

**STATE OF NEW HAMPSHIRE
PUBLIC UTILITIES COMMISSION**

DOCKET NO. DE 13-108

In The Matter of

**PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE
2012 ENERGY SERVICE AND STRANDED COST RECOVERY CHARGE
RECONCILIATION**

DIRECT TESTIMONY OF

**Michael D. Cannata, Jr., P. E.
Senior Consultant
ACCION GROUP, INC.**

November 20, 2013

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1 **I. Introduction and Qualifications**

2 **Q. Mr. Cannata, please state your full name.**

3 A. My name is Michael D. Cannata, Jr.

4

5 **Q. Please state your employer and your business address.**

6 A. For this engagement, I am engaged by Accion Group, Inc. (“Accion Group” or “Accion”) to
7 address the issues raised in this proceeding. Accion’s business address is 244 North Main
8 Street, Concord, New Hampshire 03301.

9

10 **Q. In what capacity are you employed?**

11 A. I am generally responsible for the review of energy utility engineering and operations
12 management, practices, and procedures.

13

14 **Q. Please describe your educational background, work experience, and major
15 accomplishments of your professional career?**

16 A. My educational background, work experience, and major career accomplishments are
17 presented in Exhibit MDC-1.

18

19 **Q. To what professional organizations or industry groups do you belong or have you
20 belonged?**

21 A. I am a member of the Institute of Electrical and Electronic Engineers and its Power
22 Engineering Society, and am a Registered Professional Engineer in the State of New
23 Hampshire (#5618). I served as a member of virtually all of the former New England Power
24 Pool (“NEPOOL”) Task Forces and Committees except for their executive Committee, where

1 my role was supportive to an Executive Committee member. I also served as a member of
2 the New England/Hydro Quebec DC Interconnection Task Force and the Hydro Quebec
3 Phase Two Advisory Committee. These two groups designed the Hydro Quebec Phase One
4 and Phase Two 450kV DC interconnections with New England. The various committees and
5 groups that I have served on existed to address the functions now being performed by the
6 Independent System Operator – New England (“ISO-NE”).

7
8 On national issues, I represented Public Service Company of New Hampshire (PSNH) at the
9 Northeast Power Coordinating Council as its Joint Coordinating Committee member, at the
10 Edison Electric Institute as its System Planning Committee member, and at the Electric
11 Power Research Institute as a member of the Power Systems Planning and Operations Task
12 Force.

13
14 While employed by the of the State of New Hampshire, I managed a professional staff
15 engaged in investigations regarding safety, operations, reliability, emergency planning, and
16 the implementation of public policy in the electric, gas, telecommunications, and water
17 industries. I also served as a full member of the New Hampshire Site Evaluation Committee
18 responsible for siting major energy facilities (Generating stations, gas transmission lines,
19 electric transmission lines, and gas storage facilities). At the request of the New Hampshire
20 Public Utilities Commission’s (“NHPUC” or “Commission”) Chairman, I sat on the State
21 Emergency Response Commission as a designated member. I was also a member of the
22 former Staff Subcommittee on Engineering of the National Association of Regulatory Utility
23 Commissioners.

1 **Q. Have you testified before regulatory bodies before?**

2 A. I have testified before the NHPUC in rate case, condemnation, least cost planning, fuel
3 adjustment, electric industry restructuring, and unit outage reviews. I have testified before
4 the Kentucky Public Service Commission and the Maine Public Utilities Commission in
5 transmission siting proceedings, the Maryland Public Service Commission and the
6 Massachusetts Department of Public Utilities with respect to system reliability/storm
7 restoration proceedings, and have submitted testimony at proceedings at the Federal
8 Energy Regulatory Commission (“FERC”). I have also testified at the request of the
9 Commission before Committees of the New Hampshire Legislature on a variety of matters
10 concerning regulated utilities.

11
12 **II. Summary of Testimony**

13 **Q. Please describe the areas that your testimony addresses today.**

14 A. My testimony addresses three main areas and other lesser issues. Accion was requested to
15 review (1) the market-based capacity and energy transactions performed by PSNH that
16 augmented its own generation to supply 2012 Energy Service to PSNH customers, (2) the
17 outages that occurred at all PSNH generating units during 2012 and recommend any specific
18 disallowances and/or operational changes, and (3) the review of PSNH’s efforts to address
19 the recommendations remaining from the settlement agreements in Docket DE 12-116, the
20 2012 review of PSNH’s 2011 Energy Cost/Stranded Cost Recovery Charge (“ES/SCRC”) costs
21 and revenues. I also present my views regarding the unit availabilities and capacity factors,
22 heat rates of PSNH generating units for 2012, and the adequacy of 2012 capital and O&M
23 expenditures for reliable and efficient plant operations.

1 This testimony addresses the review areas either through the questions and answers
2 presented below, or through a series of individual reports, which are attached as exhibits to
3 my testimony and are organized as follows.

4 **Capacity/Energy Transactions:**

5 Exhibit MDC-2, 2012 Capacity and Energy Transactions

6 **Generating Unit Outages:**

7 Exhibit MDC-3, Merrimack Outages for 2012

8 Exhibit MDC-4, Newington Outages For 2012

9 Exhibit MDC-5, Schiller Unit Outages For 2012

10 Exhibit MDC-6, Hydroelectric Unit Outages For 2012

11 Exhibit MDC-7, Combustion Turbine Outages For 2012

12 Exhibit MDC-8, W. F. Wyman-4 Outages for 2012

13 **Prior Stipulation Items**

14 Exhibit-MDC-9, Open Stipulation Items from the 2012 ES/SCRC proceedings, Docket
15 DE 12-116.

16

17 **Exhibits**

18 I present the data responses in this exhibit that I relied upon in my testimony as:

19 Exhibit- MDC-10, Data Responses

20

21 **III. Discussion of Capacity and Energy Transactions**

22 **Q. Please summarize your capacity and energy transaction testimony.**

23 A. With regard to capacity and energy transactions, Accion concluded that PSNH's filing is an
24 accurate representation of the capacity and energy purchasing process that took place in

1 2012. Accion concluded that PSNH made sound and prudent management decisions with
2 regard to its capacity and energy purchases in its market environment consistent with its
3 2012 Least Cost Integrated Resource Plan (“LCIRP”) requirements¹. PSNH made additional
4 progress in reducing short term sales of excess energy and capacity once energy or capacity
5 was purchased. PSNH used its recently modified energy procurement procedures that limit
6 exposure to market forces to govern all aspects of supplemental energy purchases and
7 sales. PSNH’s effort continued to focus more on the short-term and has reduced net
8 supplemental energy costs. The net cost of supplemental energy service decreased from
9 \$91.4 million in 2011 to \$65.3 million in 2012.

10

11 Accion also reviewed the capacity and energy testimony filed by PSNH, conducted an on-site
12 interview with knowledgeable personnel responsible for the capacity and energy transaction
13 function at PSNH, requested follow-up information, and reviewed detailed backup
14 information of the summary results supplied by PSNH in that follow-up or data responses.
15 Accion also concluded that the capacity factor projections for PSNH units used for 2012
16 market purchases were reasonable and included ongoing discussions with generating plant
17 personnel. Accion is satisfied with the manner in which PSNH is modeling short reliability
18 outages in 2012 and the impact of economic reserve status on its forecasts in 2012. In
19 addition, Accion concluded that while the volume of customer migration in 2012 was
20 reasonably constant throughout the year, it still introduced some uncertainty into the
21 supplemental energy procurement process due to the inability to adjust purchases in a
22 timely manner for unknown customer decisions.

¹ 2007 LCIRP as amended on March 28, 2008.

1 PSNH's focus in 2012 was on the short-term market. In fact, only one energy purchases was
2 for longer than a month, and all short-term purchase decisions were made within a week of
3 the beginning of the energy transaction. In the first half of 2012 when energy prices were
4 very low due to the warm winter, PSNH made six monthly bilateral purchases and 40 daily
5 bilateral purchases. In the second half of the year when energy prices firmed, PSNH made 28
6 daily bilateral, eight monthly bilateral, and one two-month bilateral purchases with these
7 longer-term purchases made from May through November while the shorter term
8 purchases were made within a week of their need. In addition, PSNH has further developed
9 an in-depth understanding all of its units' operational requirements in a lower-priced short-
10 term market such that it stands ready to reverse those practices and procedures when
11 market prices increase. Accion concluded that PSNH has made great strides in reducing the
12 costs of their units within the market place.

13

14 **Q. Do you have recommendations regarding future capacity and energy transaction issues?**

15 A. No, I do not. This proceeding does not address those future issues.

16

17 **IV. Discussion on Outages**

18 **Q. Please state the results of your review of the PSNH unit outages that occurred during**
19 **2010.**

20 A. With regard to planned and forced unit outages, Accion found that the base-load units on
21 the PSNH system ran well in 2012, but running times of the coal units were further
22 reduced compared to 2011 due to reserve economic shutdowns. PSNH made good
23 estimates of economic reserve times and factored them into operations and unit outages.

1 Accion reviewed outage information filed, responses to data requests, conducted on-site
2 interviews, and submitted follow-up requests for information as necessary. In each outage,
3 except those noted below, Accion found the outages to be reasonable and not unexpected
4 for the particular unit, its vintage, or that the outage was necessary for proper operation of
5 the unit. Accion also concluded that PSNH conducted proper planning and management
6 oversight regarding the aforementioned planned and forced unit outages, including the
7 outages related to the Clean Air Project (“CAP”). Additionally, from its review of unit
8 outages, Accion has a recommendation it believes will support and elevate PSNH’s efforts in
9 achieving additional improvement in unit operation.

10

11 **Q. Which outages did you find unreasonable?**

12 A. Accion found a few of the PSNH unit outages to be unreasonable and they are noted below.
13 Accion also lists outages below which were found reasonable, but the circumstances
14 presented an opportunity for PSNH to improve its processes. Accion will first present its
15 findings with regard to unreasonable outages.

16

17 The first outage Accion believes to be unreasonable is associated with Newington, Outage E
18 on June 22, 2012 as identified in Exhibit MDC-3. The unit was in hot reserve shutdown and
19 the ISO-NE called for the unit to operate. The induced draft fan was running and the forced
20 draft fan was ready to be started. When the forced draft fan was started, the unit tripped
21 on high furnace pressure. The correct start sequence, according to the starting checklist, is
22 to put the induced draft fan in auto mode prior to starting the forced draft fan in order for
23 the induced draft fan to regulate the amount of airflow through the boiler. In this case, an

1 EO-A² in training (accompanied by an equipment operator (“EO”) within arm’s reach) missed
2 the check off box and did not put the induced draft fan in auto prior to starting the forced
3 draft fan.

4
5 PSNH states that the EO-A was following the control operator (“CO”) start-up sheet, but
6 missed the “ID Fan Controller and Master in Auto” step. The CO realized that the ID fan was
7 not put in auto and was not able to timely stop the EO-A from starting the forced draft fan.

8
9 Because of the extreme dynamic nature of the operation of the station during start-ups,
10 PSNH does not require the use of 3-Part communications³. In addition, 3-Part
11 communications are not used during normal operation or training.

12
13 The individual was counseled and a plant-wide meeting of EOs and EO-As was held to
14 discuss the issue.

15
16 In this outage, an EO-A in training did not place the induced draft fan in auto mode prior to
17 starting the forced draft fan, as required by the start-up checklist. The start-up checklist
18 specifically requires that each action be checked off prior to being performed. In this
19 instance, it is clear that the EO-A was not following the checklist as required. Following
20 checklists is a fundamental aspect of operator training. Where the EO-A is a fully trained

² An EO-A is an Equipment Operator that is fully qualified to perform Control Operator procedures, but is not normally called upon to do so.

³ 3-Part communications is an industry wide practice where instructions are repeated back and forth between a system dispatcher and an equipment operator to ensure that the proper operation is being conducted and has been completed.

1 operating individual, Accion expects that they should have followed basic operating
2 principals.

3

4 Since basic operating principles were not followed, Accion recommends that replacement
5 power costs for this outage not be recovered.

6

7 The second outage Accion believes to be unreasonable is associated with Schiller, Outage 4-
8 F on October 16, 2012 as identified in Exhibit MDC-5. The unit tripped on loss of condenser
9 vacuum. Generating units require vacuum in the condenser to ensure proper heat transfer
10 characteristics and steam flow. Thirty inches of vacuum is near perfect, 29 inches is very
11 good, and near where units #4 and #6 generally operate, and an alarm is triggered at 27
12 inches of vacuum. The unit is tripped at 19 inches of vacuum.

13

14 To maintain vacuum, air ejectors are utilized. Both Unit #4 and Unit #6 have two sets of air
15 ejectors that run at 600 psi steam each, and can obtain higher steam pressure when both
16 are in operation. (Air ejectors extract air when steam is passed through venture nozzles that
17 create a vacuum that draws air out of the condenser.) Unit #6 runs one air ejector at 600 psi
18 and maintains about 29 inches of vacuum. Unit #4 has developed a vacuum leak and
19 temporarily requires two sets of air ejectors running at 900 psi steam to maintain vacuum
20 that at times can be below the 27 inch alarm point. (Higher steam pressure results in faster
21 steam flow that creates faster air removal and a higher vacuum in the condenser.)

1 In this case, PSNH did not follow procedure for passing information shift-to-shift because of
2 the temporary nature of the two-ejector condition requirement. PSNH used verbal
3 communications to pass on the information. The operator on duty on the next shift was not
4 aware of the temporary air extractor requirement and only ran one air ejector at 600 psi.
5 Once in alarm, PSNH stated that it had no apparent reason to monitor vacuum for this
6 condition, and as a result, vacuum deteriorated to the trip point. (It is estimated that the
7 deterioration took an hour to take place.) The deteriorating vacuum condition should have
8 been continuously monitored so that further deterioration was known.

9
10 To remedy this condition, PSNH placed signage at the air ejector location indicating that
11 both sets of ejectors for Unit #4 need to be running at 900 psi. PSNH also established an
12 additional alarm point at 22 inches of vacuum to act as a LOW-LOW alarm that requires
13 immediate attention.

14
15 This outage involved the failure to pass information on from shift-to-shift. Accion believes
16 that this requirement is one of the most core procedures of a 365/24/7 operation. As such,
17 variances from the procedure are not allowed under any circumstances and should be
18 deeply engrained in the operator's actions. In addition, Accion believes that the vacuum
19 level should have been monitored, as procedure requires.

20
21 Accion recommends that the replacement power costs for this outage not be passed on to
22 customers.

1 The second outage Accion believes to be unreasonable is associated with Schiller, Outage 4-
2 H on December 7, 2012 as identified in Exhibit MDC-5. The unit was in startup mode from
3 Outage G and phased when it tripped on high drum level. There are two feedwater valves
4 that operate in parallel the main feedwater valve is larger than the other valve. The normal
5 procedure during startup is to close the main feedwater valve and operate the smaller valve
6 in automatic mode. When feedwater requirements require more water than can be
7 supplied by the smaller valve, the larger valve is opened in a manner that allows the smaller
8 valve in automatic to provide the required flow trim.

9

10 In this case, the EO-A responded to a high drum level by placing the main feedwater valve in
11 the manual mode anticipating that the smaller feedwater valve would regulate the
12 feedwater flow in automatic mode. The smaller valve did not regulate the flow of water
13 into the boiler because it was fully open and in manual mode, which was forgotten by the
14 EO-A. The boiler finally tripped on high drum level.

15

16 The operator was counseled.

17

18 The normal procedure during unit startup is to close the main feedwater valve and operate
19 the smaller valve in automatic mode. The checklist procedure requires that the smaller
20 pump be placed in automatic control and requires operator to confirm their action prior to
21 performing the action. When feedwater requirements require more water than can be
22 supplied by the smaller valve, the larger valve is closed in a manner that allows the smaller
23 valve in automatic to provide the required flow trim.

1 There is no procedure requirement for the operator to place the smaller boiler feedwater
2 pump into manual control. Such action suggests that the operator was not as well trained
3 as he should have been, or that insufficient operating time was given during training. Accion
4 recommends that the replacement power costs for this outage not be passed on to
5 customers.

6
7 The third outage Accion believes to be unreasonable is associated with Schiller, Outage 6-E
8 on August 14, 2012 as identified in Exhibit MDC-5. The unit was conducting VAR tests for
9 ISO-NE when it tripped on loss of field indication. The test for leading VARs (removing VARS
10 from the system) was to be performed when the unit was at ISO-NE eco-min levels (27
11 MW), the lowest economic operating point of the unit. The lowest emergency operating
12 point of the unit is 13 MW. Because of operating parameters at this unit, most equipment is
13 half-sized so that the practical and daily eco-min from a practical perspective is 27 MW, and
14 the lowest emergency operating point is 13 MW.

15
16 The test was mistakenly scheduled to be conducted at 13 MW while absorbing of 24 MVAR,
17 the emergency low operating point for the unit. The operator recognized that this was not
18 the proper load level to conduct the test and appropriately scheduled the test to be
19 conducted at 27 MW, but failed to also adjust the MVAR level for the test. The operator
20 also never contacted his manager to confirm his decision. The shift supervisor put the
21 voltage regulator in manual and was able to achieve negative 24 MVAR for 45 minutes with
22 the unit at 27 MW when the unit tripped on loss of field.

1 Operational procedures have been clarified to add the difference between practical daily
2 eco-min and emergency-min unit loadings. In addition, the operator has been counseled.

3
4 This outage concerned a unit trip while performing a repeated ISO-NE operational test. ISO-
5 NE testing requirements are clear. It appears that confusion existed at the station between
6 the emergency-min operating points of the unit and the eco-min operating points of the
7 unit. These operating points should be well understood by operators and should be readily
8 available to them when needed.

9
10 Accion recommends that the replacement power costs for this outage not be passed on to
11 customers.

12
13 The next outage Accion believes to be unreasonable is associated with Eastman Falls,
14 Outage 2-I on July 13, 2012 as identified in Exhibit MDC-6. The unit was taken off-line due
15 to loss of control of the runner hydraulic system. Initial PSNH investigation determined that
16 the cause was a likely failure of a component internal to the runner hydraulic servo system.
17 On July 18, 2012, PSNH contacted Andtriz (a hydroelectric technical expert) to be a technical
18 expert and provide support for the outage. Andtriz informed PSNH that it was not able to
19 provide timely support (late September to early October) and recommended Hydro
20 Consulting & Maintenance Services (“HCMS”). An HCMS representative arrived on site to
21 oversee further troubleshooting and repair work on August 21, 2012.

1 PSNH systematically disassembled the unit runner hydraulic system including the nose cone,
2 servo motor, and hydraulic piping. No major failures were found. Initial determination was
3 that worn hydraulic seals caused the failure. While repairs were being made to the seals, the
4 root cause of the failure was identified to be a set screw failure on the hydraulic servo nut.
5 The set screw was designed to provide a flat surface lock of the hydraulic servo nut. The
6 loosening of this set screw allowed the runner shaft to turn two inches and imbalance the
7 hydraulic pressure seal.

8

9 The necessary repair required a full disassembly of the hydraulic and runner systems that
10 had never been performed before. During this outage, PSNH determined the reason for
11 continuing excessive leakage around the bestobell seal was the loose set screw. The set
12 screw was replaced with a pointed set screw so that no slippage could take place.

13

14 PSNH has filed an insurance claim of \$144,614 for replacement power cost after 60 days as
15 stated in its insurance policy. PSNH also established the need for developing the need of
16 preferred maintenance contractors that can provide support during maintenance outages.
17 The insurance claim process is continuing.

18

19 PSNH experienced a runner control problem at Eastman Falls Unit #2 on July 13, 2012. As a
20 result of restructuring of the electric supply market, PSNH has moved certain capabilities
21 outside of the corporate umbrella and has relied on the market place for certain expertise.
22 In this outage, the market expertise (Andtriz) that PSNH relied upon was not contracted to
23 be available within a reasonable time period and in fact could not respond to PSNH's needs
24 for approximately two and one-half months. Andtriz was able to provide PSNH with an

1 alternative vendor, HCMS, but they too had difficulties with a timely response to PSNH, as
2 they could not timely locate a qualified field service technician with proper experience.

3
4 Accion believes that PSNH did not adequately foresee and plan for outside technical
5 assistance that would be required for expected outage conditions. As a result, qualified
6 personnel could not be on-site for approximately one-month after the outage occurred.
7 Accion does understand that it does take a finite time to prepare for a response to a
8 situation.

9
10 Accion believes that two weeks would be a reasonable period of time needed to respond to
11 an unexpected outage and therefore recommends that the last two weeks of replacement
12 power costs for the outage not be recovered from customers.

13
14 In addition, Accion recommends that PSNH submit the results of its insurance recovery with
15 its submittal of the 2014 review of 2013 ES/SCRC costs.

16
17 The next outage Accion believes to be unreasonable is associated with Jackman, Outage D
18 on August 9, 2012 as identified in Exhibit MDC-6. The unit was taken out of service when a
19 neighbor reported to PSNH that there was a problem with the wooden section of the
20 penstock. PSNH found that multiple upper and lower penstock bands had failed with many
21 of them being ones installed in the outage that ended one day earlier.

1 PSNH had previously manufactured upper and lower penstock bands for the penstock. PSNH
2 discovered that the manufacturing process for the upper and lower penstock bands was
3 different than that of upper and lower bands that had been previously fabricated.

4
5 The bands are coupled together by a “ball and hook” arrangement where the ball end slides
6 into the hook end and is then tightened by threaded adjusters. In the original manufacturing
7 process the “hook” end was screwed on to a threaded rod and welded and nuts were
8 welded on to a threaded rod to form the ball connection. In the recent fabrication process,
9 all materials were the same grade, material, size, and shape. The “hook end of the
10 tightening mechanism also remained the same; however, the “ball” end manufacturing
11 process was changed. In the most recent process, PSNH slipped a hollowed piece of metal
12 over a straight rod and plug welded (welded in the end hole) the “ball”. Welders that are
13 boiler pressure vessel certified performed welding. No tensile strength of the new “ball”
14 design was performed.

15
16 At the beginning of the outage, PSNH ordered new upper and lower penstock bands from
17 the original manufacturer. Those materials were used to repair the penstock. When repairs
18 were completed, the unit was returned to service.

19
20 Accion understands that the change in the design of the “ball” end design was to facilitate a
21 reduced time response. Although certified welders performed the welds, and the welds
22 were of acceptable quality, Accion believes that PSNH failed to realize that the welded
23 surface area was significantly reduced and made no effort to assess the strength adequacy
24 of the new design.

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Accion therefore recommends that the incremental (two weeks at the end of the outage) replacement power costs for this outage not be recovered from customers.

Q. Is that the extent of the outages that you find to be unreasonable?

A. Yes, it is.

Q. How should the replacement power costs of the outages you believe to be unreasonable be quantified?

A. PSNH has consistently used a method to quantify replacement power costs in recent Energy Service/Stranded Cost Recovery Charge reviews. I recommend PSNH continue to use that methodology in a modified form for these outages and provide such quantification for review prior to the hearing in this proceeding.

Q. How should the replacement power cost calculation be modified?

A. The methodology is essentially sound, but due to short time periods where the units may be in economic reserve or in operation an inaccuracy is introduced. The current methodology does not take into consideration the start-stop characteristics of the unit, but merely calculates cost or benefit for the day and then nets them to calculate a cost for the outage. I recommend that if an outage is recommended to not have its replacement power costs recovered, that a refinement be made to factor in the start-stop characteristics of the unit.

1 **V. Unit Operation Recommendations**

2 **Q. In addition to your recommendations regarding the recovery of outage costs, you**
3 **mentioned that you have recommendations that you believe will support and elevate**
4 **PSNH's efforts in achieving additional improvement in unit operation. Please present**
5 **those recommendations.**

6 A. Certainly. First, let me clarify that while Accion found the following referenced outage
7 reasonable, and recommends the recovery of all costs related to this outage, the outage
8 presents circumstances from which PSNH may be able to improve operating proficiency and,
9 thus, lower costs to customers.

10

11 The recommendation relates to Outage D at Newington Station on June 20, 2012 as
12 described in Exhibit MDC-4. The unit was in cold reserve shutdown and the ISO-NE called
13 for the unit to operate. The unit was in the synchronization process when the unit tripped.
14 The synchronization process calls for the opening of the 0451 345kV breaker, opening of the
15 0163 345kV breaker, closing of the G106 345kV disconnect switch and phasing the unit to
16 the 0163 breaker. This sequence was being performed by an EO-A who was in training and
17 was accompanied by a full EO. The EO-A opened the P2A breaker to the station service
18 breaker, rather than the 0451 345kV breaker, dropping one-half of the station service load
19 and tripping the unit before the EO could halt the action. These two breakers are adjacent
20 to each other on the control board, and are clearly marked. In addition, the P2A breaker is
21 identified with red tape surrounding its location. Proper 3-Part communications were used
22 as required for switching orders.

23

24 The individual was counseled.

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Accion recommends that PSNH instruct senior operators who are responsible for operator in training actions to familiarize the operators in training of the “potential pitfalls” of operations that have been previously identified in the specific tasks being performed as part of a tail board discussion.

VI. Open Stipulation Items from the 2012 ES/SCRC Review

Q. Commission Staff also requested that you review PSNH’s efforts with regard to the remaining items agreed to in a Stipulation and Settlement Agreement (“Settlement Agreement”) Docket No. DE 12-116. Please present the results of your review.

A. Certainly. The details of my review are contained in Exhibit MDC-9. Exhibit MDC-9 describes the issue in each remaining stipulated item, PSNH’s actions, Accion Group’s view regarding whether PSNH’s effort was appropriate and complete, and Accion Group’s recommendation as to the disposition of the item. A summary of Exhibit MDC-9 appears directly below.

Recommendation No. 2012-1 Re: Wet Flue Gas Desulfurization System (“scrubber”) Installation at Merrimack

Accion stated that due to the installation of the scrubber there are now situations that may exist that could result in failures of both Merrimack units. Accion therefore recommended that, if it has not already done so, PSNH should review the interaction of the scrubber with both units to identify possible failure conditions and determine the need for spare parts or additional redundancy to maximize operational efficiency.

1 PSNH agreed to continue its review of the new scrubber installation and assess potential
2 failure modes to determine the necessity for spare parts or additional redundancy.

3
4 During the design phase of the scrubber, PSNH worked with an engineering firm to develop
5 an equipment redundancy summary. The evaluation included a review of the absorber,
6 various pumps, tanks, gypsum handling, air compressor system, and ball mills. The final
7 design included redundant systems for all critical equipment.

8
9 During the construction phase of the scrubber project, PSNH worked closely with the
10 program manager, URS Corporation (“URS”), in developing a spare parts inventory. URS
11 tasked each of the contractors with providing a recommended inventory list for each
12 scrubber system, reviewed with PSNH the recommended inventory list, and
13 comprehensively conducted a review of those lists to ensure completeness. The final spare
14 parts inventory list for the scrubber consisted of over 500 items and was considered
15 consistent with industry standards for the scrubber system.

16
17 PSNH has also developed an ongoing dynamic process to address the adequacy of spare
18 parts, redundancy, parts availability in the marketplace, performance of the scrubber, and
19 inventory level reviews.

20
21 Planning and operational considerations were considered in the design of the scrubber
22 project.

1 Accion agrees that PSNH's actions satisfy the intended purpose of the Settlement
2 Agreement and recommends closure of this item.

3

4 **Recommendation No. 2012-2 Re: Planned Outages**

5 Accion noted that during planned outages decisions are made about assumptions used to
6 develop an outage schedule, but that during a planned outage at Merrimack, certain
7 assumptions required refinement during the outage that resulted in planning schedule
8 changes. Accion recommended that PSNH review all planned outage schedules prior to the
9 outage to detect any assumptions that need to be verified.

10

11 PSNH agreed to review planned outage schedules to detect assumptions that need to be
12 verified.

13

14 PSNH reviews its outage schedules prior to the outage to ensure that assumptions are
15 correct. In addition, PSNH has always conducted "what if" analysis to determine the
16 flexibility of its outage schedule and to formulate hedging actions as required at the
17 discretion of the outage team. That process has been more formalized in order to open
18 more dialog and anticipatory thinking, planning, and contingency readiness.

19

20 Accion agrees that PSNH's actions satisfy the intended purpose of the Settlement
21 Agreement and recommends closure of this item.

1 **Recommendation 2012-3 Re: Use of Refurbished Equipment**

2 Accion stated its belief that PSNH will be using increased amounts of used or refurbished
3 equipment as its unit fleet ages and recommended that PSNH add the testing performed on
4 such equipment to the history documentation of the equipment. Accion recommended that
5 this be implemented at all stations including the hydro units and that expectations about
6 testing and documentation be made clear to vendors.

7
8 PSNH agreed to add testing performed on refurbished parts to the part’s history
9 documentation. This will be implemented at each station including the hydro units and
10 testing expectations will be made clear to vendors.

11
12 PSNH understands that used equipment needs to be tested to ensure functionality for its
13 replacement purposes. PSNH has added testing history to its used parts for its power plants
14 and reviewed its testing requirements for used parts.

15
16 Accion agrees that PSNH’s actions satisfy the intended purpose of the Settlement
17 Agreement and recommends closure of this item.

18
19 **Recommendation 2012-4 Re: Start-Up Commitments to Independent System Operator –**
20 **New England (“ISO-NE”)**

21 Accion recommended that in satisfying the needs of the ISO-NE, PSNH make it clear to ISO-
22 NE and all its unit operators that all requested unit starts that are shorter than committed
23 start-up times will be on a best efforts basis and that PSNH is not responsible if the start-up
24 time requested is less than the committed start-up time requirement.

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PSNH agreed to make clear to the ISO-NE that all requested unit starts that are shorter than committed start-up times are made on a best efforts basis only and that it is not financially responsible if the start-up time requested is less than the committed start-up time.

PSNH has reviewed the notification times of its units to ensure accuracy and has communicated this information to the ISO-NE. PSNH has also met with its operators to ensure that PSNH does not commit to accelerated start times. PSNH will continue to be flexible and start the unit as soon as possible when requested, but will not commit to an accelerated start time.

Accion agrees that PSNH's actions satisfy the intended purpose of the Settlement Agreement and recommends closure of this item.

Recommendation 2012-5 Re: Generator Interconnections

Accion noted that when PSNH was making repairs required by Smith Outage 1C, PSNH was installing a 115 kV breaker where there had not been one before. Accion recommended that PSNH review all generation tie-in configurations to assess the risk of possible failures similar to the one at Smith and address any risks that are discovered.

PSNH agreed to review its generation tie-in configurations, assess the risk of similar failures, and, as appropriate and economical, address the risks found.

1 PSNH completed a review of each generator's tie-in configuration on both the high and low
2 voltage systems. The results of this review led PSNH to conclude that the interconnections
3 are consistent with good utility practice for the type and vintage of these generating units.
4

5 In recent years, PSNH has improved reliability and system protection at its generator
6 interconnections if economic to do so. PSNH has installed high side circuit breakers at both
7 Jackman and Smith stations. In addition, PSNH has replaced the low side circuit breaker at
8 Ayers Island, is currently in the process of replacing the step-up transformer at Ayers Island,
9 and has replaced one of the step-up transformers at Garvins Falls.

10
11 Accion agrees that PSNH's actions satisfy the intended purpose of the Settlement
12 Agreement and recommends closure of this item.

13

14 **Recommendation 2012-6 Re: Use of Mercoid Switches**

15 Accion recommended that to avoid unit interruptions caused by outdated Mercoid switches,
16 PSNH develop a program to replace those switches within a finite time at the hydro, and all
17 other, generating facilities.

18

19 PSNH agreed to develop a time bounded program approach for replacement of Mercoid
20 switches at its hydro stations and other generating facilities with identified opportunities
21 and submit the switch replacement schedule.

1 PSNH recognizes that changing out of Mercoid switches is necessary. PSNH hydro has
2 developed a replacement program that will change out all Mercoid switches with Reed
3 switches at its hydro stations by December 31, 2018.

4

5 At PSNH's fossil stations, PSNH has more flexibility in the replacement of these devices, as
6 reconfiguration of the original design of the system is not required. As a result, Mercoid
7 switch issues have not been a problem at the fossil stations. PSNH therefore has not
8 developed a predetermined schedule to replace Mercoid switches at its fossil stations and
9 will replace them on an as-needed basis.

10

11 Accion agrees that PSNH's actions satisfy the intended purpose of the Settlement
12 Agreement and recommends closure of this item.

13

14 **Recommendation 2012-7 Re: Date of Hydro Station Seasonal Temperature Setting**
15 **Changes**

16 Accion recommended that PSNH review and modify the time of year it changes its hydro
17 stations to summer temperature settings to account for early or late season weather events,
18 or that PSNH eliminate the winter temperature period altogether.

19

20 PSNH agreed to review the time of year it changes temperature settings to address early or
21 late season temperature changes.

22

23 During the spring, particularly when the building ventilation system is not configured for
24 summer time operation, outages have occurred due to elevated building temperatures.

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PSNH’s readiness for summer-time ventilation operation of its hydro stations requires, among other things, manual modifications of louvers. To address this issue, PSNH has triggered a discussion that starts on April 15th with hydro personnel that will institute summer-time building ventilation system requirements if weather conditions substantiate such action. In addition, PSNH is considering ventilation controlled by barometric dampers to reduce the chance of high bearing temperature conditions.

Accion agrees that PSNH’s actions satisfy the intended purpose of the Settlement Agreement and recommends closure of this item with the caveat listed directly below.

Accion also recommends that PSNH submit the results of its barometric controlled ventilation analysis along with its future plans in this regard in the 2014 review of 2013 ES/SCRC costs and revenues.

Recommendation 2012-8 Re: Replacement with Not In-Kind Equipment

Accion recommended that when PSNH is replacing equipment with new equipment that is not in-kind, a hold should be placed on the replacement until the new equipment is well understood.

PSNH agreed to reinforce to employees (e.g., engineers, operators, and mechanics) the importance of understanding and confirming the appropriateness of a replacement that is not in-kind.

1 PSNH completed a training session of employees who would be involved with not in-kind
2 equipment replacements. PSNH further emphasized the need to verify that replacement
3 parts need to be verified that they are consistent with the particular system design. This
4 training is also given to new hires.

5

6 Accion agrees that PSNH's actions satisfy the intended purpose of the Settlement
7 Agreement and recommends closure of this item.

8

9 **Recommendation 2012-9 Re: Compatibility of Materials at Interface Connections**

10 Accion recommended that PSNH review changes in the compatibility of materials used in
11 interface connections and strengthen training for proper installation of various interface-
12 sealing mechanisms at all stations, including hydro operations.

13

14 PSNH agreed to review changes in the compatibility of materials used in interface
15 connections and to strengthen its training of proper installation of the various interface
16 sealing mechanisms at all of its stations.

17

18 PSNH now makes a point to discuss workmanship issues during the daily outage meetings at
19 each generating plant. In addition, PSNH has obtained two training documents written by
20 the Electric Power Research Institute titled "Static Seals Maintenance Guide" and
21 "Mechanical Seal Maintenance and Application Guide." These publications are
22 comprehensive technical documents designed to assist plant engineering and maintenance
23 personnel in static and mechanical seal maintenance. These documents have been

1 transmitted to all fossil and hydro station maintenance supervisors and working foremen for
2 their review and future reference.

3

4 Accion agrees that PSNH's actions satisfy the intended purpose of the Settlement
5 Agreement and recommends closure of this item.

6

7 **Recommendation 2012-10 Re: Over-Trips on Lower Voltage System, Coordination**
8 **Studies, Transient Stability Analysis**

9 Accion noted that PSNH is conducting coordination studies that also require a transient
10 stability analysis. Accion recommended that if the over-trip outages are found to be
11 systemic upon conclusion of the PSNH analysis, that system reliability design criteria
12 incorporate the unit-over trips on a local basis only if other economic remedies are not
13 available.

14

15 PSNH agreed to perform coordination studies at its smaller stations. PSNH also agreed to
16 acquire the capability to perform in-house transient stability and perform transient stability
17 studies at Canaan and Jackman hydro areas first before proceeding with other generating
18 locations. In addition, PSNH agreed that subsequent to the completion of these two
19 transient stability analyses, PSNH will identify the most cost-effective next steps. Relative to
20 the extent that systemic issues are identified as associated with over trip outages, PSNH will
21 determine prudent action on an on-going basis using good engineering judgment.

22

23 Since the 2012 update, PSNH has completed a relay coordination study at Smith Station.

24 The study concluded that overlapping zones of protection protected Smith Station. In

1 addition, high-speed fault clearing will occur for all phase faults within the facility and that
2 no transmission coordination problems exist. Recommended relay setting adjustments will
3 be completed during the 2013 annual inspection outage for the unit.
4

5 In 2012, PSNH also developed the in-house capability to conduct transient stabilities, trained
6 in-house personnel in that expertise, and conducted transient stability studies at Canaan
7 and Jackman stations, the two units most prone to system instability. PSNH modeled both
8 peak and light load conditions and simulated faults in the area of the study unit. The results
9 of those studies generally agree with actual fault scenarios, but not as well as anticipated.
10 The PSNH model included the generator step-up transformer impedance as part of that of
11 the unit. In the Jackman study, some units were netted with load and not dynamically
12 represented. Accion requested that PSNH verify that the model was conservative as stated
13 by PSNH by rerunning some faults with all step-up transformers represented, all generators
14 represented, and an updated load model that PSNH is currently developing.
15

16 Accion recommends that this item remain open.
17

18 **Recommendation 2012-11 Re: Vegetation Outages along Rights-of-Way**

19 Accion recommended that PSNH initiate a five-year distribution vegetation management
20 program that continually addresses danger trees (known as risk trees to PSNH) outside of
21 the rights-of-way as part of its distribution maintenance cycle and that a similar program for
22 the transmission vegetation management cycle also is initiated.

1 PSNH agreed to conduct a vegetation inspection along the 355 and 355X10 34.5kV circuits
2 connected to the Canaan Hydro Station during the fourth quarter of 2012 in preparation of
3 full right-of-way maintenance in 2013, and a vegetation inspection of the 335/332 34.5kV
4 circuits that are connected to the Hooksett and Garvins Hydro Stations. PSNH transmission
5 further agreed to implement the recently developed transmission plan to remove trees from
6 outside the right-of-way when they pose a risk to the line and the easement allows for
7 removal of such trees, contingent upon funding and available easements. PSNH will notify
8 the NHPUC of the final budgeted amount and the completion of the project versus the
9 transmission right-of-way maintenance program.

10

11 PSNH distribution agreed to complete a circuit-by-circuit analysis and identify the rights-of-
12 way that contain easements that allow PSNH to address risk trees outside of the right-of-
13 way. PSNH also agreed to continue its full right-of-way clearing program for the duration of
14 the existing Reliability Enhancement Program (“REP”). PSNH will remove risk trees outside
15 of the right-of-ways when they are identified and the easement allows for removal of such
16 trees. If the easement does not allow removal, a reasonable attempt will be made to
17 contact the property owner for permission to remove the tree.

18

19 PSNH inspected the 355X10 34.5 kV line in 2011 and all hazard trees were removed. The
20 355 34.5 kV line was patrolled in 2011 and hazard trees were removed in 2012. Additionally,
21 the right-of-way for the 355 34.5 kV line will be mowed in 2013.

22

23 PSNH patrolled the 335/332 34.5 kV lines in 2010 and hazard trees were removed in 2011.

1 PSNH distribution completed a circuit-by-circuit analysis and identified which easements
2 have the authority to remove hazard trees that are outside of the right-of-way. PSNH
3 reports that most of the easements have these tree removal rights. PSNH has incorporated
4 the removal of hazard trees into its scheduled and enhanced vegetation management
5 programs for the duration of the REP.

6
7 PSNH transmission also agreed to the removal of hazard trees outside of its rights-of-ways if
8 allowed to do so by easement. In 2013, \$600,000 was allocated to New Hampshire
9 transmission rights-of-ways to begin a four-year schedule for hazard tree removal. As of
10 October 2013, \$675,000 was spent for the removal of over 5,550 hazard trees. PSNH also
11 stated that the program was contingent on funding and easements.

12
13 Accion confirmed that PSNH transmission is also making a good faith effort to remove
14 hazard trees that are out of the right-of-way where no easement exists. PSNH stated that
15 the program has been included in the 2014 budget, but that budget has not been approved.

16
17 Accion agrees that PSNH's actions satisfy the intended purpose of the Settlement
18 Agreement and recommends closure of this item, except for the limited purposes of
19 tracking results as described in the caveat listed directly below.

20
21 Accion also recommends that PSNH submit the results of its transmission and distribution
22 efforts to remove hazard trees as part of its annual filing of ES/SCRC costs and revenues for
23 the next four filings beginning in 2014. It is expected at that time the distribution and
24 transmission systems would both have a complete vegetation management cycle finished.

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Accion further recommends that REP funding continue to be made available to remove distribution hazard trees and full right-of-way width clearing.

Recommendation 2012-12 Re: Recovery of Insurance Deductible Regarding the 2008 MK-2 Turbine Outage

Accion recommended that where litigation was ongoing, that PSNH track the boiler and machinery insurance deductible recoupment.

PSNH agreed to update the status of the ongoing litigation regarding the MK-2 turbine outage.

PSNH joined the lawsuit against Babcock and Wilcox in an effort to recover the \$1 million boiler and machinery insurance deductible related to the 2008 failure of the new high pressure/intermediate pressure turbine. Litigation activities including depositions are currently under way. PSNH recently re-evaluated its position in this case.

Without regard as to the merits of the suit, PSNH’s recent evaluation of the case considered how the case has developed over time, the amount of time and money expended to date, the amount of time and money to be expended, and the projected length of the case. PSNH concluded that the case would be drawn out and that its expenditures would exceed any payment assuming the PSNH suit was successful. PSNH has therefore decided to withdraw from the suit against Babcock and Wilcox.

1 Accion agrees that PSNH's actions satisfy the intended purpose of the Settlement
2 Agreement, and recommends closure of this item.

3

4 **Q. Are there any other operational performance improvements recommendations that you**
5 **wish to discuss?**

6 A. No, there are not.

7

8 **VII. Unit Availabilities and Capacity Factors**

9 **Q. What was the result of your review of the unit availability factors and capacity**
10 **factors of the PSNH units?**

11 A. From a capacity factor basis, PSNH's coal units performed lower than the level that PSNH
12 had forecasted due to both higher outage rates and reduced operating times. In projecting
13 the amount of time that a coal unit would be in economic reserve, PSNH was 9% low for
14 Schiller #6, its highest cost unit and between 0% and 3% low for the three other coal units.
15 The resultant capacity factors for the units is that they decreased 14% to 21% for the coal
16 units, remained about the same for Newington, and increased by 12% for the wood unit at
17 Schiller.

18

19 PSNH's units generally performed as well or better than forecasted from an availability
20 perspective and with very high availability on the 30 highest priced energy days during 2012
21 (96% to 100%) with a fleet availability of 98% for those same days. The fleet availability was
22 the highest it has been since prior to 2008 and approximately 4 % higher than 2011.

23

1 Accion Group made the following observations regarding 2012 overall unit availability
2 factors:

- 3 • Schiller 4 availability decreased from about 95% to about 85% due to its major
4 turbine repair. Schiller 6 availability increased to near 100% from about 95%.
- 5 • The availability at Schiller 5 and Newington remained near 100%.
- 6 • The availability at Merrimack-1 remained near 95%.
- 7 • The availability at Merrimack 2 dropped from about 95% to approximately 85%,
8 which is due in most part to the CAP tie in shut-down requirements.

9 **Q. Are there other observations you made with regard to the availabilities and capacity**
10 **factors of PSNH generating units?**

11 A. No, there are not.

12

13 **VIII. Unit Heat Rates**

14 **Q. What are your observations regarding the heat rates of the PSNH major generating units?**

15 A. The full load heat rates of the PSNH units have remained relatively constant over the last
16 seven years and remained at those levels in 2012. Actual heat rates for the units have
17 changed. Accion comments on each major unit below:

- 18 • The actual heat rates for Merrimack-1 and Merrimack-2 increased slightly from 2011
19 reflecting their reduced hours of full-load operation. The reasoning for only a slight
20 impact on heat rates is that when called upon to run, the units ran at high load
21 levels and for reasonable periods of time. Such operation does not significantly
22 impact unit heat rates.

- 1 • The Newington heat rate in 2012 decreased slightly 2012 from 2011. Accion believes
2 that better understanding of unit operation in a low energy cost market is the
3 reason for the decrease.
- 4 • Heat rates for Schiller-4 and Schiller-6 decreased markedly for 2012 from 2011
5 levels. Accion believes that better understanding of unit operation in a low energy
6 cost market is the reason for the decrease.
- 7 • The heat rate for Schiller-5 remained relatively constant from its improved 2011
8 levels reflecting unit and operational maturity.

9

10 **IX. Capital and Operations and Maintenance ("O&M") Expenditures**

11 **Q. What did you form as a conclusion when you reviewed the 2012 spending for capital**
12 **projects and O&M at PSNH generating stations?**

13 A. Accion reviewed the 2012 capital and O&M budgets (business plan) for Merrimack Station,
14 Newington Station, Schiller Station and the Wyman #4 unit. Accion also reviewed the 2012
15 business plan for the Hydro group. In addition, Accion reviewed the fossil five-year and
16 hydro ten-year conceptual budget plans. Accion Group made the following general
17 observations, and drew the following conclusions.

18

19 **Capital**

- 20 • PSNH's 2012 capital expenditures at the coal units were significantly
21 reduced from historic levels reflecting reduced operating times that stretch
22 out budget planning.
- 23 • The reduced operation of the coal units due to increased economic reserve
24 status requires a downward adjustment of capital expenditures because

1 most capital expenditures are based on run-time. This is the same process
2 that PSNH used at Newington to align capital expenditures with actual
3 operation. Some in the industry refer to this as the “snowplow effect”
4 where major maintenance items are pushed into the future.⁴

- 5 • PSNH has included FERC licensing requirements, dam repairs, and general
6 capital project replacements in its budget projections at all stations.
- 7 • Newington and other non-coal units’ capital spending remained relatively
8 constant.
- 9 • Capital spending adequately addresses upcoming maintenance issues as
10 necessary.

11

12 **O&M**

- 13 • PSNH’s 2012 O&M expenditures at the coal units were significantly reduced
14 from historic levels. The reduced operation of the coal units due to
15 increased economic reserve status requires a downward adjustment of
16 O&M expenditures because most O&M expenditures are based on run-
17 time. This is the same process that PSNH used at Newington to align O&M
18 expenditures with actual operation.
- 19 • PSNH’s O&M expenditures at non-coal units remain relatively constant.
- 20 • O&M spending adequately addresses upcoming maintenance issues as
21 necessary.

⁴ Accion notes that if unit operation is increased because of increasing market prices that maintenance items would then be brought into closer time frames and could be coined as a “tsunami effect”.

1 Accion Group concluded that PSNH is currently spending sufficient funds for capital
2 replacement/improvement and maintenance projects and sufficient money for adequate
3 maintenance to assure continued high performance operation of its units consistent with
4 good utility practice, consistent with its long-range plans for continued operation of the
5 units, and with recognition of unit age and operational duty cycle as required.

6

7 **Q. Are there any other items you wish to discuss?**

8 A. I only wish to present the data responses relied upon by Accion Group in preparation of its
9 testimony in addition to the materials filed by PSNH so they may be officially admitted into
10 the record. Those data responses appear as Exhibit MDC-10 and are identified as:

11 **Staff Set 01**

12 Data Responses 1 through 3, and 8 through 35.

13 **Staff Set 02**

14 Data Responses 2 through 3 and 6 through 10.

15 **Office of Consumer Advocate Set 01**

16 Data Responses 8, 11 through 13, 15 through 19, and 29 through 53.

17 **Office of Consumer Advocate Set 02**

18 Data Responses 3 through 4, 6 (Confidential), 9 through 13, 15 through 18, 21, and
19 23 through 24.

20 **TECH Set 02**

21 Data Responses 1 through 7.

22

23 **Q. Does that conclude your testimony?**

24 A. Yes, it does.