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Thomas B. Getz

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Clifton C. Below
Amy L. Ignatius

EXECUTIVE DIRECTOR
AND SECRETARY
Debra A. Howland

PUBLIC UTILITIES COMMISSION
21 S. Fruit Street, Suite 10
Concord, N.H. 03301-2429

Tel. (603) 271-2431

FAX (603) 271-3878

TDD Access: Relay NH
1-800-735-2964

Website:
www.puc.nh.gov

January 20, 2012

Debra A. Howland
Executive Director
New Hampshire Public Utilities Commission
21 South Fruit Street Suite 10
Concord, New Hampshire 03301

Re: Docket No. DE 08-103
Public Service Company of New Hampshire
Investigation of PSNH Installation of Scrubber Technology Station
Update on Jacobs Consultancy Review and Reports

Dear Ms. Howland:

In Order No. 24,898 (September 19, 2008), the Commission ruled, among other things, that in order to meet its obligations regarding its later determination of the prudence of the costs of complying with RSA 125-O:11-18 in connection with Public Service Company of New Hampshire's (PSNH) installation of a wet flue gas desulphurization system, commonly referred to as scrubber technology, at PSNH's Merrimack Station, it would keep Docket No. DE 08-103 open to monitor PSNH's actions as it proceeded with installation of the scrubber technology. In 2010, the Commission contracted with Jacobs Consultancy, Inc. (Jacobs) to provide a variety of consulting services. Pursuant to the contract, Jacobs has reviewed PSNH's installation of the scrubber technology upon request of Commission Staff, and has prepared and made available to Commission Staff certain reports based on its review. Jacobs' arrangements with PSNH to obtain information regarding the scrubber project include a confidentiality agreement under which it is contemplated that confidential information as defined in the agreement will be protected appropriately.

To provide information pertaining to the Commission's monitoring of PSNH's installation of the scrubber project pursuant to Order No. 24,898, Staff is filing with this letter the reports Jacobs has prepared to date, i.e., three quarterly reports and two copies of a "Due Diligence" report dated June 2011: a redacted (public) version and a confidential version. A redacted version of the "Due Diligence" report is being filed at this time as Staff understands that PSNH intends to request the Commission to order protective, confidential treatment of the redacted information in the "Due Diligence" report and that the Commission will ultimately determine the merits of the request. Staff

further understands that PSNH does not intend to request protective, confidential treatment of the information in the quarterly reports.

I certify that a copy of this letter and the public documents filed herewith will be served electronically on those parties on the service list in the instant docket. If you have any questions, please let me know.

Sincerely,

Suzanne G. Amidon
Staff Attorney

Service List

Attachments

New Hampshire Clean Air Project
Due Diligence on Completed Portion

Prepared For
New Hampshire Public Utilities Commission

June 2011

New Hampshire Clean Air Project
Due Diligence on
Completed Portion Report

Prepared For

New Hampshire Public Utilities Commission

For Jacobs Consultancy,

Frank DiPalma

June 2011

This report was prepared based in part on information not within the control of the consultant; Jacobs Consultancy Inc. Jacobs Consultancy has not made an analysis, verified, or rendered an independent judgment of the validity of the information provided by others. While it is believed that the information contained herein will be reliable under the conditions and subject to the limitations set forth herein, Jacobs Consultancy does not guarantee the accuracy thereof. Use of this report or any information contained therein shall constitute a release and contract to defend and indemnify Jacobs Consultancy from and against any liability (including but not limited to liability for special, indirect or consequential damages) in connection with such use. Such release from and indemnification against liability shall apply in contract, tort (including negligence of such party, whether active, passive, joint or concurrent), strict liability or other theory of legal liability, provided, however, such release limitation and indemnity provisions shall be effective to, and only to, the maximum extent, scope, or amount allowed by law.

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1 Executive Summary

Background and Scope

The New Hampshire Public Utilities Commission (Commission) retained Jacobs Consultancy to monitor the progress of the Public Service of New Hampshire Clean Air Project at Merrimack Power Station. Public Service of New Hampshire (PSNH) is installing a wet scrubber at its Merrimack Power Station to comply with state environmental requirements. The New Hampshire Clean Air Project completion is planned to occur in 2012 at a recently reduced estimated cost of $430M. Jacobs Consultancy's scope of work is twofold: first, to complete a due diligence review on the completed portion of the project and second, to monitor the project through completion.

In 2002, the State of New Hampshire passed the New Hampshire Clean Power Act to address four pollutant emissions, sulfur dioxide (SO_2), nitrogen oxide (NOx), mercury (Hg), and carbon dioxide (CO_2). In 2005, Senate Bill - 128 was introduced requiring mercury emissions be reduced at the Merrimack Power Station plant to 24 pounds per year through a technology identified as activated carbon injection. In 2006, The New Hampshire Clean Power Act was amended to require reduced mercury emissions by 80% using wet flue-gas desulphurization technology at the Merrimack Power Station no later than July 1, 2013.

Since the inception of the Clean Power Act, PSNH had begun working with engineering firms to determine appropriate technologies to meet the regulatory requirements, eventually settling on wet flue-gas desulphurization (FGD). In order to determine preliminary costs, specifications were prepared for the required major equipment and work areas. In addition to the wet FGD system, other supporting systems or "islands", as they became to be known, were materials handling for receiving and delivery of the limestone and handling the gypsum byproduct, a chimney for discharge of the scrubbed flue gas to the atmosphere, and effluent treatment to process the blow-down water from the FGD process. Through a bidding process, eventually Siemens Environmental Systems and Services was selected to supply the FGD system. The selection was based on both price and mercury removal warranties.

Approach and Assessments

Jacobs Consultancy completed its due diligence review using a process consisting of four stages:

1) Project Initiation – involved the initial conference call/meetings with the Commission and PSNH to provide a thorough understanding of the Commission's expectations, as well as an orientation to the PSNH Clean Air Project.
2) Investigation, Data Gathering and Fact-Finding – a detailed review to opine if the appropriate controls, systems, and processes were in place and if PSNH properly executed its plans. This process includes collecting data and metrics, conducting interviews with PSNH personnel, and identifying current key processes, policies, practices, and procedures. Because of pending litigation against PSNH, extensive delays associated with document confidentiality were encountered in obtaining and securing data through the discovery process. In addition, the amount of discovery reviewed was extensive amounting to almost 3,000 pages.
3) Analysis – made use of both quantitative and qualitative assessment techniques. Quantitative assessments are based on the information gathered through our review of documents and qualitative assessments are based on the information gathered during interviews.
4) Reporting – includes periodic project updates and status reports in addition to the Draft and Final reports. We report our results in terms of findings, conclusions, and, if warranted, recommendations to the Commission.

In conducting our due diligence assessment PSNH's Clean Air Project at Merrimack Power Station, we focused on a number of discrete assessments:

Large Project Review Process - PSNH procurement, risk review, approval, and contracting strategy process are well developed for reviewing projects of this size. In addition to numerous Northeast Utilities' internal assessments, risk mitigation factor considerations and approvals, PSNH sought to seek the most appropriate contracting strategy. It did so by conducting an FGD installation cost comparison, and a study to understand market conditions and their impact on large construction projects.

Cost Estimates - Large projects typically go through a series of project estimate stages, depending on the level of information available and cost estimate parameters. As projects move from conceptual design through detailed engineering design and pre-construction design to construction, estimates become better defined and refined. PSNH's process for developing the project estimate chain follows this sequence with the initial conceptual estimate, the detailed Clean Air Project estimate, and the current estimate. The initial estimate of $250M, developed by Sargent and Lundy, was based on existing FGD designs and installations, did not contain any specific mercury or sulfur dioxide guarantees, PSNH costs, or site-specific needs. The Clean Air Project estimate of $457M was developed by PSNH with the support of the program manager, URS. This detailed estimate contained an actual proposal price with mercury and sulfur dioxide guarantees, all PSNH costs including AFDC, as well as specific-site needs. Jacobs was able to reconcile the 2006 conceptual estimate and the 2008 detailed Clean Air Project estimates by taking into account the factors cited above, as well as the impact of extensive inflationary pressure on certain commodities and materials, which occurred during that period. Since the Clean Air Project estimate in 2008, there have been several itemized reductions and additions, and as a result, the current estimate for the project is now $430M.

Project Schedule - While the statutory obligation completion date of the mandated Clean Air Project is mid 2013, the detailed 2008-project schedule projected an in-service date of mid 2012. When Jacobs reviewed the schedule and verified actual construction, it was evident the completion date shown in the schedule was both reasonable and attainable.

Project Management Approach - Along with providing its own internal oversight, PSNH made use of two leading engineering firms to help manage the project. URS Corporation (URS) was employed as program manager and R.W. Beck as independent engineer. As the program manager, URS performs the engineering, procurement, and construction management role; and as independent engineer, R.W. Beck provides an independent third-party oversight of the engineering, procurement, and construction functions. PSNH's oversight role, as clearly defined in its Clean Air Project Manual, consists of three essential elements: 1) project manager contract management, 2) project schedule control, and 3) project cost control. These established safeguards for project overview and control are ensuring the Clean Air Project is controlled and managed effectively.

Construction Approach – Even with the series of contract safeguards previously described, actual construction is not necessarily assured to proceed smoothly. There are critical elements ranging from how the project is divided, to the interaction among independently constructed portions of the project – in this case the four islands. In addition, knowing the physical congestion present at Merrimack Power Station, safety assurance is critical. Given the size and complexity of the Merrimack project, the construction approach has functioned as planned. The various contractors have worked well together and produced a project that has been on schedule and within budget.

Safety – The safety performance has not been good. A common indicator for safety for the construction industry is Recordable Incident Rate (RIR), which is an indication of recordable incidents per 200,000 hours worked. While there are multiple databases against which safety performance can be compared, the RIR for the Merrimack Clean Air Project has fallen above (worse) the URS set target of 0.9 and well above the Construction Industry Institute average of 0.64.

Conclusion

The project has been a well-defined and documented effort. The PSNH team did a thorough analysis of the requirements up-front, availing themselves of various industry specialists to strengthen their findings. They followed rigid corporate procedures to ensure compliance with regulatory and prudent business requirements. The selection process for a program manger was an exhaustive and fruitful procedure followed by equally exhaustive processes for selecting equipment suppliers and contractors. PSNH has strong processes in place to effectively control the project and it appears both the schedule and final project cost estimate are attainable.

In Jacobs Consultancy's opinion, the overall Clean Air Project development, execution, and control are a success, with the exception of the poor safety performance. Consequently, Jacobs is making the following recommendation.

Recommendation

It is recommended both PSNH and URS management place renewed emphasis on safety for the remainder of the project and additional trained safety professionals be assigned to the project. In Jacobs' experience, the best arrangement would be for a safety professional to be assigned exclusively to one of the four islands working closely with each lead contractor and their sub-contractors.

2 Background

This initial report section discusses Jacobs Consultancy's scope of work and how we methodically approached it through our four-stage process. We also provide an overview of how the report is organized. In addition, we address the New Hampshire Clean Power Act and the technology Public Service of New Hampshire (PSNH) had to utilize in an effort to control the mercury content and sulfur emissions of the coal burned at the Merrimack Power Station.

2.1 Jacobs' Role

The New Hampshire Public Utilities Commission (Commission) on January 26, 2010, contracted Jacobs Consultancy to monitor the progress of the Public Service of New Hampshire Clean Air Project at Merrimack Power Station. PSNH is installing a wet scrubber at its Merrimack Power Station to comply with state environmental requirements. Planning of the New Hampshire Clean Air Project completion is scheduled to occur in 2012 at a recently revised cost of $430M.

Jacobs Consultancy's scope of work is twofold:

1) Due diligence on completed portion of the project.
2) Monitoring of the ongoing portion of the project.

The due diligence report is intended to cover items such as technology selected, accuracy of cost estimates, cost and project schedule with major deviations noted and detailed, and PSNH project controls. While the quarterly monitoring of the ongoing project reports will track progress of the scrubber project noting deviations from budget and schedule and highlighting major accomplishments. This report addresses portions of the New Hampshire Clean Air Project already completed.

2.2 Jacobs' Approach

Jacobs Consultancy employed a workflow process to accomplish the investigation in an efficient and concurrent approach that uncovers key issues concerning the Clean Air Project. Our team

conducted this review using a process that consisted of four principal stages: 1) Project Initiation, 2) Investigation, Data Gathering and Fact-finding, 3) Analysis, and 4) Reporting.

Project Initiation Stage

This stage involved the initial conference call/meetings with the Commission and PSNH and was intended to provide us with a thorough understanding of the Commission's expectations, as well as introductions, logistics, and Clean Area Project orientation at PSNH.

Investigation, Data Gathering, and Fact-Finding Stage

Based on the detailed work plan and schedule as mutually determined in the Project Initiation Stage, we began the detailed review of PSNH to opine if essentials such as the appropriate project controls, systems, and processes were in place, and if PSNH properly executed its plans relative to the scrubber installation. This process includes:

- Collecting data and metrics, including pre-filed testimony. The amount of data collected and reviewed was extensive and amounted to almost 3,000 pages. A list of our document requests is contained in Section 8.1 in the Appendix.
- Conducting interviews with PSNH personnel.
- Identifying current key processes, policies, practices, and procedures for the functional areas.
- Providing ongoing communications and project status as mutually determined with the Department.

Because of pending litigation against PSNH, we encountered extensive delays associated with document confidentiality. Specifically, in obtaining and securing data through the discovery process.

Analysis Stage

Our analysis made use of quantitative and qualitative assessment techniques:

- **Quantitative Assessments -** based on the information gathered through our review of documents.

- **Qualitative Assessments -** based on the information gathered during interviews with knowledgeable individuals and the professional experience of our consulting team.

Reporting Stage

This is an ongoing process consisting of periodic project updates and status reports in addition to the Draft and Final reports. The status reports include a summary of completed activities, observations and findings, project issues, and project budget status in the format approved by the Commission.

Following the completion of the analysis stage, we will report our results in terms of findings, conclusions, and if warranted, recommendations to the Commission.

- **Findings**—represent facts supporting strengths, weaknesses, opportunities, and threats that can be directly tied to documents, interviews, or observations.
- **Conclusions**— summarize and represent our assessment of the related findings and our opinion regarding proposed opportunities for improvements associated with a specific topic. Our conclusions may lead to recommendations.

2.3 Report Organization

The Executive Summary provides an overview of our report's key findings and conclusion.

The body of our report is divided into five sections, generally along functional lines. The five sections are Large Project Review and Contracting Strategy, Cost Estimates, Project Schedule, Project Management Approach and Construction Approach. Each section contains an overall assessment, background, and analysis of specific topics. Overall assessments are narrative statements of conclusion that provides a summary of our general perception of the function or topic. In the various sections, we address 17 specific topics. For each specific topic, we present our analysis in the form of findings and conclusions as appropriate.

In the report's Appendix, we have included Jacobs' document requests, acronyms, industry terms and a description of the various project contracts required.

2.4 What Law Required PSNH to Do

In July 2002, the state of New Hampshire passed the New Hampshire Clean Power Act (NHCPA), also known as the Multiple Pollutant Reduction Program; RSA 125-O. NHCPA addressed four pollutant emissions: sulfur dioxide (SO_2), nitrogen oxide (NOx), mercury (Hg), and carbon dioxide (CO_2). This Act, amended in June 2006, specifically required PSNH to reduce mercury emissions by 80% using wet flue-gas desulphurization (FGD) technology. The Act also limited the SO_2 credits available to PSNH.

2.5 Technology Employed

PSNH had to reduce 80% of the aggregated mercury content of the coal burned at the Merrimack Units 1 and 2 and Schiller Units 4, 5 and 6; and as a co-benefit, expected a 90% reduction in sulfur emissions. To accomplish these objectives, the law required the best-known commercially available technology, a wet flue-gas desulphurization (FGD) system installed at the plant no later than July 1, 2013. The NHCPA also mandated a reduction in the sulfur dioxide (SO_2) credits available to Merrimack Station to comply with Federal Acid Rain requirements.

For several years before House Bill 1673 passed in May 2006, the subject of mercury removal had been an ongoing issue at the PSNH facilities. In January 2005, Senate Bill - 128 was introduced, requiring mercury emissions be reduced at the Merrimack plant to 24 pounds per year. Senate Bill -128 identified Activated Carbon Injection (ACI) as the technology employed to achieve this level of mercury removal.

While ACI technology had long been utilized in the Waste-to-Energy industry to remove mercury, it was unknown if it would remove mercury to the level being proposed by Senate Bill - 128. During the summer of 2005, the units at Merrimack underwent testing using a well-developed and extensive test protocol. The results showed that ACI would not meet the stringent requirements proposed by Senate Bill 128[1].

[1] **BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL**

Since ACI failed to show promise of meeting the mercury removal mandate, and the fact House Bill -1673 stipulated the technology be wet FGD, PSNH began working with several engineering firms to determine the potential of the FGD technology meeting the requirement and to determine preliminary costs[2]. Specifications were prepared for the major equipment that would be needed – the FGD system being the primary one. The other associated equipment installation work areas or "islands", as they became to be known, were essentially supporting systems for the FGD. The islands identified were the materials handling for receiving and delivery of the limestone and handling gypsum byproduct, a chimney for discharge of the scrubbed flue gas to the atmosphere, and effluent treatment to process the blow-down water from the FGD process. The work area islands are further described in Section 4.2. The technologies selected for these ancillary systems are commonly utilized processes and the type of technology is not an issue; the only unproven technology for the intended purpose was the FGD system itself. While wet FGD systems have been in operation for decades for sulfur removal, the Merrimack plant FGD requirement was the first in the United States to mandate mercury removal as a function and require a guarantee for the percent removed.

PSNH and URS Corporation (URS), the program manager, prepared a comprehensive specification for the process and issued it for bid from reputable FGD system suppliers. PSNH received bids from three of the most respected names in the FGD industry, who offered similar equipment in their proposals consisting of the type commonly used for sulfur removal with enhancements to reduce the mercury emitted. Only one of the bidders, Siemens Environmental Systems and Services (SESS) was willing to guarantee the mandated mercury removal percentage, and SESS had the lowest evaluated cost and the highest overall evaluation[3], and consequently was selected by PSNH. In their evaluation, PSNH did a commendable job evaluating the technology and the supplier, and initiated the practical enhancements needed to ensure success for the system. PSNH, in Jacobs' opinion, chose the proper technology for the Merrimack installation, but this opinion is based on the assumption the technology will prove out after thorough testing and evaluation.

[2] The decision to utilize wet FGD technology is further discussed in Section 4.1 - Initial Conceptual Estimate.

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2.6 Findings

- New Hampshire law requires a reduction of 80% in mercury from coal fired power generation facilities of PSNH.
- In 2005, PSNH tested ACI technology for mercury reduction with unsatisfactory results.
- New Hampshire Department of Environmental Services determined wet flue-gas desulphurization is the best-known commercially available technology for mercury reduction.
- New Hampshire law requires the installation and operation of scrubber technology by July 1, 2013, at the Merrimack Power Station.
- Three viable wet FGD proposals were received; however, only one of the bidders, Siemens Environmental Systems and Services, was willing to guarantee the mandated mercury removal percentage.

2.7 Conclusions

PSNH did a thorough investigation of similar FGD installations and was able to confirm the technology decision mandated by the legislation. Through the competitive bidding process, only one supplier, Siemens Environmental Systems and Services – the supplier eventually selected, was willing to guarantee the level of mercury removal. In Jacobs' opinion, PSNH chose the proper technology for the Merrimack installation, but this opinion is based on the assumption the technology will prove out after thorough testing and evaluation.

3 Large Project Review and Contracting Strategy

In this section, we discuss Northeast Utilities' (NU)/PSNH procurement, risk review, approval, and contracting strategy process. We also comment on the contracting strategy study performed by R.W. Beck and its findings and conclusions. Further, we comment on the study performed by Power Advocate, Inc. related to market conditions associated with capital construction projects and retrofit scrubber projects.

3.1 Large Project Review Process

The Clean Air Project, at a cost of $457M, clearly qualifies as a large project; and was therefore subjected to NU's Large Project Review Process.

Northeast Utilities (NU) has a well-developed process for reviewing large projects. This process has several review committees that must signoff before NU Purchasing will release any RFP. The following described is the threshold and process for large project procurement:

All NU project procurements, that exceed $5M for a project, are subject to the Large Project Review Process and review by their Risk Management Council[4]. The objectives of Large Project Review Process[5] are to conduct risk analysis, ensure prudence/due diligence, provide lowest total cost and manage "What If" scenarios. To meet these objectives the process encompasses:

Contract Risk Mitigation

- Identify Project Risk
- Develop Risk Mitigation Strategy for RFP Development and Contract Negotiations
- Corporate Acknowledgement of Risk

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[5] **BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL**

Ensure Prudence/Due Diligence

- Documentation of Detailed Evaluations and Negotiations
- Documentation of RMC Concurrence
- Provide for Lowest Total Cost of Ownership

Cost/Benefit of Risk Mitigation

- Provide For Clear Understanding of Roles and Responsibilities of Core Project Team and Support Departments
- Manage "What If" scenarios from a Cost, Execution, and Legal Perspective

NU's Large Project Review Process allows for a structured and consistent approach to contracting for projects. It standardizes the signoff and approval process and reporting requirements. It also establishes the participation of the core team, risk management, and executive risk management panel. If the procurement exceeds $25M an Executive Risk Management Council (ERMC) review is also required.

Prior to the approval of any purchase order valued at $10M or more, associated with existing projects, the NU director of purchasing will confirm the Risk and Capital Committee has reviewed the purchase order and the NU chief executive officer (CEO) has approved the expenditure.

Risk and Capital Committee and Executive Risk Management Council[6]

The Risk and Capital Committee (RaCC) of Northeast Utilities, together with its subsidiaries, has the responsibility for ensuring NU is prudently managing its principal enterprise-wide risks. Specifically the RaCC will:

- Provide oversight for the development and implementation of Enterprise Risk Management (ERM) and the NU Risk Management Policy (Risk Policy).
- Provide oversight for the risk assessments prepared in accordance with the Risk Policy.
- Review and assess the risks associated with strategic projects and/or proposals and policy and investment decisions that expose NU to material financial, strategic, operational, or reputation risk.

- Review key risk topics that could materially affect the Company.
- Review the NU business and functional area risk and financial assessments of capital projects undertaken in accordance with the RaCC Project Approval Policy and Procedures (RPRP) and make recommendations to the Company's CEO for approval, if required.

Starting in December 2007, the project team presented quarterly reviews of the clean-air project at the Merrimack Power Station to the RaCC. These presentations include a status of the project to date and a review of the financial cost. The quarterly review also detailed the accomplished items in each of the preceding quarters. The presentations also included a list of risk events, horizons, likelihood of occurrence, expected cost exposure, and mitigation plans.

3.2 Contracting Strategies [7]

During 2006, PSNH retained R.W. Beck to provide contract strategy consulting engineering services associated with implementation of the Merrimack project. In order to develop the contract strategy, R.W. Beck took into account:

- Realities of the current market for scrubber projects.
- Influence of current market conditions on contracting options.

Using the R.W. Beck draft study results, NU Contracting and PSNH project leadership reviewed four different contracting options and issued request for qualifications (RFQ) to selected contractors and FGD vendors. Subsequently, a decision was made to have the FGD original equipment manufacturers (OEM's) complete the same RFQ as the potential Engineer/Procure/Construct (EPC) or Engineering/Procurement/Construction Management (EPCM) firms that were under consideration for work in the other islands. From the RFQ results, it was clear OEMs, as a group, were not interested in increasing their scope of work beyond the "Scrubber Island."

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[7] **BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL**

The four options PSNH Contracting considered were:

- **Turnkey EPC Contract – Fixed Price Proposal**

  None of the respondents were executing a competitively bid scrubber retrofit project. Only one qualified turnkey contractor[8] indicated a willingness to provide a proposal on a fixed price basis, and that contractor confirmed fixed price would likely be the most expensive contracting option for PSNH.

- **Turnkey EPC Contract – Fixed Price After "Open Book"**

  Only one qualified turnkey contractor was currently executing scrubber retrofit projects on a Fixed Price After Open Book[9], turnkey contract basis; and only that contractor indicated a willingness to provide a proposal for the project on this basis.

- **Alliance EPC Contract – Contractor and PSNH Share the Risk**

  An Alliance Contract approach is where risks are shared between the contractor and the owner. Two qualified contractors are executing projects on this basis. Both these contractors indicated a willingness to perform the project using this contracting approach.

- **EPCM Contract**

  The EPCM Contract approach has been executed in a number of scrubber retrofit projects, and all the qualified respondents indicated a willingness to perform the project using this contracting approach, although two of them were less interested under this type of contract because of the significantly lower profit potential compared with other contract types.

R.W. Beck recommended the EPCM contract was the best approach for the Merrimack project. This approach addresses the project's objectives as follows:

[8] Turnkey contract: a single EPC contractor that provides a complete project "wrap" including other subcontracts, i.e., scrubber island, material handling, stack, construction labor etc.
[9] Open Book is a method of procurement that allows each party to have access to the project cost information.

- Cost risks are limited:
    - Fixed price supply and erect contracts for the scrubber island and the stack.
    - Fixed price design and material supply contracts for the material handling systems and the wastewater treatment. In addition, it may be possible to supply these systems on a supply and erect basis.
    - Detailed engineering and design up to 80% complete before awarding major construction subcontracts. This is a critical advantage of the EPCM approach. The EPCM approach allows bid packages for the construction subcontracts to be complete and obtain the most competitive bids from local and regional contractors. The EPCM approach also allows the contractor and the owner to design a construction contracting plan that will support the project's need for well-trained and highly skilled labor, while also supporting the project's need for a predictable schedule without the possibility of labor disruptions.
    - Allows for an award fee or other incentives to the contractor when appropriate.
- Enables performance and delivery guarantees and liquidated damages with the major equipment suppliers.
- Separate owner's engineer provides project oversight, compensating for PSNH's limited staff.
- Project change orders can be addressed quickly and at minimum cost.

3.3 Power Advocate Study [10]

PSNH hired Power Advocate, Inc. in July 2008 to conduct a thorough review of the market conditions associated with capital construction projects and retrofit scrubber projects. The study, updated in March 2009, specifically sought to:

[10] **BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL**

- Assist in a review of URS' cost estimate to determine its reasonability by accurately comparing the cost of this project with other wet scrubber projects through a normalization of the dollars per kilowatt cost.
- Consider the project's risk mitigation strategy in conjunction with the overall cost control technique in order to develop a comprehensive project cost management assessment.
- Take into account the considerable opportunities for PSNH to capitalize on current favorable market conditions with the un-awarded project subcontracts.

This report evaluated the unique site-specific factors including engineering, Balance of Plant[11] (BOP), Flue Gas Desulphurization (FGD), and Material Handling considerations as well as how they affect the overall project cost.

By analyzing the unique or project specific attributes and applying adjustments for site specific and unique factors, Power Advocate was able to normalize the scope of Merrimack's project with other wet scrubber projects. This approach allowed for the more realistic "apples to apples" comparison. The table below shows the factors considered as a potential impact to the cost of the project.

Table 1 - Site-specific Analysis Components

Site-specific Component	Significant Impact?
Mercury Scrubber	Yes
Asymmetrical Units to Single Absorber	Yes
Station Site Constraints	Yes
All-Subcontract Construction Basis	Yes
Foundations	No
Limited Highway Access	No
Pressurized Cyclone Boiler	Yes

Each of the factors with significant impact potential was normalized based on the following logic:

[11] Balance of Plant is the sum of all equipment for safe operation as well as the technical coordination of all concerned parts of a power plant.

Mercury Scrubber

Merrimack's project is designed specifically for Hg removal with an added benefit of further reducing SO_2 emissions. Most WFGD scrubbers in use today and under construction are designed primarily for SO_2 capture. The design differences for this type of approach include additional Hg oxidation controls/consideration, increased surface area of absorber bed and increased contact time with flue gas to allow for full reaction. This scrubber technology conforms to the requirements mandated by the passing of House Bill 1673-FN, an act passed by the State of New Hampshire for the reduction of mercury emissions in May 2006.

Asymmetrical Units Combining into a Single Scrubber

This is the largest design difference between Merrimack Station's absorber and majority of similar sized systems in the industry. Since Unit 2 has over twice the power of Unit 1, the flows and capacities of the duct and induced draft system are different. In addition, there are design aspects of balancing unequal flows into the same duct channel setting this project apart from many others.

Station Site Constraints

Merrimack Station is located on the Merrimack River in central New Hampshire. The eastern edge of the main plant is bounded by the river and there are several railroad spurs cutting north south across the station's footprint. In addition, the material handling design extends from the coal yard to the north, down the east side of the power block to the absorber building to the southeast. This would require construction of components for the material handling and other systems to occur directly above a rail spur.

All-Subcontract Construction Basis

The Clean Air Project is being constructed without any direct labor hired from the Engineer Procure Construct Manager (EPCM). All aspects of the project are being completed in Contract

Packages utilizing a General President's Project Maintenance Agreement (GPPMA),[12] or National Maintenance Agreement (NMA)[13] primarily with local union personnel. This approach simplifies management for PSNH, but increases the likelihood of markups associated with multiple layers of subcontractors. However, PSNH feels this approach provides higher accountability on contracts, stronger product guarantees, and better warranties, all of which help mitigate extra cost risks.

Pressurized Cyclone Boiler

Both coal combustion units at Merrimack Station are of the pressurized cyclone type. This type of combustor can produce higher temperatures and flows than similar pulverized coal combustors. Due to these operating characteristics, further engineering is required to ensure proper long term operation.

Each of these factors contributes to the uniqueness of the project when compared to a more standard wet FGD system. When these attributes are summarized and used to levelize the per-kilowatt cost, the Power Advocate Study concluded the Merrimack Station's Clean Air Project costs are reasonably in line with other projects of similar size and scope.

3.4 Findings

- NU/PSNH has a well developed process for Large Project Review.
- All project procurements over $5M are subject to the NU/PSNH large procurement process.
- Both the Risk Management Council and the Executive Risk Management Council reviewed the Merrimack Station's Clean Air Project.
- PSNH contracted R.W. Beck to identify and recommend contracting strategies.
- R.W. Beck recommended the EPCM contracting approach.

[12] The General Presidents' Project Maintenance Agreement is designed to provide skilled, highly trained craft people to contractors who perform continuing supplemental maintenance work at industrial sites throughout the United States, using a nationally negotiated collective bargaining agreement designed to provide many cost saving provisions to the owner community.

[13] The NMAPC administers the National Maintenance Agreement (NMA), which is a collective bargaining agreement utilized by over 3,500 industrial contractors employing the members of fourteen participating building trades international unions throughout the United States.

- PSNH contracted Power Advocate Inc. to assist in a review of PSNH/URS project cost estimate to determine its reasonability.
- Power Advocate Inc. found the project cost estimate to be in line with other scrubber projects after normalization.

3.5 Conclusions

The process for approval and monitoring of the Merrimack Station's Clean Air Project is well developed and contains check and balances to ensure all risk and mitigation factors are considered. PSNH was prudent to contract for support in developing their contract strategy and reviewing project cost estimates, which were jointly developed with URS, the program manager.

4 Cost Estimates

In our experience, utilities typically go through a series of project estimate stages depending on the level of information available and cost estimate parameters. As projects move from conceptual design through detailed engineering design and pre-construction design to construction, estimates become better defined and refined. Cost estimates will change in response to changes in the design concept, changes in scope, more detailed material cost estimates and build sequence modifications that can affect the total cost, in some cases appreciably. In this section, we discuss PSNH's process for developing the project estimate chain over time and review, in particular, the initial conceptual estimate, the detailed Clean Air Project estimate, and close with an estimate comparison along with a discussion of estimate change-agent impacts.

4.1 Initial Conceptual Estimate[14]

In 2004, PSNH contracted with Burns and McDonald for a feasibility study, which identified three possible alternatives for addressing future air quality requirements at Merrimack Station. In 2005, PSNH continued to pursue mercury control options as part of the ongoing compliance with New Hampshire's four pollutant bill, RSA 125-O, also known as the New Hampshire Clean Power Act (NHCPA). Specific to mercury emissions, based on initial testing of activated carbon injection (ACI), it was clear ACI would not provide sufficient mercury control to satisfy the goals of NH legislators and stakeholders. Encouraged by early indications from some scrubber manufacturers of possible mercury capture capability, PSNH proceeded to acquire experienced engineering assistance.

Based upon the feasibility study, a specification for engineering services was prepared consistent with all indications that New Hampshire would require significant mercury capture. The specification not only addressed mercury emission capture, but also the request to assess an overall multi-pollutant strategy recognizing New Hampshire's four pollutant requirements. The following referenced excerpt is from Section III of PSNH's specification, which deals with the broad review of multi-pollutant control strategy at Merrimack Station. Specifically, in Section III, the first item requests optimizing a scrubber for sulfur emissions reduction. The second item

[14] **BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL**

requested determining the mercury capture associated with a scrubber, including guarantees, and determine other controls that could be required to provide the additional, incremental mercury capture above the scrubber to a total capture of 90 and 95%. At the time of this specification, information suggested conventional wet scrubbers were achieving a capture rate in the range of 70 - 85% mercury, under certain conditions[15].

Once the Burns and McDonald feasibility study and specification for engineering services was completed, PSNH in 2005 contracted Sargent and Lundy (S&L) to develop an early conceptual estimate for a FGD at Merrimack Station to satisfy legislative and stakeholders' discussions. The first costs provided by S&L relied on past installations of FGDs and certain Merrimack Station conditions. During the first conceptual pricing of a scrubber system, PSNH found FGD suppliers were open to discussions, but still unwilling to provide mercury reduction guarantees and equipment pricing with associated guarantees. S&L's cost estimate was developed working in an expedited time frame and with no vendor guarantees in writing. Based on the available information, S&L issued an initial conceptual estimate of $250M for the installation of an FGD system at Merrimack Station. The estimate contained one very significant caveat, "No specific mercury guarantee was included in S&L pricing since it was not available at this time from suppliers[16]."

4.2 Clean Air Project Estimate Contracts

Contracting Strategy[17]

As previously discussed in Section 3, Large Project Review Process and Contracting Strategy PSNH management desired high accountability on contracts, strong performance guarantees and product warranties, and greater price certainty through risk transfer to the suppliers of goods and services. Consequently, they determined the best available industry expertise and insight were necessary in order to decide the appropriate contracting strategy for the Merrimack project.

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On July 25, 2006, PSNH issued the "Specification for Contract Strategy Consulting for a Wet Flue-Gas Desulphurization Project" and, in September 2006, contracted with R.W. Beck to provide contracting strategy consulting services. R.W. Beck was asked to identify options and recommend the contracting strategy and the final structure for project oversight by PSNH. As previously described in Section 3.1 - Contracting Strategies, R.W. Beck recommended the EPCM contract is the best approach for the project.

The results of R.W. Beck's analysis were presented to the RMC and the ERMC, and PSNH management sought authorization to issue a request for proposal (RFP) for Program Management Services and a RFP for the Scrubber Island EPC contractor.

Program Manager Bid [18]

During late April 2007, bidding documents for the Project Program Manager continued to be developed. Request for Proposal RFX 00147-2007, "Clean Air Project, Merrimack Station Program Management" was issued on May 16, 2007.

PSNH assembled an internal cross-functional team to evaluate the bids. The evaluation team consisted of the Merrimack Station Plant Manager, the Merrimack Clean Air Project Manager, and Project Engineer, as well as representatives from Purchasing, NU, and PSNH Legal.
On July 2, 2007, bids were received from the following four contractors:

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- Washington Group International — later was acquired by URS

Contract Award

On September 21, 2007, PSNH entered into a contract with Washington Group International (later URS). The Northeast Utilities' RaCC reviewed and approved the Project Program Manager selection and recommended increasing the initial funding to $10M and commitment authority to $45M. PSNH approved and released the purchase order on September 27, 2007.

[18] **BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL**

In early May of 2008, URS submitted the revised Target Price Project Cost Estimate to PSNH.

An overview of URS final estimate is shown below:

Table 2 - Target Price Project Cost Estimate

PSNH/URS Item Description	PSNH/URS June 2008 Estimate (Millions $)
Program Manager	39.3
FGD Island	100.0
Chimney Island	13.1
WWT Island	15.0
Materials Handling Island	44.8
URS Engineered Equipment	26.1
URS Balance of Plant	61.0
URS Escalation	23.0
URS Growth and Contingency	19.1
Contingency	10.0
TOTAL	**351.4**

This estimate includes the work and associated costs managed by URS, but exclude NU/PSNH's costs. These costs include:

- Work scope retained by NU/PSNH.
- Owner's costs including NU labor, indirect, project financing costs, insurance, etc.

The estimates for the NU/PSNH cost were:

Table 3 – Owners' Cost

PSNH Item Description	PSNH Estimate (Millions $)
Electric Power Supply	15
E-Warehouse	1
Office/Training Building	1.5
NU Labor	7
Indirect Costs	8
AFUDC	56
Insurance (OCIP and Builders Risk)	12
Miscellaneous	5
Total	**105.5**

The combined estimate for the total cost of the Merrimack project was $457M[19].

In June 2008, the project schedule confirmed an in-service date of mid 2012 based upon key island proposals. Early completion was encouraged by the NHCPA.

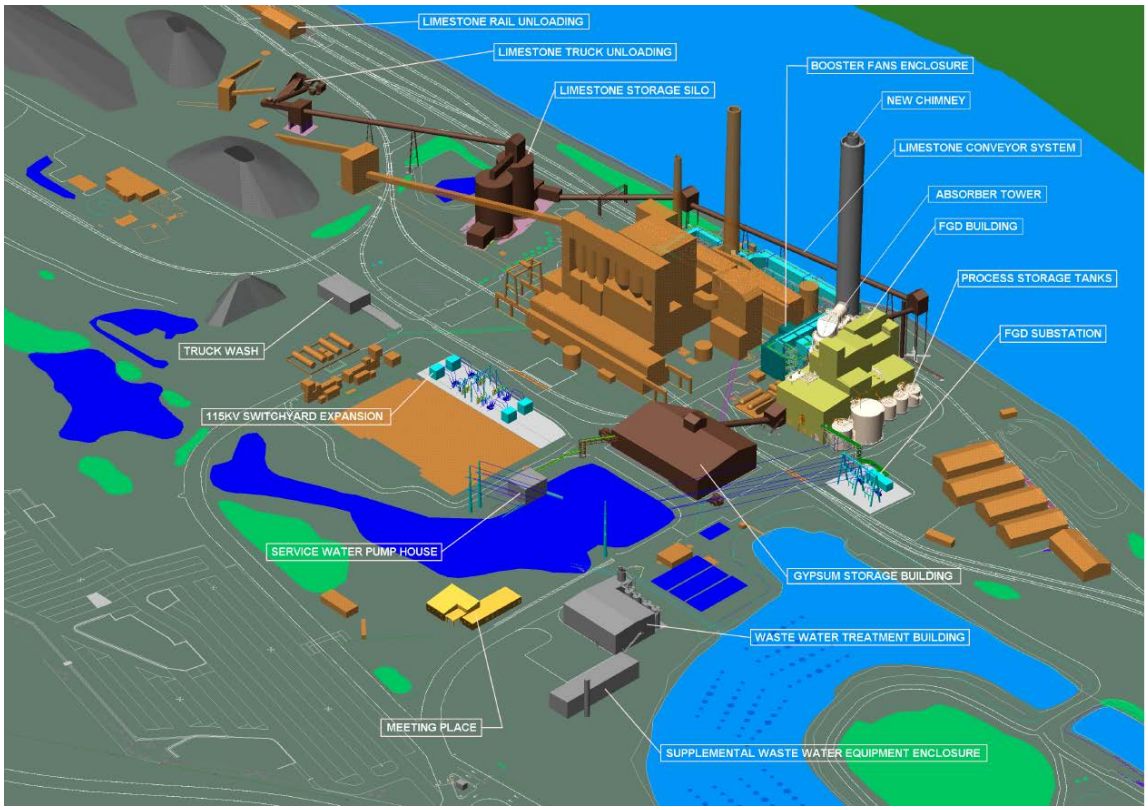
As previously described in Section 3.2 - Power Advocate Study, PSNH engaged Power Advocate to assist the clean air project team review of the revised cost estimate. The Power Advocate Study concluded the Merrimack Project Cost Estimate was in the range of comparable FGD projects considering its scope and complexity and other site-specific factors.

The Clean Air Project at Merrimack Power Station was presented to NU corporate management for capital project review and approval at an estimated cost of $457M. Management recommended approval of the project by the NU Chairman and CEO and final approval of NU Board of Trustees was required. PSNH Senior Management obtained NU corporate management approval of an advanced in-service date for the project of mid 2012. On July 14, 2008, NU Board of Trustees approved the $457M for Merrimack Clean Air Project Estimate.

[19] **BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL**

Clean Air Project Component Description[20]

The work areas or islands include a Scrubber Island, the Material Handling Island, the Chimney, and the Wastewater Treatment System. URS, the Program Manager, responsibilities include the design and oversight of the construction of the foundations based on criteria supplied by the systems supplier. Other significant Merrimack project contracts managed by URS relate to construction work, major material/equipment purchases, and major services contracts. Preliminary site surveys and investigations were procured and managed by PSNH. The permanent FGD substation and the 115 kV switchyard expansion were also directly managed by PSNH/NU with close coordination with the PSNH Clean Air Project Team, URS, and the affected contractors. PSNH determined this approach was advantageous since PSNH and NU Transmission and PSNH Energy Delivery had greater expertise. The project islands are depicted in the rendering below:



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A brief description of each island follows:

Scrubber Island

The Scrubber (FGD) Island includes the limestone preparation, absorber, and gypsum-dewatering systems with all auxiliary support equipment from the day silo inlet, absorber vessel outlet breeching to the chimney, recycle pumps, oxidation air blowers, process tanks, dewatering equipment and an electrical distribution room. All interconnecting piping systems, electrical system downstream of switchgear and motor control centers (MCCs), and buildings are part of the complete system.

Material Handling Island

The Material Handling Island includes the limestone rail and truck unloading, reclaim, transfer conveyors/towers, bents, gypsum conveyors, bents, and stack-out systems and building along with all auxiliary support equipment/systems. All dust suppression, water, air, electrical system downstream of switchgear and MCC buildings are part of the complete system.

Chimney

The Chimney Island includes the complete chimney outer shell and fiberglass liner (flue) from the absorber outlet (breeching inlet) and all appurtenances such as aircraft lighting, lighting protection, elevator and elevator platforms, and electrical supply.

Wastewater Treatment System

The Wastewater Treatment System Island includes all treatment equipment and systems to comply with the discharge limits established by the New Hampshire Department of Environmental Services and the United State Environmental Protection Agency requirements. The existing treatment pond was utilized as the source of make-up water for the scrubber, which provides for the use of 100% reused or recycled water for the FGD system. All interconnecting piping systems, electrical system downstream of switchgear and MCCs, and buildings are part of the complete system.

In order to accomplish the large variety of work required to complete the Clean Air Project, PSNH and its Program Manager had to prepare 17 RFPs and award 18 major contracts.

Section 8 – Appendix, item 8.4 is a summary of the major contracts that have been awarded in connection with the equipment and physical work required for the Clean Air Project.

4.3 Current Estimate

On October 7, 2010, PSNH revised the Clean Air Project estimate to $430M. The reduction was due to higher productivity than estimated, lower than anticipated commodity costs, and favorable weather conditions during the major construction period in 2008 through 2010. The combination of these factors resulted in a lower cost estimate. To some extent, these savings were offset by required additions. These additions included an enhancement to the primary waste water system, a secondary water treatment system and the potential adjustment protection system. Please refer to Section 8 – Appendix, item 8.4 for details regarding the purpose and cost of these systems[21].

4.4 Estimate Comparison

In this section, we will analyze the differences between the initial conceptual estimate and the final URS estimate to determine if the variances are within expected tolerances.

When comparing estimates, we must be aware an estimate is "an approximate judgment or calculation, as of the value, amount, time, size, or weight of something[22]." It is important we understand the bases for each estimate and changes from one estimate to the next.

The original 2005 study done by S&L was conceptual based on current industry standards at the time and did not contain any guarantees for mercury. The estimate also excluded AFUDC, and cost of removal and relocation of existing facilities was included only for the known scope[23].

Other S&L assumptions were[24]:

[21] **BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL**
[22] As defined by Dictionary.com
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- Single duct from MK-1 and MK-2 (365 tons including support steel).
- Fourteen thousand (14,000) square feet gypsum storage building.
- Hooded conveyors system.
- Basis for Rail Road car unloader was bottom dump.
- Basis for silo discharge was basic hopper arrangement.

The URS 2007 estimate was based on a more detailed study using site-specific needs and included guarantees and project specific Allowance for Funds Used during Construction (AFUDC). It also built upon S&L assumptions and determined that several enhancements were needed:

- Designed separate ducts for MK-1 and MK-2 (1935 tons including support steel).
- Nearly doubling the size of the gypsum storage building to 26,600 square feet.
- Totally enclosed conveyor galleries.
- Basis for Rail Road car unloader was rotary dump.
- Basis for silo discharge was rotary plow dischargers due to winter conditions.
- Included a limestone emergency silo fill bucket elevator and receiving hopper.
- Larger absorber tank.
- Additional tray level.

To determine if the increase in the project between the conceptual and final estimate is reasonable, Jacobs made a side-by-side comparison looking at major work effort, owner's cost, escalation, contingency, and AFUDC as shown in the table below[25].

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Table 4 - Estimate Cost Comparison

Item	PSNH/URS Item Description	PSNH/URS June 2008 Estimate (Millions $)	PSNH/S&L 2006 Estimate (Millions $)
1	Program Manager	39.3	18.1
2	FGD Island	100.0	75.0
3	Chimney Island	13.1	13.1
4	WWT Island	15.0	11.0
5	Materials Handling Island	44.8	21.8
6	URS Engineered Equipment	26.1	9.5
7	URS Balance of Plant	61.0	38.3
8	URS Escalation	23.0	0.0
9	URS Growth and Contingency	19.1	11.6
10	Electrical power Supply	14.9	6.3
11	New Yellow Building	1.5	0.0
12	E-Warehouse	1.0	0.0
13	NU Labor	6.7	35.2
14	NU Costs 1	15.4	0
15	NU Costs (Miscellaneous) 1	4.1	0
17	NU Indirect Costs 1	5.5	0
18	AFUDC 1	56.5	0
16	Contingency	10.0	10.0
	TOTAL	**457.0**	**250.0**
	1 included in 13		

Because of the two-year time difference between estimates, a number of project related costs experienced significant escalation. Jacobs' Engineering Estimating Group estimated that during this time period, prices for certain materials and commodities escalated between 45 and 60%. This extraordinary increase was reflected in the price of certain types of equipment. Overall, the impact of this price escalation on the entire project is estimated to be an increase of 20%. When we apply this 20% factor to the S&L estimate, the cost variance between the estimates is reduced from 82% to 52%.

Table 5 - Normalized Estimate Cost Comparison

Item	PSNH/URS Item Description	PSNH/URS June 2008 Estimate (Millions $)	PSNH/S&L 2006 Estimate (Millions $)
1	Program Manager	39.3	21.7
2	FGD Island	100.0	90.0
3	Chimney Island	13.1	15.7
4	WWT Island	15.0	13.2
5	Materials Handling Island	44.8	26.2
6	URS Engineered Equipment	26.1	11.4
7	URS Balance of Plant	61.0	46.0
8	URS Escalation	23.0	0.0
9	URS Growth and Contingency	19.1	13.9
10	Electrical power Supply	14.9	7.6
11	New Yellow Building	1.5	0.0
12	E-Warehouse	1.0	0.0
13	NU Labor	6.7	42.2
14	NU Costs 1	15.4	0.0
15	NU Costs (Miscellaneous) 1	4.1	0.0
17	NU Indirect Costs 1	5.5	0.0
18	AFUDC 1	56.5	0.0
16	Contingency	10.0	12.0
	TOTAL	**457.0**	**300**
	1 included in 13		

When PSNH retained work of $83.5M is added to the S&L estimate, the cost variance between the estimates is reduced to 15.4%. While we cannot determine a specific monetary value for the additional non-NU/PSNH items URS included in their estimate, it is easy to envision their value would approach the remaining 13% cost variance figure[26].

In October 2010, PSNH revised the project estimate to $430M due to productivity gains that reduced escalation reserves by $16M and contingency by $11M. In January 2011, the budget was further reduced by $22M. This reduction reduced escalation reserves by $4M and contingency by $18M. When these reductions are factored into the URS estimate, the cost

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variance is reduced to 6%. Several contract additions were added to cover secondary water treatment, cathodic protection and enhance treatment for the primary water treatment without changing the final estimate of $430M[27].

4.5 Findings

- Sargent and Lundy was contracted to develop a conceptual estimate based on existing FGD designs and installations.
- The Sargent and Lundy 2006 estimate of $250M did not contain any specific mercury guarantee and was not site-specific.
- AFUDC and other NU/PSNH costs were not included in Sargent and Lundy 2006 estimate.
- In May 2008, URS Final Clean Air Project Estimate of $457M was submitted to PSNH.
- Both the Power Advocate Study and Jacobs Consultancy have been able to reconcile the differences between the $457M and $250M project cost estimates.
- During the course of the project, PSNH has been able to recognize savings due to higher productivity and lower commodity costs revising the Clean Air Project estimate to $430M.
- To some extent, the $27M cost differential reflects both PSNH and URS's ability to effectively control project costs.

4.6 Conclusions

The process PSNH followed in developing the estimates for the Clean Air Project started with the feasibility study, followed by development of engineering specifications, which combined became the basis for development a preliminary estimate. This estimate was followed by a detailed Clean Air Project Estimate, which included a number of items excluded from the initial estimate. Based on the various adjustments to the initial estimate, Jacobs Consultancy has been able to reconcile the original Sargent and Lundy project estimate within 1% the actual projected costs.

[27] **BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL**

5 Project Schedule

5.1 Initial

When Jacobs was first engaged in this assignment, a project schedule published in June of 2008 for the Merrimack Clean Air Project was presented[28]. The schedule was very detailed incorporating input from all of the entities that make up the total project. The schedule provided details of all information about the project from design through construction and commissioning.

While the completion of the clean-air project mandated by House Bill -1673 was mid 2013, the detailed schedule confirmed an in-service date of mid 2012. When Jacobs' personnel reviewed the schedule and then toured the site to see the state of the construction, it was evident the completion date shown in the schedule was both reasonable and realistic.

5.2 Current

In the time frame, that Jacobs' personnel have been regularly monitoring the project, the schedule has been updated to reflect actual progress. The revised schedule is equally as detailed as the initial one. Based on a review and a recent site inspection by the Jacobs team, it appears the schedule correctly represents the project. The current schedule represents a very comfortable project completion timeline, with adequate time allowed for construction completion, even for the facilities and systems added to the scope as the project progressed. The schedule also represents adequate time for checkout, start-up, and commissioning for the systems involved, and if the schedule is followed, the project should result in a fully operable system on or before the stated date of mid 2012.

Based on information presented in the January 2011 Quarterly Executive Review Meeting, URS reported their portion of the project was approximately 92% complete. This percent completion estimate does not include the entire project scope and costs. For example, since URS is not responsible for the substation, 115 KV switchyard expansion, AFUDC, etc. these costs are not included in their project completion projection. Through the end of January 2011, the cumulative

[28] **BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL**

total project expenditures, including both URS and PSNH retained work, was reported to be $302,771,489, which is approximately 80% of the latest overall project budget.

5.3 Findings

- The project schedule is detailed and is reviewed regularly.
- As of January 31, 2011, URS project progress on their scope of work was reported to be at approximately 92% complete, while PSNH reported overall project completion is 80%.
- In June 2008, the project schedule projected an in-service date of mid 2012, a year earlier than the legislative mandate.
- The mid 2012 project completion date represents a reasonable target date for commissioning and start-up of the clean air project initiative.

5.4 Conclusions

The current schedule start-up date for the New Hampshire Clean Air Project at the Merrimack Station is mid 2012 and based on Jacobs Consultancy's onsite observations is a realistic projection.

6 Project Management Approach

Utilities often contract out the management of large capital intensive projects. For the Merrimack Project, PSNH made use of two leading engineering firms to manage the project, with strong internal oversight. In this section, we examine the roles played by URS, as program manager, and R.W. Beck, as independent oversight engineering, for the project as well as to discuss PSNH's internal project controls.

6.1 URS' Role

Emissions from the PSNH plants, including Merrimack, have been the subject of multiple discussions for years, with a collaborative agreement reached among several entities in November 2001. With all of the scrutiny and interest in this subject, PSNH, over the span of several years, took an intelligent path, that being engaging respected, competent engineering firms in the quest for the right project for Merrimack. They engaged Burns & McDonnell and Sargent & Lundy in their early studies. These firms are very experienced in power plant engineering and in wet scrubber technology. The two firms were most helpful in establishing a path forward for the Merrimack plant.

In May 2007, a Request for Proposal for a Program Manager was issued for the Clean Air Project at Merrimack Station. Proposals were received from four firms, all well experienced in projects of this type and size. The firms were:

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- Washington Group (later becomes URS)
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After a thorough evaluation on September 24[29], 2007, URS was awarded the contract to manage the Merrimack project. URS, as the program manager (PM), was to function in an Engineering, Procurement, and Construction Management (EPCM) role. Accordingly, they are

[29] **BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL**

responsible to PSNH management to ensure that all aspects of the project proceed as the owners management team has mandated. As the PM, URS performs the following functions:

- Engineering:
  - Develop design criteria and basis
  - Prepare specifications for equipment and construction services
  - Prepare general drawings for the project
  - Assist in evaluation of proposals
- Procurement
  - Prepare bid documents for major equipment packages
  - Prepare bid packages for Balance of Plant (BOP) equipment
  - Prepare bid packages for BOP construction services
  - Coordinate evaluation of bids
  - Lead vendor presentation meetings
- Construction Management
  - Assist in evaluation of bids
  - Provide day-to-day supervision of all onsite contractors
  - Monitor progress of contractors against schedules and budgets
  - Oversee the project safety program
  - Prepare periodic project progress reports
  - Coordinate commissioning, start-up and training
  - Coordinate, closeout and demobilization of the project site

To fulfill the role as program manager, URS established a typical project organization for this type project. They assigned a project manager whose initial functions centered on managing the home office engineering disciplines as the project scope was developed. The project manager is assigned personnel as needed in the various disciplines, including support functions as the needs arose. As the design progressed and the construction activities on the project began in earnest, the project manager's role focused more in the field. To assist in managing the construction activities, a construction manager, who reports to the project manager, was assigned to handle the day-to-day construction activities. Reporting to the construction manager are various superintendents who provide the intimate coordination and monitoring required for a well-run project.

URS has accepted their role as program manager; and with the exception of the safety area, has done a good job ensuring the project meets PSHN's expectations, the project schedule, and budget. With the noted exception, they have fulfilled the role for which they were engaged. We will discuss safety in detail in Section 7 - Construction.

6.2 R.W. Beck's Role[30]

PSNH released a RFP for an Independent Engineering Service contract in September 2009, and R.W. Beck was selected as the vendor. The vendor's contract provides an independent third-party oversight of the engineering, procurement, and construction of the Clean Air Project. The specific services provided by the independent engineering group are:

To conduct on a monthly basis:

- Review of the final design for general compliance with contract guarantees.
- Review the progress of design for compliance with milestone schedule.
- Review the progress of the procurement specifications and procurement contracts.
- Review reports for general suitability regarding start-up and performance.
- Review proposed work plans and quality control procedures.
- Conduct monthly onsite visits for observation of the work in progress.
- Consulting with project participants in advance of scheduled major inspections' tests or start of important work phases.
- Review the activities of the project to ensure that appropriate due diligence was performed, appropriate alternatives were considered and decisions and actions were prudent.
- Review change orders to construction contract.
- Provide independent assessment of:

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- Performance guarantees specified in the contact
- Initial operation of the project
- Substantial completion of the project
- Completion of the construction contract

- Prepare monthly independent engineer's report. The report includes, but is not limited to:
  - Introduction
  - Summary of monthly review
    - Execution of the work plan
    - Review the actual / projected costs of the project and compare them to the Target Budget. Review the actual / projected schedule of the project and compare them to the Target Schedule.
  - Recommendations / Conclusions
- R.W. Beck will perform the following tasks during the startup and testing phase of the project.
  - Review performance testing procedures.
  - Witness selected performance tests.
  - Review contractor's test report.
- Verifying project completion.
  - Monitor successful completion of key open issues.
  - Conduct final site visit to verify punch list items have been completed
- Provide follow-up services and regulatory support as needed.

6.3 Project Controls [31]

The approach to project control is documented in the Clean Air Project manual and consists of the following three distinct areas:

- Program Manager Contract Management
- Project Schedule Reporting
- Project Cost Reporting

Program Manager Contract Management [32]

Contract management is accomplished though the use of change notices and change orders and processed as outlined in Section 10.6 of the Project Execution Plan and Attachment K of the PXP, PEP-314 Change Control[33].

Change Orders must be approved by PSNH and URS management and are processed in accordance with Article 6 of the Contract. Major changes in the Scope of Work, the division of responsibility, the project schedule, or circumstances addressed in the Contract can necessitate change orders. These changes may be, but are not limited to:

- Design basis or design concept changes.
- Site conditions beyond those presented in the Project Design Manual and existing site, survey reports.
- PSNH permit obligations.

Client authorization and approval of Contract Change Orders must be obtained prior to implementation and written authorization to proceed is required for client initiated or client requested changes regardless of contract type.

Change order control was implemented by use of a system of Work Change Requests and amendments to the Contract.

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Work Change Requests are a required process needed before any scope change or any contractor can implement cost change. This requires a full scope, cost, and justification presentation by URS to PSNH for approval prior to any such work proceeding.

Project Schedule Reporting

URS developed and maintains the integrated Project Schedule in accordance with the requirements of Article 1.4 of Appendix I to the Agreement and has submitted periodic updates as described below.

The Project Schedule is a Critical Path Method (CPM) precedence diagram using Primavera Project Planner software produced by Primavera Systems and includes PSNH obligations and deliverables' receipt as milestone activities. URS provides PSNH information regarding project work operations, sequence of the work, breakdown of the work into individual activities with estimated durations, labor and material estimates, and weekly or monthly schedule updates as required.

The Project Schedule status is reviewed weekly and is updated monthly throughout the project, unless otherwise requested by PSNH, except during unit outages when updates are required on a daily basis. The Planning Unit for the Project Schedule activities is one "day", except during outages when the planning unit is one "hour."

All schedules are subject to PSNH's review and approval, but do not reduce or affect URS's responsibility for completing the work under its contract in accordance with applicable schedule requirements.

Project Cost Reporting

The project costs are reported and controlled at various levels against the PSNH project Code of Accounts. A resource analyst maintains the Project Cost Summary and the monthly actual costs are recorded early the following month. The project manager reviews the actual costs, compares them to the projected costs and revises future cost projections as necessary.

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URS is responsible for developing and maintaining a project cost monitoring and control program. This monitoring is by island and URS provides PSNH a monthly list of contractors' personnel charging time to the project including hours charged.

Material and engineered equipment costs are reported in the Monthly Progress Report. The cost reporting identifies the budget, commitments, actual, and forecast costs. Subcontract costs are also reported in the Monthly Progress Report.

6.4 Findings

- URS is the program manager responsible for Engineering, Procurement, and Construction Management of the project.
- PSNH contracted R.W. Beck to give an independent engineering overview of the project.
- PSNH has a documented approach to project control as defined in the Clean Air Project Manual.
- Project control process consist of three essential elements:
    1) Project manager contract management
    2) Project schedule control
    3) Project cost control
- Project costs are reported and reviewed on a monthly basis.

6.5 Conclusions

PSNH established safeguards for projects overview and controls to ensure that the Clean Air Project is controlled and managed effectively. These safeguards rely on outside engineering expertise and a well-structure process that monitor change order, scheduling, and cost.

7 Construction Approach

Even with the series of contract safeguards previously described, actual construction is not necessarily assured to proceed smoothly. There are critical elements ranging from how the project is divided to the interaction among independently constructed portions of the project; in this case, there are four islands to assure the overall project designs and concepts are upheld. In addition, given the physical congestion present in such a work site, safety assurance is critical. In this section, we address the decision to undertake the work in four islands, how contractor and project manager coordination was handled, and how safety performance is monitored and shortfalls mitigated.

7.1 Four Islands

There are several approaches that can be implemented in a construction project similar to the Merrimack Station Project. Whether one is managing the project themselves or has engaged a PM, as is the case for the Merrimack Project, the alternatives relative to approach the construction remain essentially the same. Here are three available alternatives:

Detailed design, procure, and manage the construction.

- In the first approach, the engineer prepares the detailed design for the project, determines the processes to be used, performs all of the calculations required, prepares the detailed drawings and specifications for the equipment and specifications, and provides engineering oversight and assistance during construction, commissioning, and start-up. The equipment and system suppliers provide design information, such as process requirements and support information. The engineer uses this information in preparing the detailed design drawings. In this approach, the procurement process is very detailed as every part of the project is individually addressed by the PM's procurement group. Once the equipment and systems are selected, the PM must obtain contractors for the total project, which may require multiple contractors, to address the specialty equipment type and systems prevalent in a large, complex system such as a scrubber.

- In the second approach, the engineer prepares less design; in essence, the engineer describes the project arrangement and process criteria. The suppliers prepare the design and procure the equipment for their systems and can either construct their equipment, known as Supply and Erect, or the PM can handle the construction similar to the first approach. The engineer will perform a less detailed design relative to the major equipment and systems since the suppliers are preparing some designs for their scope. The supplier commonly supplies the commodity items, such as structural steel, piping, and electrical cable for the systems within its scope. The PM must provide engineering, procurement, and construction management for the remaining items for the system. They will be responsible for foundation, buildings, controls, and electrical supply to the supplier terminal points throughout the site. The engineering, procurement, and construction management effort is less than the first approach, but nonetheless a substantial undertaking, which requires a sizeable project team.
- The third approach is to divide the project into major systems and procure the systems on a lump-sum turnkey basis. The supplier for a major system is responsible for the total design, procurement, and construction management for its scope. This is the approach chosen for the Merrimack Project. The suppliers are responsible for what is within their boundaries. By shifting these responsibilities to the suppliers, this minimizes the number of personnel required by the PM for engineering, procurement, and construction management. However, this approach requires the PM have highly competent, experienced personnel assigned to the project to monitor and direct the suppliers for compliance with the project specifications and requirements.

With the assistance of R.W. Beck, the third approach is what PSNH chose for the Merrimack Project[34]. PSNH decided the project would be broken into four major islands for implementation. The islands were identified as the scrubber, the materials handling, the chimney, and the wastewater treatment. The advantage of this approach was it provides a high level of cost certainty to a project. This aspect, combined with the incentive contract awarded to URS, gave PSNH comfort the project would be performed for the projected budget estimate or at a reduced amount. One disadvantage to this selected approach is the owner can lose a degree of control over desired details for their project if these are not clearly described in the bidding documents for the islands. This becomes a responsibility of the PM once the owner has

[34] **BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL**

identified these requirements and has presented them to the PM. In Jacobs' opinion, PSNH clearly described the details of the project.

In the approach chosen for the Merrimack Clean Air Project, there is a balance of plant design and interconnection issues that need to be handled. URS, as PM, is expected to manage these issues, and in Jacobs' opinion, has done an acceptable job in this area.

7.2 Coordination

Selecting the island approach makes the coordination efforts to some extent more streamlined. Each of the island contractors is responsible for all aspects within its scope. PSNH and URS did an excellent job in defining the scopes for the island contractors, and URS is fulfilling their responsibilities to manage the various island contractors. In addition to the four major island contracts, URS is handling BOP construction coordination issues. Section 8.4 in the Appendix contains a description of the major contracts required for the project. Since URS performed the design and procurement for these systems, in addition to coordinating their construction and the four islands, the coordination of the entire site construction interfaced well. Large and complex projects the size and complexity of the Merrimack Project requires significant attention to coordination, which is a prime responsibility of the PM. Further, when a project such as this is being performed in an operating plant, with a very congested site throughout the year, coordination of the various construction activities becomes paramount. Initially in the project, PSNH assigned personnel with intimate plant knowledge and overall involved the plant operation personnel. Due to the close involvement of PSNH, in this aspect, the PM capabilities of URS, and the selection of competent contractors, the coordination of this challenging project has been well managed.

7.3 Safety

Current Safety Performance

Safety on all construction projects is paramount. On any project ensuring a safe work environment is challenging; the larger a project becomes and the more spread out the workforces are, the more challenging it becomes. When a project is in an existing plant, where

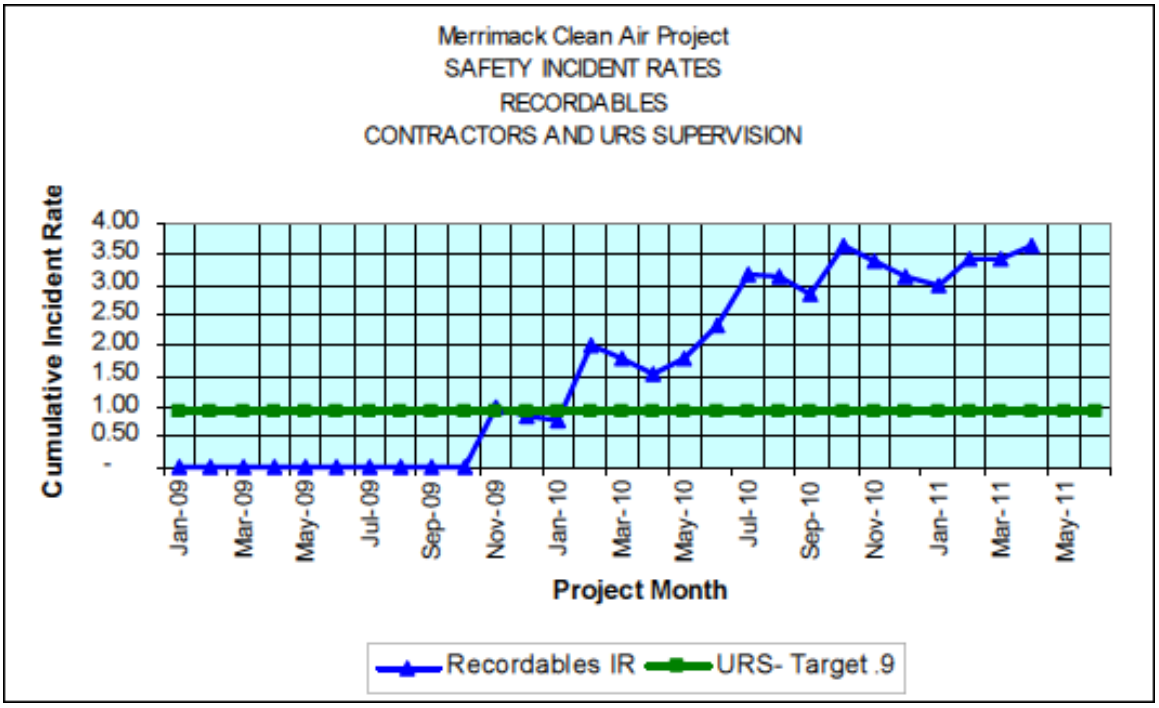
operations must continue and the new systems must be built and incorporated as the plant operates, safety related issues are further compounded. The Merrimack Clean Air Project has all the above mentioned factors; in addition to being a complicated project, the plant is located in the North where the winters can be severe. Considering this, the project becomes a challenge from a safety standpoint and demands that those responsible for safety be extremely diligent in performing their daily task.

For projects where there is a Program Manger (PM) engaged, as in this case, the main responsibility for the safety program is typically assigned to them. While the owner PSNH has a role, it is essential to pass the corporate expectations to the PM and require them to be the entity responsible for the function of the safety program. This is appropriate, because for a safety program to function well it must be promulgated, monitored, and closely supervised. The PM has the responsibility for constant contact and supervision of the sub-contractors in order to observe opportunities and enforce safety procedures. It is incumbent on the PM to assign the proper number of professionally trained safety personnel to ensure the entire workforce is working safely. The safety program that will work in a small Greenfield project will not necessarily work for a large, congested project such as the Merrimack Project. An experienced PM organization like URS knows what is expected and knows the number of safety personnel and qualifications required.

However, it does not appear safety has been the primary focus for the Merrimack Project. There have been a disturbing number of recordable incidents since the time a significant number of construction personnel have been working at the Merrimack Station. While the difficult work related circumstances listed above may have contributed to the high Recordable Incident Rate (RIR)[35], the incident rate continued to rise as the weather improved, consequently appearing the problems were not due to bad weather. This trend can clearly be seen in Figure 1, Recordable Incident Rate, which describes the recordable incident rate for 2009 through April of 2011.

[35] Recordable incident rate is defined as the number of recordable incidents per 200,000 hours worked.

Figure 1 Recordable Incident Rate[36]



One must conclude the management of the sub-contractors is not fully committed to safety. In addition, while it is the PM's responsibility to ensure environmental and worker safety, it is also their responsibility to ensure safe worker performance, personnel transition, or replacement of the offending sub-contractor.

Performance Benchmarks

One can compare safety performance against multiple statistical databases. Two notable databases are the Construction Industry Institute (CII) and the Bureau of Labor Statistics (BLS) of the U.S. Department of Labor.

Most large contractors, including URS and Jacobs Engineering, belong to the CII. CII monitors member projects for multiple aspects such as productivity, schedule, cost, and most importantly safety. CII has a comprehensive safety monitoring and training capability. For the calendar year 2009, the last year for which the annual safety report was compiled, CII member companies had a RIR on their major projects of 0.64, while the BLS statistics show a

[36] Source for chart is the May URS Merrimack Clean Air Project Status Report

significantly higher RIR of 4.3. BLS statistics reflect the compilation of all construction activities under the purview of the Occupational Safety and Health Administration (OSHA). Consequently, BLS statistics reflect the safety performance of all contractors of appreciable size, but they are not a reflection of the safety performance that the highly reputable contractors deliver or the results that major corporations like PSNH expect.

Safety Performance Targets and Concerns

Until recently, URS, as a member of the CII, has been using the CII standards as the benchmark for injury trending. For the Merrimack Clean Air Project, URS set a target of 0.90 for the project RIR, which is somewhat puzzling since is it considerably higher than the CII average. However, the 0.90 still serves as an indication the type safety results the project expected to achieve. Even with the higher than average RIR target, the actual safety performance has not met the target. As can be seen from Figure 1, the RIR performance reported at the January 2011 Quarterly Executive Review Meeting, held on February 16, 2011, was 2.96 for the total project, or more than three times worse than targeted performance. The RIR performance reported that at the April 2011 Quarterly Review Meeting, on May 18, 2011, was 3.64, over four times worse than targeted.

URS has definitely been aware of the poor safety performance and on several occasions had meetings with the sub-contractor's senior management, but there has not been a significant improvement in the information reported to Jacobs. Senior management cannot mandate safety. An effective safety program can be planned and promulgated in plans and corporate procedures, but the only successful method to affect the plan is to present the plan on a daily basis to the workers, in their language, their culture, and by their immediate supervision in a face-to-face environment. It would appear this is not done effectively in the Merrimack Project.

Fortunately, the incidents occurring on this project are relatively minor, such as foreign objects in eyes, scratches, sprains, and pinches. However, minor incidents when not stopped can lead to the conclusion the workers are okay and inadvertently the minor cases become major. It is surprising, for the number of reportable incidents the Merrimack Project has, and is continuing to experience, even though there have been no lost-time incidents.

From the safety performance perspective of this project, it seems URS and the sub-contractors do not have safety performance as a paramount concern, and do not have either, enough or properly trained safety professionals assigned. Safety performance for the Clean Air Project has not been successful for PSNH.

7.4 Findings

- The project was contracted on a lump sum-turnkey basis and awarded in four major islands in addition to the balance of plant (BOP) work.
- As Project Manager, URS is fulfilling their responsibilities to manage the various island contractors.
- Monthly and quarterly project reports have continually indicated poor safety performance when compared to CII standards.
- PSNH and URS are well aware of the deteriorating safety performance.

7.5 Conclusions

Given the size and complexity of the Merrimack Clean Air Project, the construction approach has functioned as planned. The various contractors have worked well together and produced a project that has been on schedule and within budget. Safety performance has been poor, falling below the target set by URS and well below the CII average.

7.6 Recommendations

It is recommended both PSNH and URS management place renewed emphasis on safety for the remainder of the project and additional trained safety professionals be assigned to the project. In Jacobs' experience, the best arrangement would be for a safety professional to be assigned exclusively to one of the four islands working closely with each lead contractor and their sub-contractors.

8 Appendix

8.1 Data Request

Item	Description	Date Requested	Priority
1	BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL	4/16//10	1
2	BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL	4/16/10	1
3	BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL	4/16/10	1
4	BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL	4/16//10	1
5	BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL	4/16//10	1
6	BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL	4/16/10	1
7	BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL	4/16/10	1
8	BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL	8/19/10	1
9	BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL	8/19/10	1
10	BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL	8/19/10	1
11	BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL	8/19/10	1

Item	Description	Date Requested	Priority
12	BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL	8/19/10	2
13	BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL	8/19/10	2
14	BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL	8/19/10	2
15	BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL	8/19/10	2
16	BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL	11/03/10	1
17	BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL	11/03/10	1
18	BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL	11/03/10	1
19	BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL	11/03/10	1
20	BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL	11/03/10	1
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24	BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL	11/03/10	2
25	BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL	11/03/10	2

Item	Description	Date Requested	Priority
26	**BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL**	11/03/10	1
27	**BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL**	11/03/10	2
28	**BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL**	11/03/10	2
29	**BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL**	11/03/10	2
30	**BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL**	11/03/10	2
31	**BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL**	11/03/10	1
32	**BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL**	11/03/10	2
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34	**BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL**	11/03/10	1
35	**BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL**	11/03/10	2
36	**BEGIN CONFIDENTIAL[ ] END CONFIDENTIAL**	11/03/10	2

Item	Description	Date Requested	Priority
37	**BEGIN CONFIDENTIAL[** **] END CONFIDENTIAL**	1/7/11	1
38	**BEGIN CONFIDENTIAL[** **] END CONFIDENTIAL**		1
39	**BEGIN CONFIDENTIAL[** **] END CONFIDENTIAL**	3/17/11	1
40	**BEGIN CONFIDENTIAL[** **] END CONFIDENTIAL**	3/17/11	1
41	**BEGIN CONFIDENTIAL[** **] END CONFIDENTIAL**	3/17/11	1

8.2 Acronyms

ACI	Activated Carbon Injection
AFUDC	Allowance for Funds Used during Construction
BOP	Balance of Plant
CAP	Clean Air Project
CII	Construction Industry Institute
CO_2	Carbon Dioxide
CPM	Critical Path Method
EPCM	Engineering, Procurement, and Construction Management
ERMC	Executive Risk Management Council
FGD	Flue-gas desulphurization
GPPMA	General President's Project Maintenance Agreement
Hg	Mercury
NHCPA	New Hampshire Clean Power Act
NMA	National Maintenance Agreement
NOx	Nitrogen Oxide
NTX	Not-to-Exceed
NU	Northeast Utilities
OEM	Original Equipment Manufacturers
PO	Purchase Order
PM	Program Manger
PSNH	Public Service of New Hampshire
RaCC	Risk and Capital Committee
RFP	Request for Proposal
RFQ	Request for Qualifications
RIR	Recordable Incident Rate
RMC	Risk Management Council
S&L	Sargent and Lundy
SO_2	Sulfur Dioxide
SO_3.	Sulfur Trioxide

8.3 Industry Terms

Balance of Plant: Is the sum of all equipment for safe operation as well as the technical coordination of all concerned parts of a power plant.

Turnkey Contract: A single EPC contractor that provides a complete project "wrap" including other subcontracts; i.e., Scrubber Island, material handling, stack, construction labor etc.

Flue-Gas Desulphurization: Technology used to remove sulfur dioxide (SO_2) from the exhaust flue gases of fossil fuel power plants.

Activated Carbon Injection: System from which powdered activated carbon is pneumatically injected into the flue gas ductwork of a coal fired power plant or industrial boiler.

8.4 Contracts

Scrubber (FGD) Island Contractor Bid

In January 2008, the Program Manager issued a RFP for turnkey services for the supply and installation of the Scrubber Island. The scope included engineering, supply, construction, and testing for the FGD system, including the limestone silos through gypsum dewatering with all mechanical and electrical installation, and all architectural/structural work above the foundations. The RFP was issued to the following potential bidders:

- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**
- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**
- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**
- Siemens Environmental Systems & Services (SESS)

Contract negotiations with SESS resulted in a final contract price of **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** with acceptable terms and conditions on all legal, commercial, and risk management issues. PSNH executed the full contract with SESS on October 20, 2008.

On October 31, 2008, PSNH opened a Purchase Order (PO) with a Not-to-Exceed (NTX) amount of **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** for the FGD island work.

Island Procurement Strategy

In January 2008, the PSNH Clean Air Project team made a presentation to the RMC requesting authorization to issue RFPs for supply and installation of the following "islands":

- Chimney
- Material Handling System
- Wastewater Treatment System

The scope of work for each of these proposed RFPs included:

- Chimney - supply and installation of the chimney shell and fiber reinforced plastic flue liner.
- Material Handling System - supply and installation of the limestone rail unloading system, limestone storage silo and conveyor transfer system, as well as the gypsum conveyor transfer and storage building.
- Wastewater Treatment System - supply and installation of the FGD wastewater treatment system, including all equipment, piping, tankage, electrical and instrument and control systems.

PSNH established pricing format to be firm, lump sum pricing to the greatest extent possible.

The NU/PSNH Large Project Procedure previously described in Section 3 was followed throughout the contract letting process. The RMC approved release of all three RFPs and the ERMC approval for release of the RFP for the Material Handling System on March 25, 2008. The ERMC approval was required since the Material Handling System was greater than $25M.

Material Handling Contractor Bid

Request for Proposal 29834-15-6-714-SC was issued on March 26, 2008, for the supply and installation of the Material Handling System. The RFP was issued to the following potential bidders:

- Dearborn Midwest Conveyor Co. (DMW)
- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**
- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**

Negotiations with DMW resulted in acceptable terms and conditions on all legal, commercial, and risk management issues. On December 19, 2008, NU executed a contract with DMW for **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** and on January 26, 2009, PSNH opened a PO with a NTX amount of **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** the material handling contract.

Chimney Contractor Bid

Request for Proposal 29834-13-6-901-SC was issued on January 30, 2008, for the supply and installation of the reinforced concrete chimney. The RFP was issued to the following potential bidders:

- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**
- Hamon Custodis
- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**

Negotiations with Hamon Custodis resulted in a final contract price of **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**, with acceptable terms and conditions on all legal, commercial, and risk management issues. On December 9, 2008, NU executed the full contract with Hamon Custodis and on December 16, 2008, PSNH opened a PO with a NTX amount of **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** for the chimney contract.

Wastewater Treatment System Contractor

RFP 29834-21-6-403-SC was issued on February 27, 2008, for the supply and installation of the wastewater treatment system. The RFP was issued to the following potential bidders:

- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**
- Siemens Water Technologies (Siemens)

On December 5, 2008, NU executed a contract with Siemens for **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** and on December 16, 2008, PSNH opened a PO with a NTX amount of **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** for the WWTS contract.

Phase I Site Preparation (Pre-Construction) Contractor Bid

PSNH was authorized by the RMC in July 2008 to issue the RFP for Phase I Pre-Construction Site Preparation. The scope of work included site development for the craft parking lot, fabrication, and lay-down areas, temporary power, and miscellaneous temporary buildings and foundations. The estimated value of the work was $8M. The contract was intended to be a lump sum with unit pricing for additions and deletions.

On August 8, 2008, RFP 29384-12-6-001-SC was issued for Phase I Site Preparation to the following bidders:

- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**
- George Cairns & Sons, Inc. (Cairns)
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The Phase I Site Preparation Contract for **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** was awarded to Cairns on October 31, 2008, and PO 02246117, effective November 17, 2008, with a NTX amount of **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** was issued.

Booster Fans & Motors Contractor Bid

The RMC in August 2008 authorized PSNH to issue a RFQ for the supply of booster fans and motors. The estimated value of this contract was $5,133,730, which was executed on a lump sum fixed price basis.

The following firms identified as qualified bidders are shown below:

- FlaktWoods Americas Operations
- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**
- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**
- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**

A contract for **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** was awarded to FlaktWoods for Booster Fans and Motors on February 2, 2009. The amount included a fixed amount of **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** plus an estimated **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** for freight and PO 02247380 was issued on February 2, 2009, with a NTX amount of **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**. Additionally, PO 02248788 for long term spares was also issued in the amount of **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**, plus freight.

Phase II Site Preparation Contractor (Construction) Bid

NU issued RFQ No. 29384-12-6-002-SC, on March 6, 2009, for Site Preparation Phase II Construction Work to the following prospective bidders:

- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**
- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**
- Daniel O'Connell's Sons (O'Connell)
- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**
- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**

Phase II Site Preparation work scope included, among other items:

- Installation of underground storm drains system.

- Demolition of the existing "yellow" building.
- Relocation of the existing north-south road (west of the station).
- Relocation of the utility trench.
- Installation of underground process piping.

On June 8, 2009, the Phase II Contract for **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** was awarded to Daniel O'Connell's Sons Inc. (O'Connell). NU opened PO 2249996 on June 10, 2009, with a NTX amount of **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**

Construction Services Contractor Bid

Request for Proposal 29834-13-6-550-SC was issued on November 25, 2008, to the following pre-qualified bidders for the construction services contract:

- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**
- CCB Inc. (CCB)
- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**
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- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**
- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**

The scope of work included ongoing general site services, maintenance services, operations and maintenance services, miscellaneous constructions activities as directed by the owner and provision of Construction Power, Water Distribution, and Sanitary Systems. The selected contractor would be paid on a time and material basis.

The Construction Services contract for **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** was awarded to CCB in February 2009, and PSNH opened PO 02247576 on March 4, 2009, with a NTX amount of **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**

Concrete Foundation Installation Contractor Bid

On November 24, 2008, the Project requested and received RMC authorization to issue the RFP for Foundation Installation. The scope of this work was excavation and installation of foundations with an estimated value of $15M. The following contractors were identified as qualified bidders through a pre-qualification submittal process that included a review of safety records. The contract was pricing was structured to be a lump sum for foundations that were already designed and unit prices for estimated quantities based on the degree of complexity for foundations that would be designed in the future.

Request for Proposal 29834-12-8-001-SC was issued on December 2, 2008, to the following pre-qualified bidders:

- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**
- Francis Harvey & Sons Inc. (Harvey)
- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**
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- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**
- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**

The scope of work included provision of foundations for the following:

- Chimney
- Absorber Vessel
- Booster Fans (one for MK1 and two for MK2)
- FGD Building
- Ball Mills (FGD Building)
- FGD Building Tanks
- Gypsum Storage Enclosure, including exterior slab
- FGD Service Water House
- Two Limestone Storage Silos
- Duct Supporters
- Truck Wash Building

- Utility Bridge from FGD Substation to FGD Building
- Ash Silos- Relocation
- Limestone Conveyor Transfer Towers
- Limestone Receiving Chute
- Gypsum Conveyor Belts
- Limestone Bucket Elevator and Emergency Reclaim Dozer Trap

On February 4, 2009, the Concrete Foundations Installation Contract for **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** was awarded to Francis Harvey & Sons and NU opened PO 022474589 with an NTX amount of **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** on February 6, 2009. The final contract amount was revised from the initial evaluation estimate based on information received after the evaluation was completed. The adjustment in pricing lowered the estimate from **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** to **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** as the initial amount of the contract.

Permanent FGD Substation Contractor Bid

RFX-00213-2008 was issued to nine prospective bidders on July 15, 2008. This RFX was issued by NU/PSNH without URS involvement. PSNH had greater experience with substations of this type including PSNH's experience at the Northern Wood Power Project at Schiller Station.

The scope of work included engineering, design, development of protection and control settings, procurement of materials, and the installation, testing, and commissioning of a complete 115 kV — 4.16 kV two-transformer substation. The RFX requested lump sum pricing.

The RFX estimate was $4M; therefore, prior RMC authorization was not requested. Three bids, all over **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**, were received from the following bidders:

- Eaton Electric (Eaton)
- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**
- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**

On December 26, 2008, Eaton was awarded a contract for **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** and PO 02246779 was issued for **BEGIN CONFIDENTIAL [ ], END CONFIDENTIAL** including **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** contingency.

Balance of Plant Mechanical Contractor Bid

On September 9, 2009, authorization was sought and received from the RMC to issue the RFP for Balance of Plant (BOP) Mechanical Equipment / Piping Installation, mechanical work that was not logically scoped into the other "island" packages, including non-ductwork insulation. The contract was anticipated to be a lump sum for completed design with unit prices for additional scope. Nine prospective bidders were pre-qualified based on their submittals, review of their safety records and their membership in local building trades. Prospective evaluative criteria and weighting as well as a summary of contract risks and mitigation measures were presented to the RMC.

On November 25, 2009, RFP 29384-15-6-531 was issued to eight prospective bidders including:

- AZCO, Industrial Construction & Fabrication (AZCO)
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Following further negotiations, on March 25, 2010, PSNH opened a PO with AZCO for the BOP mechanical work with a NTX amount of **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**.

Balance of Plant Electrical Contractor Bid

On September 9, 2009, PSNH sought authorization and received approval from the RMC to issue the RFP for balance of plant Electrical Power, electrical work that was not logically scoped into the other "island" packages, including the digital control system and continuous emissions monitoring system installation. The contract was planned to be lump sum for completed design with unit prices for additional scope.

PSNH / URS pre-qualified ten prospective bidders based on their submittals, review of their safety records, and their membership in local building trades. PSNH / URS developed prospective evaluative criteria and weighting as well as a summary of contract risks and mitigation measures, which were presented to the RMC.

On December 15, 2009, RFP 29384-17-6-754 was issued to eight prospective bidders including:

- E.S. Boulos (Boulos)
- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**
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On April 23 2010, PSNH issued a PO to Boulos for the BOP electrical work with a lump sum total of **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** (including OCIP and base scope revisions) and a NTX amount of **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**.

Ductwork Fabricator Bid

On April 27, 2009, authorization was sought and granted by the RMC to issue the RFP for Ductwork Fabrication. The scope of work included furnish, fabricating, and delivering steel ductwork. The estimated value of the contract was $8.3M. The contract was intended to be lump

sum for those designs that were complete and unit pricing for estimated quantities for future designs. Award was anticipated for July 2009. Delivery of ductwork was planned to start in February 2010 and be complete in July 2010. Liquidated damages would be applied to meeting the delivery schedule.

On April 29, 2009, RFQ 29834-13-6-513, Ductwork Fabrication was issued to the following pre-qualified prospective bidders:

- Merrill Iron & Steel, Inc. (Merrill)
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On August 5, 2009, PO 02250987 was opened for Merrill Iron and Steel, Inc. for Ductwork Fabrication. NU entered into a contract with Merrill for **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**, which included **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** for future work authorization, plus **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** for a letter of credit option. The NTX amount was **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**.

Ductwork and Structural Steel Erector Bid

On August 5, 2009, CA Project Management requested and received RMC authorization to issue the RFP for Ductwork and Structural Steel Erection. The scope of work included erection of the ductwork and structural steel to be fabricated and delivered by Merrill (see above discussion). The estimated value of this work was approximately $18.54M. The contract was intended to be lump sum for complete designs and with unit prices and estimated quantities for future designs.

The following were pre-qualified as prospective bidders:

- Merrill Iron & Steel Inc. (Merrill)
- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**
- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**
- **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**
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Contract Award

PO 02252748 was issued to Merrill Iron and Steel, Inc. for Ductwork and Structural Steel Erection. PSNH entered into a contract with Merrill for **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**, including adjustments based upon information received after the bid evaluation was completed. The NTX PO opened on December 24, 2009 had a value of **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**.

Enhanced Primary Waste Water Treatment System — Contract Addition[37]

On March 16 2010, URS issued an RFP to four bidders for an Enhanced Wastewater Treatment System to provide for polishing treatment of mercury and arsenic downstream of the Wastewater Treatment System, which was being built by Siemens. This system was required to meet the rigorous emission limits of the water discharge permit limitations imposed by the NHDES.

Siemens Water Technologies / Northern Peabody Inc. (Siemens) and **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** submitted proposals. The procurement team evaluated the Siemens and **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** with final evaluation scores of **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** and **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**, respectively.

[37] **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**

Siemens' bid was considered to have a proven technology, and the evaluated cost plus recommended options was reasonable.

URS recommended to the PSNH CA Project Team that Siemens be awarded the Enhanced Wastewater Treatment System contract work for **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**, plus **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** for future work authorization, if needed. The resultant authorized value of **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** was added to the existing Siemens Wastewater Treatment System contract with a NTX value of **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**.

Potential Adjustment Protection System — Contract Addition[38]

In mid 2010, PSNH became aware of a potential problem with the A-2205 material used in the absorber tank. High Alloy Stainless Steels have been used for FGD reaction vessels as an industry standard for years and A-2205 is the material most commonly used. In very limited cases, A-2205 materials have not stood up to certain corrosion mechanisms.

PSNH obtained more knowledge of the problem by speaking to utilities that had experienced the problem and engineering firms which have specific and current knowledge and expertise on this topic. It was determined the Sargent and Lundy (S&L) had the most firsthand knowledge of this issue and a PO was issued on November 9, 2010.

After a full analysis of our absorber tank and a review of all industry knowledge, it was concluded that a Potential Adjustment Protection System is the most effective way to ensure corrosion protection. Potential Adjustment Protection systems have been successfully used in many industries for this type of problem. Corrosion Service is an industry leader and they can provide corrosion protection guarantees. Sole sourcing was used for the specialized design and supply of equipment (tank internals and external controls) and a PO was issued in January 2011.

Secondary Waste Water Treatment

[38] **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL**

PSNH decided pursue the supplemental WWTS option and hired Burns & McDonald (B&M) on November 17, 2010, to provide technical assistance based on their unique knowledge and expertise. Burns & McDonald was engaged to provide engineering and construction oversight under the pre-existing contract arrangement with NU/PSNH due to their experience with the only other similar system in the United States.

Burns & McDonald's analysis of the Clean Air Project WWTS and effluent concluded the installation of a brine concentrator, crystallizer would reduce the liquid waste stream to between zero to five gpm, which may allow for re-use and an additional crystallizer, and dewatering device will be installed to insure zero discharge.

On January 12, 2011, the RMC reviewed the procurement strategy and the plans for the release of RFPs for equipment and construction for the Supplemental WWTS. The RMC approved immediate release of the equipment RFP and the release of the construction RFP later in the spring 2011.

In January 2011, Clean Air Project management revised the project budget to include $20.2M for the supplemental WWTS. The overall project budget did not increase since Clean Air Project management utilized funds from reserve and contingency accounts. PSNH elected to manage the Supplemental WVVTS work directly under a separate PSNH Work Order. On January 20, 2011, the RMC reviewed evaluations of the equipment supply bids received from Aquatech and **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** under RFP-00014- 02011.

Discussions were held with both bidders to further clarify scope of work, schedule and guarantees; both bidders provided best and final offers.

Due to long delivery and the equipment being of foreign manufacture PSNH eliminated **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** and continued negotiations with Aquatech.

On February 3, 2011, a PO in the NTX amount of **BEGIN CONFIDENTIAL [ ] END CONFIDENTIAL** was opened with Aquatech. This included a provision for potential future options, design development and shipping as well as a contingency provision allowance.

JACOBS Consultancy

New Hampshire Clean Air Project
July 2011 Quarterly Report

Prepared For
New Hampshire Public Utilities Commission

September 20, 2011

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New Hampshire Clean Air Project
July 2011 Quarterly Report

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New Hampshire Public Utilities Commission

For Jacobs Consultancy

Frank DiPalma

September 20, 2011

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1 Executive Summary

1.1 Background and Scope

The New Hampshire Public Utilities Commission (Commission), on January 26, 2010, contracted Jacobs Consultancy (Jacobs) to monitor the progress of the Public Service of New Hampshire Clean Air Project at Merrimack Power Station. Public Service of New Hampshire (PSNH) is installing a wet scrubber at its Merrimack Power Station to comply with state environmental requirements. Completion of the New Hampshire Clean Air Project is scheduled to occur in 2012 at a recently revised cost of $430M[1].

In 2002, the State of New Hampshire passed the New Hampshire Clean Power Act to address four pollutant emissions, sulfur dioxide (SO_2), nitrogen oxide (NOx), mercury (Hg), and carbon dioxide (CO_2). In 2005, Senate Bill 128 was introduced requiring mercury emissions be reduced at the Merrimack Power Station plant to 24 pounds per year through a technology identified as activated carbon injection. In 2006, The New Hampshire Clean Power Act was amended to require reduced mercury emissions by 80 percent using wet flue-gas desulphurization technology at the Merrimack Power Station no later than July 1, 2013.

Since the inception of the Clean Power Act, PSNH had begun working with engineering firms to determine appropriate technologies to meet the regulatory requirements, eventually settling on wet flue-gas desulphurization (FGD). In order to determine preliminary costs, specifications were prepared for the required major equipment and work areas. In addition to the wet FGD system, other supporting systems or "islands," as they became to be known, were materials handling for receiving and delivery of the limestone, and handling the gypsum byproduct, a chimney for discharge of the scrubbed flue gas to the atmosphere, and effluent treatment to process the blow-down water from the FGD process.

Jacobs Consultancy's scope of work is twofold:

[1] The reduced cost estimate was due to higher productivity than estimated, lower than anticipated commodity costs, and favorable weather conditions during the major construction period in 2008 through 2010. To some extent, these savings were offset by required additions including: an enhancement to the primary waste water system, a secondary water treatment system, and the potential adjustment protection system.

1) Due diligence on completed portion of the project.
2) Monitoring of the ongoing portion of the project.

The Due Diligence Report, completed in June 2011, addressed portions of the New Hampshire Clean Air Project already completed. That report covered items such as technology selected, accuracy of estimate, cost, and schedule with major deviations noted and detailed, and PSNH project controls.

This second quarterly report covering May-July 2011 focuses on monitoring of the ongoing project and tracking progress of the scrubber project noting deviations from budget and schedule and highlighting major accomplishments. The report also reflects the results of Jacobs' on-site inspection conducted on August 17, 2011, and attendance at PSNH's quarterly project status meeting.

1.2 Conclusions

- The overall project reported to be on schedule with anticipated July 2012 completion date.
- The projected costs for the Clean Air Project were unchanged at $430 million. This cost figure includes contingency and reserve funds.
- While URS Corporation (URS) and PSNH have made efforts to improve safety, the performance remains poor.

1.3 Recommendation

- Continue the concerted effort to increase emphasis on safety.

2 Overall Project Status

In this section, we discuss the overall project status and the progress during the past quarter. We will use the planned complete and the amount budgeted versus the earned complete percentage and the amount spent to determine the project performance. We will also discuss safety performance, environmental, permitting, and any emerging issues.

2.1 Project Percent Complete

PSNH has stated the overall project was 82 percent complete as of April 2011, and 86 percent complete as of July 2011. These assessments are based on completion of the entire Clean Air Project scope. The calculation mechanism is based on direct costs and excludes contingency funds. Through on our review of the supplied documents and on-site field observations, we believe PSNH assessment of percent complete maybe on the conservative side.

The project has moved from a construction effort into the start-up effort with the majority of the major contract work now complete.

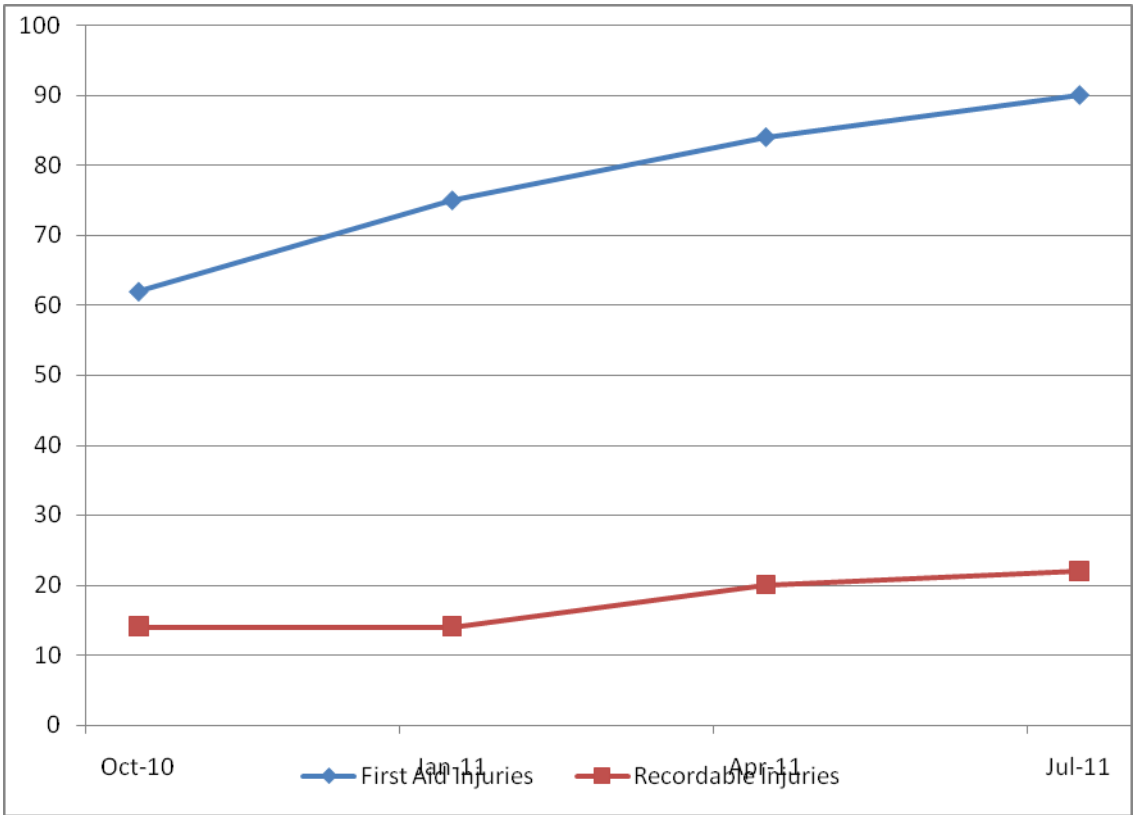
2.2 Safety

There were six first aid, two recordable injuries, and zero lost-time accidents during the last quarter as shown in Table 1 - Injuries. The project reached 1,202,527 person-hours without a lost-time accident. URS was presented their corporate recognition plaque for achieving 1,000,000 safe-work hours without a lost time injury.

Table 1 - Injuries

	Jan-11	Apr-11	July-11	Difference	Percentage Changed
First Aid Injuries	75	84	90	6	7%
Recordable Injuries	14	20	22	2	9%
Lost Time Injuries	0	0	0	0	0%

Figure 1 - Injuries Trend



- The last quarter first aid and recordable incidences accounted for seven percent of the total incidents since the beginning of the project.
- The project safety performance has continued to be poor, but has improved slightly from the last quarter. During the first two months, there were zero recordable accidents and three first-aid incidents, but in the last months, there were two recordable accidents and three first-aid injuries that occurred.
- PSNH and URS have put an emphasis on safety and now have developed the following safety initiatives:

    - Weekly management safety walkthroughs conducted with all major Clean Air Project contractors. All observations noted in the walkthroughs addressed by contractors.
    - Management Safety Steering Committee with URS, PSNH, Siemens Environmental Systems and Services, AZCO, ES Boulos, and Dearborn Midwest Conveyor Co. site management participating once per month.

- Monthly all-hands meeting with all craft to discuss safety issues, statistics, and upcoming events

2.3 Environmental and Permitting

A. Construction Permits

- Received an extension of the Temporary Air Permit, until September 30, 2012.
- Issued and received the structural and architectural building permit for the limestone truck delivery system conveyors.
- Siemens Environmental Systems and Services and Siemens Water Technologies have initiated discussions with the Bow Building Inspector to obtain Occupancy Permits for their respective buildings.
- Issued electrical building permit application for limestone truck unloading system conveyors.

3 Major Project Contracts

In this section, we discuss the project major contracts and their progress during the past quarter. All construction accomplishment performed during the past quarter will be presented in the appropriate island section. Since the project has moved from the construction phase and into the turn-over/start-up phase, we will review any outstanding item that needs to be accomplished and key project milestones.

3.1 Program Manager

URS conducted an Outage Readiness Review to assess accomplishments made by the project team regarding elements of work required to assure a successful outage. Preparation includes material procurement, work package preparation, outage infrastructure, scope definition, schedule development, and technical document completion.

The Outage Readiness Review Checklist indicated that Merrimack Units 1 and 2 Clean Air Project is 90.32 percent prepared to start the outage tie-in. During the Outage Readiness Review six items were identified as not complete and are as follows:

1. Outage duration and schedule approved.
2. Crane and rigging plan complete and coordinated with plant outage manager.
3. All risk identified — contingency plans developed.
4. Totally integrated outage schedule complete.
5. Integrated plant outage schedule published.
6. All craft specialty training completed (i.e. crane operator).

During the review, action items were recorded and are being addressed in weekly meetings to ensure outage readiness.

During this quarter the contractor was able to complete:

- Issued preliminary Site Finalization Phase 2 bid evaluation for PSNH review, secondary questions to bidders, and conducted bid review meeting.
- Issued and began review of proposals for Performance Testing Inquiry.
- Finalized the booster fan differential relay design modifications with PSNH.

- Finalized the design of the service water redundant filter and piping.
- Completed the design of the selective catalytic reduction/force draft fan limit switch interface with the Boiler Management System.

Planned activities for the next month are:

- Perform test runs on booster fans with revised CT design.
- Verify closure of Punch List items.
- Integrated Testing with complete Flue-Gas Desulfurization and Material Handling Systems.
- Continuous Emission Monitoring Systems training.

Specific item to monitor next quarter:

- None

3.2 FGD Island

During this quarter the contractor completed:

- Coating the interior of the shop fabricated tanks.
- Installation of the hold tank agitators.
- Coating the hold tank and painting the remaining tank exteriors.
- Performing system walk downs.
- Turned over six systems to start-up this month.
- Installing the valves on the fire protection risers in the stairways.
- Ball Mill motor runs.
- Ran Ball Mills empty on main motor.
- Filled the Absorber Vessel.
- Commissioned the oxidation air compressors.
- Commissioned the recycle pumps.
- Commissioned the sump pumps and agitators.
- Commissioned the Ball Mills and Reagent Prep System.
- Commissioned the vacuum pumps and belt filters.

Planned activities for the next month are:

- Complete flashing the Oxidation Air Blower Room sound attenuation panels.
- Install the Fire Water Booster Pump building foundation and set the pump.
- Complete fire proofing installation.
- Complete installing the west building wall louvers.
- Complete testing of the rotary plows.
- Achieve mechanical completion.

Specific items to monitor next quarter:

- Main areas behind schedule include FGD tanks, electrical pulls and terminations, and construction system turnovers, and preoperational checkouts.
- Siemens Environmental Systems and Services will be adding additional manpower to enhance turnaround on loop checks.

3.3 Material Handling Systems

During this quarter the contractor completed:

- Limestone storage silo exterior concrete repair.
- Loaded limestone to the storage silos from rail cars.
- Performed final integrated test on the limestone unloading system.
- Commissioning of process field bus automation communication technology to a digital control system.
- Flushed service water and air lines.

Planned activities for the next month are:

- Start to erect the limestone truck unloading system.

Specific item to monitor next quarter:

- None

3.4 Waste Water Treatment

During this quarter the contractor completed:

- The steel for the Enhanced Mercury and Arsenic Reduction System platform and placed the concrete floor slabs.
- System hydrostatic tests.
- Start to anchor the fiberglass tanks.
- Start to install agitator blades and coat them.
- Filled hydrated lime tanks and commissioned the hydrated lime system.
- Commissioned Clarifier Rakes.
- System turnover to start-up for base scope.
- The steel for the Enhanced Mercury and Arsenic Reduction System platform monorail steel and received the fiberglass tank.
- Anchoring the fiberglass tanks and installing and coating agitator blades.
- Commissioned the sumps and agitators, hydrated lime system, reaction tanks, sludge system, filters, treated waste water, and chemical feed systems.

Planned activities for the next month are:

- Prefabricate pipe, install curbs, and receive/set equipment for Enhanced Mercury and Arsenic Reduction System.
- Achieve mechanical completion.
- Continue exercising system and prepare for wet lay-up of base system.

Specific items to monitor next quarter:

- System design interface issues associated with Supplemental Wastewater Treatment System.
- Enhanced Mercury/Arsenic System completion date/start-up plan.

3.5 Ductwork and Structural Steel Erection

During this quarter the contractor completed:

- Completed insulating the dampers and expansion joints.
- Painted the block wall in the truck wash and doorframes in other areas.
- Submitted tie-in outage schedules with an option to reduce the Unit 1 tie-in schedule.

Planned activities for the next month are:

- None

Specific items to monitor next quarter:

- None

3.6 Balance of Plant Mechanical

During this quarter the contractor completed:

- Installation of the Quench Engine diesel tank overflow alarm.
- Start-up support for the booster fans with final alignment and coupling installation.
- Commissioned variable inlet vane dampers.
- Commissioned duct dampers and seal air fans.
- Installing the Quench Engine fuel and exhaust pipe.
- Installing the booster fan lube oil piping.
- The construction turnover of the truck wash, Continuous Emission Monitoring System, and Boiler Management Systems.

Planned activities for the next month are:

- None

Specific item to monitor next quarter:

- None

3.7 Balance of Plant Electrical

During this quarter the contractor completed:

- The pulling of the cables from the duct area to existing Plant Control Room.
- Released the digital control system and uninterruptible power supply in the Plant Control Room.
- Released the Continuous Emission Monitoring System equipment to start-up.
- Commissioned Damper electrical feeders.

Planned activities for the next month are:

- None

Specific item to monitor next quarter:

- None

As the project moves towards tie-in with the Merrimack units PSNH and URS, personnel are conducting system checkouts and walk downs to provide a list of items (punch list) that needs to be accomplished. The punch list is divided into categories of items based on criticality for start-up with "A" items being the most critical. As noted in the figure below, PSNH is addressing the most critical items in a timely manner.

Table 2 - Punch List as of July 31, 2011

Items	Total	Open	Last 7 Days	Last 30 Days	Total Reported	Total Verified
A	549	20	3	29	529	343
B	617	69	4	92	548	192
C	471	272	12	66	199	13
D	56	34	0	12	22	6
Total	**1693**	**395**	**19**	**199**	**1298**	**554**

While the projects missed some of their target dates in the beginning of the quarter, they have been able to make-up delays and are accomplishing milestones on or near the target date.

Table 3 - Key Project Milestones

Milestone	Responsibility	Target Date	Forecast / Actual Completion Date
Final Set Lime Slurry Storage Tanks A & B	SWT	4/26/2011	6/30/2011 A
Complete Preoperational Checkout : Absorber	SESS	5/13/2011	6/24/2011 A
Paint/ Coatings Absorber Hold Tanks CBI	SESS	5/16/2011	6/16/2011 A
Initial Ops. Testing ABS: Absorber	SESS	5/24/2011	6/24/2011 A
Flush Low/High Pressure Lube Oil System - A	SESS	5/20/2011	6/27/2011 A
A & B Limestone Feed Available To Day Silos	SESS	6/15/2011	6/21/2011 A
Apply Clarifier Coatings	SWT	4/25/2011	6/17/2011 A
Complete Cable Pulls and Terms for Building Equipment	SESS	4/8/2011	7/11/2011 A
Mechanical Completion - Service Water	SWT	4/29/2011	7/28/2011 A
P re-Commissioning complete and ready for testing	SESS	6/112011	7/15/2011 A
WWT Island Mechanical Completion	SWT	6/1/2011	8/1/2011
Final Set Sludge Tanks	SWT	7/812011	7/13/2011 A
A & B Limestone Feed to Ball Mill	SESS	7/11/2011	7/212011 A
Mercury/Arsenic reduction Vessels - Fabrication	SWT	71142011	7/14/2011 A
A & B Ball Mill Test Run In (with 30% ball charge)	SESS	7114/2011	7113/2011 A
Mechanical Completion - Lime Slurry Feed	SWT	7/15/2011	7/26/2011 A
A & B Test/Run Dewatering System	SESS	7/25/2011	7/26/2011 A
A:& B Install Filter Cloth on Vacuum filters	SESS	7/27/2011	9/13/2011
Drain Absorber Vessel	SESS	7/28/2011	8/4/2011
FGD Island Mechanical Completion	SWT	7/2842011	81412011
DCS FAT Support at Emerson	SWT	8/1312011	8/19/2011
Fire Pump Start Up & Testing	SESS	8/23/2011	8/23/2011
Complete Integrated toting	URS	8/31/2011	8/31/2011
MK-1 Tie-In Outage Start	PSNH	9/6/2011	9/6/2011
MK-1 Electrical Tie-In complete	ESB	9/14/2011	9/14/2011
MK-1 Ductwork Tie-In complete	AZCO/MIS	9/24/2011	9/24/2011
MK -2 Tie-In Outage Start	PSNH	10/13/2011	10/13/2011
MK-2 Unit Electrical Tie-In complete	ESB	10/26/2011	10/26/2011
MK-2 Unit Ductwork Tie-In complete	AZCO/MIS	11/3/2011	11/3/2011
Complete MK1 Tie-in CEM Performance tests	URS	11/4/2011	11/4/2011
EMARS Mechanical Completion	SWT	11/30/2011	11/23/2011
Complete MK2 Tie-in CEM Performance tests	URS	12/5/2011	12/52011
Perform U1 & U2 FGD Performance Test	SESS	1/20/2012	1/20/2012
Perform VVWT Performance Test	SWT	3/13/2012	3/13/2012
PROJECT COMPLETE	URS	4/1/2012	4/1/2012

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1.2 Conclusion

- Safety performance remains poor and a concerted effort to increase emphasis on safety should be initiated.
- The overall project is reported to be on schedule with anticipated July 2012 completion date.
- All of the major contracts report, except for the wastewater treatment and the balance of plant electrical, have an earned complete of over 90 percent.
- The projected costs for the Clean Air Project were unchanged at $430 million. This cost figure includes contingency and reserve funds.

1.3 Recommendation

- Place additional experienced safety professionals, one dedicated to each of the four major islands, working closely with the contractors to keep the emphasis on employees to finish the project safely.

2 Overall Project Status

In this section, we discuss the overall project status and the progress during the past quarter. We will use the planned complete and the amount budgeted versus the earned complete percentage and the amount spent, to determine the project performance. We will also discuss safety performance, environmental, permitting and any emerging issues.

2.1 Project Percent Complete

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The project is moving from a construction effort into the start-up effort with the majority of the major contract work complete.

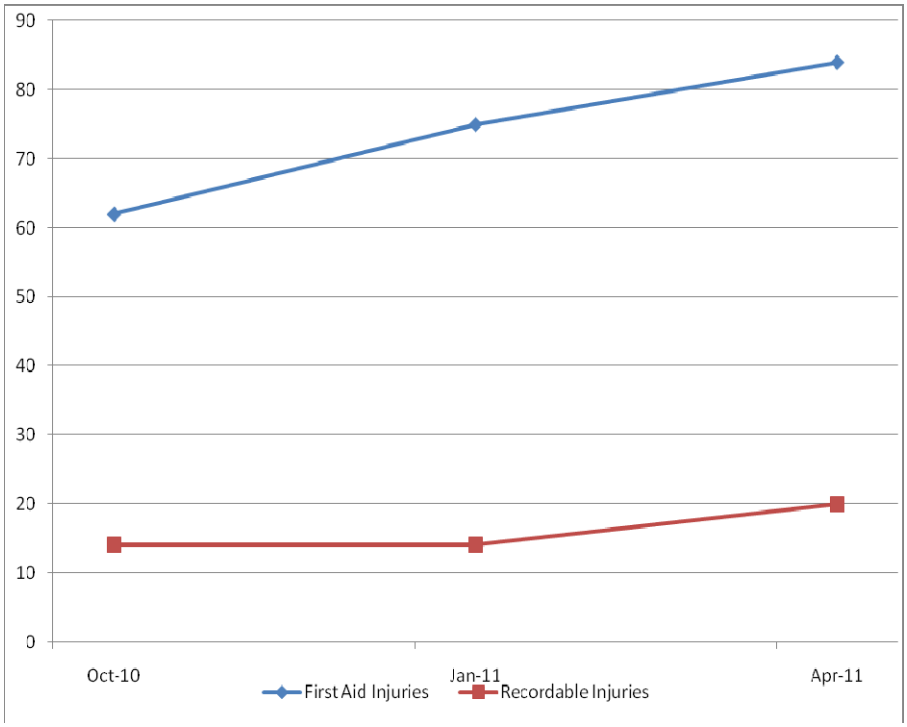
2.2 Safety

There were nine first aid-six recordable injuries, and zero lost-time accidents during the last quarter (refer to Table 1 Injuries). The project reached 1,098,030 person-hours without a lost time accident. PSNH and URS were presented recognition plaques for achieving 1,000,000 safe work hours without a Lost Time Injury by Old Republic Insurance.

Table 1 Injuries

	Jan-11	Apr-11	Difference	Percentage Changed
First Aid Injuries	75	84	9	11%
Recordable Injuries	14	20	6	30%
Lost Time Injuries	0	0	0	0%

Figure 1 Injuries Trend



- The last quarter first aid and recordable incidences accounted for 14 percent of the total incidents since the beginning of the project.
- The project safety performance has continued to be poor. The last quarter safety results were actually worse than the previous, which is both disturbing and unexpected (refer to Figure 1 Injuries Trend). The major construction efforts have passed and the on-site staff is steadily decreasing yet, recordable incidents are increasing. The last stages of a project are normally when there must be a concerted effort to maintain emphasis on safety. The workers, for the most part, have been on the project a long time and often get in a hurry to finish and move on so management must continue repeating the safety theme. There needs to be a renewed safety emphasis for the remainder of the project.
- As Jacobs stated in the Due Diligence Report, when there is a relatively high level of recordable incidents, there is an indication of laxity towards safety and eventually there will be an incident resulting in a serious injury. The last quarter results point even more so towards this possibility.
- Jacobs recommends placing additional experienced safety professionals, one dedicated to each of the four major islands, working closely with the contractors to keep the

pressure on the employees to finish the project safely.

2.3 Environmental and Permitting

A. Bow Planning Board

- Received planning board approval for the Limestone Truck Delivery Facility architectural and aesthetic standards.

B. Construction Permits

- Received building permit for the Limestone Truck Delivery Facility foundations.
- Received code review approval for the proposed firewater booster pump electrical power supply configuration.

3 Major Project Contracts

In this section, we discuss the project major contracts and their progress during the past quarter. We will use the planned complete percentage versus the earned complete percentage to determine the performance status of each contract. [2]

3.1 Program Manager

URS Corporation reported their portion of the overall project, including engineering and procurement services, has a planned percent complete of 96.4 and an earned percent completed of 95, which was an increase of two percent and three percent respectively over the previous quarter (refer to Figure 2 Program Manager Overall Project Completion). The overall construction progress has a reported planned percent complete of 93.4 and an earned percent completed of 91, which was an increase of four percent and five percent, respectively over the previous quarter (refer to Figure 2 Program Manager Overall Construction Performance).

[2] The planned complete is the amount that is budgeted for the time period and the earned complete is the amount actually spent for the same time period.

Figure 2 Program Manager Overall Project Completion

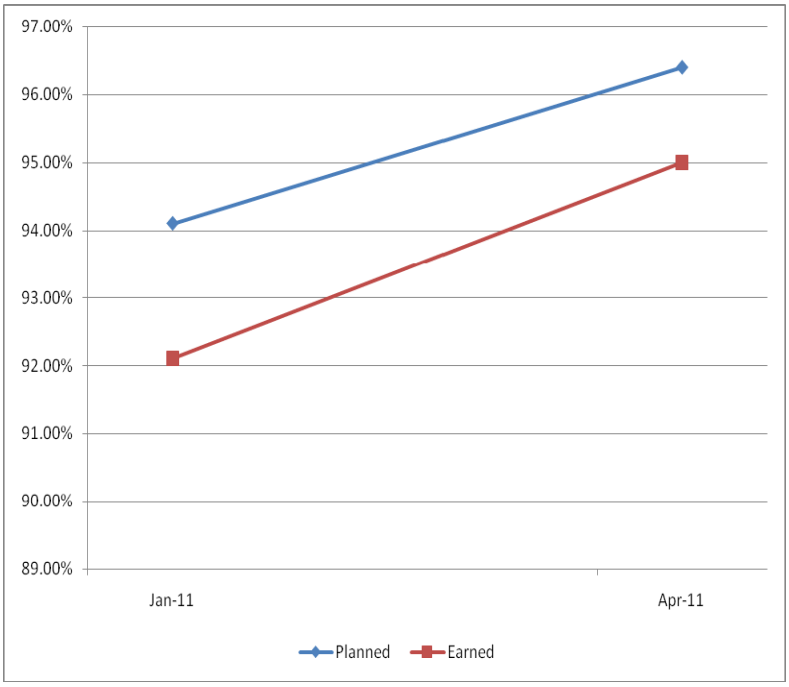
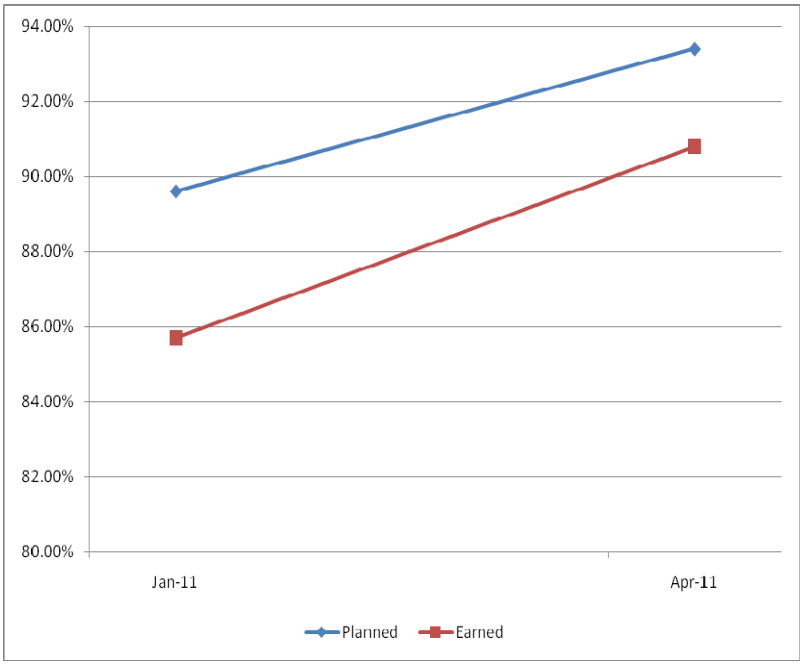


Figure 3 Program Manager Overall Construction Performance



During this quarter the contractor was able to complete:

- Issued the Site Finalization Phase 2 inquiry package for final PSNH review prior to RFP issue.
- Awarded the Limestone Truck Delivery Facility foundations contract and issued a notice to proceed for construction.
- Finalized calcium and magnesium concentrations in waste stream and reviewed compressed air supply in support of Supplemental Wastewater Treatment design.
- Used Merrimack Unit 1 and Unit 2 outage period for final walk down of existing plant electrical interface for Distributed Control System, Burner Management System and Continuous Emissions Monitoring System wiring terminations.
- Awarded Distributed Control System package to Emerson for the Enhanced Mercury and Arsenic Wastewater Treatment System.
- Issued design requirements to start-up for the Limestone Truck Delivery Facility system Distributed Control System data-link interface.
- Issued final Continuous Emissions Monitoring System Monitoring Plan, Relative Accuracy Test Audit Protocol and disposition of prior New Hampshire Department of Environmental Services comments to PSNH for formal submittal to New Hampshire Department of Environmental Services.

Planned activities for the next month are:

- Coordinate and support start-up activities between the island contractors.
- Assist in walk downs of island contractors' turnover packages.
- Assist Siemens Environmental Systems and Services with the filling of the absorber vessel.
- Bump and run miscellaneous motors and equipment for Siemens Environmental Systems and Services.
- Assist Siemens-Water Treatment with coordination of turnovers.

- Bump and run booster fan motors.
- Issue system turnover to PSNH schedule.
- Complete Material Handling Operator and Maintenance Training Program in May.

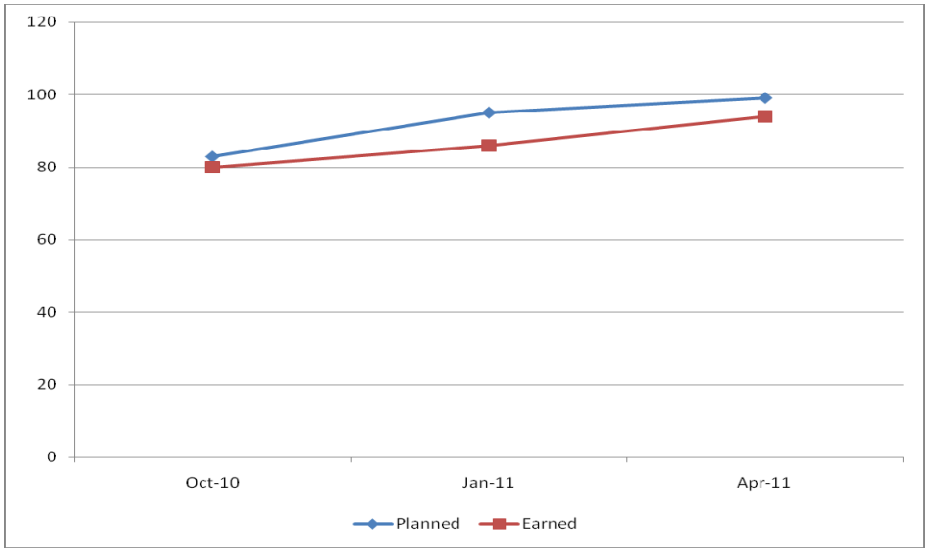
Specific item to monitor next quarter:

- Siemens Environmental Systems and Services Pre-Operational checkout schedule.

3.2 FGD Island

The contractor, Siemens, reported their portion of the overall project has a planned percent complete of 99 and an earned percent completed of 94, which was an increase of four percent and nine percent, respectively over the previous quarter (refer to Figure 4 FGD Performance).

Figure 4 FGD Performance



During this quarter the contractor completed:

- Installing structural steel around the field erected tanks.
- Installing roofing and siding around the field erected tanks.
- Installing the absorber awning.
- Testing and blow downs of the instrument air system.

Planned activities for the next month are:

- Complete cleaning absorber and fill.
- Continue internal coating installation of the Absorber Hold Tank and start external painting.
- Complete installing piping in all areas.
- Continue to walk down systems for Construction Turn Over. Sixteen are forecasted for May.
- Complete 12 systems operational testing in May.

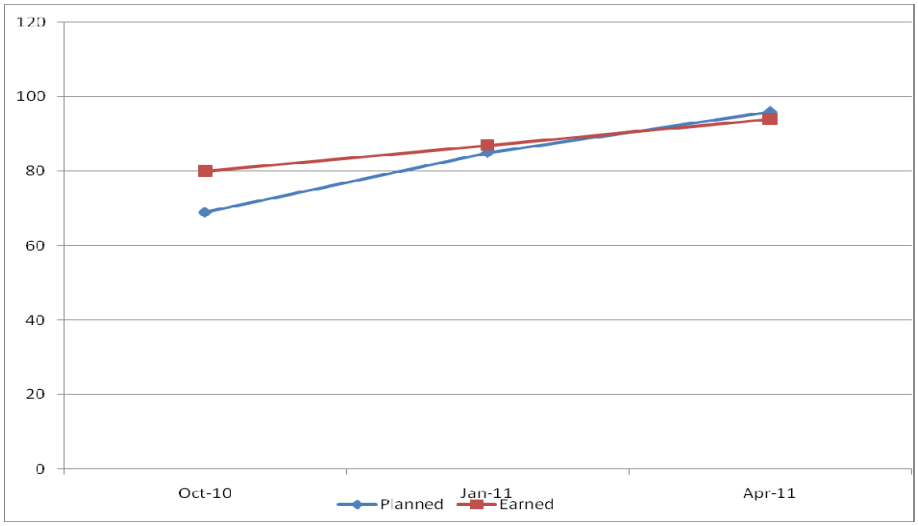
Specific items to monitor next quarter:

- Main areas behind schedule include FGD tanks, electrical pulls and terminations, and construction system turnovers, and preoperational checkouts.
- Siemens Environmental Systems and Services will be adding additional manpower to enhance turnaround on loop checks.

3.3 Material Handling Systems

The contractor, Dearborn Midwest, reported their portion of the overall project has a planned percent complete of 96 and an earned percent completed of 94, which was an increase of eleven percent and seven percent, respectively over the previous quarter (refer to Figure 5 Material Handling Performance).

Figure 5 Material Handling Performance



During this quarter the contractor completed:

- Installing teepees and setting shelving and convey or frames in both Limestone Silos.
- Terminating cable from the Gypsum Storage Building and L-5 conveyor to the FGD electrical room.
- Installing the rotary plows for both conveyors and aligning them to the shelving.
- Installing conduit for conveyors 3A and 3B.
- Pulling cable to Transfer Tower #1 Motor Control Center.

Planned activities for the next month are:

- Complete running miscellaneous conveyor equipment without material.
- Complete punch listing of the Limestone Silo concrete work.
- Run in the rotary plows.
- Perform integrated test for conveyor operation.

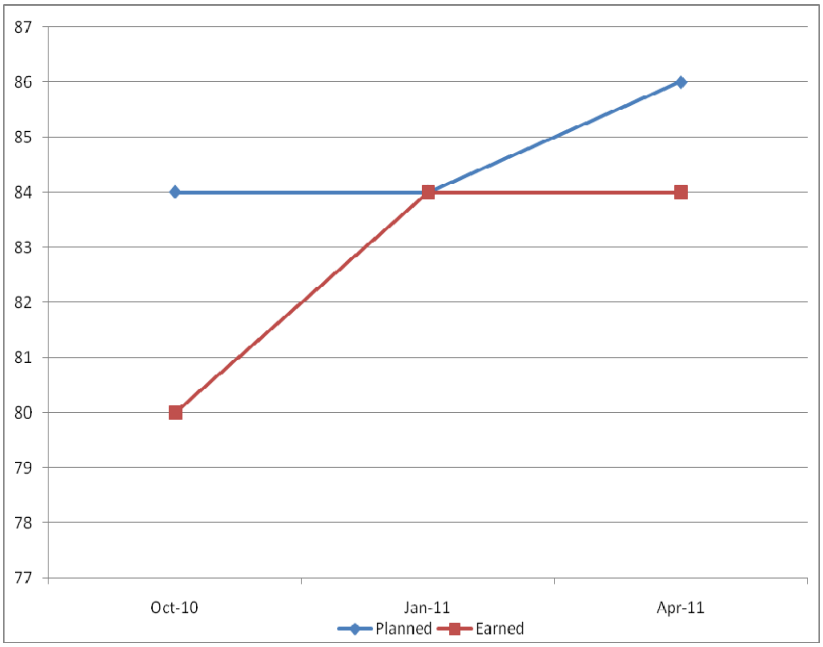
Specific item to monitor next quarter:

- Resolve final offer for the premature deteriorating paint finish of conveyor idlers.

3.4 Waste Water Treatment

The contractors, Siemens-Water Technology and Northern Peabody, reported their portion of the overall project has a planned percent complete of 86 and an earned percent completed of 84, which was an increase of two percent and zero percent, respectively over the previous quarter (refer to Figure 6 Wastewater Treatment Performance).

Figure 6 Waste Water Treatment Performance



During this quarter the contractor completed:

- Instrument Air System

Planned activities for the next month are:

- Complete remaining system walk downs.
- Continue start-up of systems with water.
- Complete all system related work.

Specific items to monitor next quarter:

- System design interface issues associated with Supplemental Wastewater Treatment

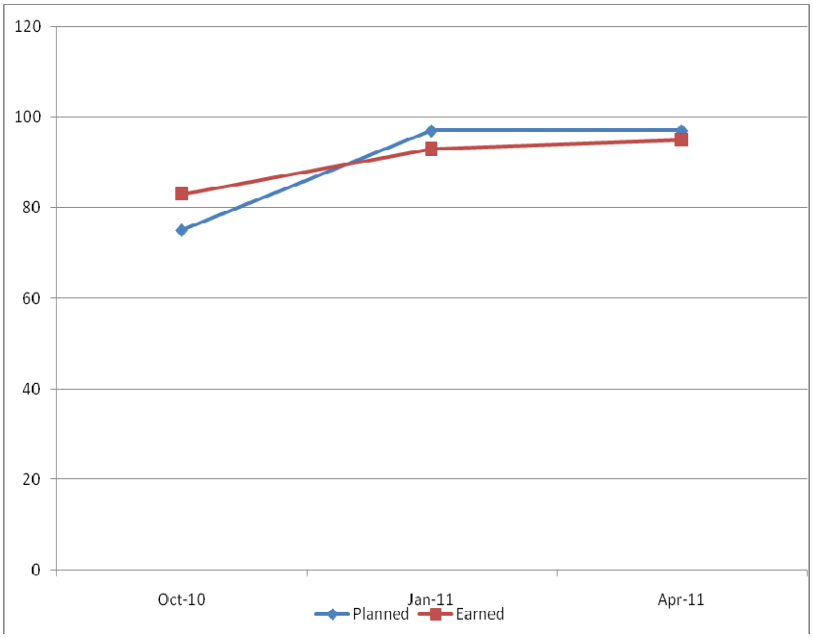
System.

- Enhanced Mercury/Arsenic System completion date/start-up plan.

3.5 Ductwork and Structural Steel Erection

The contractor, Merrill Iron and Steel Inc., reported their portion of the overall project has a planned percent complete of 97 and an earned percent completed of 95, which was an increase of zero percent and two percent, respectively over the previous quarter (referred to figure 7 Ductwork and Structural Steel Performance).

Figure 7 Ductwork and Structural Steel Performance



During this quarter the contractor completed:

- Erecting the truck wash building block wall, dry wall, and fireproofing.
- Booster fan utility bridge steel.
- Installing siding on the booster fan enclosure.
- Installing roofing on the booster fan enclosure.
- Installing fans and louvers on remaining buildings.

Planned activities for the next month are:

- Complete siding and roofing punch list items.
- Complete the Truck Wash building painting.
- Complete insulating the ductwork and expansion joints.
- Demobilize from site until U1 tie-in outage pre-work scope.

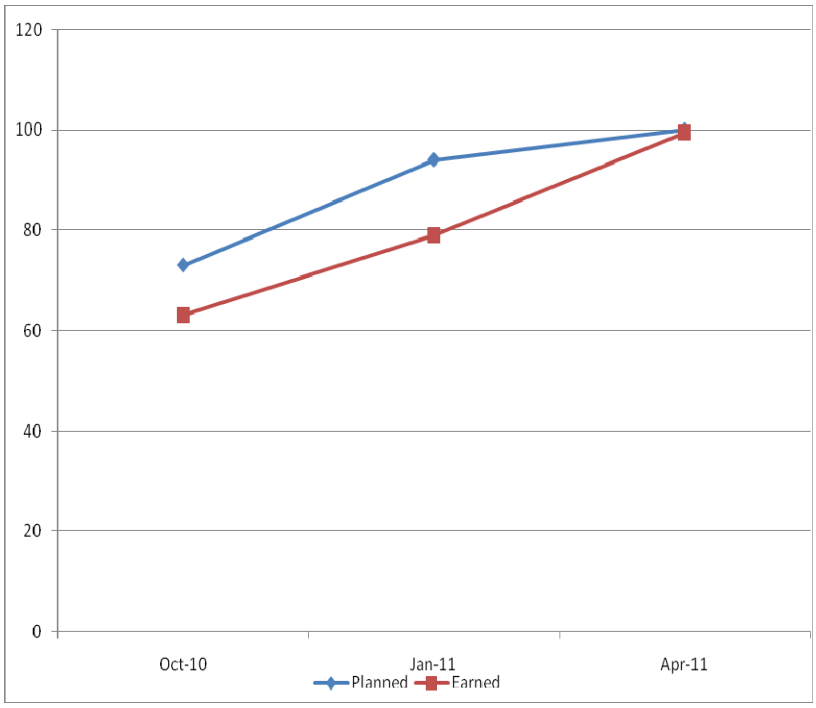
Specific items to monitor next quarter:

- Continue to refine the tie-in outage schedules for the Unit 1 and 2 Fall outages.
- Complete building architectural and heating, ventilation, and air conditioning work.

3.6 Balance of Plant Mechanical

The contractor, AZCO Inc., reported their portion of the overall project has a planned percent complete of 100 and an earned percent complete of 99.5, which was an increase of 6 percent and 21 percent, respectively over the previous quarter (refer to Figure 8 Balance of Plant Mechanical Performance).

Figure 8 Balance of Plant Mechanical Performance



During this quarter the contractor completed:

- Installing the booster fan lube oil piping.
- Flushing the booster fan lube oil piping and released the Construction turnover.
- Installing the air filter for the FGD building system.
- Installing the acid and caustic unloading station with safety shower at the existing plant.
- Pipe installation to the Truck Wash equipment.
- Installing and testing the quench-water pipe.
- Installing instrument air in the booster fan area.

Planned activities for the next month are:

- Continue Turnover of Truck Wash equipment.
- Complete installation of the Quench System associated piping.
- Complete Turnover of the Quench and Instrument Air Systems.

Specific item to monitor next quarter:

- Complete the Construction Turnover of the booster fans.

3.7 Balance of Plant Electrical

The contractor, E. S. Boulos Co., reported their portion of the overall project has a planned percent complete of 98 and an earned percent completed of 88, which was an increase of 14 percent and 18 percent, respectively over the previous quarter (refer to Figure 9 Balance of Plant Electrical Performance).

Figure 9 Balance of Plant Electrical Performance

During this quarter the contractor completed:

- Installing cable tray in the booster fan enclosure and utility bridge.
- Installing conduit and tray from the plant control room to the duct support steel and in the fan enclosure.
- Cable pulls and terminations for the booster fans.

Planned activities for the next month are:

- Complete all work to the booster fans.
- Continue to pull cable from the FGD to the existing Unit 1 and 2 equipment and control room.
- Remove the scaffolding in the Electrical Equipment room at Elevation 232.

Specific item to monitor next quarter:

- Installation of cable to support booster fan April Construction Turnover (CTO)

3.8 SECONDARY WASTE WATER TREATMENT

The Secondary Wastewater Treatment System was felt necessary by PSNH as a result of EPA actions concerning the timeliness of the NPDES Permit process. The installation of the Secondary Wastewater Treatment System will reduce the volume of the liquid waste to a manageable 0-5 gpm; and potentially has a beneficial re-use for fly-ash dust control or in other station processes.

A team of PSNH, Burns and McDonald, CAP Engineering, NU Purchasing and Legal was formed to obtain specifications and cost information. So far, PSNH has accomplished:

- Obtained competitive equipment pricing.
- Released engineering and long lead-time materials in early January 2011 once vendor selection and firm pricing were available.
- Developed a schedule to seek an in service date of late 2011 to support start-up.

Jacobs will initiate monitoring this addition to plant in subsequent quarterly reports.

JACOBS Consultancy

New Hampshire Clean Air Project
October 2011 Quarterly Report

Prepared For
New Hampshire Public Utilities Commission

December 22, 2011

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New Hampshire Public Utilities Commission

For Jacobs Consultancy

Frank DiPalma

December 22, 2011

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1 Executive Summary

1.1 Background and Scope

The New Hampshire Public Utilities Commission (Commission), on January 26, 2010, contracted Jacobs Consultancy (Jacobs) to monitor the progress of the Public Service of New Hampshire (PSNH) Clean Air Project at Merrimack Power Station. PSNH is installing a wet scrubber at its Merrimack Power Station to comply with state environmental requirements. The forecast project completion cost was originally $457M. In the fall of 2010, this forecast cost was revised downward to $430M. As of September 30, 2011, the project forecast cost was further revised downward to $422M. Completion of the PSNH Clean Air Project is scheduled to occur in 2012 at a recently revised cost of $422M[1].

In 2002, the State of New Hampshire passed the New Hampshire Clean Power Act to address four pollutant emissions, sulfur dioxide (SO_2), nitrogen oxide (NOx), mercury (Hg), and carbon dioxide (CO_2). In 2005, Senate Bill 128 was introduced requiring mercury emissions be reduced at the Merrimack Power Station plant to 24 pounds per year through a technology identified as activated carbon injection. In 2006, The New Hampshire Clean Power Act was amended to require reduced mercury emissions by 80 percent using wet flue-gas desulphurization technology at the Merrimack Power Station no later than July 1, 2013.

Since the inception of the Clean Power Act, PSNH had begun working with engineering firms to determine appropriate technologies to meet the regulatory requirements, eventually settling on wet flue-gas desulphurization (FGD). In order to determine preliminary costs, specifications were prepared for the required major equipment and work areas. In addition to the wet FGD system, other supporting systems or “islands,” as they became to be known, were materials handling for receiving and delivery of the limestone, and handling the gypsum byproduct, a chimney for discharge of the scrubbed flue gas to the atmosphere, and effluent treatment to process the blow-down water from the FGD process.

[1] The reduced cost estimate was due to higher productivity than estimated, lower than anticipated commodity costs, and favorable weather conditions during the major construction period in 2008 through 2010. To some extent, these savings were offset by required additions including: an enhancement to the primary waste water system, a secondary water treatment system, the electrical potential adjustment protection system for the scrubber absorber vessel, and the booster fans recirculation systems.

Jacobs Consultancy's scope of work is twofold:

1) Due diligence on completed portion of the project.
2) Monitoring of the ongoing portion of the project.

The Due Diligence Report, completed in June 2011, addressed portions of the PSNH Clean Air Project already completed. That report covered items such as technology selected, accuracy of estimate, cost, and schedule with major deviations noted and detailed, and PSNH project controls.

This third quarterly report covering August-October 2011 focuses on monitoring of the ongoing project and tracking progress of the scrubber project noting deviations from budget and schedule and highlighting major accomplishments. The report also reflects the results of Jacobs' on-site inspection conducted on November 16, 2011, and attendance at PSNH's quarterly project status meeting.

1.2 SUMMARY OF PROJECT'S IN-SERVICE STATUS

- Unit 1 initiated a very successful start-up on Saturday, September 24, 2011. Concurrently, the Clean Air Project systems were prepared for operations. At 3:18PM on Sunday, September 25, 2011, the unit was phased on-line, was providing power to the grid, and was released to the Independent System Operator-New England (ISO-NE) for dispatch. At about 10:00 PM on Sunday, the unit obtained full load operations.
- Upon scrubber start-up, the flue gas from Unit 1 was passed through the absorber vessel where it came into contact with the limestone reagent slurry. This contact provided means for a chemical reaction between the limestone reagent and the emissions compounds in the flue gas, specifically the sulfur, producing calcium sulfate, which is synthetic gypsum. The synthetic gypsum has commercial value, most notably as raw material for the filler in wall board, and will be sold.
- The new Continuous Emissions Monitoring (CEM) system indicated the scrubber was achieving initial SO_2 reductions of 90% or higher with Unit 1 on-line.
- As noted in Revised Statutes Annotated (RSA) 125-O:15, the statutory mandate the required the installation of the scrubber to reduce mercury emissions, the mercury

quantities in the units' emissions are so small that the measurement tools that have been presently developed as part of the CEM systems are not capable of reliably providing accurate, repeatable results. Presently, pursuant to RSA 125-O:15, the mercury emissions are to be determined by manual stack testing. This testing is planned to be performed in late 2011.

- Following two days of observation and successful operation the scrubber system was officially deemed to be in-service and "used and useful in the generation of electricity" on September 28, 2011.
- Unit 2 was undergoing an outage for tie-in purposes at the end of October and was to be tied to the scrubber in mid-November. (Note – as of the quarterly review meeting on November 16, Unit 2 was tied-in to the scrubber and fully operational)

1.3 CONCLUSIONS

- The overall project is reported to be on schedule with anticipated July 2012 completion date. Based on the very successful, early start-up of both units to the scrubber systems, the Clean Air Project should most definitely meet this start-up date.
- The projected costs for the Clean Air Project were revised downward to $422 million on September 30, 2011. This cost figure includes contingency and reserve funds.
- URS Corporation (URS) and PSNH have made efforts to improve safety; however the overall project safety performance has been less than favorable. For the most recent quarter, there were fewer safety incidences than in previous quarters, but one has to wonder if this is due to increased safety awareness or fewer craft personnel on the site.

1.4 RECOMMENDATION

- Continue the concerted effort to increase emphasis on safety. Project close out is typically a time when personnel lose focus on safety and become more focused on leaving the site. Increased vigilance is in order through the complete close out of the project.

2 Overall Project Status

In this section, we discuss the overall project status and the progress during the past quarter. We will use the planned complete and the amount budgeted versus the earned complete

percentage and the amount spent to determine the project performance. We will also discuss safety performance, environmental, permitting, and any emerging issues.

2.1 Project Percent Complete

PSNH has stated the overall project was 86 percent complete as of July 2011, and 89.5 percent complete as of October 2011. These assessments are based on completion of the entire Clean Air Project scope. The calculation mechanism is based on direct costs and excludes contingency funds. Through on our review of the supplied documents and on-site field observations, we believe PSNH assessment of percent complete maybe on the conservative side.

The project has moved from a check out and start-up effort to an operational one. The majority of the major contract work, other than the secondary waste water facility, is now complete with punch list items remaining.

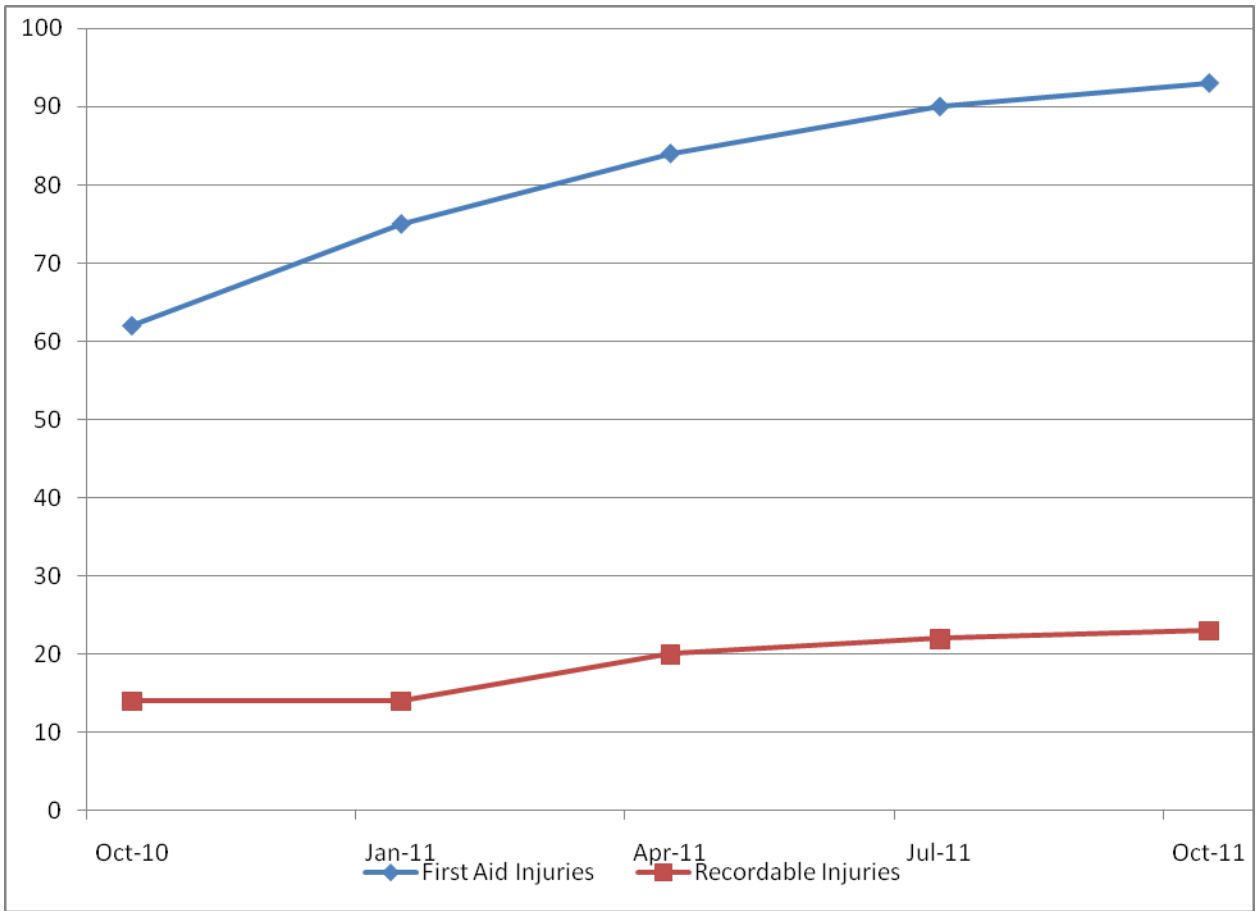
2.2 Safety

Table 1 - Injuries shows the cumulative first aid injuries, recordable injuries, and lost time accidents since project inception. Between July and October 2011, there were three first aid injuries and one recordable injury, and zero lost-time accidents. The project has reached 1,277, 831 person-hours without a lost-time accident.

Table 1 - Injuries

	Jan-11	Apr-11	July-11	October-11	Difference	Percentage Changed
First Aid Injuries	75	84	90	93	3	3%
Recordable Injuries	14	20	22	23	1	4%
Lost Time Injuries	0	0	0	0	0	0%

Figure 1 - Injuries - Since Project Inception



- The last quarter first aid and recordable incidences accounted for three percent of the total incidents since the beginning of the project.
- The project safety performance has been poor, but has improved slightly as the project comes to a close. Hopefully, the drop in injuries is attributable to the increased effort by all involved. However, some of the improvement comes from a rapidly decreasing work force.

2.3 Environmental and Permitting

A. Environmental

- During November, the CEM systems will have a Relative Accuracy Test Audit (RATA)
- Beginning in December, the scrubber system will have an extensive performance test

performed

B. Construction Permits

- Working with the Town of Bow Planning Board for a building permit for the Soda Ash Silo installation
- Dearborn Midwest Conveyor Co., the Materials Handling System supplier, has resubmitted the electrical building permit application for the limestone truck unloading system conveyors to address the 3rd party review comments.

3 Major Project Contracts

In this section, we discuss the project major contracts and their progress during the past quarter. All construction accomplishment performed during the past quarter will be presented in the appropriate island section. Since the project has moved from the construction phase and into the turn-over/start-up phase, we will review any outstanding items that need to be accomplished and key project milestones.

3.1 Program Manager

URS activity for the past quarter has been centered on supporting the check out and start-up functions. The activities were:

- Continued working on plant system turnover packages in support of operations
- Coordinated tie-in sequencing
- Continued working with PSNH and other contractors on resolving the punch list items
- Met with New Hampshire Department of Environmental Services to review CEM systems RATA protocol
- Prepared design for the installation of recirculation ductwork and dampers around the booster fans
- Performed review of vendor submittals for the water softening scope for the Wastewater Treatment System in support of the Secondary Wastewater Treatment System
- Continued investigation of the service water system operation and development of potential modifications to enhance operation
- Supported PSNH in review and analysis of operating the scrubber at 12,000 ppm Chlorine

Planned activities for the next month are:

- Continue submitting system turnover packages to PSNH
- Continue to work with island contractors to resolve punch list items
- Continue engineering support for the installation completion of the recirculation ductwork and dampers for the booster fans
- Assist in sizing the seal air fan for the mansafe dampers at the booster fans
- Provide support as needed for the truckwash commissioning
- Develop recommendations on limiting service water system pressure
- Support scrubber system performance testing which is schedule to being in late 2011

Specific item to monitor next quarter:

- None

3.2 FGD Island

During this quarter the contractor completed:

- Achieved mechanical completion of the scrubber system
- Received occupancy permits for the scrubber buildings
- Very successfully began operation of the scrubber system
- Worked on punch list items and performed painting and clean up of the scrubber building
- Completed the installation of the filter presses and produced gypsum
- Completed fireproofing in the scrubber building

Planned activities for the next month are:

- Work to complete the punchlist
- Continue painting and building clean up
- Tune the scrubber system equipment for two unit operation
- Support the RATA test
- Participate in the system performance tests

Specific items to monitor next quarter:

- None

3.3 Material Handling Systems

During this quarter the contractor completed:

- The Material Handling System was put into operation and supplied the limestone to the scrubber system
- There was some level of difficulty in the operation of the feeders that remove the limestone from the silos
- Completed installation of the truck unloading feeder

Planned activities for the next month are:

- Perform an evaluation and possible testing of the silo unloading systems to determine the source of the feed operation problems
- Develop a plan and recommendations for possible modifications to the silo unloading feeders

Specific item to monitor next quarter:

- The evaluation of the silo unloaders and recommendations for modifications

3.4 Waste Water Treatment

During this quarter the contractor completed:

- Received occupancy permit for building
- Completed construction testing of the Enhanced Mercury and Arsenic Reduction System (EMARS) piping systems
- Performed checkout of the EMARS
- Began flowing water through the system
- Began installation of the Soda Ash Silo foundation

Planned activities for the next month are:

- Complete the installation of the Soda Ash system
- Operate the base water treatment system
- Complete commissioning the EMARS

Specific items to monitor next quarter:

- Continue evaluating and determining system design interface issues associated with Supplemental Wastewater Treatment System.

3.5 SECONDARY WASTEWATER TREATMENT

During this quarter, the contractor completed:

- Continued construction of the Secondary Wastewater Treatment System

Planned activities for the next month:

- Continue construction of the system
- Prepare check out and start up activities
- Continue coordination efforts and interface issues with the base Wastewater Treatment System

3.6 Ductwork and Structural Steel Erection

During this quarter the contractor completed:

- Completed installation of ductwork and performed tie-in of Unit 1 with the scrubber
- Worked on installing the recirculation ductwork and dampers for the booster fans

Planned activities for the next month are:

- Complete tie-in of Unit 2 to the scrubber
- Continue installation of the booster fan recirculation systems

Specific items to monitor next quarter:

- None

3.7 Balance of Plant Mechanical

During this quarter the contractor completed:

- Operation of the booster fans - There is a need to improve control response of the booster fans. PSNH stated this was identified as a potential issue early on in the project and it was determined to wait and see if the control actually was an issue at start-up. It has become an issue. Subsequently, it was decided to install recirculation systems of the fans, consisting of ductwork and dampers. This alternative was selected in lieu of installing more expensive Variable Frequency Drives (VFD) to the fan motors which would result in variable speed operation. While more expensive, the VFD system is a more efficient system
- Truck scale foundation was completed
- Trench modifications were completed near the ammonia tank farm and begun near the truck wash

Planned activities for the next month are:

- Complete the asphalt roads
- Continue truck scale foundation
- Complete installation of a redundant service water strainer
- Commission the truck wash system

Specific item to monitor next quarter:

- None

3.8 Balance of Plant Electrical

During this quarter the contractor completed:

- Completed Unit 2 tie-in work

Planned activities for the next month are:

- Complete cable tray covers and building seal work

Specific item to monitor next quarter:

- None

As the project moves towards tie-in with the Merrimack units, PSNH and URS personnel are conducting system checkouts and walk downs to provide a list of items (punch list) that need to be accomplished. The punch list is divided into categories of items based on criticality for start-up with "A" items being the most critical. As noted in Table 2 below, PSNH is addressing the most critical items in a timely manner.

Table 2 - Punch List as of October 31, 2011

Items	Total	Open	Closed Last 7 Days	Closed Last 30 Days	Total Reported	Total Verified
A	589	13	4	41	576	531
B	690	50	21	35	640	578
C	535	68	13	35	476	300
D	54	32	1	1	22	20
Total	**1868**	**163**	**29**	**112**	**1705**	**1429**

- While some target dates were missed in the beginning of the quarter, they have been able to make-up delays and are accomplishing milestones on or near the target date. As of quarterly review meeting, the punch list consisted of 0 Category A items and 7 Category B items.

Table 3 - Key Project Milestones

Milestone	Responsibility	Target Date	Forecast / Actual Completion Date
MK-2 Tie-In Outage Start	PSNH	10/13/2011	10/12/2011 A
MK-2 Unit Electrical Tie-In complete	ESB	10/26/2011	10/26/2011 A
MK-2 Unit Ductwork Tie-In complete	AZCO/MIS	11/3/2011	11/8/2011
U1 Booster fan recirculation work complete	AZCO/MIS	11/10/2011	11/9/2011
U1 Booster fan recirculation work complete	AZCO/MIS	11/10/2011	11/9/2011
MK-1 Cold Air Fan testing	URS	11/11/2011	11/10/2011
MK-2 Cold Air Fan testing	URS	11/12/2011	11/12/2011
Complete MK1 Tie-in RATA testing	URS	11/4/2011	11/15/2011
EMARS Mechanical Completion	SWT	11/30/2011	11/23/2011
Complete MK2 Tie-in CEM Performance	URS	12/5/2011	12/5/2011
Perform U1 & U2 FGD Performance Test	SESS	1/20/2012	12/12/2011
Perform WWT Performance Test	SWT	3/13/2012	3/13/2012

WWT Island Substantial Completion	URS	4/1/2012	4/1/2012