Division

PRELIMINARY DETERMINATION ON BASELINE MERCURY EMISSIONS

November 29, 2011

RSA 125-O, *Multiple Pollutant Reduction Program*, was amended in 2006 to include strategies to reduce mercury emissions from coal-burning electric power plants in the State. Specifically, RSA 125-O:11-18 became effective on June 8, 2006, and requires statewide reductions in mercury emissions from "affected sources" defined as Merrimack Units 1 and 2 in Bow and Schiller Units 4, 5, and 6 in Portsmouth. RSA 125-O:13 creates two distinct emission-related requirements.

The first emission-related requirement is set forth in RSA 125-O:13, II. In particular, RSA 125-O:13, II establishes an emission reduction requirement for "affected sources." The percent reduction is based on a "baseline mercury input" which is calculated by multiplying the average mercury content of coal being combusted at the "affected sources" by the average annual throughput of coal combusted by each affected source during the baseline period, to arrive at the pounds of mercury input per year. This method includes coal sampling and analysis, but does not include stack testing or other actual emission tests. RSA 125-O:13, II requires the total mercury emissions from the "affected sources" to be "at least 80 percent less on an annual basis, beginning on July 1, 2013, than the baseline mercury input as defined in RSA 125-O:12, III." On June 28, 2011, the Department of Environmental Services (DES) issued its final determination of the baseline mercury input, and the resulting mercury reduction requirement.

The second emission-related requirement is set forth in RSA 125-O:13, III. In particular, RSA 125-O:13, III establishes an early emissions reduction incentive. This section does not contain a specific percentage reduction. Instead, RSA 125-O:13, III provides that "[p]rior to July 1, 2013, [PSNH] shall test and implement, as practicable, mercury reduction control technologies or methods to achieve early reductions in mercury emissions." (RSA 125-O:13, III). Emission reductions are based on the "baseline mercury emissions" as defined in RSA 125-O:14, II. Specifically, RSA 125-O:14, II(a) provides that the baseline mercury emissions shall be determined by conducting a minimum of four stack tests at each of the units specified in subparagraph (b). RSA 125-O:14, III(b), then requires the "owner" of the "affected sources" to provide a written report to DES that includes the stack test results and calculations used to determine the baseline mercury emissions. DES then must verify this data and make a determination of the baseline mercury emissions. Unlike the emission reduction requirement established using the "baseline mercury input," the early emissions reduction provisions establish incentives in the form of early emissions reduction credits for reducing mercury emissions prior to the compliance deadline of July 1, 2013. (*See* RSA 125-O:16, I(a)).

Although both RSA 125-O:13, II and III focus on reducing the amount of mercury entering the environment through emissions, the provisions establishing the emission reduction requirement and the provisions establishing the incentive for early emission reductions relate to different operational objectives, and use different methodologies to

establish the relevant baseline. On February 17, 2011, DES made a preliminary determination of the baseline mercury *input* and on June 28, 2011, DES issued its final determination. The following serves as DES's preliminary determination of the baseline mercury *emissions* pursuant to RSA 125-O:11-18.

Background

RSA 125-O:14, II(a), required PSNH to conduct a minimum of four stack tests to determine a statistically valid average mercury emissions rate for each unit expressed in pounds of mercury emitted per ton of coal combusted at each affected source. For purposes of the baseline mercury emissions determination, RSA 125-O:14, II (b), requires the stack tests to be conducted at Merrimack Unit 1 and Unit 2, and at either Schiller Unit 4 or Unit 6 to serve as representative of all Schiller units. RSA 125-O:14, II(b) also specifies that if mercury emissions improvements are made or are being made during the testing period, that the stack tests shall be conducted without the improvements running at the time of the tests. The rate for each affected source must then be multiplied by the average annual throughput of coal for the period 2003, 2004, and 2005 (average tons of coal combusted per year) for each respective affected source to yield the average pounds of mercury emitted per year from each affected source. The sum of the annual emitted averages (in pounds) from each affected source then equals the baseline mercury emissions.

On August 30, 2006, PSNH submitted to DES, via fax, its baseline mercury emissions testing plan. PSNH proposed to complete the stack testing using the sorbent trap method. RSA 125-O:14, II does not specify the stack test methods to be used for purposes of determining the baseline mercury emissions. However, RSA 125-O:15 requires PSNH to conduct stack testing twice per year, subsequent to the baseline mercury emissions testing under RSA 125-O:14, II, and specifies that this testing shall employ a federally recognized and approved methodology. Therefore, on October 2, 2006, DES sent PSNH a letter requesting that PSNH provide technical information demonstrating that the sorbent trap method proposed by PSNH, which was not a federally recognized method, would yield comparable results to an EPA approved test method. On December 12, 2006, DES and PSNH representatives met at the DES offices to discuss the information requested in the October 2, 2006 letter. As a follow-up to the meeting, on January 5, 2007, PSNH submitted to DES, via fax, a letter stating that the stack testing would be conducted using United States Environmental Protection Agency (USEPA) Method 29 and not the sorbent trap method as originally proposed.

RSA 125-O:14, III(b), required PSNH to provide a written report to DES that included the stack test results and calculations used to determine the baseline mercury emissions no later than eighteen months following the effective date of the section, or December 8, 2007. DES was then charged with verifying this data and making a determination of the baseline mercury emissions.

DES received the baseline mercury emissions test report on December 11, 2007, which contained the data and results of all fourteen baseline mercury emission tests. It is

important to note that while RSA 125-O:14, II required PSNH to conduct a "minimum of 4 stack tests," PSNH elected to conduct five stack tests at Merrimack Units 1 and 2 and four stack tests at Schiller Unit 4. Accordingly, DES has made the following determination based upon its review of the fourteen baseline mercury emissions tests.

Analysis

RSA 125-O:11-18, establishes methodologies for defining, measuring and determining compliance with mercury emissions reduction requirements at the existing coal-burning power plant units in the State; specifically, Merrimack Units 1 and 2 in Bow and Schiller Units 4, 5, and 6 in Portsmouth (defined in RSA 125-O:12, I as the "affected sources").

As described previously, the statute establishes two separate and distinct methodologies for determining a mercury baseline: one for purposes of compliance and one related to economic performance incentives. As stated above, RSA 125-O:12, III defines "baseline mercury input" for purposes of compliance, as the total annual mercury *input* found in the coal used by all of the affected sources calculated in accordance with RSA 125-O:14, I. RSA 125-O:13, II then specifies at least an 80 percent reduction on an annual basis from the baseline mercury *input*. On June 28, 2011, DES made its final determination of the baseline mercury input and concluded that the baseline mercury input for the affected sources is 228 pounds per year. Therefore, pursuant to RSA 125-O:13, II, the total mercury emissions from the affected sources shall be at least 80 percent less than 228 pounds per year, or no more than 46 pounds per year, beginning on July 1, 2013.[1]

In contrast, the statute establishes a different methodology for determining the baseline mercury emissions for purposes of calculating economic performance incentives. RSA 125-O:12, II defines "baseline mercury emissions" as the total annual mercury *emissions* from all of the affected sources, calculated in accordance with RSA 125-O:14, II. RSA 125-O:13, III then specifies that prior to July 1, 2013, the owner (of the affected sources) shall test and implement, as practicable, mercury reduction control technologies or methods to achieve early reductions in mercury emissions below the baseline mercury *emissions*. The baseline mercury emissions calculation is then used for the purpose of determining economic performance incentives in the form of early emissions reduction credits. In particular, RSA 125-O:16, establishes specific economic performance incentives for early emission reductions of each pound of mercury or fraction thereof reduced below the baseline mercury *emissions*.

RSA 125-O:14, II(a) specifies that the baseline mercury emissions from each unit are calculated "using appropriate testing protocols, to determine a valid average mercury emissions rate for each unit expressed in pounds of mercury emitted per ton of coal combusted at each affected source." The mercury emissions rate in pounds of mercury emitted per ton of coal combusted is not a directly measurable parameter from an affected source. The average mercury emissions from each stack test (in pounds of mercury per

[1] This decision is currently on administrative appeal in Docket No. 11-10 ARC.

trillion British Thermal Units (Btu) heat input) are measured at the stack of the affected source using USEPA Method 29 and accepted engineering calculations. This measurement, combined with the heating value of the coal combusted and obtained via a laboratory analysis of a sample of the coal, allows for the calculation of the mercury emissions rate in terms of pounds of mercury emitted per ton of coal combusted. The steps for calculating the baseline mercury emissions are as follows:

1. Determine the average mercury emission rate (expressed in pounds of mercury emitted per ton of coal combusted) by performing a minimum of four compliance stack tests at each affected source. Each test measures the average emission rate of mercury in pounds of mercury emitted per trillion Btu of heat input. For each baseline test (each test is comprised of at least three separate test runs), multiply the average emission rate (in pounds of mercury per trillion Btu of heat input) by the average of the heating values (in Btu per pound of coal) of the coal samples collected during the testing and analyzed by an independent laboratory. This results in a mercury emission rate for the baseline test expressed in terms of pounds of mercury per pound of coal, which is then converted to pounds of mercury per ton of coal. The emission rates in pounds of mercury per ton of coal are averaged for each affected unit. *See* Equation 1.

Equation 1. Mercury Emissions Rate (R_2), lb Hg/ton of coal:

$$R_2 = R_1 \times HV \times K_2$$

Where:
R_1 = Mercury Emissions Rate (R_1), in lb Hg/Trillion Btu from stack test
HV = Heating value of the coal samples collected during that run or day of baseline testing, in Btu/pound
K_2 = conversion factor of (2×10^{-9}) to convert pounds of coal to tons of coal, and trillion Btu to Btu.

Table 1 presents mercury emissions rates calculated by DES. In its calculations of the baseline mercury emissions, DES used the heating value (in Btu/lb of coal) from the coal samples collected during the stack tests. This is the heating value that most closely corresponds to the mercury emissions measured during the stack test, using the analysis of the actual coal that was combusted during the test.

Table 1. DES-calculated Hg emission rates

Unit No.	Stack Test Date	Avg. Hg lb/TBtu from stack test data	Heating value of coal sampled during test (Btu/lb)	Calculated lb Hg/ton of coal
MK1	1/30/2007	14.90	13963.54	4.16E-04
MK1	2/6/2007	8.42	13791.00	2.32E-04
MK1	2/22/2007	10.38	13854.67	2.88E-04
MK1	4/11/2007	5.33	13870.00	1.48E-04
MK1	5/31/2007	5.16	13855.00	1.43E-04
MK1	**Averages:**	**8.84**	**13866.84**	**2.45E-04**
MK2	1/31/2007	11.24	13964.50	3.14E-04
MK2	2/21/2007	9.81	13936.00	2.73E-04
MK2	4/10/2007	8.76	13727.00	2.40E-04
MK2	6/4/2007	7.51	14004.00	2.10E-04
MK2	6/5/2007	7.78	13665.00	2.13E-04
MK2	**Averages:**	**9.02**	**13859.30**	**2.50E-04**
SR4	4/3/2007	0.339	14325.00	9.71E-06
SR4	5/1/2007	0.44	14207.50	1.25E-05
SR4	5/24/2007	2.05	13606.33	5.58E-05
SR4	6/21/2007	2.01	13737.33	5.51E-05
SR4	**Averages:**	**1.21**	**13969.04**	**3.33E-05**

Table 2 presents mercury emissions rates calculated by PSNH. In its baseline mercury emissions report, PSNH calculated the baseline mercury emissions using the 3-year average of the heating values (in Btu/lb of coal) from coal combusted by each device during the time period of 2003 through 2005 rather than the coal actually being combusted during the stack tests.

Table 2. PSNH-calculated Hg emission rates

Unit No.	Stack Test Date	Avg. Hg lb/TBtu from stack test data	Avg. heating value of coal for 2003-2005 (Btu/lb)	Calculated lb Hg/ton of coal
MK1	1/30/2007	14.90	13120.00	3.91E-04
MK1	2/6/2007	8.42	13120.00	2.21E-04
MK1	2/22/2007	10.38	13120.00	2.72E-04
MK1	4/11/2007	5.33	13120.00	1.40E-04
MK1	5/31/2007	5.16	13120.00	1.35E-04
MK1	**Averages:**	**8.84**	**13120.00**	**2.32E-04**
MK2	1/31/2007	11.24	13128.00	2.95E-04
MK2	2/21/2007	9.81	13128.00	2.58E-04
MK2	4/10/2007	8.76	13128.00	2.30E-04
MK2	6/4/2007	7.51	13128.00	1.97E-04
MK2	6/5/2007	7.78	13128.00	2.04E-04
MK2	**Averages:**	**9.02**	**13128.00**	**2.37E-04**
SR4	4/3/2007	0.339	12906.00	8.75E-06
SR4	5/1/2007	0.44	12906.00	1.14E-05
SR4	5/24/2007	2.05	12906.00	5.29E-05
SR4	6/21/2007	2.01	12906.00	5.18E-05
SR4	**Averages:**	**1.21**	**12906.00**	**3.12E-05**

Although the heating values in Table 2 are representative of compliant coals that were combusted during the 3-year period, the heating values do not accurately represent the coal blend ratios that were actually being combusted during the stack tests and which are shown in Table 1. This difference in methodology and heating values as shown in Table 3, results in proposed mercury emission rates as calculated by PSNH (in pounds per ton of coal) of approximately five to six percent less (depending on the affected unit) than the rates calculated by DES.

Table 3. Comparison of DES- and PSNH-calculated Hg emissions rates

Affected Units	DES calculated lb Hg/ton of coal	PSNH calculated lb Hg/ton of coal	Percent average difference
MK1	2.45E-04	2.32E-04	**5.48**
MK2	2.50E-04	2.37E-04	**5.33**
SR4	3.33E-05	3.12E-05	**6.25**

2. Determine the total annual average coal throughput for each affected source for the period 2003, 2004, and 2005. RSA 125-O:14, II(a) specifies that the average annual coal throughput for the period of 2003, 2004, and 2005 (in average tons of coal combusted per year) for each affected unit shall be used in the baseline mercury emissions calculation. Table 4 summarizes the annual coal throughput for each of the affected sources as well as the average annual coal throughput during that period.

Table 4. Annual Coal Throughput (tons per year)

	MK1	MK2	SR4	SR5	SR6
2003	363,074	768,968	151,299	154,756	150,286
2004	339,021	841,129	155,695	166,809	163,842
2005	354,865	870,802	157,304	157,879	164,952
Average Annual Throughput	352,320	826,966	154,766	159,815	159,693

3. Calculate the baseline mercury emissions by multiplying the average mercury emission rate for each unit by the annual average coal throughput. The mercury emission rates in pounds of mercury per ton of coal, taken from Table 1, and the annual coal throughput from each affected device, taken from Table 4, are used to perform this calculation. *See* Equation 2.

Equation 2. Baseline Mercury Emissions (R_3), average annual lb Hg/year:

$$R_3 = \sum (R_2 \times TPY_{avg})$$

Where:
R_2 = Mercury Emissions Rate (R_2), lb Hg/ton of coal from Equation 1
TPY_{avg} = Average annual coal throughput for 2003-2005 for each affected unit
$\sum$ = Sum of the baseline mercury emissions for all 5 affected units

Table 5 presents the average mercury emissions rate (in lbs/ton of coal) for each affected source determined by the stack testing performed on each affected unit and the average annual throughput of coal, for each unit, combusted during the time period of 2003 through 2005. The total baseline mercury emissions is the sum of the average annual mercury emissions from each affected unit, or 309 (rounded from 308.8) pounds of mercury per year.

Table 5. Total PSNH Baseline Mercury Emissions

PSNH Affected Units	Average Hg Emissions Rate (lbs/tons of coal)	Average Annual Throughput of Coal (tons/yr)	Average Annual Hg Emissions (lbs/year)
MK1	0.0002450	352,320	86.3
MK2	0.0002500	826,966	206.7
SR4	0.0000333	154,766	5.2
SR5	0.0000333	159,815	5.3
SR6	0.0000333	159,693	5.3
	Total PSNH Baseline Hg Emissions (lbs/year) =		**308.8**

Preliminary Determination on Baseline Mercury Emissions

In summary, in order to determine the baseline mercury emissions in pounds of mercury per year, the average mercury emissions (lbs Hg /ton of coal) for each affected source was multiplied by the average annual coal throughput (tons of coal per year) for each affected source. The total baseline mercury emissions are then the sum of the unit-level average annual mercury emissions.

PSNH conducted five baseline mercury emission tests on both Merrimack Units 1 and 2. PSNH conducted four baseline emission tests on Schiller Unit 4. The results of these baseline tests were received by DES on December 11, 2007. The reports also contain the dates that the stack tests were conducted, the data and calculations of the amounts of coal combusted by each affected unit in 2003, 2004 and 2005 and the average annual throughput for each device for this period.

In its calculations, DES used the stack test-specific coal samples to determine the heating value (in Btu per pound of coal) of the coal combusted during the day of the stack test instead of using the 3-year average heating value for the coals combusted over the period of 2003 though 2005 that was used by PSNH for the same calculation. DES believes that both heating values are representative of compliant coals; however, the stack test-specific heating values are the representative of the coal blend ratios that were being combusted during the stack tests. Based upon this analysis, DES has made a preliminary determination that the baseline mercury emissions for the affected sources is 309 (rounded from 308.8) pounds per year.

The reader will likely note the discrepancy between this number and the number calculated in the "Final Determination on Baseline Mercury Input" (228 pounds per year) issued by DES on June 28, 2011. It is important to note that the mercury emissions rates measured during the baseline emissions tests are short-term measurements and are not necessarily indicative of longer term mercury emissions. This is true of all compliance stack tests, which in general, only measure the pollutant emissions for a short period over

a number of hours. In certain cases, these short-term emission rates may not be reflective of long-term emissions.

In the case of the combustion of a homogeneous fuel, such as natural gas or fuel oil, where there is little variation in the concentrations of the constituents of the fuel, either over time or between two samples taken from different parts of the whole, the emissions of any pollutant measured at the stack typically parallels the corresponding concentration of that pollutant in the fuel. The emissions measured during the short-term stack test will likely reflect long-term emissions from the device, as long as the operational parameters of the device stay relatively constant.

However, coal is not a homogeneous fuel. More specifically, its mercury content can vary greatly depending on the source of the coal and even between two samples of coal taken at the same time from proximate locations. For this reason, even though the measurement of mercury emissions is within the accuracy criteria of the EPA measurement method, it is not necessarily reasonable to expect that it will correspond to the measurement of mercury from samples taken of the coal being combusted over the long term.

Therefore, in the case of the baseline mercury emissions tests, although the coal being combusted was compliant coal, there should be no expectation that the amount of mercury determined as the baseline mercury input should be the same as the baseline mercury emissions. As described above, the lack of homogeneity of the fuel and the short-term time frame for the stack tests reduces the probability that the baseline mercury input would equal the baseline mercury emissions.