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Public Service of New Hampshire

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The Northeast Utilities System

December 3, 2010

BY E-MAIL AND OVERNIGHT MAIL

Mr. Stephen Perkins
Office of Ecosystem Protection
U.S. Environmental Protection Agency
5 Post Office Square
Boston, MA 02109-3912

Re: Public Service Company of New Hampshire
Merrimack Station, Bow, New Hampshire, NPDES Permit No. NH0001465
Response to Information Request about Planned State-of-the-Art Flue Gas Desulfurization Wastewater Treatment System

Dear Mr. Perkins:

Public Service Company of New Hampshire ("PSNH") appreciates the United States Environmental Protection Agency's ("EPA's") feedback during and following our November 8, 2010 meeting to discuss the planned state-of-the-art wet flue gas desulfurization ("FGD") system and FGD wastewater treatment system at PSNH's Merrimack Station in Bow, New Hampshire. We believe there was a productive exchange of information among the PSNH, EPA and New Hampshire Department of Environmental Services ("NHDES") representatives at the meeting, potentially laying the groundwork for a mutually satisfactory and Clean Water Act ("CWA")-compliant path forward. As we discussed at the meeting, PSNH hereby responds to EPA's October 29, 2010 information request under CWA §308 regarding the FGD WWTS (the "§308 Letter"). We appreciate that, at PSNH's request, EPA extended the due date for PSNH's submission of the majority of its response to December 3, 2010, and for PSNH's submission of its response to Question No. 4(e) to December 8, 2010. Responses to Question Nos. 5 and 9 will also be submitted at that time under separate cover as Confidential Business Information in accordance with EPA regulations.

PSNH's Responses to EPA's Information Requests (except Question No. 4(e)

1. Please identify the lowest pollutant concentrations that Merrimack Station could achieve by use of the proposed FGD WWTS technology at Merrimack Station prior to any reductions or dilution provided by the Slag Settling Pond. The pollutants to be evaluated are those included in Tables 4-8 of EPA's Steam Electric Power Generating Point Source Category: Final Detailed Study Report, dated October 2009. The data generated must take into consideration the coal type used by Merrimack Station, the sorbent used, the materials of construction for the proposed FGD system and FGD WWTS, the gypsum dewatering system used, the chemicals used in the

FGD and FGD WWTS operation, and the use of any air pollution control systems operated upstream of the FGD system, such as an electrostatic precipitator (ESP).

For purposes of PSNH's response to the §308 Letter, (1) "FGD WWTS" means the wastewater treatment system, described in PSNH's October 8, 2010 letter to EPA, that has been specially designed to address the Merrimack Station-specific pollutants expected to be present, at Station-specific concentrations, in the wastewater produced by the FGD System; and (2) "FGD Wastewater" means the wastewater produced by the FGD System. In addition, PSNH assumes that by "Slag Settling Pond," EPA means Merrimack Station's existing treatment pond.

Table 1 below identifies the regulated pollutants expected to be present, and the concentration at which each such pollutant is expected to be present, in the FGD Wastewater that has been treated by the FGD WWTS. The chemical species listed in Table 1 are the analytes listed in Table 4-8 of Steam Electric Power Generating Point Source Category: Final Detailed Study Report (EPA 821-R-09-008) (October 2009) (the "2009 EPA FGD Wastewater Study"), as the §308 Letter directs, with the following limitations.

First, PSNH evaluated only the regulated chemical species that NHDES and EPA identified for PSNH analysis under the anti-degradation provisions of the New Hampshire Surface Water Quality Regulations (Env-Wq 1708).[1] Where NHDES and EPA did not require evaluation of a particular analyte, PSNH did not address that analyte in its evaluation of expected FGD Wastewater pollutants and pollutant concentrations; such analytes are identified in the table below as "not evaluated." Second, there are three analytes identified in Table 1 as "not targeted" as the FGD WWTS physical-chemical process does not precipitate and remove them. For these analytes, the antidegradation analysis completed per NHDES Env-Wq 1708 shows that the assimilative capacity requirement is satisfied by at least an order of magnitude without treatment.

The "expected concentrations" are identified in Table 1 for each of the regulated chemical species evaluated by PSNH and URS and targeted by the FGD WWTS. These values are predicated on (1) pollutant concentrations in the influent to FGD the WWTS being below specified values, and (2) the FGD System and FGD WWTS operating in a steady-state condition. For an explanation of why certain of these expected concentration values are shown in bold, please see PSNH's response to Question No. 2 below.

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1 More particularly (and as PSNH has explained in previous submissions to EPA), NHDES directed PSNH and URS to perform an antidegradation analysis in conjunction with the permitting of the FGD WWTS. The purpose of this analysis was to determine whether, for each regulated chemical species that NHDES and EPA identified, the discharge of treated FGD Wastewater would result in an insignificant or significant loading of that species to the Merrimack River under Env-Wq 1708. URS performed this analysis in accordance with Env-Wq 1708, relevant guidance and applicable antidegradation calculation methodologies, and consistent with the direction provided by NHDES in ongoing consultation sessions. URS concluded that the Merrimack River has sufficient remaining assimilative capacity for most of the analyzed chemical species that there is no "reasonable potential" for the discharge of the treated FGD Wastewater to cause or contribute to an excursion above any New Hampshire Water Quality Standard. URS further concluded, alternatively and where applicable, that there will be "no net mass increase" between current and expected future Station discharges of evaluated pollutants.

Table 1

CHEMICAL SPECIES (FROM TABLE 4-8)	EXPECTED CONCENTRATION (MG/L)	COMMENT
Routine Total Metals[2]		
Aluminum	1.0	
Antimony	0.5	-
Arsenic	0.020	-
Barium	5.0	-
Beryllium	0.1	-
Boron	N/A	Not evaluated
Cadmium	0.05	-
Calcium	3,500	Not evaluated
Chromium III	0.05	-
Chromium VI	0.1	-
Cobalt	N/A	Not evaluated
Copper	0.05	-
Iron	0.1	-
Lead	0.1	-
Magnesium	7,000	Not evaluated
Manganese	3.0	-
Mercury	0.000014	-
Molybdenum	N/A	-
Nickel	1.0	-
Selenium	9.000	-
Silver	0.05	-
Sodium	2,000	Not evaluated
Thallium	0.6	-
Titanium	N/A	Not evaluated
Vanadium	N/A	Not evaluated
Yttrium	N/A	Not evaluated
Zinc	0.1	-
Classicals		
Ammonia As Nitrogen (NH3-N)	< 350	Not targeted
Nitrate/Nitrite (NO3-N + NO2-N)	< 350	Not targeted
Total Kjeldahl Nitrogen (TKN)	N/A	Not evaluated
Biochemical Oxygen Demand (BOD)	N/A	Not evaluated
Chemical Oxygen Demand (COD)	N/A	Not evaluated
Chloride	18,000	Not targeted
Hexane Extractable Material (HEM)	N/A	Not evaluated

2 Total Metals were used for evaluation and analysis.

CHEMICAL SPECIES (FROM TABLE 4-8)	EXPECTED CONCENTRATION (MG/L)	COMMENT
Silica Gel Treated HEM (SGT-HEM)	N/A	Not evaluated
Sulfate	15,000	Not evaluated
Total Dissolved Solids (TDS)	35,000	-
Total Phosphorus	N/A	Not evaluated
Total Suspended Solids (TSS)	3	-

2. Please explain the origin of the pollutant concentration data provided in Attachment 2, URS Table, page 2 of 2 of the NPDES Supplemental Permit Application for Merrimack Station, dated May 10, 2010. Specifically, does this data represent the consistently lowest pollutant concentrations achievable by the Merrimack Station proposed FGD WWTS?

PSNH assumes that the question refers to the "pollutant concentration data" provided in Column 10 on Page 2 of the table labeled "NPDES Executive Summary – Attachment 1 05_05_10.xls," which is included as part of Attachment 2 to PSNH's May 5, 2010 letter to EPA. The "Specified FGD WWTP Discharge Concentration" values in Column 10 are the values for each of the chemical species evaluated by PSNH and URS and targeted by the FGD WWTS. As reflected in Table 1 above, certain of these values have been revised since May 5, 2010 to reflect the lower pollutant concentrations that are expected to result from PSNH's addition of the state-of-the-art treatment subsystem that will "polish" the clarified FGD wastewater to achieve additional removal of mercury, arsenic and several other metals (and still further reduction in total suspended solids concentrations) over and above what the FGD WWTS' physical-chemical treatment steps will already have removed. These revised values are shown in bold in Table 1 above.

3. Please explain why the wastewater generated from the proposed Merrimack Station FGD WWTS is not being proposed for reuse and or recycle within the Station (e.g., for coal dust suppression or scrubber make-up water).

All of the FGD System make-up water will be recycled wastewater – including some of the recycled treated FGD Wastewater – drawn from Merrimack Station's existing wastewater treatment pond. Once the FGD WWTS commences operation, the treated FGD Wastewater will be sent to the existing treatment pond. All of the make-up water required for operation of the FGD System will be taken from the treatment pond, with the result that some treated FGD Wastewater from the FGD WWTS will be utilized for FGD System make-up. As we discussed at the November 10 meeting, it is difficult to quantify the specific amount of treated FGD Wastewater that will be recycled in this manner, because of the numerous assumptions required to perform this calculation.

The volume of make-up water required by the FGD System is much larger (approximately 750 gallons per minute ("gpm") than the volume of treated wastewater generated by the FGD WWTS (approximately 35 gpm), allowing a Station-specific optimal recycle of wastewater. Moreover, utilizing recycled wastewater from the treatment pond for FGD System makeup water will reduce the volume and pollutant loading of that portion of the treatment pond flow ultimately discharged to the Merrimack River. This allows for "no new net discharge" of many of the targeted metals in the FGD Wastewater while providing for an overall reduction in the Station's discharge to the river.

4. Please provide additional explanation - beyond that already provided in PSNH's October 8, 2010 Submission - of why, in light of engineering considerations and PSNH's pertinent detailed evaluations, the following technologies were not considered preferable as part of the FGD WWTS at Merrimack Station:

PSNH respectfully notes that under the CWA in general, and in the context of a "best available technology economically achievable" ("BAT") analysis under the CWA in particular, the meaning of the term "preferable" is unclear. Reserving its rights, PSNH responds to Question No. 4 (except for 4(e)) below.

a. Zero discharge alternatives, including recycling wastewater back to the scrubbers, evaporation ponds, and deep well injection;

PSNH examined the following "zero discharge" alternatives:

- As discussed in PSNH's response to Question No. 3 above, PSNH will be recycling a portion of the treated FGD Wastewater back to the FGD System. As the purpose of the blowdown is to remove impurities from the FGD to maintain water chemistry, it is not possible to return all of the effluent to the absorber since it will cause some elements to concentrate to unacceptable levels.

- Evaporation ponds are commonly used in the southern and southwestern parts of the United States, where the climate typically provides the opportunity for evaporation throughout the year. However, this treatment alternative is not technically feasible in the New Hampshire climate. PSNH will not further explore evaporation ponds as a treatment alternative for the FGD Wastewater.

- Deep well injection is not a viable treatment alternative for the FGD Wastewater for several reasons. First, PSNH does not currently have any deep wells at any of its facilities. Second, there would be significant local opposition – from the Town of Bow, residents in the area around Merrimack Station, and interested environmental groups – to its installation of a deep well at Merrimack Station due to potentially adverse drinking water aquifer impacts. Third, we believe it would be difficult to the point of impossible to obtain the necessary state permits, especially in light of the New Hampshire legislature's focus on groundwater quality management and use over the past few years.

- Discharge to a publicly owned treatment works ("POTW") was determined to be technically infeasible because there is no physical connection between the Station and the closest POTW, the Hall Street Wastewater Treatment Facility in Concord, New Hampshire. Furthermore, based on PSNH's assessment to date, this POTW would not be able to provide the advanced FGD wastewater treatment that is being installed at Merrimack Station. Unlike the FGD WWTS, this POTW does not employ the equipment or treatment processes that PSNH has determined would be needed to reduce the FGD-related pollutants in the FGD Wastewater to concentrations achievable by modern FGD wastewater treatment systems.

- Off-site treatment by a third party was also determined to be technically infeasible. This alternative would involve transporting the FGD Wastewater to some independent treatment facility. However, PSNH has not identified any independent facility with the capability to treat or process FGD wastewater with the volume and chemistry characteristics of the FGD Wastewater that will be generated by the FGD System.

- PSNH did not evaluate disposing of the FGD Wastewater through fixation. As described in PSNH's October 8, 2010 letter, fixation would involve mixing the gypsum solids separated from the purged FGD System scrubber slurry with lime, fly ash and the FGD Wastewater to form a concrete-like substrate that would be disposed of by landfilling. The fixation method was historically used at plants with natural or inhibited oxidation FGD systems, both of which produce an unusable calcium sulfite byproduct that requires management and disposal. However, PSNH is installing a state-of-the-art limestone forced oxidation ("LFSO") FGD system that is designed to produce a wall-board quality gypsum byproduct. Using fixation to manage the FGD Wastewater would prevent the beneficial use of this high-quality gypsum byproduct in the manufacture of wallboard. It would also prevent the recycling/beneficial use of the Station's fly ash, which PSNH currently sells for commercial processes. This would not only deprive PSNH of the "green" revenues that it could generate from promoting the beneficial use of these materials that otherwise would be disposed of. It would also significantly increase the volume of solid waste generated by the Station and requiring landfilling, and could unnecessarily expose PSNH and its customers to the environmental liability potentially associated with that disposal method. In short, while fixation is a technically proven approach to managing FGD wastewater, it is not the best available approach in terms of environmental stewardship (since it eliminates recycling of materials and creates additional solid waste) or financial practicality (since it would impose additional costs on PSNH and its customers), when established methods for treating FGD wastewater and recycling gypsum and ash are available.

b. Aerobic and anoxic/anaerobic biological treatment systems, as additions to the chemical/physical treatment already planned for Merrimack Station, to remove selenium and other pollutants.

PSNH did not consider adding a biological treatment subsystem to the FGD WWTS to remove selenium because the URS antidegradation analysis concluded – and NHDES subsequently agreed – that the discharge of treated FGD Wastewater would result in an insignificant loading of selenium to the Merrimack River, in part due to the anticipated performance of the FGD WWTS' physical-chemical treatment stages (i.e., the conditioning and clarification steps described in PSNH's October 8, 2010 letter).

Selenium is most prevalently present in FGD wastewater as either elemental (non-dissolved), selenite (Se+4) or selenate (Se+6). Elemental selenium in the FGD Wastewater will be easily removed by the FGD WWTS' physical-chemical hydroxide co-precipitation process; its particles will be captured with other settling solids. Selenium present in the FGD Wastewater in the selenite form will be precipitated and removed by the FGD WWTS' physical-chemical process. The selenate form of selenium typically is not removed by physical-chemical treatment. However, analyses during recent FGD scrubber startups have shown that the largest percentage of the selenium present in FGD wastewater is present in the elemental form and as selenite. Given this, PSNH, URS and Siemens Water Technologies anticipate that the actual selenium concentrations in the treated FGD Wastewater will be lower than the "expected concentration" values.

PSNH is aware that four biological selenium removal systems have been installed to date, all of them in North Carolina, where receiving streams are relatively small and have comparatively high concentrations of selenium. The facilities where these systems have been installed, and the owners of those facilities, are listed in Table 2 below.

Table 2

Owner	Station
Progress Energy	Roxboro (NC)
Progress Energy	Mayo (NC)
Duke Energy	Belews Creek (NC)
Duke Energy	Allen Station (NC)

The installed process uses biota, attached to a carbon-based medium, operating in a progressively reducing environment (i.e., the oxidation-reduction potential is controlled to change from positive to negative along the wastewater flow path). As PSNH noted in its October 8, 2010 letter to EPA, these systems have not been in service for a sufficiently long time to establish them as proven technology. At least five years of operation would be required to confirm the suitability of the construction materials used and the maintenance procedures employed, and to establish confidence in the long-term chemical and economic viability of the process.

c. A combination of wet and dry FGD systems to reduce the amount of wastewater generated.

Although wet and dry FGD systems theoretically could be combined to reduce and/or eliminate the FGD Wastewater stream from the FGD System, this technological alternative is not available at Merrimack Station for the following Station-specific reasons:

- The LSFO wet scrubber technology that PSNH is installing at Merrimack Station is specifically required by RSA 125-O:11-18, which the New Hampshire legislature enacted in 2006 requiring PSNH to install and operate a wet FGD system at Merrimack Station to reduce mercury emissions as soon as possible but by no later than July 1, 2013.[3] Because of this state law mandate, PSNH is precluded from installing a dry scrubber or a combination wet scrubber-dry scrubber FGD system at Merrimack Station.

- There is not enough usable open space in the limited available area next to the operating units at Merrimack Station for the installation of a combination wet scrubber-dry scrubber FGD system.

- Based on PSNH's investigation, it appears that Duke Energy's Cliffside 6 – a new 825 MW coal-fired integrated gasification combined cycle facility that is currently under construction west of Charlotte, North Carolina – will be the only power plant in the United States using a combined dry scrubber-wet scrubber FGD system, when it comes on line for commercial use in 2012,. The wet and dry scrubber subsystems are components of Alstom Power's proprietary Integrated Air Quality Control System ("AQCS") technology and have been designed to order specifically for the Cliffside 6 facility's flue gas treatment train. In brief, the flue gas passes through the dry subsystem, a baghouse, and then into the wet subsystem. The dry scrubber is designed to remove pollutants including sulfuric acid, hydrogen chloride, mercury and particulate, while the wet scrubber is designed to provide additional mercury and hydrogen chloride removal. The purge stream from the wet scrubber is used to wet the fly ash and lime used in the dry scrubber. PSNH notes that operation of the Alstom Integrated AQCS system reduces the amount of fly ash available for recycling by sale to commercial users and, more significantly, generates a non-usable solid waste product that requires landfilling. A recently published white paper regarding the Cliffside 6 facility's combined dry scrubber-wet scrubber FGD system is provided as Attachment 1 to this letter.

d. Particulate collection system, such as an ESP, prior to the FGD system to reduce pollutant concentrations in the FGD wastewater.

Merrimack Station's electric generating units already have two electrostatic precipitators ("ESPs") each to control particulate emissions. For each unit, the first ESP was installed as part of the original plant, and the second was installed later as a supplemental ESP (in 1987 for Unit 1 and 1999 for Unit 2). The suppliers for these supplemental ESPs were, respectively, General Electric Environmental Services Inc. and Southern Environmental. Both ESPs are situated in series (original, then supplemental) immediately after the air pre-heater for each unit. As a result of the planned continued use of these ESPs, the contribution of fly ash constituents to the pollutant concentrations in the FGD Wastewater is expected to be minimal.

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3 Specifically, the New Hampshire legislature expressly required PSNH to install "a *wet* flue gas desulphurization system" at Merrimack Station, on the grounds that NHDES "determined that the best known commercially available technology is a *wet* flue gas desulphurization system, hereafter 'scrubber technology,' as it best balances the procurement, installation, operation, and plant efficiency costs with the projected reductions in mercury and other pollutants from the flue gas streams of Merrimack Units 1 and 2." RSA 125-O:11,II (emphasis supplied). Therefore, PSNH did not consider installing a dry or a combination wet-dry FGD system

e. Vapor-compression evaporation system as an addition to the chemical/physical treatment already planned for Merrimack Station.

PSNH's response to Question No. 4(e) will be provided to EPA by December 8, 2010.

f. Constructed wetlands using the current area utilized now by the discharge canal.

A constructed wetland treatment system was recently installed at Duke Energy's Marshall Station in Terrell, North Carolina to remove selenium and mercury from blowdown generated by the Station's FGD scrubber. This system occupies about 30 acres of the Station site, with about 12.5 acres of active wetlands system with the capacity to treat up to 1.25 million gallons per day ("MGD") of FGD wastewater. While Merrimack Station is expected to generate much less than 1.25 MGD FGD Wastewater, PSNH has nonetheless determined that this treatment alternative is not technically feasible at the Station for the following Station-specific reasons:

- The Station's discharge canal is an integral part of the Station operation and is not available for use as a dedicated wetland treatment system for the FGD Wastewater.
- The climate in Bow, New Hampshire is not suitable year-round for this treatment.
- The effectiveness of the Marshall Station wetlands system is still under evaluation.

5. Please provide an updated flowline diagram of the proposed FGD WWTS showing: flow rates, pH of each reaction tank, internal recycle streams (i.e., sludge and filtrate), hydrochloric acid addition, temperature of reaction tank No. 1, process area storm water, washdown, and floor drain water, and any other related treatment process waste streams.

This response to be provided under separate cover as Confidential Business Information.

6. Please explain the current status of the FGD system and the FGD WWTS design and construction. For example, identify the percentage of the design and construction of each system that has been completed.

FGD System engineering and design are complete, and the overall construction of the FGD System was approximately 78% complete as of the end of November 2010. All major structures have been built for the LSFO wet scrubber and related support systems; limestone receiving and conveying; gypsum conveying, storage and truck loading; booster fans and ductwork; service water pump house; electrical supply and substation; and the FGD WWTS. All system buildings are enclosed and all major equipment (such as limestone ball mills, recycle pumps, drying tables and the absorber vessel) is on-site and in place. Support equipment, piping and electrical system installation is ongoing and will be the primary focal point over the next few months. An adequate quantity of craft labor is present to efficiently support a full schedule of work; the overall FGD System/FGD WWTS construction project currently has over 450 people working on-site.

Specifically with regard to the FGD WWTS, engineering and design are complete, and the FGD WWTS building is fully constructed. Construction of the FGD WWTS itself is over 85%

complete at this time. All vessels and tanks are in place as are equipment skids. Electrical equipment installation and piping should be completed in early 2011. The enhanced mercury and arsenic treatment system is being engineered and is expected to be installed in the second quarter of 2011. PSNH plans to begin testing the FGD WWTS in April 2011.

Training of Merrimack Station employees has begun on some systems, such as the new electrical substation and major electrical equipment. Training will continue to be conducted for station personnel throughout 2010 and 2011. Commissioning and start-up activities have also begun, with the placement of the new electric supply substation in service. Commissioning efforts will continue and grow going forward.

7. There are different types of wet FGD scrubber systems and these different types of systems may produce different wastewater streams (i.e., may have different pollutant characteristics and flow rates). Merrimack Station is installing a particular wet limestone forced oxidation FGD system. Please explain why PSNH decided not to install other types of wet FGD systems (e.g., forced oxidation, inhibited oxidation, natural oxidation, and dual-alkali).

PSNH is installing a wet FGD system at Merrimack Station because, as noted above, NHDES determined that such a system would best achieve the reductions in emissions of mercury and other air pollutants, and the New Hampshire legislature rendered NHDES' determination a binding legal requirement for PSNH. *See* RSA 125-O:11,II (expressly requiring PSNH to install "a *wet* flue gas desulphurization system" at Merrimack Station, on grounds that NHDES "determined that the best known commercially available technology is a *wet* flue gas desulphurization system, hereafter 'scrubber technology,' as it best balances the procurement, installation, operation, and plant efficiency costs with the projected reductions in mercury and other pollutants from the flue gas streams of Merrimack Units 1 and 2.") (emphasis supplied).

PSNH specifically chose to install an LSFO wet scrubber at Merrimack Station – as opposed to the other types of wet FGD system identified in EPA's Question No. 7 – for several reasons. First, this type of system has been – and likely will continue to be – installed at many more power plants than any other wet FGD technologies. According to the 2009 EPA FGD Wastewater Study, of the 223 wet-scrubbed electric generating units at the 108 plants with wet FGD systems evaluated, 111 (50%) have forced oxidation systems, while 62 (28%) have either natural or inhibited oxidation systems (EPA did not provide a further breakdown between natural and inhibited oxidation systems).[4] *See* 2009 EPA FGD Wastewater Study at page 4-3. Moreover, according to EPA, "limestone is by far the predominant sorbent used in wet FGD systems (68 percent of the currently operating electric generating units)," followed by lime (17%) and magnesium-enhanced lime (4 %). *See* 2009 EPA FGD Wastewater Study at pages 4-3 to 4-4. Finally, EPA concluded that "[p]ower plants are expected to continue installing new FGD systems in substantial numbers until at least 2025," and that "[b]ased on communications with industry and corroborated by responses to the data request, *EPA expects that new wet FGD systems will be limestone forced oxidation systems that produce a commercial-grade gypsum by-*

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4 EPA did not have information regarding the type of oxidation system for the FGD systems servicing the remaining 50 electric generating units (22%). See 2009 EPA FGD Wastewater Study at page 4-3.

product, even for those plants located in an area where there may be no market available for the sale of such a byproduct." *See* 2009 EPA FGD Wastewater Study at pages 4-4 to 4-5; *see also* 2009 EPA FGD Wastewater Study at page 4-7 ("[F]orced oxidation systems … are the most common systems operating segregated wastewater treatment systems prior to discharging FGD wastewater. In addition, based on discussions with industry representatives, *EPA expects that the majority of future wet FGD systems will be forced oxidation*") (emphasis supplied). In other words, by installing a LSFO wet FGD system at Merrimack Station, PSNH is right on the EPA-defined cutting edge of FGD system technology.

In addition, the widespread use of LSFO wet FGD systems not only affords PSNH the ability to learn from the experience of other electric generating facilities that have installed and operated such systems. It also affords PSNH's FGD System vendors the confidence, based on an established industry track record, to provide pollutant reduction guarantees. In particular, PSNH has obtained guarantees from the FGD System vendor to ensure Merrimack Station's compliance with the mercury emissions reduction provisions of the New Hampshire Multiple Pollutant Reduction Program established under RSA 125-O. It is PSNH's understanding that Merrimack Station's FGD System is the first FGD system in the United States that went out to bid with a mercury emission reduction requirement as its primary design basis (that is, with sulfur dioxide emission reductions as a secondary benefit). To accommodate PSNH's primary goal of significantly reducing its mercury emissions in accordance with New Hampshire law, the FGD system vendors responding to PSNH's bid for the Merrimack System FGD System tailored certain design features of their equipment and processes in an effort to enable PSNH to achieve this goal – and to be able to provide the guarantee that PSNH required. PSNH firmly believes that if any of these vendors had determined that a different type of wet FGD system could provide better pollutant reductions, it would have proposed that system in its bid to increase its ability to win the contract award for the FGD System.

LSFO FGD has a larger installed base than the other wet FGD technologies because it has several distinct advantages over those technologies. First, it allows for the beneficial use of the gypsum byproduct generated by the wet scrubber process. Because this gypsum byproduct constitutes the vast majority of the solids generated in the wet FGD process, recycling some or all of it greatly reduces both the costs and the potential environmental liability associated with landfill disposal. Such potential liability is lessened not only because the volume of solid waste material landfilled is greatly reduced (through recycling to a beneficial use such as wallboard manufacture), but also because the composition of the material that is ultimately landfilled material is better known. Landfilling solid waste generated by the other wet FGD technologies has produced concerns with COD and BOD in some instances. By leveraging industry experience, PSNH will be more assured that the landfilled material is stable.

Second, LSFO FGD poses fewer operation and maintenance concerns than natural oxidation and inhibited oxidation FGD. These systems generate a calcium sulfite by-product instead of a gypsum by-product, and this calcium sulfite has caused significant scaling and plugging problems at a number of units. *See* the United States Department of Energy National Energy Technology Laboratory paper entitled "Mercury Capture and Fate Using Wet FGD at Coal-Fired Power Plants," which is provided as Attachment 3 to this letter. In addition, as EPA has noted, "[a]lthough the calcium sulfite FGD solids can be landfilled after the final dewatering process, some plants operating inhibited oxidation systems further process the calcium sulfite by mixing it with dry fly ash and lime in a pug mill to generate a cementitious material similar to concrete. The resultant cementitious material is transported to a landfill." *See* 2009 EPA FGD Wastewater Study at page 4-13. In other words, inhibited oxidation systems typically generate more solid waste requiring landfilling than does an LSFO system producing a gypsum byproduct that can be sold for commercial uses.

PSNH did not consider installing a dual-alkali FGD system at Merrimack Station because such systems are designed to target the sulfur dioxide in flue gas. As noted above, PSNH's primary goal in installing the FGD System at Merrimack Station is to be able to comply with the stringent mercury emissions reduction requirements of the New Hampshire Multiple Pollutant Reduction Program established under RSA 125-O.

8. In PSNH's October 8, 2010 Submission, the company makes a number of statements regarding pollutant levels expected to be in the wastewater from the FGD WWTS. Please explain in more detail the basis and meaning of the following statements:

a. "... the FGD WWTS will reduce mercury levels in the FGD Wastewater greater than 99.9 percent," See PSNH's October 8, 2010 Submission, at p. 2.

Consistent with vendor guarantees, and on the condition that the mercury concentrations in the FGD Wastewater influent to the FGD WWTS do not exceed 2500 μg/l, the mercury concentrations in the treated FGD Wastewater will not exceed 0.014 μg/l. This reduction from the maximum permissible influent FGD Wastewater mercury concentration to the maximum permissible treated FGD Wastewater mercury concentration represents a reduction of at least 2499.986/2500.00 = 0.9999 = 99.99%.

b. "... PSNH is taking a pioneering approach, incorporating the enhanced metals removal subsystem into the FGD WWTS to ensure the achievement of 'no net mass increase' in mercury discharges." Id.

The "no net mass increase" in mercury discharges will result from the FGD System's reuse of Station wastewater sent to the Station's treatment pond as make-up water. Specifically, the mass loading of mercury in Station wastewater other than the treated FGD Wastewater will be reduced because this wastewater will be removed from the Station effluent that is ultimately discharged to the Merrimack River. The addition of the enhanced metals removal system ensures that the mass loading of mercury in the treated FGD Wastewater will be less than that amount of mercury that will be removed from the pond in the FGD make-up water. The result is a net mass decrease in mercury discharges to the river, that is, no net mass increase in mercury discharges to the river.

c. "... only a nearly non-detectible concentration of mercury will be present in the treated FGD Wastewater upon discharge." Id.

The FGD WWTS is expected to reduce the mercury concentration in the FGD Wastewater to 0.014 µg/l. EPA Method 1631, Revision E: "Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry" allows for the determination of mercury in the concentration range of 0.0005 to 0.1000 µg/l in water. Actual field samples require dilution to avoid interference of other ions when analyzing for mercury. Because of this factor, coupled with the requirement for very high-quality control techniques when analyzing for low levels of mercury, the concentrations of mercury in the treated FGD WWTS effluent will be near the *practical* limit of accurate measurement.

d. "... the FGD Wastewater will pass through two sets of targeted adsorbent media that will enable Merrimack Station's FGD WWTS to achieve near-complete removal of mercury, arsenic and other heavy metals from the FGD Wastewater." Id. at p. 4.

The adsorbent media planned to be installed as the second stage of the FGD WWTS' enhanced metals removal subsystem will provide a "polishing step" that will enable the FGD WWTS to reduce mercury concentrations to 0.014 µg/l, which represents a removal of greater than 99.9% for mercury. Similarly, arsenic will be reduced to levels on the order of 0.02 mg/l or less, which represents a removal of greater than 99.3%.

e. ". . . these adsorbent media will remove dissolved and extremely fine particles of arsenic and mercury (ionic, elemental and in the form of hydroxide compounds and sulfide compounds) that none of the other evaluated FGD wastewater treatment technologies can remove effectively, if at all." Id. at pp. 4-5.

The physical-chemical treatment component of the FGD WWTS – which is a treatment technology train that is widely used to manage FGD wastewater generated by LSFO FGD systems – relies on pH adjustment and hydroxide and sulfide precipitation, followed by settling, additional pH adjustment and fine sand filtration. This physical-chemical technology has been demonstrated to achieve low concentrations of regulated chemical species in FGD wastewater generated by many power plant FGD systems. The FGD WWTS' enhanced metals removal subsystem, which will be located downstream of the physical-chemical component of the FGD WWTS, will use specialized adsorbent to attain even lower FGD-related pollutant concentrations by (1) filtering very small particles not removed by the physical-chemical filtration process, and (2) removing a large portion of the dissolved species, which were not precipitated in the physical-chemical system reactions (i.e., the small portion of those species that remain soluble). To PSNH's knowledge, no other FGD wastewater treatment system installed to date has incorporated this adsorption mechanism.

9. PSNH's October 8, 2010 Submission, at p. 4, states that the proposed adsorbent media ".... are demonstrated technologies for reducing heavy metals concentration in other industrial wastewaters and drinking water." Please provide data evidencing the demonstrated pollutant reduction capabilities of the adsorbent media in the other applications referred to in your letter. In addition, please explain why the proposed absorbent media will be equally, or more effective, in treating the wastewater from the FGD WWTS.

This response to be provided under separate cover as Confidential Business Information.

We look forward to continued discussions with EPA about the FGD WWTS. In the meantime, please call me or Allan Palmer (603-634-2439) if you need additional information or have any questions.

Very truly yours,

William H. Smagula

William H. Smagula, P.E.
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Enclosures

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