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**THE STATE OF NEW HAMPSHIRE  
BEFORE THE  
NEW HAMPSHIRE  
PUBLIC UTILITIES COMMISSION**

**DE 11-250  
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE  
Investigation of Scrubber Costs and Cost Recovery**

**PREFILED TESTIMONY OF ELIZABETH A. STANTON ON BEHALF OF  
THE CONSERVATION LAW FOUNDATION**

**December 23, 2013**

Submitted by:

/s/ N Jonathan Peress  
N Jonathan Peress  
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**Q. Please state your name, position and business address.**

A. My name is Elizabeth A. Stanton, and I am a Consultant with Synapse Energy Economics (Synapse) at 485 Massachusetts Avenue, Suite 2, Cambridge, Massachusetts 02139.

**Q. Please summarize your educational background and recent work experience which is more fully set forth in Exhibit 1: Stanton Curriculum Vitae.**

A. I am a senior economist at Synapse. I have more than 13 years of professional experience as an environmental economist, and have authored more than 70 reports, policy studies, white papers, journal articles, and book chapters on topics related to energy, the economy, and the environment.

Since joining Synapse in 2012, I have led studies examining environmental regulation, cost-benefit analyses, and the economics of energy efficiency and renewable energy. I have submitted expert testimony in Illinois, Vermont, and several federal dockets. My recent work includes developing comments on the U.S. Environmental Protection Agency's proposed Effluent Limitation Guidelines (ELG) rule, critiquing the analyses used to support a flawed valuation method for nuclear power plants, and developing a report on the likely future of the U.S. domestic coal market.

On behalf of the Massachusetts Clean Energy Center and its partners—the Massachusetts Departments of Energy Resources, Environmental Protection, and Public Utilities—I recently provided consulting services to estimate costs and greenhouse gas emission reductions associated with Global Warming Solutions Act (GWSA) compliance. My work analyzing climate policy in Massachusetts

also includes modeling of the GWSA for Synapse's Avoided Energy Supply Costs in New England: 2013 Report. I estimated the projected costs and carbon dioxide emissions savings of the specific GWSA electric-sector policies set out in the Massachusetts Clean Energy and Climate Plan, identified resources for compliance, and presented an example inventory method that would provide an accurate accounting of electricity sector emission reductions for GWSA compliance.

Prior to joining Synapse, I was a senior economist with the Stockholm Environment Institute's (SEI's) Climate Economics Group, where I was responsible for leading the organization's work on the Consumption-Based Emissions Inventory (CBEI) model and on water issues and climate change in the western U.S. While at SEI, I led domestic and international studies commissioned by the United Nations Development Programme, Friends of the Earth-U.K., and Environmental Defense.

My articles have been published in Ecological Economics, Renewable Resources Journal, Environmental Science & Technology, and other journals. I have also published books, including Climate Economics: The State of the Art (Routledge, 2013), which I co-wrote with my colleague at Synapse, Dr. Frank Ackerman. I am also coauthor of Environment for the People (Political Economy Research Institute, 2005, with James K. Boyce) and coeditor of Reclaiming Nature: Worldwide Strategies for Building Natural Assets (Anthem Press, 2007, with Boyce and Sunita Narain).

I earned my Ph.D. in economics at the University of Massachusetts-Amherst, and have taught economics at Tufts University, the University of Massachusetts-

Amherst, and the College of New Rochelle, among others. I currently serve on the Climate Taskforce of Economics for Equity and Environment (the E3 Network).

**Q. On whose behalf are you providing testimony in this proceeding?**

A. I am testifying on behalf of the Conservation Law Foundation.

**Q. Have you testified previously before the New Hampshire Public Utilities Commission or any other public utilities commission?**

A. I have not testified previously before the New Hampshire Public Utilities Commission. I have testified before Vermont's Public Service Board.

**Q. What is the purpose of your testimony?**

A. The purpose of my testimony is to discuss the prudence of decisions made to continue construction on the Merrimack scrubber after its costs were known by PSNH to be significantly higher than originally expected.

**Q. What documents have you reviewed to prepare your testimony?**

A. I have reviewed relevant NHPUC orders, discovery from this docket, major contracts for the Merrimack scrubber, Gary Long's September 16, 2013 deposition, FERC Form 1 data, AESC 2007, ISO-NE FCM auctions and floor prices, and the Synapse 2008 CO<sub>2</sub> Price Forecast.

**Q. In the course of preparing your testimony, did you develop an understanding of the scrubber project undertaken by PSNH at Merrimack Station?**

A. Yes, I did.

**Q. What is your understanding of the project—both in terms of the reasons for undertaking it and the timeline for completing it?**

A. In 2004, PSNH estimated that the cost of constructing a wet scrubber at Merrimack Station would be \$250 million and began to incur expenses for engineering studies and other planning activities. In 2006, New Hampshire passed legislation ordering that a wet scrubber be installed at Merrimack Station by July 1, 2013 to reduce emissions of mercury. By March 2009—when PSNH received its Temporary Air Permit from the New Hampshire Department of Environmental Conservation (NHDES) allowing it to begin construction on the scrubber—the company had spent \$23 million on engineering and planning.

By June 2008, however, PSNH had determined that the cost of the scrubber project would be higher than originally expected: \$457 million. Nonetheless, PSNH went forward with the project and the scrubber came into service in September 2011, twenty-two months in advance of the deadline required by statute.

**Q. To develop that understanding, did you review the relevant statute that authorizes PSNH to build the scrubber?**

A. Yes, I did.

**Q. As an economist, what did that review tell you regarding the ability of PSNH to recover the costs of installing the scrubber?**

A. My understanding, from reviewing N.H. Rev. Stat. § 125-O:18, is that PSNH may recover the costs of building the Merrimack scrubber from ratepayers if and only if those costs are prudent.

If the owner is a regulated utility, the owner shall be allowed to recover all prudent costs of complying with the requirements of this subdivision in a manner approved by the public utilities commission. During ownership and operation by the regulated utility, such costs shall be recovered via the utility's default service charge. In the event of divestiture of affected sources by the regulated utility, such divestiture and recovery of costs shall be governed by the provisions of RSA 369:B:3-a.) (N.H. Rev. Stat. § 125-O:18)

From this I understand that the NHPUC will examine expenses related to building the scrubber. Those costs that are determined to be prudent will be recovered from ratepayers. Those costs that are determined to be imprudent will not be recovered from ratepayers.

**Q. As an economist, please describe your understanding of what “prudent costs” means?**

A. A prudent cost is one which—to the best understanding of a utility’s manager at the time when the cost was incurred—provides a benefit to ratepayers. Critical to a determination of prudence is the requirement that a manager’s decision making must be based on the best information that he or she could and should have had access to at the time when the decision was made, and that prudent decisions must be reassessed continually up until the point that all costs are “sunk”. That is, a prudent decision to incur a capital expense is not made once in advance of all spending and then stands as prudent in perpetuity. Rather, to be prudent, such a decision must be reassessed continually throughout the planning and construction of the project in order to determine whether, given changing economic conditions or cost estimates, canceling or redesigning the project would be more beneficial to ratepayers.

**Q. From an economic point of view, what type of analysis, if any, should a prudent utility manager do when evaluating whether to undertake or complete a project like installation of the scrubber?**

A. I would expect a prudent utility manager to conduct a “cashflow” analysis of the unit—and to update this cashflow analysis continually as economic conditions and cost estimates change. A cashflow analysis compares:

(1) all of the costs of continued operation the unit (including fuel, emissions allowances, operations and maintenance, property tax, depreciation, and the return to rate base paid to shareholders for new investments) to

(2) the cost of providing the same energy services should the unit be retired (the unit’s revenues from the energy and capacity markets).

The net benefits of continued operation (the costs if the unit is retired less the costs if the unit continues operation) may be compared both year by year and in terms of their “net present value”, which is their discounted value (that is, accounting for a difference in value between dollars received today and dollars received in the future) summed up at the time when the cashflow analysis is made.

If the cashflow analysis showed a negative net present value over the period of the life of the capital expense, then retirement would be less costly than continued operation, and a prudent manager would recommend against continuing to finance the project. This judgment, of course, would have to take into consideration penalties for the cancelation of contracts.

**Q. In your opinion, would it be prudent for a utility manager to proceed with the scrubber project without undertaking that analysis?**

A. It would not, in my opinion, be prudent for a utility manager to proceed with any major capital project—including this scrubber project—without conducting a cashflow analysis comparing the expected cost of undertaking the project to the expected cost of not undertaking the project.

**Q. Why not?**

A. Prudence requires a utility manager to restrict capital expenses for which he or she plans to seek recovery from ratepayers to those projects that are beneficial to ratepayers. A cashflow analysis examines the net benefits of any such project. Without performing such an analysis—and, critically, repeating the analysis as economic conditions and cost estimates change—it would be impossible to assert that the project will result in a net benefit, and not a net cost, to ratepayers.

**Q. What was or were the critical time frame(s) during which PSNH should have analyzed the costs and benefits of proceeding with the scrubber project?**

A. Both natural gas prices and wholesale energy prices were in flux in the period from 2006 through March 2009 when PSNH received its Temporary Air Permit from NHDES and began construction on the Merrimack scrubber. So too were trends in national income—which can have an important impact on demand for electricity and on resource prices. In such a period of flux, periodic reassessments of net benefits of the project would have been essential to assuring prudence. Certainly, a thorough cashflow analysis conducted in March 2009, before beginning construction on the scrubber, was required for prudence.

**Q. In 2006, when the scrubber project was first authorized by statute, was it reasonable and prudent for PSNH to make plans to install the scrubber? If so, please briefly explain why.**

A. I have not conducted an analysis of the prudence of constructing the scrubber from the perspective of decisions made in 2006. At that time—in comparison to early 2009—the expected cost of the scrubber was much lower, \$250 million compared to \$457 million.

**Q. Did circumstances change at any point that should have caused a prudent utility manager to reevaluate the efficacy of continuing to install the scrubber?**

A. Yes.

**Q. What economic circumstances changed during 2008 and early 2009 that should have caused PSNH or a reasonable and prudent utility manager to reevaluate whether or not to proceed with the scrubber?**

A. Expected natural gas prices, expected wholesale energy prices, expected capacity factors, the expected cost of the scrubber, and the rate of migration of customers from PSNH all changed during this period. All of these changes should have caused a prudent utility manager to reassess the net benefits of the scrubber project.

**Q. At that point, based on your review of the evidence in this matter, was it too late for PSNH to stop construction?**

A. Major construction had not yet commenced in March 2009 when PSNH received the Temporary Air Permit for the scrubber. It seems then that PSNH would have had to stop construction, but rather could have made a decision not to begin construction.

**Q. How did you develop your understanding that major construction had not begun?**

A. Gary Long states in his September 16, 2013 deposition that major construction had not yet begun in March 2009 (see pages 204 through 208). In addition I reviewed a



summary of invoices from expenses incurred by PSNH for the Merrimack scrubber construction.

**Q. Did you determine whether PSNH in fact waited until after March 2009 to commence major construction?**

A. Yes.

**Q. Please describe the analysis that you undertook to make that determination, as documented in Exhibit 2: Synapse Analysis of Scrubber Invoice (Excel spreadsheet) and Exhibit 3: Graph of Scrubber Expenses (PDF document).**

A. I examined a summary of invoiced expenses incurred by PSNH in building the Merrimack scrubber (see Data Request CLF-01). I organized the summary of invoiced expenses provided by PSNH by date and calculated cumulative total expenses from April 2004 through April 2012.

**Q. And based on the analysis you conducted and your review of Mr. Long's deposition transcript, what expenses had PSNH incurred before March 2009?**

A. As of March 1, 2009, PSNH had incurred \$23 million dollars in expenses on the Merrimack scrubber.

**Q. So, to reiterate, none of the major construction contracts were implemented before March 2009 and all of them could be terminated before construction began?**

A. None of the major construction contracts were substantially implemented before March 2009. BEGIN CONFIDENTIAL [

] END CONFIDENTIAL

**Q. You earlier testified that PSNH should have reevaluated the prudence of continuing to install the scrubber during late 2008 or early 2009 due to escalating construction costs and changing market conditions, correct?**

A. Yes.

**Q. Would you agree that one of the changing conditions to consider was customer migration rates?**

A. Yes.

**Q. Did PSNH consider this factor in late 2008 or early 2009 before deciding to commence major construction of the scrubber?**

A. Gary Long states in his September 16, 2013 deposition that migration rates were not and should not have been considered in the decision to begin major construction (see page 197).

**Q. Another factor was changes in forward gas pricing; did PSNH consider gas forward pricing before beginning major construction?**

A. Gary Long states in his September 16, 2013 deposition that expected gas prices were not considered in the decision to begin major construction (see page 198).

**Q. Did PSNH consider that Merrimack might shift from a base to intermediate or peak facility?**

A. Gary Long states in his September 16, 2013 deposition that Merrimack shifting from base load to intermediate or peak load was not considered in the decision to begin major construction (see page 199).

**Q. Did PSNH consider divestiture of Merrimack Station instead of proceeding with scrubber construction?**

A. Gary Long states in his September 16, 2013 deposition that divestiture of Merrimack was not considered in the decision to begin major construction (see page 211 through 213).

**Q. Did PSNH consider retiring the plant instead of proceeding with scrubber construction?**

A. Gary Long states in his September 16, 2013 deposition that retirement of Merrimack was not considered in the decision to begin major construction (see page 214).

**Q. Did PSNH forecast the costs of complying with other environmental requirements applicable to Merrimack Station?**

A. Gary Long states in his September 16, 2013 deposition that PSNH includes the expected costs of “known rules” in its economic analyses, and explains that “known rules” are “Rules that exist, that are in place, that are enforceable.” (see page 219). Mr. Long also explains that draft environmental rules are “followed” and “monitored” but that draft rules would be too “speculative” to include in economic analysis except as “risk factors or something to learn more about.” Risk factors, Mr. Long explains, do not go into PSNH’s budgets (see page 220). Mr. Long identifies the potential need for a cooling tower for Merrimack as well as the wet scrubber as potential environmental compliance costs to which PSNH could be exposed (see page 226 through 228).

**Q. Please refer to Exhibit 4: Merrimack Cashflow using 2008 energy price projections (Excel spreadsheet). Did you create this exhibit?**

A. Yes.

**Q. Does Exhibit 4 represent the type of analysis that a reasonable and prudent utility manager could have undertaken in early 2009 - before commencing major construction on the scrubber - to determine if it made sense to continue with the project?**

A. Yes, it does.

**Q. What information did you use to create Exhibit 4?**

A. I used data that would have been available to Merrimack’s managers in 2008-2009. I used:

- 2008 variable costs for Merrimack from FERC Form 1 data;
- a range of wholesale energy prices taken from the AESC 2007 report (in which PSNH was a participating stakeholder); these prices corresponded to the range of future natural gas prices expected at that time;

- a capacity price forecast based on information known through FCM auctions and future floor prices set by ISO-NE as of March 2009, along with the assumption that the price would grow linearly to \$7/kW-month in 2018 and remain at that level;
- installation of an Activated Carbon Injection for compliance with EPA's air toxics rule under section 112 of the Clean Air Act in 2015 or 2016;
- installation of either impingement controls or closed cycle cooling pursuant to section 316 of the Clean Water Act in 2016 to 2020;
- installation of new controls for coal combustion residuals in 2015 to 2020;
- installation of new effluent (water pollution) controls in 2016 to 2020;
- the SO<sub>2</sub> and NO<sub>x</sub> allowance prices used by PSNH in Data Request TC01-01-SP01;
- expected RGGI CO<sub>2</sub> allowance prices from AESC 2007 for years 2008 through 2012;
- federal CO<sub>2</sub> allowance prices from the Synapse 2008 CO<sub>2</sub> Price Forecast for years 2013 through 2027;
- the scrubber capital costs predicted by PSNH at that time as shown in Data Request TC01-01-SP01;
- non-environmental capital costs predicted by PSNH at that time as shown in Data Request TC01-01-SP01; and
- the assumption that Merrimack would maintain its 2008 capacity factor of 72 percent.

**Q. Just to be clear, all of the information that you relied upon to create Exhibit 4 is information that was available to utility managers in late 2008 and early 2009, correct?**

A. Yes. That's correct.

**Q. Exhibits 5, 6, and 7 are graphs or tables based on the analysis performed in Exhibit 4. Is that correct?**

A. Yes.

**Q. Exhibit 5: Net Benefits to Ratepayers of Continued Operation of Merrimack (PDF document) contains a vertical axis labeled Net Benefits and a horizontal axis labeled Year. Can you explain each axis and why the analysis is conducted through 2027?**

A. The vertical axis in Exhibit 5 represents the net benefit of continuing to operate Merrimack (in the event that the scrubber was constructed) in each of the years shown. The net benefit to ratepayers is (1) the cost of purchasing the same energy services provided by Merrimack on the market less (2) the expenses of continuing to operate the plant. The expenses of continuing to operate Merrimack include both the costs of running the plant (fuel, operations, maintenance, emission allowances, property taxes, and depreciation) and the return to shareholders of and on their new investments in the plant, including the scrubber.

The cost of repaying shareholders for their existing investment in Merrimack (as of 2008) would, arguably, exist whether or not Merrimack continued operation. This kind of cost is referred to as being “sunk” and is not included in either the cost of continued operation or the cost of retirement.

The horizontal axis represents time and extends from the time of the 2008/2009 decision to construct the scrubber despite the increase in construction costs out to 2027, which is the end of the expected life of the scrubber. By 2027, loans associated with the scrubber will have been paid in full.

**Q. Exhibits 5 and 7 presents five scenarios; please briefly explain each scenario and why you chose to analyze Merrimack’s future cashflow using these five scenarios?**

A. The five scenarios analyzed in Exhibit 4 and shown in Exhibits 5 and 7 represent a range of possible future assumptions regarding gas prices and environmental control requirements from the point of view of a prudent manager in March 2009. I used low, reference/mid, and high gas price assumptions from the AESC 2007 that

correspond to low, reference/mid, and high wholesale energy prices. I also used low, reference/mid, and high environmental control requirements that correspond to the range of possible outcomes that should have been expected by a prudent manager in 2008/2009. Exhibit 6: 2008/2009 Environmental Retrofit Assumptions for Merrimack Station provides a summary of the environmental control assumptions used in my analysis.

Figures 5 and 7 show five scenarios with five different combinations of these assumptions:

- Scenario 1: Reference Case: Reference/mid gas price and reference/mid environmental control requirements.
- Scenario 2: Low gas price and low environmental control requirements.
- Scenario 3: High gas price and high environmental control requirements.
- Scenario 4: High gas price and low environmental control requirements.
- Scenario 5: Low gas price and high environmental control requirements.

These five scenarios were chosen to demonstrate the range of likely future net benefits from Merrimack Station in the event that the scrubber was constructed.

**Q. Is this typical of how a utility should project future cashflow?**

A. Yes.

**Q. Based on your analysis as summarized in Exhibit 7: Net Present Value of Net Benefits to Ratepayers of Continued Operation of Merrimack (PDF document), what should a reasonable and prudent utility manager have concluded about whether or not constructing the scrubber would provide net benefits to ratepayers?**

A. As shown in Exhibit 7, at Merrimack's 2008 capacity factor of 72 percent four out of five of these scenarios resulted in negative net benefits (that is, net costs) for ratepayers. The only scenario in which building the scrubber resulted in net benefits for ratepayers was one in which both gas prices were high (resulting in high energy replacement costs for PSNH in the Merrimack retirement case) and

environmental control requirements were low (resulting in low capital addition costs for PSNH in the continued operation of Merrimack case). In this scenario, net benefits to ratepayers would be expected as long as the Merrimack's capacity factor did not drop below 60 percent.

A reasonable and prudent utility manager would have concluded that it was more likely than not that constructing the scrubber would result in net costs, and not net benefits, to ratepayers.

**Q. Based on your analysis, would it be reasonable and prudent to assume that gas prices would be high and environmental control costs low?**

A. It would not. The assumptions represented in the Reference Case are what a prudent manager would have considered most likely in March 2009. But a prudent manager should also have taken into consideration that there was a possibility of higher or lower gas prices and more or less stringent environmental control requirements. An assumption that the low environmental retrofit, high gas price scenarios would take place with certainty would have been unfounded.

**Q. Are you familiar with N.H. Rev. Stat. § 369-B:3-a, which provides that: The sale of PSNH fossil and hydro generation assets shall not take place before April 30, 2006. Notwithstanding RSA 374:30, subsequent to April 30, 2006, PSNH may divest its generation assets if the commission finds that it is in the economic interest of retail customers of PSNH to do so, and provides for the cost recovery of such divestiture. Prior to any divestiture of its generation assets, PSNH may modify or retire such generation assets if the commission finds that it is in the public interest of retail customers of PSNH to do so, and provides for the cost recovery of such modification or retirement?**

A. Yes.

**Q. In your opinion, based on the information that PSNH had available to it in early 2009, before commencing major construction, would it have been economically prudent for the company to consider divestiture or retirement of Merrimack Station?**

A. Yes.

**Q. In your opinion, based on the information that PSNH had available to it in early 2009, was it reasonable and prudent from an economic point of view to continue with the scrubber and incur the majority of the costs associated with the project?**

A. No.

**Q. Given that PSNH is entitled to recover all prudent costs associated with installing the scrubber in a manner approved by the public utilities commission, do you have an opinion regarding what constitutes “prudent costs”?**

A. Yes.

**Q. Based on that understanding, what is your opinion concerning whether PSNH incurred any “prudent costs” associated with installing the scrubber?**

A. I believe that the \$23 million spent by PSNH prior to March 2009, together with the penalties for cancelation set out in their major scrubber contracts, are prudent costs that can be recovered by the utility. Additional costs spent by PSNH on the scrubber after March 2009 were not spent prudently—that is, these costs did not benefit ratepayers—and are not recoverable.

**Q. Does this conclude your testimony?**

A. Yes.



Dated: December 23, 2013

*Elizabeth Stanton*

ELIZABETH STANTON  
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State of Massachusetts  
Middlesex County

Personally appeared the above named Elizabeth Stanton made oath to the truth of the foregoing statements.

Before me,

*Melissa Schultz*

Attorney at Law/Notary Public



**MELISSA SCHULTZ**  
Notary Public  
Commonwealth of Massachusetts  
My Commission Expires  
July 27, 2018

*Melissa M Schultz*

Typed / printed name