EVERSOURCE

Report on the Removal of Mercury Boiler Units 1 & 2 at Schiller Station

2016-2019

Submitted to the New Hampshire Public Utilities Commission

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EVERSOURCE

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Executive Summary

On October 21, 2016, the New Hampshire Public Utilities Commission ("NHPUC" or the "Commission") issued an Order Approving Removal of Mercury Boilers from Schiller Generation Station, Order No. 25,956 in Docket DE-16-817. In Order No. 25,956, the NHPUC approved a request by Public Service Company of New Hampshire ("PSNH" or the "Company") to remove the two mercury boilers and associated equipment located at the Schiller generation station from the planned auction of generation assets, as recommended by the auction advisor, J.P. Morgan Securities LLC ("JPM").[1]

Demolition of the Mercury Boiler Units 1 and 2 at Schiller Station commenced on October 24, 2016, upon receipt from PSNH of a "Notice to Proceed." Asbestos abatement, demolition, and offsite disposal of the Mercury Boiler Units 1 and 2 at Schiller Station and restoration of the post-demolition site were substantially complete on March 29, 2019. The total cost of the Mercury Boiler Units 1 & 2 Removal Project (the "Project") was $48.433 million.

In its technical bid proposal, the primary project contractor selected to perform the demolition, Manafort Brothers, Inc. ("MBI" or "Manafort"), and its environmental subcontractor, TRC Environmental, Inc. ("TRC") proposed to conduct environmental testing and assessment as part of ongoing abatement and demolition activities, due to the fact that the large components and equipment would not be accessible for assessment until after initial asbestos abatement and external component dissection was partially or fully complete. Both PSNH and MBI assumed that any component that carried mercury vapor and liquid during operations would have a residual level of mercury contained within and that, in particular, the mercury boiler components and associated piping would have detectable levels of mercury residue within their walls.

[1] Docket DE-16-817, Order No. 25,956, at 1.

However, in January 2017, MBI began to encounter the proliferation of mercury in the infrastructure comprising Units 1 and 2. As work progressed, MBI discovered that the vapor dispersion that had occurred within the boiler system was extensive and pervasive, coating all surfaces and permeating cracks and crevices within the components of Units 1 and 2, including walls, ceilings and appurtenances and all of the equipment components. The mercury had migrated extensively beyond the normal path of operation. For example, MBI found mercury-soaked bolt sockets within the equipment components. If MBI unthreaded a bolt, there was liquid mercury waste located in the bolt socket. Mercury would sweat out of the piping and metal walls after a component was removed and prior to packaging on hot days. When the material was first removed, liquid mercury was not visible. However, two hours later, droplets and puddles of mercury would become visible within the piping. Material quantities of liquid mercury were found in low spots of piping, tubing, valves, condensers, pumps leading from the tank, which was not expected to exist.

Neither MBI nor PSNH expected that large quantities of mercury had permeated metal surfaces through the boiler systems, or that these quantities would not be easily detectable even with the dismantling and visual inspection of the mercury boiler components and associated piping. As MBI's environmental assessment progressed along with the initial stages of the work effort, the true extent of the mercury contamination began to emerge, revealing that the metal surfaces of all equipment components, piping, walls and roofing, throughout the boiler systems were impregnated with mercury. The demolition work exposed the nature and extent of the mercury saturation, and the extent to which the mercury had permeated the boiler systems and appurtenant structures was not determinable until that work was undertaken because it was the work that forced expulsion of the mercury. The impacts of the demolition work -- heat, vibration, cutting and removal – caused the mercury to "sweat" out of the system components and composite materials. In particular, the heat associated with the temperature inside containments and the actual thermal dismantling work caused the secreted mercury to discharge in quantities that could not have been anticipated in the absence of industry experience with similar demolitions. Ultimately, in completing the Project, a total of 165.5 gallons of liquid mercury was removed representing a quantity far beyond any expectation of a "residual" level.

Due to the proliferation of mercury, everything had to be changed: work processes and procedures, periodic health screenings, personal protection equipment and air emissions containment and ventilation plans. The pace of work had to be slowed considerably to assure worker safety, proper

disposal of mercury waste and refuse and air emissions containment. The procedures adopted to allow for mercury extraction while minimizing air emissions and maximizing worker safety were painstakingly intricate. For example, where an individual worker was able to perform 6.5 hours of work in an 8-hour work day on the boiler systems prior to this discovery, the individual worker would typically produce 2.5 to 3 hours of work in an 8-hour work day at later stages in the Project. This slowdown in productivity was due to the time consumed to robe, disrobe and decontaminate upon entry and exit to the containment structure and the quantity of work breaks necessitated by the non-breathable personal-protection equipment and temperature within the containments.

A slow pace and meticulously careful work method reduced air emissions and protected worker safety, but it came at a cost. However, if the Project was to be completed, the cost could not be avoided. Moreover, the cost would likely have been greater had the Company undertaken the difficult, highly infeasible steps involved in attempting to identify the true quantity of mercury "residue" before demolition commenced because all of the same steps to remove the mercury safely would have been required. Therefore, as challenging as the circumstances were, it was clear that vigilant project stewardship would ultimately result in the safe and proficient completion of the Project.

From the Company's perspective, the challenging work environment, coupled with the strict use of safety and health-related personal protective equipment, raised the risk level for safe completion of the Project with a particular focus on mercury-impacted air emissions. PSNH maintained air emissions associated with the Project in full compliance with federal and state rules beginning with the inception of the Project in 2016. Throughout the Project, PSNH and MBI worked closely with the New Hampshire Department of Environmental Services ("NHDES") to demonstrate compliance with ENV-A 1400 regulations. In addition, due to the extraordinary levels of mercury impregnation discovered during the Project cycle, PSNH committed to enhanced efforts that reduced mercury emissions by approximately 60 to 80 percent through additional controls and modified work practices. The emissions reductions were critical to provide the needed safety and health actions to protect workers and other persons present on-site. Beginning in August 2017, actions to modify procedures and work practices were successfully implemented, including expanding the use of cold cutting methods, by using new tools and equipment purchased for that purpose. The more frequent utilization of cold cutting methods with the new tooling and more aggressive draining of liquid

mercury and sealing of pipes prior to cutting added time and cost to the dismantling efforts; but achieved a measurable decrease in mercury emissions and improvement in worker protection.

This report provides a thorough accounting of the Project, including: (1) the efforts to procure an experienced and skilled contract partner to perform the demolition; (2) the resulting contract agreement and contract management; (3) the work performed over the 30-month period of the Project schedule; (4) the challenges encountered due to the unanticipated impregnation of mercury waste throughout the boiler systems, beyond any reasonable expectation of PSNH and its contractors; (5) the steps taken to resolve the challenges posed by this discovery; and (6) the steps taken to control costs while meeting and exceeding air emissions requirements caused by the need to protect worker safety and the public safety.

As detailed herein, the discovery of mercury inundation caused significant safety and health challenges, as well as technical and logistical challenges. There was no existing industry or individual experience that could be drawn upon to guide this work and the unique challenges that arose were numerous and complex. Throughout the Project, PSNH recognized that the skilled, cautious and cost-effective demolition of the Mercury Boiler Units 1 and 2 at Schiller Station was critical to its customers, as customers would ultimately bear the cost if these objectives were not achieved. Therefore, PSNH worked through the issues in a deliberate, systematic manner with the valuable assistance of MBI and its Project subcontractors.

This report is the work product of the PSNH Project Team. The PSNH Project Team consists of the following individuals who have contributed to this report:

Ellen Angley. Ellen Angley is Senior Vice President, Eversource Energy Wind Project Execution. During the Project cycle, Ms. Angley was Vice President, Supply Chain, Environmental Affairs and Property Management for Eversource Energy. Ms. Angley has worked for Eversource Energy and its predecessor companies for 38 years. As the Eversource Energy Environmental Officer, Ms. Angley was responsible for all aspects of environmental impact in the Eversource Energy electric and gas operations. For the PSNH Project Team, Ms. Angley was the Project Sponsor with Eversource senior management, as well as the contract signatory on all major contracts for the project. Ms. Angley was actively involved in making all material decisions throughout the project cycle, conducting weekly oversight meetings with the Project Team to maintain a direct line of supervision and communication regarding project progress, challenges and successes.

Catherine Finneran. Catherine Finneran is Vice President, Environmental Compliance and Sustainability. During the Project cycle, Ms. Finneran was the Director of Environmental Affairs for Eversource Energy. Environmental Affairs is a group within Eversource Energy with responsibility for managing environmental work across the entire company territory of New Hampshire, Connecticut and Massachusetts. This includes emergency response, remediation, permitting, sustainability and corporate performance and compliance. Ms. Finneran is a 4-year employee with the Company. Ms. Finneran's role on the PSNH Project Team began in 2015 in overseeing environmental due diligence associated with the divestiture of the PSNH hydro and thermal generating plants. Ms. Finneran supervised and directed the Project Manager and Project Management Team conducting the removal of the Mercury Boiler Units 1 and 2 at Schiller Station.

Daniel Watton. During the Project cycle, Mr. Watton served as the Manager of Environmental Field Response for Eversource Energy. Environmental Field Response is a group within Eversource Energy with responsibility for addressing environmental incidents in New Hampshire, Connecticut and Massachusetts. Mr. Watton is a 22-year employee with the Company. His role on the PSNH Project Team began in 2015 in conducting environmental due diligence associated with the divestiture of the PSNH hydroelectric and thermal generating plants. Mr. Watton acted as the Project Manager for the Project to oversee the demolition and removal of the Mercury Boiler Units 1 and 2 at Schiller Station. As Project Manager, Mr. Watton assisted in devising the technical scope of the Project, as well as the evaluation and selection of the Project Contractor and negotiation of the associated vendor contracts. In his role overseeing and directing the Project work activities, Mr. Watton also managed the Project budget, reviewed and approved vendor charges and maintained Project records and reporting protocols. Mr. Watton is now retired from the Company.

Steve Raymond. Steve Raymond is Senior Vice President of Construction Management at GZA GeoEnvironmental, Inc. ("GZA"), a third-party engineering and construction-management firm under contract with PSNH. GZA served as a consultant for PSNH on the Project, from preconstruction through construction. GZA actively participated in the development of quantity projections during the planning phases of the Project and assisted with the development of the Project specifications and selection of the Project contractor, MBI. During the initial phases of construction, GZA's role was primarily related to mercury air monitoring outside containments and oversight and documentation of day-to-day activities by the contractor. GZA also assisted Mr. Watton with overall management of the Project and the associated transition of plant management to Granite Shore Power

("GSP"). During the plant management transition phase, and as the Project became more complex as a result of the quantities of residual mercury found in the boiler system, GZA took a more active day-to-day role in the management of the Project with PSNH, MBI and GSP. Mr. Raymond became the full-time, on-site Project manager and took the lead role onsite for the Project-management communications between PSNH, MBI and GSP to maintain the highest level of safety, coordination and project integrity through the completion of the Project.

William Smagula. William Smagula is the former Vice President of Generation for PSNH. Mr. Smagula worked for PSNH for over 40 years and brought a wealth of experience and knowledge to the PSNH Project Team. During his tenure at PSNH, Mr. Smagula had oversight responsibility for Schiller Station, including Mercury Boiler Units 1 and 2. Mr. Smagula advised the PSNH divestiture effort in relation to the Project, providing strategic guidance and structure for management of the Project and assisting in contractor procurement and the development of project specifications with the Project engineers and environmental specialists. Mr. Smagula is retired from the Company.

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Report on the Removal of Mercury Boiler Units 1 & 2 at Schiller Station

I. Overview of the Schiller Station

A. Construction and Operation

In 1949, Public Service Company of New Hampshire contracted with General Electric for the construction of a mercury-vapor cycle electric generation facility, which would become known as the Schiller Station. The mercury-vapor cycle is a binary cycle used for producing power from fuel with greater thermal efficiency than was possible at the time using the steam cycle alone. Mercury is a metal that absorbs a large amount of heat, transferable to turbine/generators to produce electric energy. Within the generation process, pressurized mercury rather than water was used to improve the efficiency of the conversion of fuel energy to electricity.

The Schiller Station consisted of two 7,500 kW mercury turbine generators and one 25,000 kilowatts("kW") steam turbine generator. The rated capacity was 40,000 kW. The station's two mercury boilers were heated by burning pulverized coal or fuel oil to produce vaporized mercury, which was piped into two rotating turbines.

Figure 1: Mercury Turbine-Generator (center) and Mercury Condenser (either side).

Note: The Mercury Boiler units were located behind the pictured equipment, running from the bottom level of the facility to the top of the facility.

Within each turbine, the mercury vapor converted its thermal energy to rotational energy causing the turbines and generators to turn. In addition, the resulting mercury exhaust emitted from each turbine flowed into two associated condenser boilers (four boilers in total). The condenser boilers cooled the mercury exhaust and transferred the waste heat to water located in adjacent tubes, generating steam through the evaporation process that was used to power the steam turbine.

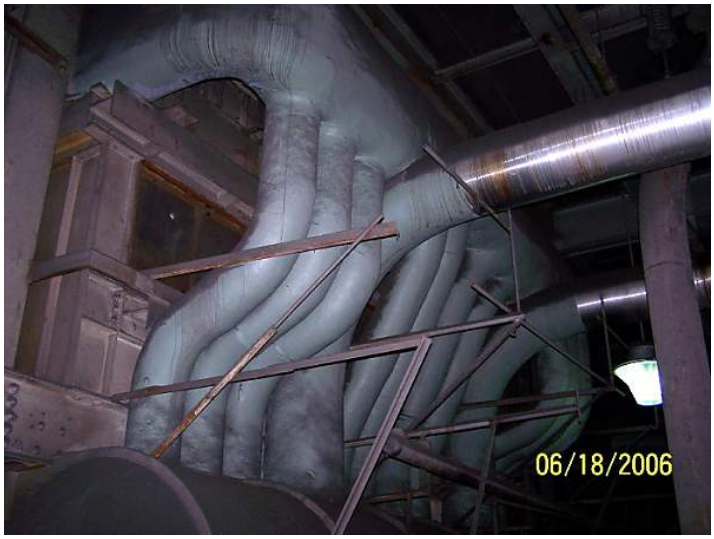


Figure 2: Mercury Drum (bottom) at the Mercury Boiler

Figure 3: Underneath of Mercury Condenser Boiler

Figure 4: Upper Level Area in Front of Mercury Boiler

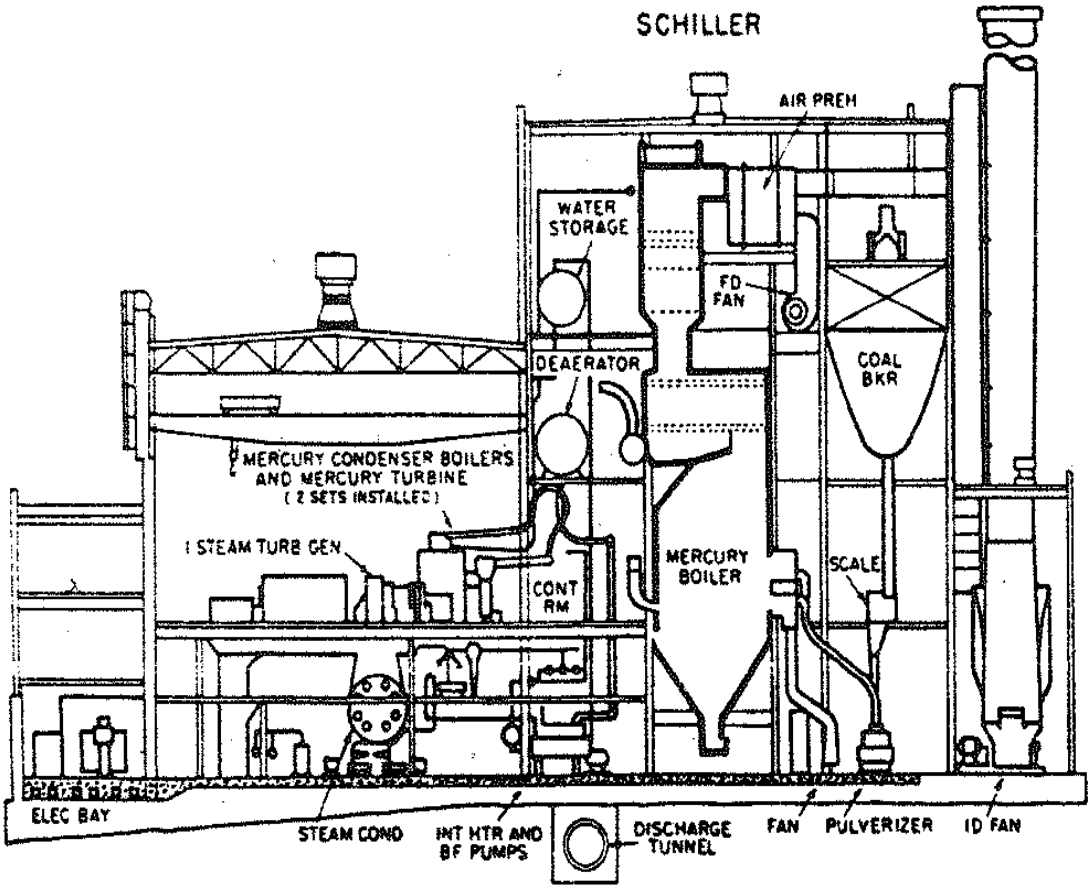
Figure 5: Liquid Mercury Storage Tank.

Mercury has a much higher boiling point than water, so the efficiency of a thermodynamic cycle that uses mercury is higher. The plants were dual-cycle, (also known as binary cycle), so that the hot mercury exhaust vapor from the mercury turbines could be used to produce steam for a second stage steam turbine. This means that the heat energy associated with the mercury not only powered the rotating mercury turbines, but in addition, the residual mercury vapor processed through the turbines and mercury condenser boilers retained sufficient heat to boil water, generate steam and rotate the steam turbine.

The Schiller Station was one of five mercury-vapor cycle generation facilities built by General Electric in the United States. The first mercury-vapor cycle unit designed for commercial operation was built in 1928 for Hartford Electric Light Company at the South Meadow Station in Hartford, Connecticut. General Electric also constructed the Schenectady Works Mercury-Steam Station in Schenectady, New York in 1933; the Kearny Generating Station in South Kearny, New Jersey in 1933; and the Pittsfield Works Power Station in Pittsfield, Massachusetts in 1949. The Schiller Station at Portsmouth, New Hampshire, was the largest and the last binary mercury/steam plant constructed by General Electric.

Figure 6: Mercury Vapor Lines and Mercury Condenser Boiler

Figure 7: Simplified Diagram of Schiller Station



During the late 1940s and early 1950s, three coal-fired generating units were designed and built next to the mercury boilers at the Schiller Station, demarcated as Units 4, 5 and 6. The Schiller Station mercury boiler units (Units 1 and 2) were operational from approximately 1949 until 1968 when the units were taken out of service. Today, the main powerhouse building at Schiller Station houses two, dual-fuel units (Units 4 and 6), capable of using coal or fuel oil, as well as a fuel oil-fired combustion turbine and a biomass boiler (Unit 5), located in a separate building. Together, these units reach a combined total output of 150 MW.

The demolition of the mercury boiler generating unit at the South Meadow generating station in Hartford, CT, occurred before 1990, with final clean-up continuing through the late 1990s and early 2000s. The original mercury turbine and boiler constructed at the South Meadow Station operated

successfully until 1947, when it was taken out of service to make room for a larger mercury-boiler system placed in service on January 1, 1949. On January 4, 1961, the replacement unit was removed from operation, and on April 19, 1961 it was officially retired. At that time, the mercury was removed and sold to Woodbridge Chemical Corporation.[2] The South Meadow Station encompassed two other steam turbines that remained in service and are now owned by the Connecticut Resource Recovery Authority ("CRRA"). Subsequently, CRRA demolished the retired mercury units housed within the old building structure as part of a full-scale demolition.[3] Facility structures were demolished down to the top of concrete slabs and their foundations. Foundations and building slabs at grade level remained in place and were later removed, subject to mercury removal and disposal.[4]

From the outset of the Mercury Boiler Units 1 and 2 Removal Project, it was clear that the removal of the Mercury Boiler Units 1 and 2 at Schiller Station could not be undertaken in a manner similar to the South Meadow Station. The Schiller mercury units existed within a facility that remained in operation (Units 4 and 6) and numerous systems used in operation of the units were commingled within the facility. Information regarding the disposition of the three other mercury-vapor cycle generation facilities constructed by General Electric (Schenectady, NY, South Kearny, NJ, and Pittsfield, MA) was not available.

When the Mercury Boiler Units 1 and 2 at the Schiller Station were taken out of service in 1968, the bulk liquid mercury was drained and disposed. The quantity of liquid mercury removed in this original retirement process is estimated at approximately 3,060 gallons (345,724 lbs.). Project literature indicates that the system required a minimum of approximately 2,656 gallons (300,000 lbs.) of mercury to operate and an additional quantity would have been stored and used as "make-up." The

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2 *Guide to the Emmet Mercury Boiler Records*, NMAH.AC.0968, Sara Wheeler 2017, Archives Center, National Museum of American History, http://americanhistory.si.edu/archives.

3 The South Meadow Station encompassed a mercury binary-cycle unit constructed before the Mercury Boiler Units 1 and 2 at Schiller Station, along with two other steam units that were constructed later in an adjoining building. The two larger boilers were retired in the 1980s. By contractual arrangement, Northeast Utilities allowed the CRRA to build and operate two trash burning boilers that generated steam to repower the two, existing steam turbines owned by Northeast Utilities (originally built by the Hartford Electric Light Company). These two operating turbines; the retired boilers; and the trash burning boilers for these units remain on site. The mercury equipment was demolished sometime before the 1990s, but the structures remained. With the divestiture of the Connecticut-based generating facilities owned by Northeast Utilities in the mid- to late-1990s, all of the South Meadow Station was sold to CRRA. Environmental due diligence conducted as part of that sale revealed mercury impregnated concrete in certain areas, which was repaired and/or coated to enable the transfer of ownership.

4 Connecticut Resource Recovery Authority Transition Plan, dated October 16, 2013.

Schiller Station encompassed two, 3,000-gallon mercury storage tanks, but it is not known how the storage tanks were utilized in the process.

In 1983, an additional quantity of approximately 15.5 gallons (1,755 lbs.) of liquid mercury was extracted from the two mercury condenser boilers and associated instrumentation (transmitters that measured process flows and levels), and disposed.[5] Once retired, the structures associated with the Mercury Boiler Units 1 and 2 sat dormant on-site, while the other units continued in operation.

B. Divestiture Proceeding

Effective August 1, 2014, HB 1602 amended RSA 369-B:3-a to require the NHPUC to commence and expedite a proceeding to determine whether all or some of the Company's generating assets should be divested. Specifically, HB 1602 gave the NHPUC the authority to direct PSNH to divest all or some of its generation assets if doing so would be in the economic interest of retail customers, and also authorized the NHPUC to provide for the cost recovery of such divestiture Investigation of Scrubber Costs and Cost Recovery and Determination Regarding Eversource's Generation Assets, DE 11-250 and DE 14-238, Order No. 25,920 at 30 (2016). The NHPUC issued an Order of Notice opening a docket in compliance with HB 1602 on September 16, 2014.

In 2015, the Company submitted the 2015 Public Service Company of New Hampshire Restructuring and Rate Stabilization Agreement ("2015 Settlement Agreement") to the NHPUC for review and approval. The 2015 Settlement Agreement presented a comprehensive approach to divestiture of PSNH's generation assets, including the Schiller Station. Order No. 25,920 at 36, 40. On July 1, 2016, the 2015 Settlement Agreement was approved as amended and adopted by the "Partial Litigation Settlement Between Settling Parties and Non-Advocate Staff." PSNH was directed to begin the process of divesting generation assets through a process conducted by an independent auction advisor to be selected by the NHPUC.

The NHPUC selected JPM as its auction advisor. JPM's preliminary recommendation was to "remov[e] the mercury boiler and all associated equipment in conjunction with the process such that the removal can be either complete or substantially complete at the expected time of closing any

[5] In 1983, mercury from the boilers was drained into a tank where it was collected and stored in steel flasks. Mercury recovered from the instrumentation was also collected and stored in steel flasks. The steel flasks were stored in a brick-enclosed reclamation room within the plant. It is unclear the duration of the storage for this mercury; however, it would have been collected in the period after the original retirement process in 1968 and the resale in 1983. At the point of sale, the weight of the liquid mercury was estimated at 1,755 pounds, or approximately 15.5 gallons.

transaction(s) at the conclusion of the auction process."[6] Given the unique nature of the mercury boiler units, it was JPM's perspective that the presence of the boilers would negatively impact the auction process based on its experience and expertise in the marketplace. JPM indicated that potential bidders would either refrain from bidding on the Schiller facility or heavily discount the value of the Schiller facility due to the environmental considerations.[7] Based on its experience, JPM recommended that the Mercury Boiler Units 1 & 2 at the Schiller Station be eliminated from the divestiture process because "the form of transaction agreement, particularly those terms related to environmental liabilities could be structured materially more favorably to Eversource and, ultimately, ratepayers.[8]"

C. Process for Removing Mercury Boiler Units 1 & 2

On September 21, 2016, NHPUC Staff submitted a letter to the Commission stating areas of agreement between PSNH, NHPUC Staff and other parties (the "Stipulation"). The letter followed a prehearing conference conducted on September 19, 2016 and covered several substantive and procedural issues. Among other points of agreement, the letter stated as follows:

> In accordance with [JPM]'s recommendation, Eversource is authorized to begin removal of the two mercury boilers and associated equipment located at Schiller Station pursuant to a contract with the contractor selected by Eversource following their bidding process, with Staff to oversee the contract process. Removal is estimated to cost $20-$30 Million and is projected to take 9-12 months to complete. Eversource shall provide monthly reports to Staff and shall notify Staff of any proposed increase in the contract costs prior to authorizing the contractor to incur additional costs. Staff will bring any substantial changed circumstances concerning the cost or progress of this removal to the Commission's and other parties' attention. All prudently incurred costs of the contract shall be considered stranded costs following the closing of the divestiture auction, and recovered by Eversource as part of the Stranded Cost Recovery Charge.

Docket DE-16-817, Letter of Stipulation, dated September 21, 2016.

On October 21, 2016, the NHPUC issued an Order Approving Removal of Mercury Boilers from Schiller Generation Station, Order No. 25,956 in Docket DE-16-817. In Order No. 25,956, the NHPUC approved a request by PSNH to remove the two mercury boilers and associated equipment

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6 J.P. Morgan, Report to the New Hampshire Public Utilities Commission, *Auction Design & Process,* September 12, 2016 (hereinafter "JPM Recommendation"), at page 6.

7 Id.

8 Id.

located at the Schiller Station from the planned auction of generation assets, as recommended by the NHPUC's auction advisor, JPM.[9] In granting this approval, the NHPUC noted that it was relying on JPM's opinion that the Schiller facility will be more likely to sell at auction and that the Schiller facility value will be enhanced at auction by beginning the removal of the two legacy mercury boilers as soon as possible. Therefore, the NHPUC approved the Company's commencement of the removal process, subject to the conditions and features delineated in the JPM Recommendation and in the Stipulation, stating that:

> It is better to launch the Schiller remediation effort now, in advance of the auction process, rather than at some unknown future date due to a failed auction of the facility. The costs of removal will be quantified during the course of this docket, and will be timely included in the Rate Reduction Bonds, offering cost savings for Eversource customers through low-interest financing. Further savings could accrue from a more successful Total Transaction Value arising from successful sales of Schiller and the other plants with which it shares synergies. We are also satisfied that the cost-review checks called for by the terms of the Stipulation will enable the Commission, Staff, and the other parties to monitor the effort for cost overruns and other potential issues. We will require that Eversource provide monthly updates on the cost and progress of the removal to Staff and we will require Staff to bring any substantial variances to our attention. We therefore find that undertaking the proposed removal of the two mercury boilers and related equipment from the Schiller generation station is prudent within the framework of the divestiture auction.

Docket DE 16-817, Order No. 25,956, at 8.

Accordingly, based on this authorization, PSNH moved forward with the Mercury Boiler Units 1 & 2 Removal Project at the Schiller Station.

[9] Docket DE-16-817, Order No. 25,956, at 1.

II. Engagement of Project Contractor

A. Request for Information

With only five mercury-vapor cycle generation facilities ever constructed in the United States, it was not possible for PSNH to commence the Mercury Boiler Units 1 and 2 Removal Project in a position to draw on industry experience with the process for dismantling and removing mercury-impacted equipment. The only known demolition of a mercury boiler generating unit was at the South Meadow generating station in Hartford, CT, which occurred under different circumstances. The generating units encompassed within the South Meadow Station were not dismantled and extracted from an operating facility, but rather were flatly demolished as part of a full-scale demolition. Facility structures were demolished down to the top of concrete slabs and their foundations. Foundations and building slabs at grade level remained in place for many years and were later removed, so that mercury-related decontamination activities were limited to the removal of mercury-impregnated concrete slabs.[10] Information regarding the disposition of the three, other mercury-vapor cycle generation facilities did not exist and at least one of the facilities, South Kearny, NJ, remains untouched and shuttered in place.

Consequently, removal of the Mercury Boiler Units 1 & 2 at the Schiller Station presented an exceptional challenge due to the presence of ongoing generation activities within the Schiller facility (Units 4 and 6 and the biomass Unit 5), and the commingling of operating systems in the plant. Because the dismantling and demolition activities would have to occur within a location adjacent to the operating steam cycle units, the demolition activities would need to occur in a highly controlled manner to: (1) avoid exposure to plant personnel, contamination of the building and the equipment housed in that building; (2) provide access through mercury dismantling work areas for daily operation and maintenance; and/or (3) provide protection and prevent disruption of the operation of energized equipment and utilities in the area (including, natural gas, water, sewer, compressed air, high/low pressure steam, oil, communications and electric).

Recognizing these unique challenges, the Company deemed it advisable to issue a request for information ("RFI") as a preliminary step in the procurement process to identify potential contractors with appropriate expertise that may be interested in bidding on the nature and scope of work involved

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[10] Connecticut Resource Recovery Authority Transition Plan, dated October 16, 2013.

in the Project. On September 9, 2015, the Company issued the RFI (RFI 0047-2015) to 15 potential bidders identified on the basis of recommendations obtained from environmental consulting firms with existing or past experience as Eversource Energy vendors, as well as other research developed by Eversource Energy's procurement and environmental groups to identify firms with experience in generation facilities, environmental remediation and construction, demolition or related experience. The only contractor solicited in the RFI that had any experience with mercury boiler removal was TRC Environmental Corporation ("TRC Environmental"), which had gained limited experience through its work on post-demolition assessments and follow-on work performed subsequent to the removal of mercury-impacted concrete slabs and foundations existing as part of the demolition project at the South Meadow site in Hartford, CT. Manafort teamed up with TRC Environmental in the bid stage and TRC Environmental was a valuable partner in the work effort given its prior experience, although limited. No contractor with relevant experience was excluded from the RFI.

Contractors Solicited by PSNH for RFI

- Costello Dismantling Company
- Brandenburg Industrial Service Company
- Moran Environmental Recovery
- Enpro Services Inc.
- Manafort Brothers Incorporated
- NorthStar Contracting Group
- Bierlein Companies
- Clean Harbors Environmental Services
- CST Environmental
- Reich Brothers Decommissioning
- Cambria Contracting
- TRC Environmental Corporation
- Triumverate Environmental Inc.
- New England Disposal Technology
- Cyn Environmental Services

The RFI solicited interest in the demolition and removal of the Mercury Boilers Units 1 & 2 at Schiller Station. The RFI indicated that the work under consideration would include, but not be limited to: (1) the dismantling, demolition and removal of the mercury boilers, turbines, generators, condensers, stack and balance of plant equipment and auxiliaries; (2) the identification and removal of mercury, asbestos and lead; and (3) the corresponding disposal of all materials.

The Company received and evaluated nine responses to the RFI from the following bidders: Costello Dismantling Company; Brandenburg Industrial Service Company; Moran Environmental Recovery; Enpro Services Inc., MBI; NorthStar Contracting Group; Bierlein Companies; Clean Harbors Environmental Services; and TRC Environmental. After an internal review and evaluation of the RFI responses, the PSNH Project Team decided to issue the request for proposal ("RFP") to

all nine of the RFI respondents because all nine respondents showed a level of expertise in their respective niche.

B. Request for Proposals

Following internal review and evaluation of the RFI responses, the Company issued a formal RFP (RFX-00485-2015) on September 28, 2015 to all nine potential bidders. The RFP was structured to solicit firm unit rates for demolition, removal and disposal of the mercury boilers and related equipment, as well as a level of restoration after dismantling and removal was complete. In terms of the scope of work, the RFP indicated that the work would include performing necessary environmental assessments, demolition, non-hazardous waste removal, and hazardous waste removal and disposal of mercury and asbestos-containing material and equipment as well as lead, and oil and coal combustion residues. To that end, the RFP included the following description of the Schiller Station (emphasis added):

> Schiller Station in Portsmouth New Hampshire is an operating power plant owned by EVERSOURCE (herein referred to as 'Owner'). The facility consists of three operating units rated at 50 MW each. Two units have dual fuel capabilities of firing pulverized coal and #6 HFO. The other is a biomass fired unit. There are two other units at the station that operated in a Rankine binary cycle configuration with mercury liquid and vapor serving as the working fluid in the topping cycle. The bottoming cycle working fluid was water. These units were built in ca. 1950 and were decommissioned in 1968. At the time of the decommissioning the mercury was removed however trace amounts remain in the boiler, turbine, and ancillary equipment and associated piping. Other hazardous materials that exist within these units include Asbestos and Lead. OWNER is soliciting bids from demolition and environmental remediation companies for the complete abatement, demolition and disposal of these units. The instructions that follow and accompanying specification are provided in order to assure that Bidder's Proposal will be complete and will include all information required for Owner's comprehensive technical and commercial evaluation.

Bidders were invited to make a proposal on two pricing structures: (1) a fixed/unit price based on the shortest duration construction schedule (work hours not to exceed 6 days/week; 20 hours/day); and (2) an alternative fixed/unit price assuming a project completion date of December 31, 2016. All fixed and unit prices were required to remain in place for the duration of the project work. The total firm/unit price was to be based on estimated quantities. Project "Work" was defined as "all hazardous material removal, abatement, storage, transportation, and disposal as defined in the General Terms and Conditions, the specification and all other contract documents."

The RFP included a "Scope of Work for the Abatement, Demolition and Disposal of the Mercury Vapor Power Units at Schiller Station," which provided the following statements regarding mercury containing materials and the contractor's responsibility for the safe performance of the work (highlighted in purple):

1) This document specifies the technical requirements for the demolition and hazardous waste removal and disposal of two mercury vapor power generation units at Schiller Station in Portsmouth New Hampshire. Schiller Station has two 7,500 kW mercury vapor power units that were installed in ca. 1950 and have been decommissioned since 1968. At the time of the decommissioning the liquid and mercury vapor was removed. However, residual amounts of mercury may currently exist in low points of piping and other areas that were not accessible during the decommissioning. The WORK, demolition and hazardous waste removal and disposal, also includes asbestos containing material, lead, and oil and coal combustion residues.
2) The CONTRACTOR shall furnish all labor, supervision, materials, equipment, tools, supplies, personal protection equipment, transportation, scaffolding, rigging, permitting, and services required for completing the WORK.
3) The WORK shall be accomplished in accordance with the requirements specified herein and as shown on the drawings.
4) Mercury containing materials include but are not necessarily limited to, piping (including floor drains), boiler tubing, turbine blading and casings, condenser boiler tubing, and other ancillary equipment are present at the site. The scope of the WORK involving mercury shall include the following:

   a) Identification of all mercury containing contaminated materials affecting or affected by the WORK; determine the extent and condition thereof; and perform mercury removal and abatement work necessary to complete the demolition task.

   b) A survey of the WORK area and sampling of mercury shall be performed to determine the presence and extent of mercury materials. The CONTRACTOR shall have samples tested by a certified laboratory with three (3) copies of the reports issued to EVERSOURCE.

   c) WORK shall be conducted in compliance with the latest OSHA and EPA standards regarding the handling and disposal of mercury as a hazardous material.

The RFP due date for bid submission was October 28, 2015. A mandatory pre-bid meeting was conducted at the Schiller Station on October 7, 2015. During the bid process, multiple requests for an extension of the bid due date were received. The PSNH Project Team extended the due date to October 30, 2015 for the technical submittals only. The completed proposal form remained due

on October 28, 2015. Out of the nine invited bidders, only four responded, which were: MBI (with TRC Environmental as a subcontractor); NorthStar Contracting Group (with Enpro Services, Inc., as a subcontractor); Clean Harbors Environmental Service; and Costello Dismantling Company. Clean Harbors Environmental was unable to provide the required technical submittals and withdrew its proposal during the Stage 1 review.

The Company reviewed and evaluated each bid applying a weighting for scoring of 60 percent commercial terms to 40 percent technical capability. The Company selected the weighting split after determining that its traditional 70/30 percent split would not be recommended due to the uncertainties involved and the unique nature of the project. The evaluation criteria encompassed the following bid submittal requirements for firm price/unit pricing:

(1) Any exceptions to the requirements of the RFP, including, without limitation, the Scope of Work, the General Terms & Conditions and the Special Terms & Conditions

(2) A list of current certifications held by the Contractor required by federal and state regulations to perform the work.

(3) Proposed project team and organizational structure with key individuals identified. Resumes of these key individuals to be submitted with bid.

(4) Proposed sub-contractors including their roles, responsibilities and qualifications.

(5) Level 1 schedule with key milestones identified.

(6) Proposed work schedule to complete the work.

(7) A plan for the mercury abatement and disposal at the site.

(8) Preliminary execution plan for mercury testing, abatement, and disposal. The plan included decontamination process steps.

(9) Proposed work practice that outlines prevention procedures for environmental release of mercury, asbestos and lead paint.

(10) Proposed method of disposal for the hazardous material.

(11) Proposed disposal vendors, treatment, storage and disposal facilities (TSDFs) and disposal endpoints.

(12) Specific laydown area requirements.

(13) The location of Contractor home office from where the work will be managed.

Following a preliminary review of the submitted proposals, the Project Team elected to invite the three remaining bidders in for formal oral presentations of their respective proposals. The objective was to develop a better understanding of the bidders' means and methods for performing

the work and estimating the quantities as well as to understand the cost drivers and risk impacts to the Project. These meetings were conducted on November 9, 2015 at the Schiller Station, approximately two weeks after the bid packages were delivered to the Company. At this time, each of the three bidders was asked to provide any and all other technical documentation that was not submitted previously. Costello Dismantling failed to provide any of the required technical documentation (other than a brief description of their work plan) and was disqualified. Therefore, the Project Team recommended proceeding to negotiations and refinement of pricing terms with the two remaining bidders: MBI and NorthStar Contracting Group.

C. Contract Negotiation

After negotiations and refinements of the contract terms, the PSNH Project Team obtained Final Evaluated Project Cost Estimates from both MBI and NorthStar Contracting Group. The PSNH Project Team recommended final negotiations with MBI because MBI had the highest overall score, lowest lump sum/unit price dollar amount and the highest technical score. MBI put forth a solid technical approach and showed an understanding of the type of boiler systems requiring removal, as well as awareness of the issues that would be associated with working in an active facility. In addition, in the RFP phase, MBI partnered with TRC Environmental, a top-tier environmental construction firm with a level of experience obtained at the South Meadow Station.

In response to the RFP, the total demolition contract costs were derived based on lump sum costs for certain definable work scopes and unit rates with assumptions on quantities (i.e., the weight and volume of clean steel; the volume of mercury-impacted demolition debris, and other items). For the RFP, the Company estimated quantities to enable bidders to put forward a bid price and to allow for an evaluation of bid terms on a comparable basis, without any expectation or representation that the quantification used for bid-assessment purposes would specify total Project costs.

Actual quantities were not ascertainable without a full environmental assessment of the mercury boiler units. However, a full environmental assessment would have required a costly, time-consuming and logistically unworkable process to sample and test internal components of the boiler units. Equipment would first need to be abated for asbestos and then piping would need to be accessed in numerous locations to identify the quantities present at bends and low points within the piping system. Thus, the actual quantities of residual mercury could not be ascertained without largely dismantling the boilers and associated equipment. Accordingly, it made preeminent sense to conduct this assessment contemporaneously with the demolition work.

The existence of unknown quantities of mercury within the boilers and associated equipment required latitude and would have to be addressed equally by any prospective Project contractor. Therefore, except for the fixed pricing obtained for removal of asbestos-contaminated materials, the RFP specified that invoicing would be based on price-per-unit rates applied to actual quantities.

Once the bids were received, the per-unit rates put forth in the bids were used by GZA to calculate the total estimated project cost, using a number of project assumptions. Specifically, GZA generated volume and tonnage estimates of system components based on limited available boiler plans and literature. Following discussions with the Eversource Energy procurement team, these estimates were modified and adjusted to generate baseline quantities, to which the appropriate unit rates were applied. Many of the disposal line items could not be estimated (i.e., elemental mercury, ash and similar items), as these quantities were not ascertainable without dissection of the mercury boiler units and related equipment. As a result, these estimates were generated through collaboration with the procurement group using order of magnitude estimates. The Company anticipated that, during actual demolition, these pre-construction assumptions on quantities would vary from actual circumstances, and the Project cost would be expected to increase, perhaps significantly, as actual quantities became known.

On February 11, 2016, the PSNH Project Team conducted final negotiations with MBI to discuss the last open issues. During the final negotiation process, PSNH and MBI developed a number of documents that were included in the final contract package to provide additional specificity to the work. These additional terms and agreements reflected the parties' knowledge that changes may have to be made throughout the process as new information was obtained from ongoing project activities. Based on the anticipated divestiture schedule, the "Shortest Duration 10 Months after Notice to Proceed" option was selected. The executed agreement with MBI was issued on April 12, 2016, subject to project authorization by PSNH and authorized by the NHPUC to remove the mercury boilers.

D. MBI Contract & Contract Performance

1. MBI Cover Agreement & Scope of Work

PSNH entered into a project contract with MBI on April 12, 2016, with work to commence following the Company's issuance of a Notice to Proceed. Under the contract provisions, the Notice

to Proceed would follow from the NHPUC's approval of the removal of the units. PSNH issued the Notice to Proceed on October 24, 2016 immediately after the NHPUC's authorization to proceed.[11]

The Cover Agreement included Technical Requirements in Exhibit E, detailing the scope of work and procedures for the abatement and demolition of the mercury boiler units. The Scope of Work prepared by PSNH in connection with the RFP (Rev. 12.16.15) was updated by Addendum 2 based on negotiations and discussions with MBI and its subcontractor team. Exhibit E also included a detailed Project Work Plan prepared by the Company's project management consultant, GZA, in conjunction with PSNH. GZA's Project Work Plan was originally issued in March 2016, as included in the contract. The Project Work Plan was subsequently revised, with the final Rev. 2 version issued on November 14, 2016, shortly after MBI mobilized to the site and initiated work on the Project.

On October 24, 2016, the PSNH Project Team executed the "First Amendment" with MBI relating to the Mercury Boiler Units 1 and 2 Removal Project. Due to the passage of time from the initial commencement of work date assumed in MBI's bid of August 31, 2016, PSNH and MBI agreed to execute the First Amendment to the Cover Agreement to adjust the pricing form to account for scheduled union labor rate increases.

On February 2, 2018, the PSNH Project Team executed the "Second Amendment" to cap certain aspects of the fixed price and to convert other unit-pricing categories to a time and materials basis, subject to a not-to-exceed cost estimate. The need for the Second Amendment is discussed in detail below.

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[11] As noted above, the NHPUC authorized the removal of the mercury boilers on October 21, 2016. Eversource Energy Auction of Generation Facilities, DE 16-817, Order Approving Removal of Mercury Boilers from Schiller Generation Station, Order No. 25,956.

2. System Component Environmental Assessment

GZA's Project Work Plan and the initial RFP documents indicated the presence of "trace amounts" of mercury, anticipated to exist in the boiler, turbine and ancillary equipment and associated piping. The "Scope of Work" document included in the RFP further indicated that the liquid and mercury vapor was removed at the time of decommissioning, while residual amounts may continue to exist in "low points of piping and other areas not accessible during the decommissioning." The Scope of Work also indicated that mercury containing materials include piping, boiler tubing, turbine blading and casings, condenser boiler tubing, and other ancillary equipment. In other words, PSNH anticipated the presence of residual quantities of mercury within the components of the mercury boiler system and associated piping where it would be expected that mercury may have remained after the draining of the system in 1968, when the system was retired.

For the RFP, the Company allowed bidders to provide an estimate of mercury based on an external, visual inspection. The Company used the average, assessed quantities against specific bid pricing to create comparability among the bid responses. In addition, because the actual quantities were unknown (and unascertainable without dissection of the affected components) the Project Work Plan and Addendum 2 to the Scope of Work required MBI to complete an environmental assessment to include, to the maximum extent possible, an evaluation of all mercury, lead and PCBs in mercury boiler components only, during the initial, up-front pre-demolition assessment activities [Cover Agreement, Exhibit E]. The required assessment did not include any environmental media such as soil, sediment, surface water or ground water. The environmental assessment was required to determine: (a) the presence of mercury, lead, and PCBs in all components to be removed, and (b) the as-found levels of concentration within those components.

In its technical proposal at the time of bid, MBI proposed to complete environmental testing and assessment as ongoing abatement and demolition activities were performed, due to the fact that all large components and equipment would not be accessible for assessment until after initial asbestos abatement and external component dissection was partially or fully complete. MBI assumed that any component that carried mercury vapor and liquid would have a residual level of mercury contained within and that the mercury boiler components and associated piping could have detectable levels of mercury residue in the walls.

Neither MBI nor the Company anticipated that MBI would find puddles of liquid mercury and other aggregated quantities of liquid mercury within all of the system components, whether

carrying mercury vapor or not during the operating process. MBI and PSNH also did not expect that large quantities of mercury had permeated metal surfaces throughout the facility, or that these quantities would not be easily detectable even with the dismantling and visual inspection of the mercury boiler components and associated piping. However, as MBI's environmental assessment progressed along with the initial stages of the work effort, the true extent of the mercury contamination began to emerge, revealing that the metal surfaces of all equipment components, piping, walls and certain areas of the roof were impregnated with mercury. Without the demolition work, the nature and extent of the mercury saturation would not have materialized. Instead, the impacts of the demolition work -- heat, vibration, cutting and removal – caused the mercury to "sweat" out of the system components and composite materials. In particular, the heat associated with the temperature inside containments and the actual thermal dismantling work caused the secreted mercury to discharge in quantities that could not have been anticipated in the absence of industry experience with similar, uniquely situated demolitions.

As discussed below, these circumstances required a change in work plan and an associated change in the contract arrangement. The PSNH Project Team executed the "Second Amendment" on February 2, 2018, primarily to convert certain unit-pricing categories to a time and materials basis, subject to a not-to-exceed cost estimate. The Company viewed this modified approach to be the least-cost approach as MBI and TRC were already mobilized. In addition, this different approach was necessitated by the results of MBI's environmental assessment and was critical to complete the Project while meeting the competing objectives of protecting the safety of workers and the general public, minimizing air emissions and mitigating air impacts, maintaining the Project schedule and containing costs to the maximum extent possible.

3. Demolition Impacts

From the outset of the project, MBI and PSNH anticipated utilizing two types of techniques to dismantle and demolish large-scale equipment and facilities: non-thermal and torch-cutting. Non-thermal methods involve manual unbolting and dismantling of equipment or mechanical cutting using demolition saws, sawzalls, abrasive rope and similar equipment. Torch-cutting involves the use of an acetylene oxygen torch to cut through steel or other metal components more quickly and therefore, generates greater heat. Due to the chemical nature of liquid mercury, methods that generate significant heat would have a strong potential to result in the vaporization and subsequent emission of mercury vapor from the work zone. Therefore, to minimize air impacts, Addendum 2 to the Scope of Work

initially directed MBI to prioritize cold cutting, or non-thermal dismantling methods. At the same time, MBI and PSNH anticipated the need to use torch-cutting for a portion of the demolition work, particularly where system components had thicker walls to cut through.

Figure 8: North Condenser, Turbine #1 (showing thickness of steel)

Achieving the appropriate balance of the use of non-thermal and torch-cutting methods was important to both MBI and PSNH because, while the non-thermal technique produced less heat and therefore lower quantities of mercury-impacted air emissions, it was a much slower process increasing labor costs. Conversely, the use of torch-cutting techniques would generate heat and greater resulting air impacts but would complete work activities quicker thereby reducing work time (and the associated labor cost).

Similarly, at the outset of the Project, MBI planned to drain liquid mercury found in the process and to decontaminate the internal surfaces of the large-diameter vapor piping, mercury turbines and condenser boilers. MBI's bid assumed that the mercury turbines and condenser/boilers would be decontaminated sufficiently to allow for shipping of the thick steel items as scrap for recycling, which would avoid the need to dispose of those heavy components as mercury-containing or impregnated waste. Thus, Addendum 2 specified that PSNH preferred to dispose of materials with the lowest practical levels of mercury impact based on cost-effective methods and provided that

PSNH would authorize whether to pursue mercury removal/decontamination for certain materials or components, or to dispose of those materials at the known waste level as reported by MBI.

However, as the Project progressed and substantial quantities of mercury were encountered not only on the surface of system components but also impregnated within the pores of the metal comprising those components, PSNH changed the disposal strategy and directed MBI to dispose of most of the demolition debris as a regulated hazardous waste. This approach was more costly on a per-ton basis, but it avoided the expensive necessity of completing onsite abatement of materials and reduced health risks by limiting employee exposure to toxins within the demolition debris. This approach also reduced the overall project schedule, saving time and associated costs for labor, equipment rentals and other items.

Lastly, as work to dismantle the internal components of the boilers progressed, it became apparent that the way in which the mercury boiler tubes were hung necessitated a change in the approach for dismantling the equipment from a "top-down" approach to a "bottom-up" approach. MBI initially proposed to take a top-down approach to dismantling equipment so that mobile liquid mercury would drain into the lower levels of the system for capture. The need for this change in approach arose due to the way in which the mercury tubes were hung inside the boiler. The boiler tubes were hung differently than the superheater tubes that were removed first. Once the work was started and it was possible to identify how the mercury tubes were hung, it became necessary to change to a bottom up approach.

This change in approach caused a need for additional containment, ventilation, and access requirements to start tube removal from the base of the boiler working up to the top. It also necessitated the need for a specialized workforce intimately familiar with generation boilers due to the removal sequencing, specialized rigging and access needed to complete dismantling. To fill this role, MBI hired a subcontractor, Frank Lill & Son, Inc., in November 2017. Frank Lill & Son has many years of experience in constructing, replacing, modifying or removing boiler equipment. However, because this specialized workforce would not typically work in environmentally hazardous atmospheres, MBI and PSNH had to provide an appropriate introduction to train this workforce to complete the required work.

4. Environmental Controls

Containments were constructed to protect all workers and plant areas from dust and vapors generated as part of the dismantling. To contain the release of general dust and mercury vapors during demolition activities, Addendum 2 to the Scope of Work and the GZA Project Work Plan called for the construction of polyethylene containment areas around all dismantling areas.[12] Each containment area had to be operated under negative air pressure with internal mercury vapor capturing equipment as well as appropriate containment exhaust filtration to control dust and mercury vapor exposure risk to plant workers outside containment and reduce emissions in the general plant. Monitoring was performed daily for the presence of mercury vapors in containments and ambient air in the powerhouse by Manafort and TRC. GZA also conducted continuous monitoring for mercury outside containments for the protection of general plant workers who were not involved with the project, but that were working in close proximity to the Project work area.

Figure 9: Containment over Turbine 1 and Associated Condensers

[12] Asbestos removal areas require the erection of similar containments due to regulatory requirements. The Project required containments around all non-asbestos dismantling work areas as well due to the possibility of generating dust and vapors that would be a concern for general plant workers. If the plant was vacant, these containments would likely not been required.

The need to limit and/or reduce air emissions associated with construction for the impact of mercury was not the central focus of the containment process at the outset of the Project. The negative air filtration was designed primarily to address dust and asbestos and to keep vapors from entering the plant. The management of mercury emissions was a step-wise process that changed as the levels of mercury vapor in containments rose as a result of work activities, requiring greater controls as the Project progressed to remain within permit limits. In addition to maintaining emissions within permit limits, the Company added a second layer of controls to reduce vapor emissions beyond regulatory compliance requirements. Ultimately, the level of emissions handling and treatment undertaken by MBI and PSNH, as well as overall ventilation, was critical to maintain a safe environment for workers and to reduce mercury vapor levels in the air so that the Project could be completed.

Figure 10: Containment and Load Out for Turbines and Boilers

5. Personal Protective Equipment

Under both the Scope of Work and applicable PSNH New Hampshire Generation Contractor Work Rules, MBI was responsible for taking all precautions necessary to protect the health and safety of construction workers. Consistent with industry practice, MBI anticipated providing personal protection equipment and included the associated cost in its base bid based upon anticipated mercury levels within the containments during dismantling. Once it was discovered that the vapor levels and quantities of liquid mercury were substantially greater than anticipated, it was necessary for MBI to

drastically change the personal protection equipment used by workers, consultants, PSNH employees and other visitors to complete the Project so that there would be no exposure to hazardous materials.

6. Project Authorization

To move forward with the MBI contractual arrangement for the Mercury Boiler Units 1 & 2 Removal Project at Schiller Station, the PSNH Project Team required authorization to proceed from Eversource Energy senior management by virtue of a Project Authorization Form ("PAF"). The PAF received final sign-off by Eversource Energy's Chief Executive Officer, James J. Judge, on May 18, 2016. Project authorization was conditioned upon obtaining regulatory approval to commence the Project. The amount of the authorization was for a total Project cost of $20.183 million, consisting of approximately $15.225 million for MBI's contract, $0.286 million for internal labor, a 30 percent contingency on MBI's costs equaling $4.567 million, and $0.105 million in other indirect capital costs.

The PAF specifically identified cost and environmental unknowns as risk factors in completion of the Project. For example, the PAF identified that MBI was unable to provide a "lump sum" bid because the exact quantities of mercury-contaminated materials for removal and disposal were unknown. PSNH did not have access to detailed, as-built drawings of all internal components of the mercury boiler units, and employees with first-hand knowledge of operational conditions were unavailable since the units ceased operation in 1968. Moreover, attempting to pre-determine the extent of mercury impact prior to construction was a logistically unworkable feat, as proven through MBI's environmental assessment. MBI's environmental assessment indicated that the mercury quantities were not substantially ascertainable outside of the demolition process of applying heat, vibration, cutting and removal to disgorge the mercury from the metal components. The actual demolition process determined that the Company could have completed an exhaustive assessment prior to the RFP process and still not detected the level of mercury impregnation that actually existed and only became apparent by physically dismantling the equipment.

To estimate the total vendor cost for demolition on a pre-demolition basis, PSNH relied on calculations performed by GZA using assumptions regarding the volumes and tonnages of demolition debris both non-impacted and potentially impacted by mercury residue and the unit rates locked in by the MBI contract. The PAF noted that, if during actual demolition the estimated volume and quantity of mercury-impacted demolition debris was proven inaccurate, the cost could rise significantly.

Ultimately, the driver of Project cost was not the cost of disposing the quantity of mercury discovered, although the disposal of mercury as a hazardous material was greater than anticipated. Rather, the increased cost of the Project stemmed from the length of time required for MBI's skilled workers to dissect the mercury impregnated components, while dealing with emission controls, safety and packaging requirements associated with mercury removal. The labor effort required to complete the Project was substantially greater than what could have been anticipated at the outset of the Project due to the adjustments made to address the mercury impregnation, while meeting the competing objectives of protecting the safety of workers and the general public, minimizing air emissions and mitigating air impacts, and maintaining a reasonable Project schedule. As discussed in more detail below, the changes in budget, schedule, project scope and the interrelated emissions and worker safety procedures resulted in the need to update the Company's Project cost estimates under a supplemental PAF authorizing a revised Project budget in the amount of $51.1 million.

III. Project Management and Oversight

A. Project Oversight and Management

1. Overview

From the outset, PSNH recognized the magnitude of the Mercury Boiler Units 1 & 2 Removal Project and that it would necessarily involve a range of complex technical and environmental issues; unique safety and health challenges; and substantial cost that would need to be contained to the maximum extent possible to protect the interests of PSNH customers. PSNH further recognized that it would need to undertake the Project in accordance with an integrated and detailed work plan, with tightly managed execution and pervasive oversight. As a result, the Company established numerous processes and documentary protocols to manage the effort with rigorous control and oversight for all aspects of the project.

2. Contract Management Plan

As a template for a comprehensive project-management plan, PSNH started with project-management guidelines previously developed for application to two, large-scale projects that PSNH has successfully completed. These two projects were the Schiller Northern Wood Power Project, involving re-powering of Unit 5 with a biomass burning boiler, and the Merrimack Station Clean Air Project, where a wet scrubber was successfully installed to remove mercury and sulfur from boiler gas emissions. The project-management guidelines were originally envisioned to serve as a framework for

project-management organization and responsibilities, technical and administrative work processes, contract management and cost control.

For the Mercury Boiler Units 1 & 2 Removal Project, PSNH modified and expanded these guidelines in several areas to best suit current work and corporate practices, as well as the specific circumstances of the Project. In this case, the Mercury Boiler Units 1 & 2 Removal Project was undertaken with the oversight of the Eversource Environmental Affairs group, which is an internal team within Eversource Energy comprised of technical experts who were able to use the PSNH project guidelines as the basis for a comprehensive project-management plan, incorporating a level of detail suited for the high complexity of the Project. The product of this effort is referred to as the "Contract Management Plan" or "CMP."

The Contract Management Plan was instituted November 2016 and revised in May 2018. The Contract Management Plan set the protocols by which PSNH would interact with the Project Contractor. Interactions covered by the CMP include processes covering the change-order process; communications; bill payment and billing disputes, if any, as well as corporate governance. More specifically, the CMP delineated appropriate record keeping, reporting, documentation of meetings and decisions, definitions of roles and responsibilities, schedule requirements, and approval processes.

The CMP included policies and procedures for cost control. The CMP required monthly reviews of the project budget based on the most recent estimates approved by the Project Manager. Work orders were opened to track all costs and were assigned one uniform work order number. The uniform work order number allowed the Company to track all costs charged to the project through its completion. Monthly reports were generated to reflect the Capital/Removal Variance Report. The report was distributed to the Project Manager and Budget Services for the Capital Budget Review Committee. Before a cost change was approved, the Project Manager and other members of the team were to evaluate whether the change is necessary and to recommend a business decision. PSNH approval was required prior to any performance. When a Change Order was submitted, it was documented in detail in the Change Order tracking spreadsheet.

Numerous types of Project update meetings were carried out during the execution of the mercury boiler demolition project in accordance with the Contract Management Plan, as follows:

1. **Weekly Project Meeting** between PSNH and all involved Vendor Managers and Supervisors, and Granite Shore Power Representatives (held onsite).

2. **Weekly Steering Committee Meeting** (Project VP, Project Director, Project Manager, Regulatory Manager and Procurement Manager) (internal only).

3. **Quarterly Corporate Officer Meeting** (Eversource Senior Management)

Topics of the Weekly Onsite Project Meeting focused on Safety, Environmental Compliance, Production, Logistics and Schedule. Weekly budget topics were discussed separately by the PSNH Project Manager, the Vendor Project Manager and GZA. During the weekly internal Steering Committee Meetings, topics included: Safety, Environmental Compliance, Production, Schedule, Critical Path, Budget and specific issues as they occurred. During the Quarterly Eversource Corporate Officer Meetings, the overall topic of Divestiture was discussed, including issues associated with the Mercury Boiler Unit 1 and 2 Removal Project, such as Safety, Environmental Compliance, Budget and Schedule, as well as other specific issues that might have occurred during the quarter.

3. Project Work Plan

As noted above, the Company retained the services of GZA to assist with managing the Mercury Boiler Units 1 & 2 Removal Project at the Schiller Station. GZA is a consulting firm specializing in geotechnical, environmental, ecological, water, and construction management services. GZA assisted the Company during the planning phases of this project, the development of the specifications for the RFP and the selection of MBI. GZA was also responsible for developing the Project Work Plan.

The Project Work Plan is a document that GZA used as tool to complement the CMP by expanding topics of schedule management, work execution, health and safety, environmental compliance, dismantling, waste disposal, and other activities. In the Project Work Plan, technical obligations and processes required of contractors were expanded and refined, which greatly enhanced execution of the work and created a detailed structure for invoice and cost management.

During the Project, GZA assisted with the oversight and documentation of day-to-day activities on-site. In fact, as Project challenges were encountered GZA was made full-time on-site Project Manager to ensure strict controls and oversight was in place as well as ensure daily coordination with the new plant management was completed. As part of its oversight, GZA prepared weekly reports of Project activities for the Company. After the "Safety Stand Down" (described below), which began in June 2017, MBI and PSNH agreed to a time and materials cost arrangement, subject to a not-to-exceed cost estimate. For this arrangement, GZA was charged with tracking time

and materials using a detailed worksheet to track labor costs and equipment usage cost. As the on-site Project Manager, GZA obtained daily worksheets from all MBI employees and tracked all work hours and on-site purchases to match hours and costs with MBI's monthly invoices. GZA handled all interactions with MBI to true-up the daily worksheets and purchasing costs to the MBI invoice. Once the invoice was received, GZA would review every single cost item and would assemble and match-up documentation to support the costs.

4. Procurement Processes and Practices

In addition to the procedures and protocols encompassed in the CMP and Project Work Plan, Eversource Energy Procurement/Supply Chain and Contract Policies were used to assure all bidding was managed with strict and documented adherence to obtain success in selecting a qualified bidder at the best price. Company policies for documentation, change orders, invoice processing, payments and other matters were strictly followed.

5. Work Oversight

The PSNH Project Team managed the daily field work with the assistance of GZA and was on site with GZA to monitor all work, respond to questions, assure proper procedures were adhered to, interface with plant operation and manage other aspects of the daily work flow. Workflow and productivity were monitored daily. PSNH conducted weekly Project meetings at the plant to discuss progress, staffing, costs and other matters. These meetings were attended by representatives of the PSNH Project Team (including GZA), MBI, TRC and other primary subcontractors. Once the MBI contract was transitioned to a time and materials arrangement, PSNH conducted additional meetings to closely monitor schedule and budget, allowing for a more detailed and timely review of work progress, cost, staffing, challenges and other issues. Through this process, all participants were made aware of critical tasks and took part in discussions to develop best solutions to any open issues.

In addition to the weekly field meetings, the PSNH Project Team conducted a weekly conference call to exchange information on field circumstances, discuss open issues and obtain leadership guidance from the department Director and Vice Presidents. Resolution of any questions was prompt and clear.

6. Eversource Corporate Oversight

On a quarterly basis, unless otherwise warranted, the PSNH Project Team provided a briefing on the status of the Project to the Eversource Divestiture Executive Committee. This allowed an

update of details to flow to higher level corporate executives and enabled guidance to flow back to the Project and associated field work.

B. Monthly NHPUC Reports

In accordance with the NHPUC's decision approving the removal of the mercury boilers, the Company conducted monthly calls with NHPUC staff and designated council to review activities, schedule and costs. The Company also met with NHPUC staff and counsel periodically to provide updates on the Project. PSNH conducted two site visits with NHPUC Staff: one site visit was conducted during active demolition (after the Safety Stand Down, to review the tiers of emissions controls and project complexities) and the second site visit was conducted at the completion of work.

IV. Project Chronology

PSNH issued a Notice to Proceed with the project to MBI on October 24, 2016. At that time, the projected schedule anticipated a target completion date of October 2017, with a total Project cost estimate in the range of $20-30 million based on information developed through the contract procurement process. The first stage of the Project was mobilization and initial environmental assessment. Mobilization involved the delivery and set-up of equipment (crane, telehandler, skid steer, scaffolding, air handlers, acquisition and staging of supplies, staging of temporary office trailers, employee parking and waste accumulation and storage areas, as well as setting up enclosures and preparing work and safety plans). Another very important aspect of mobilization was identification of active utilities within and around the Project work areas. This included identifying and marking "live" utilities that needed to remain active. This aspect of the work effort was an item that had to be constantly addressed and carefully worked around throughout the entire Project.

The initial environmental assessment involved *in situ* pre-demolition chemical characterization of materials to determine proper offsite disposal criteria. In addition to the characterization, the initial assessment also included the assessment of mercury, lead, and PCBs with the boiler systems to the extent practicable, as previously described in sections above. This characterization also took place throughout the Project as additional components or materials were accessed.

After mobilizing to the site and completing the initial environmental assessment and characterization, MBI's efforts focused on the removal of the outer asbestos containing materials or "ACM" to allow for the surgical, safe dismantling of the underlying mercury boiler system components. Demolition of Unit 1 and 2 components was initially planned over a nine-month period.

Components to be removed included the stack, turbines, generators, condensing boilers, mercury boilers, control room, coal bunker and all associated piping, lines, valves and conduits.

As of November 2016, the anticipated schedule and corresponding status for the Project were as follows:

Project Milestone/Activity	Scheduled Completion Date
Mobilize & Testing)	November 2016
ACM	December 2016
ACM & Demolition	January 2017
ACM & Demolition	February 2017
ACM & Demolition	March 2017
ACM & Demolition	April 2017
Demolition	May 2017
Demolition	June 2017
Demolition	July 2017
Demobilization, Clean-Up & Project Close	August 2017
Clean-Up & Project Close	September 2017
Project Completion	October 2017

Work progressed in accordance with the anticipated schedule from commencement of the Project through the beginning of 2017. Through the Spring of 2017, work was progressing slower than anticipated due to the growing challenges encountered during demolition. MBI was working diligently to ramp-up operations in June 2017, bringing in a new subcontractor to help accelerate demolition. The Company was aware that work was slowing down and understood the challenges that MBI was confronting.

On June 13, 2017, PSNH halted work on the removal of mercury components and instituted a "Safety Stand Down." Other work continued. The Safety Stand Down was necessitated because one of MBI's employees reported concerns regarding potential exposure to mercury, causing MBI to arrange for all employees to obtain additional mercury testing. According to MBI's Occupational Health Physicians, the results of these tests (for some employees) indicated mercury levels in blood above the normal range but not near the levels indicating toxicity or poison. However, these circumstances caused MBI (with PSNH agreement) to engage in a series of decisions ultimately leading to the implementation of a substantial step-up in personal safety and air emissions protocols that altered the work practices, cost and schedule for the overall Project. The Safety Stand Down is discussed in more detail below.

During this period, work continued on the maintenance of containments, construction of new decontamination units, non-mercury impacted asbestos removal, stack demo and other disposal of non-mercury waste. On July 26, 2017, PSNH authorized mercury-removal work to re-commence, although mercury-removal work did not re-commence for a period of time as MBI worked to establish the necessary worker-related safety protocols. Once work restarted, demolition and removal activities resumed at a slower pace than anticipated at the outset of the Project to assure worker safety and eliminate the potential for air emissions impact. Work progressed through the end of 2017 and throughout 2018 safely and steadily. MBI's decision to sub-contract key work tasks to Frank Lill & Sons for the dismantling of the large Mercury Boiler Units 1 & 2 components in November 2017 was a critical factor in the Company's ability to complete the Project safely and efficiently under the extreme circumstances that the Project had encountered.

Ultimately, asbestos abatement, demolition, and offsite disposal of Schiller Units 1 and 2 and restoration of the post-demolition site was substantially complete on March 29, 2019 [*Notice of Substantial Completion, April 10, 2019*]. Restoration and risk-assessment work continued and was completed in April 2019.

Monthly Work Progress Through the Safety Stand Down to Project Completion:

December 2016. Through the end of December 2016, the asbestos and mercury boiler equipment removal project proceeded as planned. Work was on schedule and actual expenses for the first two months of activity were in line with the overall estimated cost range. No environmental concerns were raised beyond those expected and typical at that point in the Project. The primary activity on-site involved the removal of asbestos insulation from piping and ducting located within two of the containments; removal of ACM from the Unit 1 mercury boiler flue duct; and generation of approximately 84 cubic yard boxes and 390 bags of asbestos waste from the asbestos insulation removal areas. MBI also was able to start dismantling operations within the former mercury boiler control room, generating approximately 10 tons of recyclable metal. Through December 2016, MBI collected three cubic yard boxes of metal impacted with mercury and approximately one cup of liquid mercury waste.

January 2017. The month of January 2017 was the first month of significant demolition and steel removal work. The demolition activities provided information germane to the work practices and productivity of Project staff. Therefore, the PSNH Project Team coordinated with MBI to assess

resources and the schedule with a focus on maintaining the Project completion date and identifying any potential risks or opportunities. By the end of January 2017, ACM removal was 55-60 percent complete and demolition was 5-10 percent complete.

The Project schedule planned for ACM removal to occur over approximately six months and the dismantling/demolition of the units to occur over eight months, involving five elevations in varied locations of the Unit 1 and 2 boiler-house areas. The work began at the higher elevations and proceeded to the lower elevations. MBI generated approximately 336 cubic yard boxes and 80 bags of asbestos waste from the asbestos insulation removal areas. MBI began dismantling of four water tanks generating approximately 14 tons of recyclable steel. MBI also began dismantling the Unit 1 and 2 mercury boilers, flue ducts, pre-heaters, and heat exchange units. As part of this work, MBI removed approximately 22 cubic yard boxes of asbestos insulation impacted with mercury; approximately 38 drums (55 gal. ea.) of mercury impacted ash and two 40-cubic yard roll-offs of mercury impacted steel.

By January 2017, as initial ACM progressed and MBI advanced to dismantling and demolition, MBI began to encounter liquid mercury in areas of the facility that were not known or expected to contain mercury. On January 31, 2017, MBI sent PSNH a Claim of Change in Conditions regarding MBI's air emissions compliance. MBI noted that elemental mercury was found in the control room and the flue gas duct in the coal bunker room, which was unexpected given that only a residual level of mercury was anticipated in system components used to transmit mercury vapor and liquid during operation. Retort level ash (liquid mercury present in ash) was also found in a fresh air intake system.[13] Torch cutting in those areas resulted in elevated mercury vapor readings despite the use of activated carbon filters on the work area containment exhaust.

From the outset of the Project, the potential identification of measurable mercury vapor levels led the PSNH Project Team to identify that air emissions regulatory compliance would likely be necessary. During the Project cycle, as demolition progressed, the concentrations of mercury were so much greater than anticipated that it became evident that action to reduce air emissions and comply with regulatory requirements would be necessary. With added initiatives to reduce mercury-impacted

[13] Retort is a device or process that introduces heat to a closed vessel or containment in order to produce gaseous off-products (in this case, mercury liquid changing to mercury vapor). The gaseous off-products are then collected for disposal. With respect to the Mercury Boiler Units 1 & 2 Removal Project, the items heated were pipes, pieces of steel equipment, and similar infrastructure that contained mercury.

air emissions for the benefit of employees and the public, the entire nature of the Project had to shift to a more highly controlled work environment, which in turn diminished the daily productivity of workers – albeit for the right reason.

Specifically, the discovery of mercury in those areas required MBI to reduce productive work activities to approximately three to four hours per day due to allow the Mercury Vapor Analyzers used for ambient and personal monitoring to regenerate; liquid mercury to be collected; and the emission reading levels in the air unit discharge tubes to settle. MBI installed higher capacity carbon filters to address this issue and undertook efforts to identify alternative air emission compliance methods, including the extension of work containment area air discharge points. Starting January 18, 2017, MBI implemented extended exhaust duct methods under the NHDES Adjusted In-Stack Concentration Method – Env-A 1405.05. Added costs and schedule delays were experienced to meet this standard and the resultant reductions in work productivity were necessary, as was the supply and installation of higher-level filtration equipment and the redirection of air discharge points.

The Company initially estimated that approximately 20 percent of materials removed from the facility would be sent to "retort" – the highest and most costly method of disposing mercury-affected materials – but a necessary step for mercury waste product. The Company had further estimated that 60 percent of materials removed from the facility would be disposed as hazardous materials or to retort and the remaining 20 percent would be sent to recycling. As the extent of mercury waste in the boiler system was discovered, those initial assumptions and related work plans had to be adjusted.[14]

February 2017. In February 2017, a Project schedule revision became necessary. As the dismantling activities expanded in January and February, mercury emissions were generated at higher concentrations than expected to occur with a "residual" level of mercury during the disassembly and removal process. However, during this period, greater sustained mercury emissions were measured within the work-area containments adjacent to the materials being removed due to the presence of elemental mercury. As dismantling progressed under consistent monitoring, a better determination

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[14] The extent of the mercury impact was not known at the outset of the Project and did not become apparent at any one point in time. Instead, the actual extent of the mercury waste existing within the system components and associated piping emerged over a period of many months, as the step-by-step progression of the demolition work occurred. MBI and PSNH gained information and an understanding of the magnitude of mercury waste as the demolition progressed and, as that learning occurred, MBI and PSNH adapted the work processes to account for the expanded health and safety considerations. Through the careful iteration of learned information and adjusted work processes, PSNH and MBI were able to complete the removal of the Mercury Boiler Units 1 & 2 safely and at a controlled cost.

of emissions was determined. The work was managed in full compliance with NHDES environmental regulations.

On February 23, 2017, MBI submitted a revised Project schedule to include several changes in the sequence of work to account for changes in the safety and health protection and for methods of air emission compliance. The revised schedule also included a loss of production due to the need to protect workers from higher than anticipated mercury exposure by controlling emissions during the dismantling process. The revised schedule proposed a completion date of December 27, 2017, approximately three months beyond the contracted schedule.

PSNH met with MBI on February 24, 2017 to discuss the change in conditions and the need to change the air emission compliance plan in order to mitigate the increased mercury emissions.[15] On February 28, 2017, MBI sent a "Claim of Change of Conditions" to the Company documenting the meeting. MBI's letter stated that "the levels of mercury encountered thus far, have far exceeded the reasonable expectations and conclusions made by a responsible bidder during the bid proposal process."[16] In particular, MBI noted the contract document Exhibit E, Attachment E-1 stated "residual" levels of mercury remained in the equipment. The letter also discussed that MBI found mercury in locations that were not anticipated to contain mercury and that a reasonable bidder would not have inferred that mercury would be found in locations such as exhaust gas flue ductwork, asbestos pipe wrap/insulation, and within metal wall panels.[17] Additionally, MBI noted that it "found free mercury under cabinets and on top of equipment as well as large quantities of free mercury in some of the piping removed."[18] Unexpected discoveries were documented in daily work logs and in GZA's weekly reports.

PSNH fully recognized that the circumstances that MBI was encountering well exceeded the expectations of both PSNH and MBI. In its February 28, 2017 letter, MBI proposed to continue working within existing emissions limits until an alternative compliance method could be determined. MBI offered to pursue alternative means for hazardous debris disposal, such as large component disposal to decrease mercury vapor creating cutting activities. MBI also offered to pursue alternative

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15 MBI Letter Re: Claim of Change in Conditions at 1 (February 28, 2017).

16 Id.

17 Id.

18 Id.

means for material processing, such as the use of hydraulic cutting. PSNH and its contractors recognized after reviewing the concentrations identified to date that a modified plan to manage increased levels of mercury emissions would be needed in order to continue daily dismantlement activities and avoid significant delays in the schedule.

Therefore, personnel and containment areas were monitored during the work activities; and all workers within the equipment removal containment area were properly suited with appropriate personal protection equipment. On occasion, mercury dismantling activities had to be reduced or stopped periodically to assure compliance, resulting in schedule delays. The increased volume of mercury waste found in components during the demolition process increased vapor concentrations in the work-area containments, causing issues with regulatory emissions and the need for heightened protection of personnel, while also increasing the need for monitoring and protection.

To continue progressing with dismantling activities at a pace needed to meet the Project schedule, alternative compliance methodologies that could provide increased dismantling productivity were evaluated. The alternative compliance methodology includes dispersion modeling of emissions and routing of the containment exhaust to the Unit 5 retired boiler stack. The use of a retired stack required additional ducting to route individual air-discharge exhausts from the dismantling containments to the selected boiler stack. The hundreds of individual exhaust tubes running from each air unit in each containment area had to be maintained and routed to a common plenum. This took a lot of effort. Maintenance was key because a break in the individual duct could increase ambient mercury levels in the plant for plant workers.

Figure 11: Unit 2 Removal of Boiler Tubes

To accommodate this approach, work plans were adjusted, the need for additional resources identified and a new schedule was provided by MBI. The schedule revision moved the target completion date from September 2017 to December 2017.

March 2017. Work continued in March 2017. At this point, ACM removal was 80 percent complete and dismantling/demolition was 20 percent complete. During March 2017, MBI collected and disposed of approximately 300 cubic yards of asbestos; completed demolition of fan units; continued Unit 1 & 2 boiler dismantling; and continued dismantling of flue ducts, pre-heaters and heat exchangers. MBI also collected and disposed of approximately 80 tons of metal (non-mercury impacted and mercury impacted); and collected and packaged liquid mercury from piping systems associated with Turbine 1, totaling approximately 22.5 gallons of liquid mercury waste.

April 2017. Work continued in April 2017. At this point, ACM removal was 85 percent complete and dismantling/demolition was 25 percent complete. During April 2017, MBI collected and disposed of approximately 200 cubic yards of asbestos; completed construction to route air-discharge tubes from work area containments to the retired Unit 5 stack for continuous mercury emission compliance monitoring; completed demolition of the conveyor system and duct collector above the coal bunker; completed demolition of the horizontal portion of the Unit 2 flue duct above

the coal bunker; and completed demolition on several other facility components. MBI collected and disposed of approximately four tons of metal debris impacted with liquid mercury; collected and disposed of 12 cubic yards of asbestos insulation impacted with liquid mercury for retort; collected and disposed of approximately 144 tons of metal (non-mercury impacted and mercury impacted; and removed and packaged liquid mercury found in the piping systems associated with Turbine 2, totaling approximately 20 gallons of liquid mercury waste.

As a compliance method to address mercury vapor emissions, PSNH proposed the option of using a retired on-site emissions stack to improve the emissions profile to the atmosphere of mercury emissions. MBI and its subcontractor, TRC, evaluated air dispersion models based on the use of the retired Boiler Unit #5 stack at the Schiller Station and found that combining all work containment area exhaust into a single plenum exhausted through the retired Boiler Unit #5 stack would result in greater air-quality benefits. Combining exhaust into this single point would also allow for continuous monitoring of mercury concentration and air flow rates to produce more accurate and reliable data for NHDES compliance purposes. PSNH implemented the approach on April 22, 2017.[19]

May 2017. Work continued in May 2017. At this point, ACM removal was 87 percent complete and dismantling/demolition was 30 percent complete. During May 2017, MBI collected and disposed of approximately 52 cubic yards of asbestos and completed ACM and demolition on several facility components, including Unit 1 and 2 super-heater tubing, coal bunker, precipitator, deaerator tank, and mercury and non-mercury piping. MBI disposed of approximately 8 tons of visible mercury impacted piping and 20 drums (approximately 35 gallons) of liquid mercury waste for retort. MBI also collected and disposed of approximately 172 tons of metal (non-mercury impacted and mercury impacted).

On May 9, 2017, MBI submitted a change order request to account for the supply of labor, equipment and materials to design and implement the single plenum exhaust approach approved by PSNH and implemented on April 22, 2017. MBI requested an increase in the contract amount of $550,110 to cover those costs. PSNH approved this change order as it was necessary to continue with the Project.

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[19] TRC submitted a Request for Approval of an Alternative Method for Determining Compliance under Env-A 1405.06 to the NHDES on June 14, 2017. The NHDES approved the request on October 10, 2017.

On May 10, 2017, at approximately 0815 hours, an incipient fire was observed in the Planning Office wooden rafters within the inactive Turbine #1 containment. MBI immediately notified the Schiller Station Control Room to call the Portsmouth Fire Department and Schiller Station personnel and Project workers were evacuated except for the personnel in the Control Room. Schiller Station's power generation was not interrupted during the incident. The Portsmouth Fire Department extinguished the fire and gave the all clear for personnel to return to work in Schiller Station at 1015 hrs. MBI conducted a root cause analysis of the incident and determined that an employee cutting pipe segments with a torch accidently cut through the diamond plate floor causing hot metal slag to fall on the rubber roofing of the Planning Office below. The slag melted through the rubber and began to smolder in the wooden rafters causing the fire. Hot work was temporarily suspended until the root cause analysis was conducted by MBI and new fire watch and hot work procedures could be implemented. PSNH provided the go ahead to resume torch-cutting activities at the close of business on May 12, 2017. This incident demonstrated to all parties involved the difficulty and extreme attention that had to be paid to performing demolition work in an active facility where space and access is limited due to the ongoing plant operations.

The first on-site visit with NHDES took place on May 19, 2017.

June 2017. At this point, ACM removal was 87 percent complete and dismantling/demolition was 31 percent complete. Thus, PSNH and MBI had completed relatively significant demolition during the first half of the month prior to the Safety Stand Down. However, the work initiated in the first half of June 2017 led to the revelation of the extent of mercury waste in some of the larger components and systems still requiring demolition (turbines, mercury condenser-boilers, mercury tubing, piping and valves). During June 2017, MBI collected and disposed of approximately 98 cubic yards of asbestos and completed limited ACM removal and demolition. MBI also collected and disposed of approximately 78 tons of metal (non-mercury impacted and mercury impacted).

On June 13, 2017, a Safety Stand-Down was initiated by MBI at the direction of PSNH Project Manager Daniel Watton, halting all mercury demolition and removal work while MBI began an investigation into potential employee exposure to mercury. The Safety Stand-Down was necessitated because one of MBI's employees reported the results of a home mercury urine test to the on-site MBI management staff at the Project site. The employee stated he had concerns regarding potential exposure to mercury and provided a photograph of the test result to MBI staff. MBI staff immediately sent the employee to the Occupational Health Services of Portsmouth Regional Hospital facility for

blood analysis of mercury and metals. The results of this test confirmed an elevated level of mercury in the employee's blood. MBI then arranged for all employees to obtain additional mercury testing. According to MBI's Occupational Health Physicians, the results of these tests (for some employees) indicated mercury levels in blood above the normal range but not near the levels indicating toxicity or poison.

As a result of the blood testing, MBI held an all-hands safety conference that included MBI's asbestos removal subcontractor, Absolute Environmental ("AE") on June 19, 2017. The safety conference addressed the potential mercury exposure to workers and discussed the signs and symptoms of mercury exposure. MBI presented a plan to better understand and define the potential exposure and discussed a plan that would allow for the completion of the work. Following the safety conference, all MBI and AE crew members and site supervisors completed another round of blood and urine sampling for mercury. The test results were received during late June and were reviewed by MBI's Occupational Health Physicians who reported that the detected concentrations of mercury in the blood and urine samples were not near the levels that would indicate toxicity or symptoms related to poisoning.

In addition, MBI received a letter from OSHA informing MBI that OSHA received a notice of alleged hazards pertaining to "Employees not adequately being protected while removing material containing asbestos and mercury." OSHA requested MBI immediately perform an investigation of the alleged conditions and advise OSHA in writing of the results of the investigation. MBI worked closely with OSHA to provide the requested documentation. By contract, MBI was solely responsible for the health and safety of its employees and subcontractors. Other than the work occurring on PSNH/Granite Shore Power property, PSNH is not a party to the OSHA actions.

Therefore, to protect the safety of employees working on the site, all metal cutting, burning and handling was temporarily halted in mid-June to assess safety practices and personal protective equipment due to the detection of mercury in the blood test administrated to a contract worker. As a result, no demolition work occurred from June 13 through the end of the month to allow time for worker safety re-evaluation by the contractor. Work continued on work-area containment maintenance activities and the construction of future containments, as well as the development of "return to work" plans for demolition. MBI commenced a root-cause analysis investigation and an evaluation of all mercury related work practices. In addition, MBI worked to develop a return-to-work-plan to be implemented following the completion of the root cause investigation and work

practice evaluation. Due to the Safety Stand Down, the project completion date of October 2017 had to be extended into 2018. The revised schedule was necessary to address the issues associated with mercury removal for safety re-evaluation and to allow for a work transition to orientate several new contractor employees as well as to institute revised procedures to allow a safe restart of work.

PSNH did not allow the Project workforce to disband during the Safety Stand Down (and associated suspension of mercury-removal work) due to the fact that the workforce on-site was highly specialized and hard to retain in the marketplace. By that point, the workforce had completed the required training for the type of work being conducted; had received specialized facility training; and possessed an overall competence specific to the Schiller facility, which could not be replaced. Volumes of material were disposed of during this period, which were previously removed from the containments. In addition, the containments required maintenance, necessitating the retention of numerous workers. If PSNH had disbanded the entire workforce during this period, many additional months of delay and very large re-mobilization costs would have occurred at a cost many times the cost of retention.

July 2017. Throughout the month of July 2017, MBI continued the Safety Stand Down for mercury-related dismantling. At this point, ACM removal was 87 percent complete and dismantling/demolition was 32 percent complete. During July 2017, MBI collected and disposed of approximately 98 cubic yards of asbestos and completed limited ACM removal and demolition. MBI also collected and disposed of approximately 19 tons of metal (non-mercury impacted).

During July 2017, MBI began demolition of the mercury boiler stack interior gunite, maintained the existing containments, and erected future work area containments.

On July 5, 2017, MBI conducted a Safety Stand Down and mercury training session with all employees at the New England Labor Union training facility.

On July 19, 2017, OSHA visited the project and performed a site inspection of MBI operations. On July 21, 2017 and July 27, 2017, OSHA was onsite and performed MBI employee interviews. MBI coordinated and cooperated fully with OSHA requests for information.

MBI submitted a Return to Work Plan on July 13, 2017 with the results of the investigation into potential employee exposure to mercury. On July 26, 2017, PSNH issued a Back to Work Directive letter to MBI to resume all work activities for this project.

August 2017. From August 1, 2017 through August 16, 2017, MBI continued the Safety Stand Down for mercury-related dismantling. At this point, ACM removal was 88 percent complete and dismantling/demolition was 33 percent complete. During August 2017, MBI disposed of approximately 20 cubic yards of mercury impacted asbestos; approximately 12 tons of mercury impacted metal; approximately 22 drums of mercury impacted asbestos with visible mercury for retort; approximately 6 tons of mercury impacted metal with visible mercury for retort; and approximately 30 gallons of liquid mercury was for retort.

During August 2017, MBI began dismantling the exterior portion of the mercury boiler stack. Additionally, MBI completed several projects, including asbestos removal from the exterior portion of the Unit 2 flue duct, construction of female personnel decontamination areas for existing containments, maintenance of existing containments, and modifications to the existing personnel decontamination areas and conducted general house-keeping within the El. 82' and El. 59' containment. MBI also mobilized an ARS HC24 Air Handler and two additional worker break trailers to the site.

On August 15, 2017 and August 16, 2017, Manafort conducted site specific mercury training for all employees on-site. Training included information on mercury, updated PPE requirements, and a review of the updated project Job Hazard Assessment. MBI resumed mercury-related work within containments on August 17, 2017.

On August 21, 2017, OSHA was onsite and performed a site inspection of MBI operations. MBI did not receive any direct communication from OSHA at the completion of the visit.

September 2017. No new significant issues were identified during September 2017. At this point, ACM removal was 88 percent complete and dismantling/demolition was 35 percent complete. ACM removal and dismantling work continued during September. During September 2017, MBI disposed of approximately 12 tons of non-hazardous gunite from the mercury boiler stack; approximately 4896 gallons of hazardous waste water; approximately 19 tons of scrap metal; approximately 52 cubic yards of mercury impacted asbestos; and approximately 10 tons of mercury impacted metal with visible mercury for retort.

During September 2017, MBI continued mercury-impacted metal removal and stack demolition work. In particular, MBI continued dismantling of the mercury boiler stack metal shell, interior gunite and interior baffle system. MBI began removal of the mercury piping systems and

utilizing the ARS HC24 Air Handler connected to the El.82' and El.59' containment with additional continuous emissions monitoring of exhaust for mercury. In addition to performing maintenance of all existing containments, MBI erected new work area containments at El. 11' and 24' and began construction of wooden framing at El. 82' within the El. 82' ad El. 59' containment. These frames were subsequently used in the construction of smaller sized boiler containments at El. 59' and El. 82'.

On September 11, 2017, PSNH and GZA attended a meeting with NHDES and NHPUC in Concord, NH to discuss approval of the Alternative Air Emissions Compliance Plan submitted by TRC Environmental on behalf of MBI, which was designed to address the mercury capture and added non-thermal dismantling efforts.[20] NHDES advised that the Project was in compliance with New Hampshire air emissions rules. However, in the interests of worker and public safety, PSNH committed to institute initiatives to exceed compliance requirements.

On September 20, 2017, OSHA was onsite and performed employee interviews with the MBI management team.

October 2017. At this point, ACM removal was 88 percent complete and dismantling/demolition was 39 percent complete. ACM removal and dismantling work continued during October. During October 2017, MBI disposed of approximately 12 tons of non-hazardous gunite from the mercury boiler stack; approximately 9,122 gallons of hazardous waste water; approximately 26 tons of scrap metal; approximately 10 tons of hazardous mercury impacted metal.

In addition to the disposal work described above, MBI also continued the removal of piping within the Unit 1 and Unit 2 El. 82' and El. 59 containment; the removal of mercury piping systems at El. 11'; and loadout and off-site transportation and disposal of the mercury boiler stack interior gunite. During October 2017, MBI began and completed dismantling, decontamination, and load out of scaffolding at El. 82' within El. 82' and El. 50' containment. In addition to this containment work, MBI continued maintenance of all containments and erected a "torch room" containment with carbon filtered "smoke eaters" within El. 82' and El. 59' containment and began sizing previously removed metal pieces within the torch room via torch cutting. Further, the installation of temporary roof protection over the mercury boiler Stack opening was completed.

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20 The need for alternative compliance was caused by the high level of mercury concentrations shown in early June and recognizing that the Project's existing emissions compliance plan would be hard to meet and would cause additional delays. Alternative compliance was needed to be able to continue work uninterrupted.

November 2017. No new significant issues were identified during November 2017. At this point, ACM removal was 89 percent complete and dismantling/demolition was 42 percent complete. ACM removal and dismantling work continued during November 2017. During November 2017, MBI disposed of approximately 3 tons of non-hazardous debris; approximately 3 tons of hazardous mercury metal debris with asbestos for retort; approximately 7.5 tons of hazardous mercury metal debris for retort; approximately 15 gallons of liquid mercury for retort; approximately 15 tons of scrap metal; and approximately 25 tons of hazardous mercury impacted metal with asbestos.

During November 2017, MBI continued removal of piping within Unit 1 and Unit 2, removal of mercury piping systems, and maintenance of all existing containments. Further, MBI began asbestos bulk final cleaning of the Unit 1 and Unit 2 El. 82' and El. 59' containment outside the footprint of the Unit 1 and Unit 2 boilers and began the removal of the north and south mercury storage tanks at El. 11'. In addition to beginning those tasks, MBI completed several projects including, modifications to the mercury boiler stack containment, removal of mercury reclaim room vent stack, removal of the asbestos from the Unit 2 mercury boiler drum at El. 50', and installation of additional fan unit within the original temporary plenum to the decommissioned Stack 5.

In November 2017, MBI hired a sub-contractor, Frank Lill & Son, to assist in the "bottom-up" demolition approach that was necessitated by the manner in which the mercury boiler tubes were supported. Frank Lill & Son brought a highly trained dismantling workforce to the site familiar with boilers, which was a significant addition for the Project. However, these workers needed substantial training due to the fact that they typically do not work in these types of environments (asbestos and mercury). The Project would not have been completed on a reasonable time frame without these incremental, highly experienced workforces, warranting the cost that was incurred to bring these resources on.

December 2017. No new significant issues were identified during December 2017. At this point, ACM removal was 90 percent complete and dismantling/demolition was 45 percent complete. ACM removal and dismantling work continued during December 2017. During December 2017, MBI disposed of approximately 4,810 gallons of hazardous waste water and approximately 22.5 tons of hazardous mercury impacted metal with asbestos.

In December 2017, MBI continued removal of mercury piping systems within the Unit 1 and 2 El. 82' and El. 59' containment, removal of mercury piping systems at El. 11', maintenance of all existing containments, asbestos bulk final cleaning of the Unit 1 and 2 El. 82' and El. 59' containment

outside the footprint of the Unit 1 and 2 boilers, and removal of the north and south Mercury Storage Tanks at El. 11'. Additionally, MBI completed removal of the stored equipment and materials from the Planning Office for temporary storage, removal of the mercury boiler stack, and removal of the Deaerator Tank and base at El. 59'. Also, in December 2017, MBI began and completed removal of piping within the El. 36' containment between Turbine 1 and Turbine 2.

During December 2017, MBI began construction of a large decontamination area within the Planning Office at El. 36'. This decontamination area would later be used to support the El. 36' and El. 49' boiler containments as well as the Turbine #1 containment. Further, MBI mobilized an additional 50' personnel trailer to the site and on PAC-91 air handler and two F-240 air handlers to the site for utilization in El. 36' containments.

On December 11, 2017, MBI's subcontractor, Frank Lill and Sons, mobilized to the site to assist MBI with boiler dismantling activities through project completion.

On December 12, 2017, OSHA was on-site and performed a site walk with MBI personnel.

On December 15, 2017, MBI and OSHA conducted an informal conference offsite regarding citations issued to MBI.

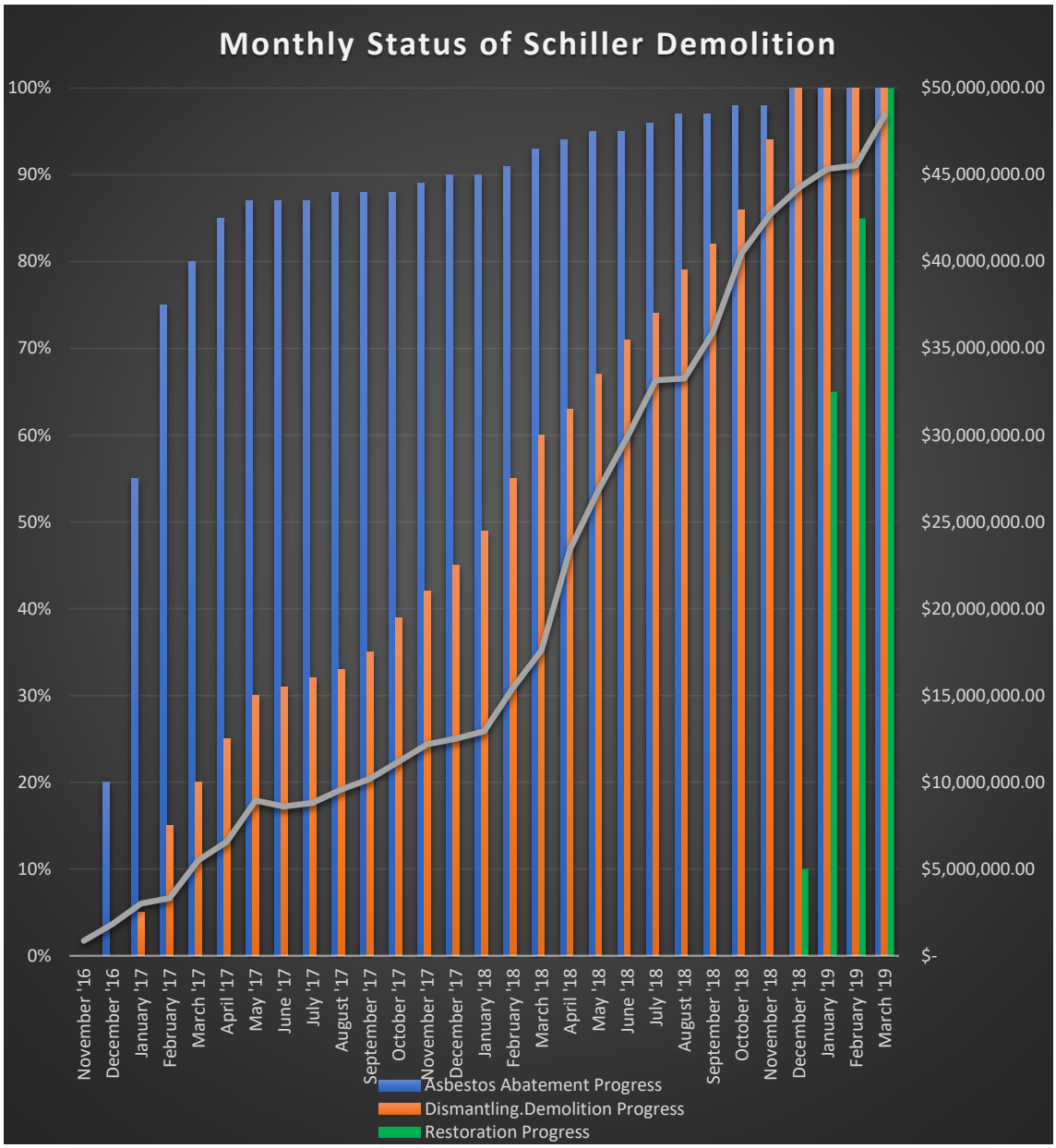
On December 18, 2017 and December 21, 2017, PSNH met with representatives of Granite Shore Power (which at the time was the anticipated acquiror of Schiller Station) to conduct a walk-through of the temporary hazardous waste storage areas utilized for the mercury boiler project.

January through December 2018. In late January 2018, MBI completed the revised cost and schedule evaluation, as new productivity levels could be quantified at that time using the new procedures outlined in the "Return to Work" plan. This included ventilation, work practices and PPE enhancements. The estimated completion date was revised to December 2018. An updated cost estimate was reviewed and approved by the Eversource Energy Service Company Subsidiary Board of Directors.

January through April 2019. In the period January through April 2019, demolition, restoration and post-demolition sampling and risk assessment activities were conducted. Restoration included infills on all levels with metal grating and plates, handrails around boiler openings on all elevations, structural concrete in-fills on the turbine deck, exterior siding and roof penetration infills. Ultimately, asbestos abatement, demolition, and offsite disposal of Units 1 and 2 and restoration of the post-demolition site was substantially complete on March 29, 2019 [*Notice of Substantial Completion,*

April 10, 2019], with risk assessment continuing into April 2019. The total direct cost of the Project was $48.433 million. An overview of the monthly work progress and cost is shown below.

Figure 12: Monthly Progress of Schiller Demolition



V. Analysis of Safety Stand Down

A. Mercury Saturation

Within the electric generation plant, the Mercury Boilers Units 1 & 2 were used to improve efficiency of the conversion of fuel to electricity. The mercury vapor, binary cycle production process was a concept that had been considered for many years, but then constructed by General Electric for commercial operation in only five locations in the country. Other technical advancements in boiler and turbine equipment design became more efficient than the mercury binary cycle technology, causing the technology to be phased out, leaving only five facilities constructed. Health concerns about mercury contact or ingestion was not an issue at the time the plants were operated or retired. Mercury was not viewed as a hazardous substance at that time, but rather as a relatively safe liquid to handle. Whether a gallon of water in a pail or a gallon of mercury in a pail, the scientific knowledge (and worker handling the element) would have treated the elements equally without any concern. Comprehensive regulation on the handling, removal and disposal of mercury did not emerge in the U.S. until the late 1970's and beyond, well after the retirement of all five mercury boilers, including the Mercury Boiler Units 1 and 2 at the Schiller Station.[21]

The mercury binary cycle concept involved two mercury boilers, two mercury turbines, and a steam turbine, along with associated piping and ancillary facilities. At the time of commercial operation and retirement of the mercury vapor facilities, it was anticipated that mercury would be found inside the mercury turbines, the mercury condensing boilers, and the mercury boilers. The steam turbine used at Units 1 and 2 of the Schiller Station was removed and shipped away more than 30 years ago, and the Company has no information as to the presence of a mercury impact based on observations during dismantlement and shipping. Therefore, the conclusion reasonably reached by both PSNH and MBI, and the contractors and sub-contractors working for PSNH and MBI, was that mercury was processed through the plant during its operation; that mercury waste would be found within the boiler systems during demolition; that the mercury residue found would predominantly exist in the equipment components used in the mercury-vapor cycle; and that to the extent that mercury residue had migrated outside of those components, the residual quantity of mercury would

[21] In 1976, the U.S. Congress enacted the Resource Conservation and Recovery Act (RCRA) governing the disposal of solid waste and hazardous waste, including requirements for products and wastes that contain mercury. In 1980, the U.S. Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), which is administered by the U.S. Environmental Protection Agency, to allow for the investigation and clean-up of sites contaminated with hazardous substances.

be minimal as there was no mercury apparent in the external surfaces of the mercury boiler components.

For example, mercury residue would be expected to exist inside the two mercury boilers; the mercury condensing boilers and mercury turbines, as well as the associated piping. Knowledge of the generating process would indicate that mercury flowed through components in liquid form and vapor form. The reasonable expectation was that the only way the mercury would have escaped from the system would have been if there was a tube or valve leak, where vapor could escape. If there were leaks of mercury from a valve or from a piece of equipment during operation, it would be expected that a small quantity of vaporized mercury could have escaped into the room over the life of those units, condensing on a beam or in insulation. Or, if there was a spill of mercury, it would be expected that the mercury would have been cleaned up and disposed of, if located in open, observable areas. In other instances, mercury could have fallen into an area of the boiler behind a wall or otherwise migrated into locations that were not visible. Accordingly, over the service life of the combined-cycle unit, there are a number of circumstances that could have occurred to allow minute quantities of mercury to escape the enclosures of the equipment. A reasonable expectation would be that these circumstances could have and would have occurred; however, the expectation was that these circumstances would be anomalistic – and if the circumstances occurred – the escape of mercury would be contained to small, residual quantities.

It was also significant that the equipment was retired in place and remained undisturbed for many years. None of the equipment was taken apart, dislodged, moved or cut down. Over time, there would be a reason that a piece of equipment or a piece of insulation would need to be disturbed and, at that time, the Company would occasionally detect a drop or two of mercury on the floor. However, procedures were in place; employees were trained; and the Company maintained equipment to collect and manage these detected quantities. The liquid mercury was reportedly removed from the system at the time of retirement. Thus, the expectation was that significant quantities of liquid mercury would not remain in the systems as it would have been drained to the greatest extent possible during the retirement because of the value that the mercury had in the marketplace at that time. Moreover, over the 50 years since Units 1 and 2 were retired, mercury detections were very infrequent and when the circumstances did occur, the amounts detected were very small, indicating to the Company that no more than a minimal, residual quantity of mercury remained in the facility.

However, in January 2017, MBI began to encounter the proliferation of mercury in the facilities comprising Units 1 and 2. As work progressed, MBI discovered that the vapor dispersion that had occurred within the boiler system was extensive and pervasive, coating all surfaces and permeating cracks and crevices throughout the boiler systems, including walls, ceilings and appurtenances and all of the equipment components. The mercury had migrated extensively beyond the normal path of operation. For example, MBI found mercury-soaked bolt sockets within the equipment components. If MBI unthreaded a bolt, there was liquid mercury waste located in the bolt socket. Mercury would sweat out of the piping and metal walls after a component was removed and prior to packaging on hot days. When the material was first removed, liquid mercury was not visible. However, two hours later, droplets and puddles of mercury would become visible within the piping.[22] Material quantities of liquid mercury were found in low spots of piping, tubing, valves, condensers, pumps leading from the tank, which was not expected to exist.

For example, some of the larger quantities of mercury were found in the turbine valves and boiler elements. The Company's knowledge and belief conveyed by former workers was that the liquid mercury had been drained and there was sufficient heat in the boiler to vaporize and dispel any residual mercury out of the equipment. However, this was not the case. The facility encompassed mercury vapor residue and liquid mercury waste to a much greater extent than was expected by PSNH and its contractors.

[22] To handle these circumstances, MBI had to conduct special packaging of the material prior to transport off-site, requiring more time, effort and cost. Special handling was also required to prevent emissions into the general plant when loading out material.

Figure 13: Liquid mercury found in equipment

As the Company came to terms with the extent of the mercury saturation, several important considerations came into focus. First, there was no industry experience with the demolition and dismantlement of a mercury-vapor boiler unit to instruct the effort. This is the first time that a system like this had ever been dismantled in this manner. Of the five original facilities in commercial operation, only one facility is known to have been demolished, which was South Meadow Station in Hartford, CT. However, the demolition of the South Meadow mercury-vapor boiler and associated piping differed substantially from the circumstances associated with the Mercury Boiler Units 1 and 2 at Schiller Station because the South Meadow mercury unit is known to have been removed within the building in which it operated, using traditional demolition concepts, and then carted off as rubble and construction waste.

Quantities of mercury were discovered in the South Meadow demolition rubble, but the lack of available historical documentation meant that there was no information to contribute to the Company's effort at the Schiller Station. Here, the Company did not have the option of destroying the plant and carting off the remains. Among other considerations, Units 4 and 6 at the Schiller Station continue to operate today using water-treatment equipment, tanks, and other electrical and

pneumatic systems that are commingled with Units 1 and 2. Therefore, demolition of Units 1 and 2 had to be accomplished using a meticulous, surgical approach that had no precedent.

Second, PSNH and MBI both understood that MBI was necessarily characterizing the mercury saturation as MBI progressed with its contractual work, rather than being in a situation where PSNH and MBI were aware of the nature and extent of the mercury saturation within the facility prior to the start of work. To that end, MBI's first priority was to complete asbestos abatement. Once the asbestos was removed from the components, work to dismantle the boilers and access components could be conducted. During the asbestos abatement, MBI found mercury in the insulation, which was not necessarily expected, but at the same time, was not completely unusual given that some routine leakage from the process could be expected to occur over time. When MBI also found mercury in the super-heater portion of the boiler that was not expected to historically contain mercury vapor, concerns were raised and expectations grew that more quantities of residual mercury would be found. MBI was finding mercury in areas where no one anticipated that mercury would be found and MBI therefore had an obligation under the contract to assure the safety of its workers and the containment of air emissions. MBI's efforts to meet this obligation were starting to have implications for cost and project schedule, which PSNH needed to accommodate. Specifically, MBI's efforts required additional time, labor and supplies that were necessary to complete the removal under the circumstances.

Third, a critical factor in the Project was the inability to substantially utilize the faster, lower-cost techniques to cut-up and remove equipment. Specifically, there are two approaches used in the industry to dismantle and demolish large-scale equipment and facilities: non-thermal dismantling and torch-cutting. The non-thermal dismantling methods use non-heat generating methods to remove pieces of steel, such as manual unbolting and disassembling of equipment or mechanical cutting using demolition saws, sawzalls, wire saws and similar equipment. Torch-cutting involves the use of an acetylene oxygen torch to cut through steel or other metal components. Due to the chemical nature of liquid mercury, torch-cutting methods that generate heat would have a strong potential to create mercury vapor and even the use of saws in a cold-cutting approach may generate enough heat to cause mercury vapor issues. These mercury vapor emissions would need to be collected and exhausted from air-tight containments to assure the protection of dismantling and plant employees. However, while the torch-cutting method creates concerns regarding mercury vapor emissions, it is exponentially faster than the cold-cutting method of demolition. For example, the time to cut through a 4-inch-thick piece of metal would be 10-20 times quicker using a torch-cutting method rather than a sawblade.

Thus, the trade-off between torch cutting and cold-cutting is emissions impact, time and cost. At the outset of the project work, the Company and MBI structured the work plan to balance these considerations with the adequate use of the torch-cutting technique with safety for plant personnel and works as the first priority.

Figure 14: Removal of Mercury Storage Tank Through Non-Thermal Cutting

To minimize the potential of emissions, Addendum 2 to the Scope of Work directed MBI to prioritize non-thermal dismantling methods to the extent possible. However, it was fully anticipated that MBI would use torch-cutting to accomplish the overall project on a reasonable timeline and that torch-cutting would be used in areas of the facility and on equipment components thought to be "non-mercury." Once the Project got underway, PSNH agreed with MBI on the decision to use torch-cutting because the non-thermal method was taking so long the Company became concerned about the cost to customers, recognizing that air emissions could be properly controlled. The specialized labor required for the Project is a key driver of Project costs. Therefore, where torch-cutting could be employed, Project costs through increased production would be mitigated.

Accordingly, MBI proceeded with its work (and contemporaneous characterization of the mercury saturation) using non-thermal techniques and sawzalls in areas that would expect to have mercury impact and torching components in areas and on components thought to be non-mercury

contaminated. Not only was MBI encountering mercury where no one thought there was going to be mercury, most all of the components were discovered to be impregnated with mercury. As MBI was conducting its work, the steel heated up, creating mercury vapors and emissions requiring additional containment, ventilation and treatment.

Moreover, certain equipment components required the use of torch-cutting techniques. For example, MBI removed storage tanks with steel walls over an inch thick, which were expected to contain mercury. MBI was able to torch-cut through the storage tanks without producing any resulting emissions levels. Conversely, the condensing boilers and turbines were comprised of thick metal, up to four inches deep in some cases. This metal was impregnated with mercury, along with the residual mercury within the equipment, and as a result, the emissions levels were significant as these components were disassembled. Even so, in some cases such as the turbines, torch cutting could not be conducted due to the mercury concentrations generated with torch cutting and therefore non-thermal methods such as wire rope saw cutting had to be utilized. Workers would have had to be in air-purification units to complete certain turbine components and that was too large of a safety risk. Therefore, due to the proliferation of mercury throughout the plant, PSNH and MBI simply had no choice, in most instances, to complete the work necessary to properly remove Units 1 and 2, while avoiding the emissions impacts and worker-safety issues. Therefore, if any work was to continue at all, steps had to be taken to address emissions impacts and worker-safety in order to complete the Project.

For example, a major component of the Project involved the dismantling of the turbines. PSNH did not possess any as-built documents showing the internal construction of the turbines or the condensing boilers associated with those turbines to facilitate the dismantling of the units. Therefore, the only option was to start the process by torch-cutting on those components. However, the presence of mercury was so great that MBI was unable to conduct the torch-cutting on certain components within the turbines because no amount or type of personal protection equipment would adequately protect MBI's workers. These components are very large, bigger than a room. Therefore, the Company had to investigate different methods of removing the turbines. One method is hydro cutting and the other is wire-saw cutting, which uses a wire with diamonds in it to cut through the metal. The Company elected to use the wire-saw cutting because MBI could not disassemble the units any other way although the premium cost was high to do that type of cutting. However, after MBI completed the first unit, the Company and MBI were able to see how the unit was put together and

adjust dismantling methods for the second turbine. Therefore, the Company was able to save costs on the second unit through strategic cutting and sending big components offsite for disposal.

In addition, at the time of the original shuttering of the Mercury Boiler Units 1 and 2, mercury was not viewed as any type of safety or health problem, nor was the presence of mercury identified, evaluated or considered beyond the quantities that would be extracted through draining of the liquid into flasks. Upon retirement, the bulk liquid mercury was drained from the Unit 1 and 2 equipment components and disposed of. Only very small quantities of mercury were detected over the years following the retirement of the units (e.g., approximately 15.5 gallons were collected and recycled in 1983). By comparison, MBI and its sub-contractors removed an additional 165.5 gallons of *collectible* liquid mercury waste, which does not account for the thousands of tons of material that MBI sent out for retort because it was impregnated with mercury. A total of 2,100 tons of hazardous waste steel was sent to retort and a considerable quantity of the abated asbestos contained mercury. Based on today's knowledge of the toxicity quotient, heating up just one droplet of mercury causes a major emissions issue, not just from a health and safety perspective, but also in terms of emissions into the atmosphere. However, MBI ultimately removed at least 165.5 gallons of liquid mercury waste, not accounting for the huge quantities of mercury impacted refuse that was removed and disposed.

In constructing the RFP and negotiating the initial project estimate for the MBI agreement, PSNH assumed that less than 20 percent of the refuse generated through the demolition and dismantlement work would be sent to "retort." Retort is the disposal strategy when liquid mercury is present. The Company assumed 60 or more percent would be "hazardous waste," which is a step of disposal below retort. The Company further assumed that 20 percent or so would go out for recycling and require some level of mercury removal.

Once the level of mercury saturation was discovered, the Company had to send most of the refuse from the facility to retort as high-subcategory hazardous waste. The Company stopped recycling and treatment of the steel because the Company did not want workers generating more vapors trying to clean the steel. Mercury removal is labor intensive and would cause more emissions, and because of the impregnation of the mercury in the metal, was technically infeasible. Retort is a more specialized level of hazardous waste disposal involving a high-level of thermal treatment as compared to a landfill, for example. Retort is more expensive and involved taking the material and putting it in big ovens to bake it and heat it to get the vapor and the mercury out of the equipment so the material can be disposed of while the mercury is separately collected. With retort, the disposal

cost does not represent a major cost differential. However, the cost of packaging and handling is substantially greater. These decisions increased the cost of disposal, while moving the Project to completion and minimizing future risks of environmental recourse from currently permitted disposal locations.

Due to the proliferation of mercury, everything had to be changed: work processes and procedures, periodic health screenings, personal protection equipment and air emissions containment and ventilation plans. The pace of work had to be slowed considerably to assure worker safety, proper disposal of mercury waste and refuse and air emissions containment. A slow pace and intricately careful work method came at a cost. However, if the Project was to be completed, the cost could not be avoided. Moreover, the cost would likely have been greater had the Company taken steps to identify the true quantity of mercury "residue" before demolition commenced.

As noted above, a full environmental assessment would have required a costly, time-consuming and logistically unworkable process to sample and test internal components of the boiler units. Equipment would first need to be abated for asbestos and then piping would need to be accessed in numerous locations to identify the quantities present at bends and low points within the piping system. Thus, in effect, the actual quantities of residual mercury could not be ascertained without largely dismantling the boilers and associated equipment.

The majority of equipment in the plant requiring insulation was insulated with ACM, as was customary in the 1940s – 1950s. Therefore, to characterize the extent of the mercury saturation on a pre-demolition basis, it would have been necessary to perform asbestos abatement to get access to the equipment components and determine the level of mercury existing in those components. In addition, the Company would have had to construct mini-containments with ventilation and to cut or drill into the equipment to observe and test the mercury levels at many points. This type of effort would have cost many millions of dollars and taken years to complete. More important, the outcome of the effort would have been a work plan with the highest level of focus on worker safety and containment of air emissions, which is exactly the outcome that occurred here. Therefore, as striking as the discovery was, the most time-efficient approach for the Project involved assessing the level of mercury as the project progressed and adjusting the work plan for the circumstances found.

PSNH also installed several continuous mercury air emission monitors in the Granite Shore work spaces to protect the safety of Granite Shore workers, which were monitored throughout the

Project by GZA. Through the installed telemetry, PSNH and Granite Shore could remotely view real time monitoring from computers on a 24/7 basis.

B. Air Emissions Impact from Mercury Saturation

Air emissions associated with the Project were in full compliance with federal and state rules since the inception of the Project in 2016. Throughout the Project, the PSNH Project Team (including GZA), MBI and TRC Environmental worked closely with NHDES to demonstrate compliance with ENV-A 1400 regulations. During the Project cycle, PSNH committed to enhanced efforts that reduced mercury emissions by approximately 60 to 80 percent through additional controls and modified work practices. The emissions reductions were critical to provide the needed safety and health actions to protect workers and other persons present on-site.

In the January – February 2017 time frame, PSNH and MBI discussed and considered that the use of torch-cutting in the demolition process would produce mercury vapor emissions. PSNH approved the use of the method so long as MBI did not exceed the emissions thresholds at three levels: (1) worker protection in containment; (2) Schiller workers outside of the containments; and (3) actual emissions into the atmosphere regulated by the State of New Hampshire. MBI was confident that it could adequately protect its workers and remain in compliance with emissions thresholds, although at this point, the extent of the mercury impact and the associated vapor levels that would be triggered through demolition activities was not known.

As the demolition continued to progress into components that had greater mercury saturation, emissions increased. However, the compliance mechanism that MBI was using encompassed an ambient air limit, or "AAL." MBI recognized that, if it continued its work, it would exceed the AAL. Therefore, a new compliance mechanism for emissions was needed. Beginning in Spring 2017, MBI developed a new compliance mechanism for NHDES. At the end of July, PSNH met with NHDES to discuss the Project and the Alternative Air Emissions Compliance Plan ("AAECP"). During this meeting, NHDES advised it was their opinion that the AAECP and the Project were in compliance with New Hampshire air emissions rules. However, PSNH committed to initiate further controls to exceed compliance requirements in order to protect the public safety and the safety of workers. Exceeding compliance requirements involved adopting a devout focus on eliminating and treating vapors at the source, leaving containments at small air machines, as well as the implementation of a

large air machine. This approach required a high level of monitoring to know when alterations to work practices and ventilation and treatment were needed.

On October 10, 2017, NHDES issued approval of an alternative compliance method as referenced in the Request for Alternative Method for Determining Compliance under ENV-A 1405.06 outlined in the June 14, July 20, and August 24, 2017 submittals by TRC. This alternative was to demonstrate compliance utilizing a combination of continuous monitoring of mercury emissions and exhaust flow from the Project and air dispersion modeling analysis. In addition, on December 13, 2017, TRC submitted a letter to the NHDES requesting a modification to the previously approved compliance monitoring methodology. NHDES approved the request to modify compliance monitoring on December 19, 2017.

Prior to receipt of NHDES approvals of the alternative compliance method and during the compliance methodology submittal process, PSNH met with NHDES on April 28 and September 11, 2017 to discuss the pathway to alternative compliance method approval. At these meetings, in addition to discussing the alternative compliance method pathway, NHDES requested that PSNH and MBI evaluate all other incremental efforts to reduce mercury emissions associated with the mercury boiler dismantling activities. These efforts would include new cold cutting tools and equipment for steel as compared to standard hot torch cutting; employing new work practices of removing larger pieces of material to reduce cuts; efforts to enhance containment exhaust system design; and the use of added filtration and collection equipment. Following the meetings, the PSNH Project Team (including GZA), MBI and TRC worked diligently to identify and implement numerous supplemental efforts to reduce mercury emissions. The supplemental mercury emission reduction efforts implemented to date and the effectiveness of those efforts are as follows:

Supplemental Mercury Emissions Reduction Efforts - MBI began the utilization of supplemental efforts to reduce mercury emissions associated with dismantling activities in August 2017. The supplemental efforts implemented primarily consisted of a greater focus on cold cutting and air filtration including, but not limited to, the following:

- Utilizing a number of new cold cutting tools and equipment such as hydraulic shears, band saws, and reciprocating blade demolition saws to dismantle and resize metal components containing or possibly containing mercury;
- Limiting the use of torch cutting to only those components that cannot practically be removed using cold cutting methods;

- Addition of carbon filtration to the existing High Efficiency Particulate Air (HEPA) exhaust filter units being utilized to exhaust air from the work containments to Stack 5;
- Supplemental air systems with carbon filtration exhausting to Stack 5 capable of up to an additional 36,000 Cubic Feet per Minute (CFM) air flow;
- More frequent cleaning of accumulated dusts within containments;
- More frequent waste load-outs inside containments to reduce static mercury emissions;
- Utilization of portable "smoke eaters" equipped with carbon filtration to capture and treat mercury emissions at the point of generation;
- More aggressive draining of liquid mercury in pipes prior to cutting by vibrating pipes to remove as much free mercury as possible and injecting urethane foam sealants into the pipes before cold cutting to minimize the escape of mercury vapor from the cut area;
- Real time mercury monitoring to assess the effectiveness of the filtration performance for the supplemental air systems;
- Testing of spent carbon removed from service prior to disposal to assess the total mass of mercury removed by the carbon filtration systems; and
- The addition of a dedicated project monitor to observe exhaust equipment and monitor numerous measurement devices to ensure reduced emissions are maintained.

The supplemental efforts to reduce mercury emissions resulted in measurable reductions since implementation in August 2017. Prior to the Safety Stand Down in June 2017 where worker health and safety were reviewed and addressed through important process changes, daily total mercury emissions in Stack 5 typically ranged from 100 to as high as 1,300 grams per day during torch cutting activities. During the Safety Stand Down from June 2017 to August 2017, total mercury emissions in Stack 5 were averaging approximately 70 grams per day. Following the return to work in August 2017, MBI focused on cleaning accumulated dusts in containments and packaging previously removed boiler components within the containments. Through these cleaning and packaging activities, with only limited processing of boiler components to be packaged taking place during this period, the total daily mercury emissions averaged dropped to approximately 30 grams per day or a 55 percent reduction in the pre-supplemental efforts baseline emissions. The reduction in emissions through more frequent cleaning and waste load-out demonstrated the effectiveness of removing on-going sources of static emissions.

Dismantling of boiler components resumed in September 2017 utilizing a combination of the supplemental efforts detailed above. These supplemental efforts included more frequent utilization of cold cutting, utilization of portable "smoke eaters" with carbon filtration, more aggressive draining of free mercury and sealing of cold cut areas prior to cutting, utilization of HEPA units and additional air systems equipped with carbon filtration, and more supervision of work due to more workers in each containment area, new cutting tools and techniques used, monitoring cause and results emissions levels, and adjusting equipment locations to enhance emissions reductions. More stringent personal protection equipment and work place practices were implemented at this time. An evaluation of the mercury emissions from April 2017 through February 2018 indicated that mercury emissions during active dismantling have dropped from a range of 100 to 1,300 grams per day prior to the shutdown to 25 to 85 grams per day since dismantling activities resumed, which supports the effectiveness of the supplemental efforts, as there was no indication of an increase in the total daily emissions as compared to the emissions prior to resuming dismantling activities.

In addition to the daily mercury emissions total, the concentration of mercury in one of the supplemental air systems (F-240 #1) was also evaluated to measure the effectiveness of the supplemental efforts. The inlet and outlet of the F-240 #1 supplemental air system was continuously monitored to evaluate the efficiency of the carbon filtration within the unit. Based upon the daily efficiency data, the daily mercury removal efficiency ranges from 7 percent to 34 percent with a daily average of 21 percent. Through the continuous monitoring of the removal efficiency, the Company was also able to determine when carbon change out was required.

The "smoke eater" carbon filter systems were also evaluated to measure the effectiveness of mercury removal. The evaluation was completed by measuring the mercury concentration at both the inlet and outlet of the "smoke eater." At lower mercury concentrations (0.01 – 0.1 mg/m^3) the average reduction in mercury concentration was approximately 51 percent. At higher mercury concentrations (0.1 – 1.0 mg/m^3) the average reduction in mercury concentration was approximately 53 percent. The removal efficiencies observed with the "smoke eaters" demonstrates the effectiveness of reducing mercury concentrations with carbon filtration at the source of mercury vapor generation.

Therefore, beginning in August 2017, actions to modify procedures and work practices were successfully implemented, including expanding the use of cold cutting methods, by using new tools and equipment purchased for that purpose. The more frequent utilization of cold cutting methods with the new tooling and more aggressive draining of liquid mercury and sealing of pipes prior to

cutting have added more time and cost to the dismantling efforts; but achieved a measurable decrease in mercury emissions. In addition, the utilization of the "smoke eaters" with carbon filtration and the use of carbon filtration on air handling units added costs associated with the labor and expenses to provide, install, and dispose of the carbon. However, the net reduction in mercury emissions was significant. The identification of safety and health risks associated with the workforce also required added measures after the June 2017 Safety Stand Down. These emission-reduction efforts were critical in addressing these important priorities.

C. Worker Safety Impact from Mercury

By contract, MBI had responsibility to manage the employees on site and to conduct work in a manner that protected the health and safety of the workers. MBI had responsibility for work procedures and the issuance of personal protection equipment. Standard personal protection equipment includes hard hats, respirators, respirator cartridges, earplugs, one-piece suits, safety glasses, and other equipment – some of which are specifically designed to prevent mercury from entering the human body. Despite the difficulties encountered during the first and second quarter of 2017 as work commenced and began to ramp up, MBI believed that it was meeting its obligation given the ongoing assistance of TRC Environmental; the standard of personal protective equipment applied and site monitoring that MBI was undertaking; the presence of the third-party health and safety monitor; and the impact of MBI's internal health and safety program.

However, on June 7, 2017, an MBI employee made an initial report of the results of an at-home mercury urine test to the on-site MBI management, indicating possible mercury exposure. MBI immediately halted all mercury demolition and removal work and directed the employee to the Occupational Health Services of Portsmouth Regional Hospital facility for blood analysis of mercury and metals. The results of this test confirmed an elevated level of mercury in the employee's blood. Results from medical facility testing was received on June 12, 2017. MBI management reported this incident to PSNH. PSNH learned of this event on June 13, 2017.

In response to the reported incident of mercury exposure, PSNH Project Manager Dan Watton issued a verbal cease work directive immediately on June 13, 2017. PSNH followed up in writing on June 14, 2017 from the Procurement Director, directing MBI and its subcontractors to suspend demolition activities indefinitely pending the outcome of an incident investigation and discussions with PSNH regarding the possible return to work. MBI completed efforts to: (1) obtain

and report blood and urine testing of MBI workers and subcontractors; (2) conduct a review of potential pathways for mercury exposure; (3) explain its response to OSHA reporting; (4) identify additional actions based on results of worker tests, site assessments and process and procedure reviews regarding personal protection equipment and industrial hygiene changes; and submitted a written action plan and revised Demolition and Hazardous Materials Management Plan to PSNH.

MBI also immediately employed the services of certified industrial hygienists from TRC Environmental and the WCD Group, as well as occupational health care specialists from WorkCare and Exeter Hospital to assist with the response to this incident. MBI sent all workers to the hospital for mercury screening. Blood testing of MBI employees and subcontractors for mercury exposure indicated that some employees had mercury levels above the normal range, but not near the levels required for toxicity or poison. As a result of the blood testing, MBI held an all-hands safety conference. The safety conference addressed the potential mercury exposure to workers and discussed the signs and symptoms of mercury exposure. MBI presented a plan to better understand and define the potential exposure and discussed a plan that would allow for the completion of the work. Following the safety conference, all MBI and MBI subcontractor crew members and site supervisors completed another round of blood and urine sampling for mercury. Upon return to work, MBI implemented a very rigorous medical monitoring program that slowed production due to the time spent on regular screenings and involved a cost. However, this led to more comprehensive personnel monitoring. MBI's Occupational Health Physicians subsequently reported that the detected concentrations of mercury in the blood and urine samples were not near levels that would indicate toxicity or symptoms related to poisoning.

MBI was also notified by OSHA that it had received a notice of alleged hazards pertaining to inadequate employee protection while removing asbestos and mercury containing materials. OSHA requested that MBI immediately perform an investigation of the alleged conditions and advise OSHA in writing of the results of the investigation. Further, on July 19, 2017 and August 21, 2017, OSHA was onsite for a site inspection of MBI operations. OSHA was also onsite to conduct employee interviews on July 21, 2017 and July 27, 2017.

From the Company's perspective, the challenging work environment, coupled with the strict use of safety and health-related personal protective equipment, raised the risk level for MBI's performance on the Project. MBI monitored its workers and executed on its obligations regarding worker safety. That said, it is the Company's perspective that, once the worker concerns were raised,

MBI came to the realization quickly that more needed to be done in relation to medical monitoring based on the concentrations of mercury that MBI was experiencing in containment. When the Safety Stand Down was called, PSNH requested a report from MBI of what happened and what MBI was doing to remediate the situation. PSNH conferred with both the Eversource Energy internal safety department and the Vice President of Safety. PSNH worked collaboratively as an internal team at Eversource Energy before granting the go ahead for resumption of Project work. PSNH's fundamental concern was the safety of the workforce performing the contract work on a day-to-day basis.

In the end, MBI responded professionally to address the concerns of its employees, engaging in an open dialogue with employees so that work could move forward on the Project. As a result of the mercury exposure, MBI hired third-party health and safety experts, as well as specialized physicians. MBI also worked hard on collaboration with the workforce union leadership to demonstrate to workers that, even though they had elevated levels of mercury, the levels were not above a health risk parameter. The union hired its own experts to address worker concerns and rising emotion, concurring with MBI's actions and initiatives. The expansion of analysis of sampling and the expansion of more testing of employees grew quite a bit to get facts in order to then determine what was the next level of personal protection sophistication that was appropriate. MBI increased its PPE requirements to protect against elevated levels of mercury by using heavier Tyvek protective suits and more protective respirators. Engineering controls were also implemented to make the containment areas as safe as possible. MBI worked with the building trades, unions and the workers to be accepting of this strategy to reestablish work activity. This took a number of months to achieve.

No demolition work related to mercury-impact steel cutting occurred from June 13, 2017 through August 16, 2017. Only limited demolition of areas not regulated as mercury impacted was permitted during that time. PSNH authorized MBI to resume mercury impacted metal removal on August 17, 2017, although there was a very slow, gradual startup from that point. PSNH allowed MBI to send its workers back to work removing mercury components after the Company was sufficiently satisfied that MBI was taking accountability for worker safety.

Once the workers returned to work, many changes were applied. The major difference was the labor to complete the work with all these controls in place and the work would now take twice or three times as long as it did prior to the Safety Stand Down. For example, MBI mandated use of a protective suit that was completely non-breathable for certain operations where direct exposure to

mercury liquid was possible. As a result, where an individual worker was able to perform 6.5 hours of work in an 8-hour work day on the boiler systems prior to this discovery, the individual worker would typically produce 2.5 to 3 hours of work in an 8-hour work day at later stages in the Project. At any given time, there were 50 to 60 people in containment and workers were cycling out at 40 minutes, rather than two hours previously. This represented a reduction in productivity of approximately half because of the time it takes for workers to don and doff personal protection equipment. More specifically, individual workers were going in to work for 45 minutes, coming back out, and then resting and going back in to avoid heat stress. Because the protective equipment is impermeable, heat becomes unbearable for the workers. Work performed in the summer months and shoulder period is hot and therefore employees must go slow and cycle through to stay healthy and productive. Thus, in addition to air handling, the Company introduced air-conditioning in the summer months to provide cooler air in the work area to lengthen time in containment between needed breaks. Added costs were incurred for suits, special respirators, filters and other equipment, but the costs were necessary and provided a benefit in terms of productivity in the final result.

In addition to the controlling and trying to reduce emissions going out the stack by changing and filtering the airflow, PSNH and MBI added a substantial complement of filtering equipment to capture the mercury at the source, similar to the "smoke eater." PSNH and MBI installed several of these units within containments, in many cases adjacent to the hot work, so the emissions could be extracted before release into the containment. The cost of the continuous in-containment and exhaust monitoring by TRC after the shutdown was significant, but this monitoring allowed the Project to control emissions from both a regulatory and safety standpoint.

The workforce of 50 to 60 workers returned to the facility in September. During that time frame, PSNH and MBI realized that a larger, more highly trained workforce was needed to do components of the work. Demolition work is within the jurisdiction of the laborer trade in the building trades unions. However, this was a unique demolition project due to both the mercury and the large steel, boiler and turbine equipment and the resultant rigging and other special skills required. In November, PSNH encouraged MBI to pursue hiring boilermakers to leverage the skills that they have to work on the dismantling of the internal sections of the boilers because they are most skilled at doing that work. Part of the purpose in getting these workers involved was to obtain the training and credentials only to do the work, because none of these employees were trained in hazardous waste

or had asbestos licenses. All of these workers had to complete the required training to work on the Project.

By November 2017, it was clear that additional trained workforces would be required to complete certain components of the work on a timely basis. Members of the local boilermaker union were brought in to increase productivity. Although boilermakers are familiar with steel and boiler components, boilermakers are not typically licensed to handle hazardous material. As a result, the boilermakers had to be trained and receive the credentials to handle hazardous materials. This training and credentials needed to be obtained prior to beginning work at Schiller Station. The new boilermakers began work in December 2017.

Also, MBI dramatically increased its medical monitoring program for employees, starting with biweekly monitoring on every employee to check the effectiveness of the controls that they were put in place. From an incremental cost standpoint, the medical monitoring, as well as the daily personnel monitoring, and wearing different types of mercury monitors, was dramatically increased from what it was previously. That was part of what happened during the shutdown when they developed the program of how they were going to continue work.

VI. Project Costs

A. Overall Considerations

As the concerns regarding mercury saturation were escalating, PSNH had to come to a decision as to what would be the best way forward to minimize costs for customers, while getting the Project done with the utmost safety of Project and plant workers and for nearby residents of the facility. PSNH determined that the advisable course of action was a transition from a fixed unit price contract to a time and materials contract. Fundamentally, the Company recognized that no contractor would have been able to avoid the situation that MBI was diligently striving to deal with at the Schiller Station. Moreover, it would have cost millions of dollars and taken several years to identify and characterize the mercury saturation prior to demolition. Lastly, if MBI had known that every bolt had mercury around the threads and every component was saturated with mercury residue, MBI would have drastically altered the schedule for demolition and mercury removal from the outset, which would have only increased the cost up front substantially. MBI committed to perform the work with the utmost safety and contained air emissions and did so on a skilled basis and reasonable cost under the challenging circumstances.

During the Safety Stand Down, MBI remained the most qualified expert to be on-site and it was critical for PSNH to keep that workforce in place. If PSNH were to consider substituting another company for MBI, PSNH would have incurred a significant amount of time and cost for MBI to demobilize and for a different contractor to take over. Demobilization would have involved removal of tooling, equipment, frac tanks, and other equipment and it would have taken months. Moreover, PSNH would have had to allow demobilization to occur before the next contractor would be able to mobilize. The demobilization and mobilization costs would be significant and the skilled, trained, experienced workforce would be disbanded. The time to get a workforce onsite to conduct all of the necessary nonproductive time and training to get that force up to speed, would have taken the rest of the year at minimum.

Because the dismantling and demolition activities had to occur within a location adjacent to the operating steam cycle units, the demolition activities needed to occur in a highly controlled manner to avoid exposure to plant personnel, contamination of the building and the equipment housed in that building; to provide access through mercury dismantling work areas for daily operation and maintenance; and/or provide protection and prevent disruption of the operation of energized equipment and utilities in the area (including, natural gas, water, sewer, compressed air, high/low pressure steam, oil, communications and electric). All of these considerations required employee training and familiarity with the specific protocols put in place. Restarting the learning curve with new employees would have required substantial, unwarranted cost. Therefore, keeping the workforce in place was the safest, lowest-cost approach under the circumstances.

In addition to the issues associated with demobilizing, PSNH had multiple active containments that had to be maintained constantly. It is not proper to take down a containment until all the work is completed in that containment. Because the Schiller Station was an operating facility, the building was under both positive and negative pressure at times, exerting pushing and pulling forces on the containment structure, creating weakness and the high potential for breach of the walls. Therefore, regardless of whether the contractor was MBI or another contractor, the contractor would have needed to maintain those containments. However, the Company was working with a deliberate focus on project completion at the least possible cost given the circumstances. Therefore, it was critical for PSNH to maintain the skilled and specialized workforce already assembled to maintain compliance with the on-site requirements for demolition work.

To control Project costs, the PSNH Project Team conducted weekly project meetings at the jobsite, attended by the PSNH Project Team (including GZA), MBI, TRC and other key subcontractors. A heavy focus was placed on numerous critical issues: safety, budgets, active and emerging work activities, resources, critical path schedule scrutiny, current and emerging risks and mitigation actions, emissions, environmental compliance, procurement, tooling, etc. A weekly conference call also began in 2016 involving project leadership and the field management team. Reviews and discussions focused on budgets, schedule and other challenges, with responsive feedback to questions field activities. This also provided a conduit of knowledge for Project leadership to inform the divestiture oversight team, as needed.

B. Cost of the Safety Stand Down

On October 31, 2017, MBI sent PSNH a claim for costs incurred for the Safety Stand Down and temporary suspension of mercury-removal work. MBI stated that because no mercury-removal work was performed for approximately two months during the Safety Stand Down, it was necessary to take additional steps when work resumed in August 2017 to assess the condition of the work area and ensuring work area containments were intact. MBI also indicated that enhanced protective measures employed as a result of the investigation and work plan revisions slowed work progress. For example, MBI went from negative pressure respirators to powered air purifying respirators for torch-cutters. MBI also switched from Tyvek to saran-coated Tyvek suits.

On April 3, 2018, PSNH and MBI reached agreement to reimburse MBI a total of $1,418,000 for certain costs relating to the Safety Stand Down and the temporary suspension of mercury-removal work. MBI invoiced PSNH for all of its costs related to the Safety Stand Down, which was significantly more than the amount of $1,418,000 ultimately settled upon. PSNH negotiated a final amount below the amount submitted by MBI, which was deemed fair and appropriate for the work performed because it was critical to keep the labor force on the project as issues were sorted out. The labor costs were necessary to mitigate the overall workforce costs for customers because the funds were used to keep the current workforce and equipment intact, avoiding the possibility of costly delays to on-board new crews upon the re-commencement of work.

PSNH did not pay for MBI's legal costs, nor did PSNH pay for any fines that MBI was assessed from OSHA. PSNH paid only for the cost of labor and equipment to keep these resources engaged through that time period. PSNH also did not pay for any specialists retained by MBI such as hygienists, consultants, lawyers, fees for any fines, or anything that dealt with fighting the compliance

violation. As part of the settlement of the Safety Stand Down costs, PSNH obtained an agreement that MBI that it was responsible for all of the costs of the OSHA violation, and that the Company was not responsible for any of those costs.

The settlement between the Company and MBI included the following:

1. Payment by PSNH of $1,097,000 for costs associated with labor, labor-related costs and costs related to health and safety protections, capital equipment standby, and certain materials and supplies, which were incurred during the project shutdown and ramp-up period of June through September 2017. This amount represents a negotiated portion (less than 50 percent) of MBI's claim.
2. Payment by PSNH of $171,000 for costs incurred from October through December 2017 representing a negotiated portion of charges submitted for health and safety protections.
3. Payment by PSNH of $150,000 for costs incurred from January through February 2018, representing a negotiated portion of charges submitted for health and safety protections.

MBI accepted this settlement in satisfaction of all outstanding claims related to the Safety Stand Down and suspension of mercury-removal work.

C. Project Costs Addressing Emissions Impact and Worker Safety

Due to the extraordinary mercury contamination encountered in the Mercury Boiler Units 1 & 2 units at Schiller Station, MBI was prevented from meeting the originally planned Project completion date of October 2017. Moreover, there was no possible method for MBI to deliver the Project at the original contract cost of $20.2 million due to the need to take extraordinary steps to limit mercury-impacted air emission; to protect employee and public safety and to complete the Project without disruption to the ongoing operations associated with Units 4 and 6, operating in the same building. The key reasons for the cost and schedule changes are itemized below:

- Units 1 and 2 equipment, facilities and all associated facilities were determined to be fully impregnated with mercury that was not apparent on visual inspection, representing a "residual" level of mercury far greater than could have been anticipated.
- New MBI safety procedures were developed in response to employee exposures due to the increased mercury concentrations and OSHA requirements.

- New air emissions controls were added to achieve and exceed regulatory compliance. If changes were not made to heighten the stack, the Project could not have met regulatory compliance thresholds.

The original project estimate was $20.2M, based on MBI's original contract value of approximately $18M, plus other direct costs of $2.2M for PSNH labor, engineering consultant project oversight (GZA), office trailer rentals and PSNH contract electricians. Although circumstances became much more challenging as the work progress, both the PSNH Project Team and MBI and its subcontractors also found ways to become more efficient, which helped to control costs, even as costs were increasing due to the mercury-removal challenges.

For example, as the dismantling work progressed and additional information on the assembly of the components and the extent of mercury impact within those components was identified, more efficient work practices could be implemented. The dismantling of Turbine 1 and 2 were completed utilizing very different means and methods of dismantling. Drawings identifying the assembly of the turbines and integral blading and shaft were not available, so identifying how the internal components were assembled was not possible until portions of the turbine could be cut apart and removed. Thus, the initial dismantling of Turbine 2 was completed by torch cutting and wire-rope sawing the turbine into segments that could be rigged and placed into cubic yard boxes for retort disposal.

Without knowing how the components were mechanically connected, once the torch cutting of Turbine 2 commenced, larger pieces of the turbine could not be safely rigged and removed due to concerns with the stability of the turbine. Therefore, once torch-cutting and wire-rope sawing commenced on Turbine 2, the completion of Turbine 2 dismantling had to be completed by removing small components via these methods. The use of torch-cutting and wire-rope sawing was very labor intensive and required significant health and safety and emissions controls due to level of mercury impact within the turbine. However, once the dismantling of Turbine 2 was complete, the knowledge gained on how the turbines were assembled and associated internal mercury impacts was utilized to develop a new dismantling plan for Turbine 1. The new plan would allow for strategic cuts of the turbine and shaft with the wire rope saw to safely separate the turbine from the remaining components and rig the turbine into a custom hazardous waste compliant packaging for shipment directly to the retort facility on a flatbed truck as a permitted overweight oversized load.

The large component removal of Turbine 1 took additional effort to engineer rigging, supports, and packaging for transportation of the turbine as one whole unit to the retort facility, but

ultimately this approach significantly reduced the extent of torch cutting and associated labor for removal as well as providing a removal approach that was safer for workers due to the limited generation of mercury emissions. The approach for Turbine 1 dismantling also reduced the overall Turbine 1 dismantling time when compared to Turbine 2 by approximately 2 months. The comparison of removal approaches for Turbine 1 and 2 is an example of how the project constantly looked at ways to conduct work safer and more efficiently as additional knowledge regarding the assembly of the components and extent of mercury impact was gained.

Beginning in September 2017, following the Safety Stand Down, the Company and MBI began work to develop a cost estimate for the completion of the Project, as well as a revised contractual arrangement to convert the original fixed-price contract to a capped, time and materials contract. On December 6, 2018, as a result of these works efforts, MBI submitted a Change Order Request to establish a time and materials contract with a "not-to-exceed" contract price. The revised contract was executed on February 2, 2018, with an amended project completion date of December 31, 2018.[23] Based on assumptions, projections and estimates developed, reviewed and negotiated by the PSNH Project Team and MBI, the additional labor, disposal and interrelated air emissions and worker safety requirements caused by the mercury saturation added an estimated $26.2M to the Project budget for MBI's work.

Based upon the information obtained regarding the extent of the mercury saturation, PSNH determined that shifting to a time and materials contract with MBI was more reasonable than pursuing other options, such as procuring an alternative vendor. If the MBI contract was terminated, PSNH would have incurred significant costs and delays to demobilize MBI's workers and equipment and reestablish the site with a new workforce. In addition, PSNH's initial RFP results suggested that limited alternative contractors were available to complete this work. Particularly given the site conditions discovered, PSNH reasoned that it would be unlikely to identify a vendor that was more cost-effective than MBI. Therefore, PSNH executed the Second Amendment to the Cover Agreement detailing the time and material terms on February 2, 2018.

In addition, while MBI was reassessing its procedures during the Safety Stand Down, the PSNH Project Team had several meetings with the NHDES and NHPUC, focusing on air emissions

[23] Contract for Abatement, Demolition and Disposal between MBI and PSNH, as amended Feb. 2, 2018.

and the Company's commitment to initiate further controls to reduce the potential for mercury-impacted air emissions and to protect worker safety, although the measures exceeded applicable requirements. In October and November 2017, the Company worked to revise its Project cost estimates to contemplate the unique challenges and scope change, including negotiating an update to MBI's contractual arrangement. These cost updates were refined into a revised Project cost estimate during December 2017 and January 2018, and then used for the supplemental PAF that was ultimately authorized in March 2018 by Eversource Energy management. The supplemental PAF was based on assumptions developed over this time period regarding higher costs for labor and supplies, debris disposal, air-emissions controls, as well a contingency factor. The updated Project cost contemplated completion of MBI's demolition work by December 2018. The supplemental PAF added $30.9 million to the Project budget, including the $26.2M associated with MBI's work on the Project along with its subcontractors, resulting in the new Project total of $51.1 million.

Ultimately, the costs associated with individual cost categories comprising the updated Project budget varied from certain costs estimated in the fourth quarter of 2017. However, on an overall basis the actual project cost of $48.433 million was less than the $51.1 million budget amount planned for completion of the Project. The primary cost drivers in the final stages of the Project were as follows:

- Deliberate, meticulous personal protection procedures and additional safety equipment were used to protect the health and safety of MBI employees as they performed the required demolition and removal work. These procedures and the use of additional equipment slowed work progress, causing the need for additional work hours to complete the requisite tasks. It took more time per ton than it did prior to June 2017. Additional cutting tools, work time and personal-protection measures created additional cost.

- Beginning in March 2017, the method of hazard-waste disposal was changed involving a higher-cost, but higher protection approach. Starting in March 2017, no steel was designated for recycling due to the presence of mercury. The original MBI estimate assumed a portion of the removed steel could be recycled at a credit to PSNH.

- A greater portion of steel was transported off-site for retort at a much higher cost than steel designated as hazardous waste. Steel disposal as hazardous waste costs approximately $1,000 per ton. Steel requiring retort due to visible mercury droplets costs approximately $10,000 per ton. Retort is more expensive than simple hazardous waste disposal because the steel is cycled

through a mercury reclaim process first. However, retort is a much safer process to limit mercury in disposed metal.

- Upgraded air-emissions controls required to meet and exceed regulatory compliance included additional air monitoring; additional blowers and vents; additional carbon filters for scrubbing air; and additional spent carbon disposal. In addition, potential air emissions are lowered by replacing "hot cutting" with "cold cutting" techniques. These additional air-emissions initiatives and use of cold-cutting techniques consumed substantially more work time and result in higher costs.

- MBI cut system components into larger pieces to further reduce emissions and increase safety, resulting in higher disposal costs due to packaging and transport.

A summary of the contractors and vendors used on the Project is as follows:

1. **Ayer Electric, Inc.** – Electrical contractor reporting direct to PSNH. Ayer isolated electrical services to Units 1&2 prior to demolition, set up electrical outlets for demolition, and restored electrical after demolition.

2. **CES, Inc.** – Contractor retained by PSNH to clean and repair cable trays during the project.

3. **Clean Harbors Environmental Services, Inc.** – Pollution control and cleanup vendor reporting direct to PSNH for post demolition floor drain inspection and cleaning, and replacement of mercury impacted roofing above the reclaim room.

4. **GZA Geo Environmental, Inc.** – Engineering Consultant retained to assist is preparing original RFP Scope of Work and provide onsite day-to-day oversight on behalf of and reporting directly to PSNH. Other GZA duties included plant air-monitoring outside demolition containment within the building; post-demolition sampling of the former Units 1 and 2 spaces within the building, and preparation of a written post-demolition worker health risk assessment.

5. **Integral Consulting, Inc.** – Third Party independent Risk Assessor retained to review and validate the written GZA post-demolition Worker Health Risk Assessment.

6. **Manafort Brothers, Inc.** – Primary demolition contractor retained to perform physical removal and disposal of the Units 1&2 Boiler/Turbine System.

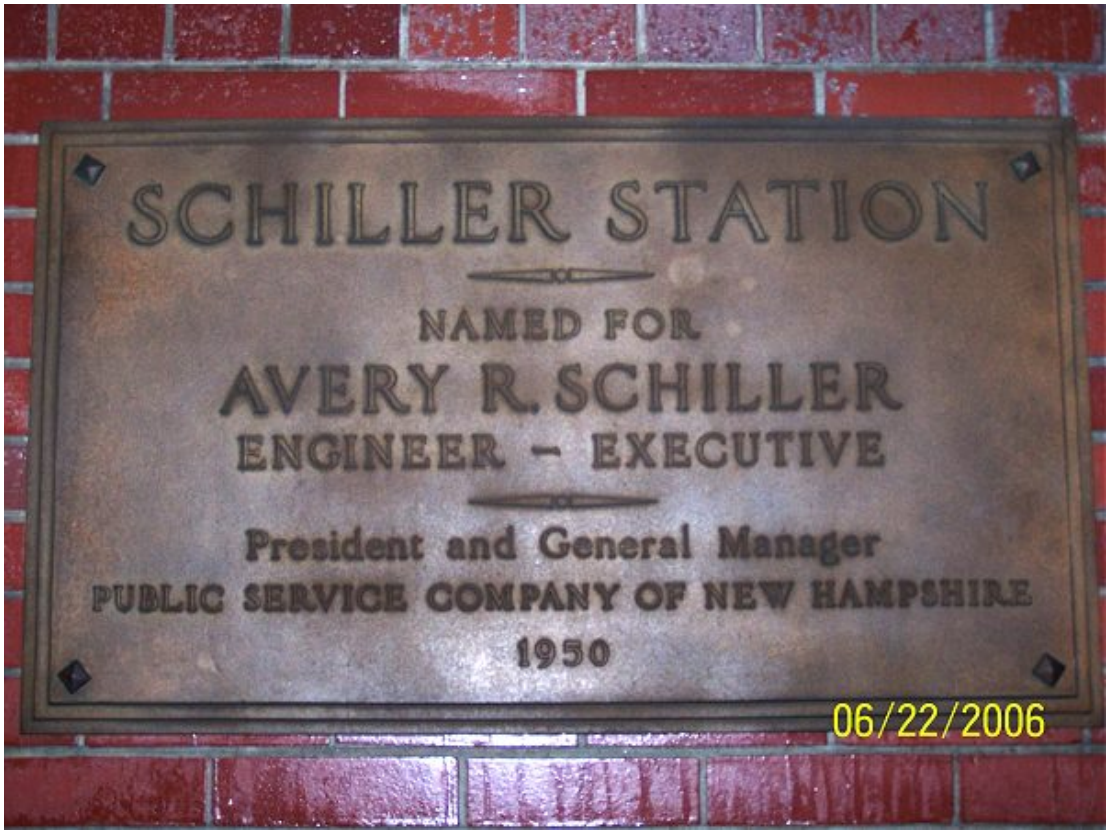
7. **Mohlin & Company** – Civil Structural Consultant reporting to PSNH to perform structural reviews of the plant prior to and during demolition to ensure building integrity.

8. **O'Connor Corp.** – General contractor providing skilled labor directly to PSNH to assist in general cleaning and project plant support prior to and during demolition.

9. **William Scotsman, Inc.** - Construction & Office trailer rentals.

A summary of the final Project Cost is shown below:

Cost Components		Amount
Labor (Straight, Overtime & Expenses)	$433,691	
Business Expenses	$8,368	
Materials & Supplies	$1,568	
Sub-Total		**$443,627**
Contractor & Vendor Costs		
Ayer Electric, Inc.	$48,188	
CES, Inc.	$1,262	
Clean Harbors Environmental Services	$278,912	
GZA Geo Environmental, Inc.	$1,819,843	
Integral Consulting, Inc.	$12,933	
Manafort Brothers, Inc.	$44,306,547	
Mohlin & Company	$10,688	
O'Connor Corp.	$55,909	
Town of Newington	$1,980	
Williams-Scotsman, Inc.	$49,588	
Sub-Total		**$46,594,218**
Carrying Charges		**$1,057,619**
Allocations (Overhead & Loaders)		**$345,925**
Total Project Cost		**$48,433,022**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