

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

**Public Service Company of New Hampshire  
d/b/a Eversource Energy  
Reconciliation of Energy Service and Stranded Costs for  
Calendar Year 2016**

**DIRECT TESTIMONY OF  
Elizabeth H. Tillotson**

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1 **I. Introduction**

2 **Q. Please state your name, position, employer and address.**

3 A. My name is Elizabeth H. Tillotson. I am the Manager – Regulatory and  
4 Environmental for the Generation Division of Public Service Company of New  
5 Hampshire, d/b/a Eversource Energy (“Eversource”). My business address is 780  
6 North Commercial Street, Manchester, New Hampshire 03101.

7 **Q. Please provide a brief summary of your background.**

8 A. I received a Bachelor of Science in Mechanical Engineering from the University of  
9 New Hampshire. I began working for Public Service Company of New Hampshire  
10 in 1980. My duties have included Results Engineer – Merrimack Station, Senior  
11 Engineer on Staff including serving as the Division’s weld engineer, Project  
12 Engineer – Merrimack Station’s Supplemental Precipitator, Production Manager –  
13 Merrimack Station and Station Services Manager at Merrimack Station responsible  
14 for the installation of the Merrimack Unit 2 supplemental precipitator and the  
15 Merrimack 1 SCR. In February 2002, I assumed the responsibilities of Technical  
16 Business Manager - PSNH Generation. In 2014, I became the Manager –  
17 Regulatory and Environmental for the Generation Division.

1 **Q. Have you ever testified before this Commission?**

2 A. Yes. I have provided testimony in previous Commission proceedings including  
3 energy service and reconciliation dockets. I also testified before the commission  
4 during the Schiller Conversion proceeding, Docket No. DE 03-166.

5 **Q. Please describe your responsibilities as Manager – Regulatory and  
6 Environmental, Generation.**

7 A. In my present position, as Manager – Regulatory and Environmental for  
8 Generation, I am responsible for the support of environmental and regulatory  
9 compliance, as well as supporting legislative activities for PSNH’s generating  
10 stations. Eversource maintains a diversified fuel portfolio including gas, oil and  
11 coal-fired units as well as hydro and renewable biomass with a total generation  
12 capacity of approximately 1150 MW.

13 **Q. What is the purpose of your testimony in this proceeding?**

14 A. The purpose of my testimony is to provide information on all outages that took  
15 place at Eversource’s fossil-fired, hydroelectric and biomass units and at NextEra  
16 Energy Resources, LLC’s (formerly FPL Energy) Wyman Station, Unit No. 4 in  
17 which Eversource is a minority owner. This information will be for the period  
18 January 1, 2016 through December 31, 2016. I shall also provide information on  
19 unit equivalent availability achieved by Eversource’s steam generating units,  
20 consistent with reporting provided in previous years. Unit availability including  
21 planned outages will be calculated consistent with past submittals, as well as  
22 similar calculations, without the influence of planned outages.

23 **II. Generating Unit Operation**

24 **Q. Please provide an overview of the performance of Eversource’s generating  
25 units in 2016.**

26 A. Eversource’s generating units produced 1,069,775 megawatt-hours (MWH) during  
27 2016. The fleet’s availability during the 30 highest-priced days when customers’

1 exposure to high market prices was the greatest was 98.42%. Eversource focused  
2 on safe, compliant, reliable, and cost-effective operations and management of the  
3 generating fleet as well as the successful management of planned outages and  
4 forced outages during 2016 to provide benefit to customers. These efforts resulted  
5 in the generating stations achieving an aggregate equivalent availability of 90.6%  
6 in 2016.

7 Merrimack Unit 1 and Unit 2 provided high availability in the winter months of  
8 January, February and March with equivalent availability factors of 97.3% on Unit  
9 1 and 100% of Unit 2. The annual equivalent availability factors (“EAF”) were  
10 95.4% and 81.1%, respectively. These availabilities are reduced due to outage  
11 planning which considers overtime costs and replacement power costs, often  
12 resulting in a longer outage window (lower EAF), but lower overall costs to  
13 customers. The Flue Gas Desulfurization system (“scrubber”) completed its fifth  
14 full calendar year of successful operation with overall good performance.  
15 Merrimack Station also operates four electrostatic precipitators and two selective  
16 catalytic reduction systems to significantly reduce flue gas emissions.

17 At Schiller Station, December 1, 2016 marked the tenth anniversary of the  
18 Northern Wood Power biomass unit (Unit 5). In 2016, Unit 5 produced 306,137  
19 MWH, an 81.3% capacity factor; and it has generated about 3,200,000 MWH  
20 during its 10 years of operation. During the year, Unit 5 burned about 484,000  
21 tons of wood and logged three runs of greater than 100 days including the 2<sup>nd</sup>, 3<sup>rd</sup>  
22 and 7<sup>th</sup> longest runs. Units 4 and 6 generated about 70,000 MWH with equivalent  
23 availability factors of 91.6% and 96.3%, respectively.

24 Eversource’s hydroelectric facilities consist of 9 hydro facilities with a total of 20  
25 units. These units have a total installed capacity of approximately 70 MW and  
26 successfully produced 282,669 MWH in 2016. The annual generation was about  
27 15% below the long term average due to below average precipitation. The hydro

1 fleet produces the Company's lowest cost power while using a renewable,  
2 reusable, emission-free energy source.

3 In 2016, Newington Station continued to use both natural gas and #6 fuel oil to  
4 support the system grid and maximize its value to customers. Natural gas  
5 accounted for about 75% of total station generation and #6 oil accounted for about  
6 25% of the total station generation. Newington Station participated in the ISO-  
7 NE<sup>1</sup> Winter Reliability Programs for the 2015/2016 period and the 2016/2017  
8 period through the provision of oil inventory service. This resulted in a benefit to  
9 customers of approximately \$2 million in the 15/16 program period and about \$1.7  
10 million in the 16/17 program period. Eversource managed this program to  
11 maximize customer benefit while maintaining unit availability and reliability.  
12 Newington Station completed the year with a 96.9% equivalent availability.

13 **Q. Please provide an overview of the safety and environmental performance of**  
14 **Eversource's generation employees in 2016.**

15 A. There were no safety incidents in 2016 in which Generation employees lost  
16 workdays or had any restricted ability to perform their full duties. Eversource's  
17 generation employees maintain a high focus on individual ownership of safety.  
18 Safety efforts are recognized by management; and employees have the ability to  
19 stop and/or modify jobs as necessary to maintain a safe environment. Hazard  
20 analyses are completed before each job; and job hazard analyses are developed for  
21 more complex tasks. As of December 31, 2016, it had been 491 days since the last  
22 Lost Time Incident.

23 Environmental compliance receives a similar high priority focus. There is well  
24 trained staff at each facility to maintain compliance and recognize potential  
25 environmental issues. Local environmental staff is supported by highly qualified  
26 subject matter experts. A recent 3<sup>rd</sup> party engineering review confirmed that the

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<sup>1</sup> The ISO-NE Winter Reliability Programs run during winter months beginning December 1 and ending February 28.

1 facilities are operated in accordance with all applicable laws and regulations. Key  
2 permits and approvals are in place to operate the facilities; and regulatory  
3 requirements and deadlines have been appropriately satisfied. Importantly, in  
4 2016, the facilities continued their record of no Notices of Violation.

5 **Q. Please provide a summary of how Eversource's generating units continue to**  
6 **operate well, with high reliability and high availability, recognizing the**  
7 **changing market conditions, the capacity demands and the on-going**  
8 **discussion of divestiture.**

9 A. Quality operations and maintenance ensures the generating equipment is prepared  
10 to provide high reliability in an efficient and timely fashion to provide value to  
11 customers and benefit to the ISO-NE grid.

12 Eversource's Generation team continues to focus on key items important to long-  
13 term operational success: the day-in and day-out operation and maintenance of the  
14 units; the corrective and preventative maintenance conducted during forced and  
15 maintenance outages; pre-planning and execution of scheduled and planned  
16 maintenance outages; and the use of a long-term maintenance outage and capital  
17 expenditure planning process. While plans to accomplish these goals have been  
18 revised to accommodate the changing market and unit operations, the goals still  
19 remain safety and high reliability at the lowest possible cost.

20 While the goal of the preventive and predictive maintenance program, maintaining  
21 safety and high reliability at the lowest cost, has not changed, assessment methods  
22 for equipment and system conditions have changed as capacity factors have  
23 decreased. More information and accurate information allows targeted expenditure  
24 of funds and only when needed.

25 With less wear and tear on equipment due to reduced operating hours, major  
26 overhaul work and preventive and predictive maintenance work has been assessed  
27 utilizing new and expanded techniques which allow maintenance and operations

1 professionals to make better informed decisions. These expanded efforts to assess  
2 preventative maintenance has generally resulted in reduced maintenance needs and  
3 lengthened overhaul and repair cycles, as appropriate. Condition-based  
4 maintenance is used to more cost effectively determine routine work, as well as  
5 outage scopes and budgets.

6 Long-term maintenance plans prioritize reliable plant operations and are founded  
7 on operations, equipment history, on-going condition assessment, and industry  
8 experience. The generating stations maintain a long-standing preventative  
9 maintenance program to best execute quality maintenance and the operation of the  
10 units. With fluctuations in market conditions due to economic changes, as well as  
11 the continuing evolution of gas markets, Generation has made changes to the  
12 management of its fleet with adjustments to expenses and staffing consistent with  
13 reduced capacity factor operations. Generation continues to rely on an experienced  
14 management team and a well-trained, skilled work force utilizing sound practices  
15 derived from experience within our facilities, as well as working with suppliers,  
16 contractors, experts, and other generating plant peers in the industry.

17 To summarize, Generation management continues to perform thorough reviews of  
18 the preventative maintenance programs at all fossil steam units. The key goals in  
19 making changes are to avoid any risks of reduced reliability while reducing  
20 customer costs. Also, in addition to modified work practices, efforts have focused  
21 on appropriately reducing inventory levels to be in line with reduced usage of parts  
22 and materials. Finding the proper balance of these numerous related issues is an  
23 on-going focus of our station workforce, staff professionals and management.

24 The 2016 capital and O&M expenses reflected a number of planned major  
25 maintenance activities. A boiler overhaul on Merrimack Unit 2 included  
26 replacement of two cyclones and the penthouse roof. Schiller Station completed  
27 overhauls on Unit 4 and Unit 5. Newington completed a spring outage on the unit.  
28 At Lost Nation unit controls and relays were replaced; additional protection

1 capabilities were also installed. And finally, licensing submittals associated with  
2 the Eastman Falls Hydro renewal were completed. No issues have been raised by  
3 the agencies and the Company received the new license in April, well before the  
4 January 1, 2018 renewal date.

5 Operating budgets continued to emphasize a proper balance between spending  
6 what is necessary in the most critical areas, while being sensitive to the overall cost  
7 of production. Generation reviews maintenance projects to determine how they  
8 can be most effectively executed and how capital investments can be best applied  
9 to achieve a high level of plant performance.

10 **Q. Please discuss how Generation has been addressing the stringent North**  
11 **American Electric Reliability Corporation (NERC) standards as regulated by**  
12 **the Northeast Power Coordinating Council (NPCC)**

13 A. Eversource as a whole, and the Eversource New Hampshire operations including  
14 Generation, is regulated by the NPCC and undergoes stringent audits of NERC  
15 standards and requirements at least every three years. During year 2016, such an  
16 audit did occur for NH including the Generation Owner (GO) and Generation  
17 Operator (GOP) functions.

18 In preparation for these audits, the entire NH organization worked to fulfill and  
19 document compliance with the NERC standards and requirements. As a result of  
20 the history of compliance, and documentation to support that compliance  
21 demonstrated by Eversource in 2015, 2016 and before, the NPCC Internal Controls  
22 Evaluation Team recommended a reduction of 73% from the original 2016  
23 targeted audit scope of NERC's Compliance Monitoring and Enforcement Program  
24 for Eversource NH as a whole. Additionally, NPCC gave Eversource NH the  
25 highest internal control rating for the remaining audit standards in their pre-audit  
26 review. NPCC identified that the remaining standards were required to be audited  
27 either because they were new or because of their criticality to the Bulk Electric  
28 System (BES). For those remaining six standards encompassing eleven

1 requirements, for which Eversource GO and GOP was audited, NPCC had no  
2 findings, no recommendations, and no suggestions for improvement.

3 **III. Unit Outages and Availabilities**

4 **Q. Please provide a list of all unplanned outages that took place during the**  
5 **period January 1, 2016 through December 31, 2016 for Eversource’s fossil,**  
6 **hydro, and biomass units and for NextEra’s Wyman Station Unit No. 4.**

7 A. Attachment EHT-1 lists these outages. This listing is similar to the information  
8 submitted in the past, as a reporting requirement for the fossil hydro “outage  
9 information” resulting from discussion with the Staff in Docket No. DR 91-011.

10 **Q. Is there additional reporting with respect to outages?**

11 A. Yes. Eversource provides outage reports for all forced and maintenance outages in  
12 excess of two days at either Newington Station or at the two units at Merrimack  
13 Station, and in excess of four days at the three units at Schiller Station or at  
14 Wyman Unit 4. These Outage Reports are included as Attachment EHT-2.

15 **Q. Please provide a chronological listing of the forced and maintenance outages**  
16 **for which Outage Reports are provided in the testimony.**

17 A. The following table provides the chronological listing along with the start and end  
18 dates and times, the duration, and the causes of these forced and maintenance  
19 outages. The outages listed do include short term maintenance outages  
20 coordinated with wholesale marketing and scheduled with ISO-NE.

## FORCED &amp; MAINTENANCE OUTAGE LIST

NH Generation Steam Units Forced & Maintenance Outage List							
Report No.		Outage Start Date Time		Outage End Date Time		Duration Days	Reason
OR-1	MK1	02/18	1505	02/20	1615	2.0	Maintenance Outage - 1A Boiler Feed Pump Seal Leak
OR-2	SR6	09/02	0412	09/09	0729	7.1	Transmission Outage (generating unit available)
OR-3	SR5	09/02	2311	09/09	1534	6.7	Maintenance Outage (coincident with transmission outage)
OR-4	MK1	09/26	0700	10/07	1930	11.5	Maintenance Outage - 1A Boiler Feed Pump Barrel Replacement
OR-5	MK2	11/28	1937	12/03	2310	5.1	Turbine Auxiliary Oil Pump Motor Bearing
OR-6	MK2	12/05	1500	12/09	0714	3.7	Turbine Auxiliary Oil Pump
OR-7	SR5	12/26	0305	12/31	2400	5.9	Attemperator Control Valve Repair
OR-8	MK2	12/28	1730	12/31	0001	2.3	Maintenance Outage - Furnace Waterwall Tube Leak

1 **Q. Please discuss the longer outage durations provided in the table.**

2 A. Eversource monitors customer load and the energy market and seeks to provide  
3 low cost energy to Eversource's customers. With that, during periods of low  
4 electrical demand and low power market prices, the outage duration is adjusted to  
5 use less overtime. While this practice may extend the duration of the outage, the  
6 total outage expense is minimized by avoiding the associated overtime costs.

7 **Q. Please provide a brief summary of each of the Outage Reports discussed**  
8 **above.**

9 A. A summary of the Outage Reports follows:

1           2016-OR-01

2           This Merrimack Unit 1 outage was 2.0 days long and began on February 18. The  
3           unit was in reserve status with expected low energy load and price forecasts. It  
4           was decided to declare the unit unavailable and replace the outboard mechanical  
5           seal on the 1A Boiler Feed Pump that had been leaking excessively during the  
6           previous unit run. Station personnel worked limited extended hours to reduce  
7           overtime costs, but the low energy prices allowed the work to be completed on a  
8           one-shift basis and maintain crew consistency.

9           The work was completed and the unit released to ISO at 16:15 on Saturday,  
10          February 20th. The unit remained in reserved outage. Additional jobs from the  
11          outage backlog were also completed.

12          2016-OR-02

13          This Schiller Unit 6 outage was 7.1 days long and began on September 2. While  
14          Unit 6 was available to operate, transmission work being performed in the high-  
15          yard prevented the unit from sending energy to the grid. This transmission outage  
16          was scheduled during what was expected to be a low cost, low demand energy  
17          period and there were no replacement power costs associated with the Schiller Unit  
18          6 outage.

19          2016-OR-03

20          This Schiller Unit 5 outage began on September 2 and lasted 6.7 days, finishing on  
21          September 9. This maintenance outage was planned coincident with the  
22          transmission outage, which was needed to complete work in the Schiller Station  
23          highyard by the T&D organization. Maintenance work completed on the wood  
24          unit included inspection and cleaning of the six cyclone separators, inspection and  
25          cleaning of the in-bed tubes, and inspection and cleaning of the tuyeres. Valve  
26          maintenance and inspections were performed. Targeted replacement of baghouse  
27          filter bags was completed as well as NDE work on the deaerator tubes. Additional  
28          jobs from the outage backlog were also completed within the 7 day window  
29          associated with this transmission outage.

1           2016-OR-04

2           This Merrimack Unit 1 maintenance outage was 11.5 days long and began on  
3           September 26. The unit was in reserve status and with expected low energy load  
4           and price forecasts, it was decided to declare the unit unavailable to replace the 1A  
5           boiler feed pump barrel assembly balance drum and other rotating components.  
6           During the unit's previous operation, the boiler feed pump had exhibited  
7           operational characteristics that indicated that the rotating assembly needed to be  
8           changed. A pump specialist was consulted and the diagnosis confirmed the need  
9           for replacement of the barrel assembly balance drum and other rotating  
10          components. While some of the vendor shop work was performed on an expedited  
11          basis, station repairs were completed on a one-shift basis to control overtime costs  
12          and maintain crew consistency.

13          The unit was declared available to reserve status at 19:30 on October 7 when the  
14          work was completed. Other corrective and preventative maintenance jobs were  
15          completed.

16          2016-OR-05

17          This Merrimack Unit 2 outage was 5.2 days long and began on November 28.  
18          During startup of the unit for scheduled station testing, the turbine auxiliary oil  
19          pump experienced high vibration and tripped its breaker. Initial inspection  
20          indicated damage to both the motor and pump. The motor and pump were sent to  
21          vendor shops for repairs. Once repaired and returned, the pump and motor were  
22          installed and test run. The unit was declared available to reserve status at 23:10 on  
23          December 3. Additional jobs from the outage backlog were also completed.

24          2016-OR-06

25          This Merrimack Unit 2 outage was 3.7 days long and began on December 5. The  
26          unit was removed from service due to high vibration of the turbine auxiliary oil  
27          pump.

1 During startup of Unit 2 for scheduled station testing, the turbine auxiliary oil  
2 pump experienced high vibration and was shut down by operations personnel.  
3 Initial inspection indicated that the lower motor bearing had failed. The pump and  
4 motor had been recently repaired by qualified vendors; see 2016-OR-5. Given the  
5 repetitive failure, the motor was removed and sent to a second motor shop for  
6 inspection and repair. The turbine auxiliary lube oil pump was inspected in place  
7 with no damage found. Once repaired and returned, the motor was installed and  
8 successfully test operated. The unit was declared available at 07:14 on December  
9 9. Startup activities were initiated to perform the required station testing. Note  
10 that the station has since purchased a spare motor for this pump.

11 2016-OR-07

12 This Schiller Unit 5 outage was 7.1 days long and began on December 26. The  
13 unit was removed from service to repair the packing on the desuperheater  
14 attemperator control valve. Prior to this outage, the station had a tentative plan  
15 identifying maintenance work to be completed during the next outage opportunity,  
16 specifically including removal of pluggage from the six cyclone separators. The  
17 planned outage work included cleaning and inspection of the six cyclone  
18 separators and the repair or replacement of in-bed tubes based on NDE work  
19 completed by Thielsch Engineering. Valve inspection and maintenance was  
20 performed on all critical control valves as well as other selected valves. Other  
21 work from the outage backlog was also completed.

22 2016-OR-8

23 This Merrimack Unit 2 outage began on December 28 to repair a variety of boiler  
24 tube leaks. The unit was in reserve status and with expected low energy load and  
25 price forecasts, it was decided to declare the unit unavailable after a boiler  
26 inspection identified several cyclone and furnace water wall tube leaks. All tube  
27 leaks were pad welded back to original thickness. A boiler floor membrane crack  
28 was also identified and repaired. After the repairs were complete, a hydrostatic test

1 was successfully performed. The unit was released to ISO on December 31 at  
 2 0001 in reserve status. Additional jobs were completed for corrective and  
 3 preventative maintenance to support reliability during the upcoming winter period.

4 **Q. Were scheduled Planned Outages performed at any of Eversource's fossil and**  
 5 **hydro units during the period January 1, 2016 through December 31, 2016?**

6 A. Yes. Attachment EHT-1 contains a list of unit outages including planned  
 7 maintenance outages for each of Eversource's fossil, biomass, hydro, and  
 8 combustion turbine units, as well as the Wyman 4 unit. EHT-3 also summarizes  
 9 the planned maintenance periods for the fossil units.

10 **Q. Please provide a list of scheduled Planned Outages at Eversource's fossil units**  
 11 **during January 1, 2016 through December 31, 2016.**

12 A. The planned maintenance outages and their durations were:

Unit	Planned Outages
Schiller Unit 5	03/25 – 05/05
Newington Unit 1	04/04 – 04/10
Merrimack Unit 2	09/09 – 11/15
Schiller Unit 4	10/01 – 10/28

13 The outages listed in the table above were scheduled to complete routine  
 14 maintenance to support improved reliability during subsequent higher priced  
 15 operating periods.

16 **Q. Are these scheduled outages usually included as part of the Reconciliation of**  
 17 **Energy Service and Stranded Costs docket review?**

18 A. Yes. A review of the scheduled outages has traditionally been completed by the  
 19 Commission's Staff utilizing an outside consultant. The outside consultant has  
 20 performed on-site interviews and a review process of the planned outages.

1 **Q. Are there any other requirements associated with this filing to be discussed?**

2 A. Yes. The Company is required to report for a 3-year period on one remaining  
3 recommendation associated with past SCRC filings. That recommendation is the  
4 continuation of hazard tree assessment within our rights of way, and the trimming  
5 or removal of those trees which pose a threat to equipment. The Company  
6 committed to continue this work and to provide information regarding the work  
7 performed in reconciliation dockets for years 2014, 2015 and 2016. At the end of  
8 that time the distribution and transmission systems will have completed their on-  
9 going 5-year vegetation management cycles. Please see Appendix A for a  
10 summary of the 2016 tree removal and costs.

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

12 A. Yes, it does.