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N.H.P.U.C. Case No.	DE 11-250
Exhibit No.	28
Witness	William H. Smagula
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Clean Air Project

Development of Costs associated with
a CAP Cancellation Scenario

An analysis was performed to identify the total cost exposure in the event that the Clean Air Project was cancelled at any given month from Project inception to in-service.

March 28, 2014

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Part I: Overview

Objective

Testimony filed in Docket DE 11-250 has prompted PSNH to provide the following analysis and forecast of Clean Air Project (CAP) Cancellation costs. The Company recognized a detailed estimate of cost exposure at key points throughout the Project would be valuable information to develop. As this exercise requires extensive knowledge of CAP and experience in project management, the Company, along with the Project's Program Manager, URS, is the only party with the first-hand knowledge and experience to provide such an analysis.

Approach

Developing exposure costs associated with cancellation of a multi-year, large scale project is complex. The structure of the contract, construction schedule, payment schedule, engineering, design, long lead material procurement, fabrication, shop testing, and delivery were some of the factors considered. A detailed discussion of the methodology implemented is included in Part II.

To accurately assess this Project cancellation scenario, costs were developed per the *Contract Termination* provision, defined in all of the major Clean Air Project agreements. As a reference, the following is the applicable *Contract Termination* language, excerpted from the Waste Water Treatment System Agreement signed with Siemens Water Technologies and Northern Peabody on December 5, 2008.

(b) In the event of a termination for convenience under this Section 16.2, as full and final compensation for Contractor's services hereunder, Owner shall pay to Contractor, upon Contractor's satisfaction of all Agreement requirements, as applicable, with particular attention to the requirements, terms, conditions, and provisions of this Section 16.2, the sum of:

(i) payment for Work completed or partially completed through the effective date of termination, less amounts previously paid to Contractor; plus

(ii) Reimbursement of costs and expenses paid to Subcontractors resulting from an orderly termination of the Work, including costs and expenses of unused materials, equipment, tools, construction equipment and machinery, warehousing, cancellation and restocking charges, engineering and other services for which Owner has agreed to compensate Contractor under this Agreement to the extent that (i) such services have been rendered to date of such termination and (ii) payment pursuant to the preceding paragraph (i) does not include payment in respect of such services rendered; plus

(iii) Demobilization expenses of Contractor's equipment and personnel that are actually incurred by Contractor as a result of such termination; plus

(iv) Reasonable and customary settlement costs with Subcontractors that are actually incurred by Contractor; plus

(v) Such other termination expenses as may be reasonably identified and mutually agreed by Owner and Contractor, plus

(vi) A reasonable markup on the above (i) through (v) for Contractor's profit and overhead on such completed Work.

Consistent with the prescribed termination language in each contract, four categories were defined to capture and build the cost exposure; the summation of these categories represents the total cost exposure. These categories can be applied to all CAP contracts and agreements as they have similar elements. The following defines and briefly describes the categories.

- Category I: **Money Spent** – all project costs that were paid or booked on a monthly basis such as vendor and contractor invoices, outside services, material purchases, Company indirect costs, and NU labor.
- Category II: **Project Costs and Liabilities** – projected payment for all tangible contractor and vendor work completed or partially completed and all actualized subcontractor costs incurred up to cancellation. Also, those additional direct and indirect costs associated with a large project wrap-up such as continued outside services, AFUDC, and support staff to resolve contract cancellation. See Section 1 for further discussion.
- Category III: **Reasonable and Customary Termination Costs** - all costs associated with contract termination including demobilization, home office re-assignment, profit and markup. See Section 2 for further discussion.
- Category IV: **Station Remediation and Project Area Moth-Balling** – all costs required for site remediation and restoration such as safety, storage, and clean-up. Additional costs to place Project equipment in safe and preserved condition. See Section 3 for further discussion.

Results

All of the various cost components of the Clean Air Project were evaluated in accordance with contract termination language and grouped into the above described categories. The resulting data is provided in the Total Cost graph (*Attachment 1*). An additional graph was provided for ease of review of key dates in the Project's history (*Attachment 2*). A detailed description of the evaluation methodology is available in Part II of this report.

Below are the cancellation costs at key dates in the Project's history.

Cancellation Date	Cancellation Cost
July 1, 2008	\$41,189,650
October 1, 2008	\$67,420,301
January 1, 2009	\$106,759,373
April 1, 2009	\$141,764,247
July 1, 2009	\$176,488,193

Attachments

Attachment 1: Depiction of Concept

Attachment 2: Total Cost Graph

Attachment 3: Total Costs at Key Dates

Part II: Detailed Discussion

Section 1: Project Costs and Liabilities

General

For all of the major island contracts (Chimney, FGD, PWWT & Material Handling), the units of property value submittals that were completed by the contractors were used along with contract pricing sheets to establish the values for the various equipment components and systems supplied by the contractors. The units of property submittals provided breakdowns for engineering, equipment & materials, and installation costs.

For the Program Management contract, the invoice scheduled payments and potential hours required to negotiate and close out major contracts were used to estimate future expenditures.

The contract construction schedules and monthly reports submitted by the contractors were reviewed to establish the following:

- Engineering durations
- Dates for sub-contractor(s) purchase order awards for various equipment, components or subcontracts
- Fabrication periods and equipment / component delivery dates to the site
- The start and duration for installation activities associated with the various equipment components or process systems. These installation durations also reflected time for the associated piping and electrical systems associated with the equipment component or system.

Chimney Contract

The Hamon Custodis initial engineering release for the chimney contract was made 7/16/2008 followed by Contract Award on 12/9/2008. Since this work needed to be completed early in the project, efforts to move this work forward promptly were important. The contract payment schedule required an initial payment of \$450,000 during the first month to fund detailed engineering activities. Values for the engineering subcontracts for vortex shedding, flow modeling and obtaining the air permit are reflected over the appropriate periods. The balance of the engineering costs are distributed over the 5 month engineering duration ending in October 2008.

The FRP liner subcontract LNP was made in September 2008 and an initial \$500,000 payment was required by the contract payment schedule to fund engineering activities. Upon receipt of the air permit, the sub-contract for the FRP liner was awarded and 30% of the liner material/fabrication costs are allocated to the first month to account for material procurements. The balance of the FRP liner subcontract is distributed over the fabrication period and the erection costs are spread over the liner erection period.

The balance of the fabrication and erection costs were assigned to the following categories:

- Concrete shell
- Structural Steel
- Electrical
- Elevator

These subcontracts were treated in a similar manner. A portion of the material/fabrication costs (30% for electrical and elevator and 50% for structural steel) were assigned to the month when the subcontract was placed to address material procurements. The balance of material costs are estimated to be fabrication costs and were distributed over the fabrication period. In general construction costs were distributed evenly over the construction period for the component. A higher percentage was allocated to the first month of the concrete shell construction to account for mobilization costs for the slip forming equipment.

FGD Contract

The Siemens Environmental Systems and Services (SESS) initial engineering release was issued on 7/10/2008 followed by Contract Award on 10/20/2008. SESS engineering costs could be distributed evenly over a 21 month engineering duration ending in March 2010, however large complex systems such as this one and others can be front loaded to insure design, interface, and procurement activities are well supported to avoid delays and added costs.

The FGD System costs are broken into the following major sub-systems:

- Absorber Tower (including the recycle tank agitators)
- Field Fabricated Tanks (including agitators)
- Limestone Day Silos
- Absorber Recycle Pumps (including knife gate valves)
- Limestone Ball Mills
- Oxidation Air Blowers
- Vacuum Belt Filters, Pumps & Motors
- Misc. Pumps
- Hydroclones & Distribution Boxes
- Building Costs as follows:
 - Structural Steel
 - Siding and Roofing
 - Fire Proofing & HVAC
 - Lighting

For each sub-system's material/equipment costs, a split was estimated based on our experience between material and fabrication costs. Material costs were assigned to the month that purchase orders were released with fabrication costs appropriately distributed over the fabrication period leading up to delivery. In general, the material cost portion of the various equipment components was estimated between 25 to 33% of the overall material/fabrication cost for the component. This accounts for placement of steel mill orders, orders for major components such as motors and commitments to other sub-suppliers.

Erection costs were distributed over the installation period for the sub-system. A percentage of the installation costs, generally 20%, were assigned to the first month to account for initial costs such as equipment mobilization, scaffolding, component staging and installation, rigging, etc. The balance of the installation costs were distributed over the construction period as identified in the schedules and monthly reports. The construction period included installation of the associated piping and electrical raceway systems.

PWWT Contract

The Siemens Water Technologies (SWT) initial engineering release was issued on 9/30/2008 followed by Contract Award on 10/20/2008. SWT engineering costs are appropriately distributed over the 21 month engineering duration ending in June 2010. Based on the contract payment schedule, 40% of the

engineering costs were assigned to the first 4 months when the majority of the process engineering was completed. 80% of the engineering was complete by September 2009 with the balance distributed over the last 9 months.

The PWWT System costs are broken into the following major sub-systems:

- PWWT Building, Structure & Foundation
- Air Compressors
- Pump Skids
- Chemical & Polymer Feed Skids
- Solids Contact Clarifiers
- Continuous Backwash Gravity Filters
- Lime Silos
- Filter Presses
- FRP Tanks
- Sump Pumps
- Variable Frequency Drives
- Enhanced Mercury Treatment System (EMARS)
- Softening Conversion System

The last two bullets for the EMARS and softening systems were changes to the PWWT contract, so the engineering associated with these systems was distributed separately from the primary system engineering discussed above.

Similar to the FGD system discussion, for each sub-system's material/equipment costs, a split was estimated between material and fabrication costs. Material costs were assigned to the month that purchase orders were released with fabrication costs appropriately distributed over the fabrication period leading up to delivery. In general, the material cost portion of the various equipment components was estimated between 25 to 33% of the overall material/fabrication cost for the component. Most of the PWWT skids have small components with quite a bit of intricate piping and electrical raceway on the skid, so in most cases material costs were estimated to be the lower value of 25% assigning a higher weighting to fabrication costs.

Also similar to the FGD system, erection costs were distributed over the installation period for the sub-system. A percentage of the installation costs, generally 20%, were assigned to the first month to account for initial costs such as equipment mobilization, scaffolding, component staging and installation, rigging, etc. The balance of the installation costs were appropriately distributed over the construction period as identified in the schedules and monthly reports.

Material Handling Contract

The Dearborn Midwest (DMW) initial engineering release for the material handling contract was made 11/14/2008 followed by Contract Award on 12/19/2008. The contract payment schedule required an initial payment of \$1,087,000 during the first month to fund initial engineering activities. Based on the contract schedule, 80% of the engineering was complete by June 2009. The balance of the engineering costs were distributed over the final 4 months ending in October 2009.

The Material Handling System costs are broken into the following major sub-systems:

- Structural Steel & Tubular Conveyor Galleries
 - Limestone Conveyors

- Gypsum Conveyors
- Limestone Storage Silos
- Gypsum Storage Building
- Conveyor Equipment Components
 - Limestone Conveyors
 - Gypsum Conveyors
 - Bucket Elevator and Belt Feeders
- Rotary Plows
- Limestone Truck Delivery Facility (LTDF)

Similar to the previous systems discussion, for each sub-system's material/equipment costs, a split was estimated between material and fabrication costs. Material costs were assigned to the month that purchase orders were released with fabrication costs distributed over the fabrication period leading up to delivery. Material costs for structural steel, conveyor galleries and the gypsum storage building were estimated to be 33% of the overall equipment/fabrication cost to reflect early commitments to mill orders for structural steel. The conveyor equipment components consist of idlers, conveyor belts, skirts, motors and other components that require minimal fabrication. Therefore for these systems the material cost was estimated to be 50% of the overall material/fabrication cost. The larger equipment (rotary plows and LTDF) used a lower percentage of 40% as these components required more shop fabrication.

Also similar to the previous systems, erection costs were distributed over the installation period for the sub-system. A percentage of the installation costs, generally 20%, were assigned to the first month to account for initial costs such as equipment mobilization, scaffolding, component staging and installation, rigging, etc. The balance of the installation costs were distributed over the construction period as identified in the schedules and monthly reports.

Program Management Contract

The Program Management (PM) contract was awarded in the fall of 2007 and began with the development of the project cost estimate and the primary Island specifications and contracts. This contract continued with the development of conceptual designs, studies, evaluations, detail design, procurement, construction management/oversight and project close out.

To estimate cost exposure over the life of the PM contract, the following categories were analyzed:

Delayed invoicing: Due to contract payment terms and the delay in invoicing for hours spent, the next two month's invoices were used to account for hours spent but not yet billed.

Contract cancellation support: Should there have been a need to close out contracts due to cancellation of the project, hours were estimated over the life of the PM contract to account for support services in negotiating fair and reasonable contract cancellation terms to account for costs incurred by the vendor/contractor. These contract close-out costs were estimated for the four major Island contracts, Foundation and Site Preparation contracts, Ductwork and Steel, Mechanical and Electrical Installation contracts and eleven major purchases of Engineered Equipment.

NU Labor

A number of months of PSNH Project team resources were included to support and facilitate the cancellation process. The Company, with support from URS, would be responsible for contractual and commercial items such as contract close-out, final invoicing, and accounting. In addition, PSNH would need to oversee Project area moth-balling and Station remediation.

Outside Services

Technical, legal, and other consulting services would be required throughout the cancellation process. A number of months of this resource are included to address legal and environmental issues arising as a result of Project cancellation.

Employee Expenses, Vehicles, Rents & Leases, and Indirect Costs

The Project would continue to incur Company expenses over the course of Project cancellation. All assets and responsibilities would be eliminated as soon as reasonably possible. Similar to the NU Labor discussion, the costs for a number of months were included.

AFUDC

Recognizing that as contracts are settled and final invoicing is submitted, charges to the Project will continue throughout the cancellation process. These ongoing charges would result in additional monthly AFUDC. An estimate of six months was used.

Contract Labor

Contracts primarily tasked with the installation of equipment and materials were evaluated similarly. These labor intensive contracts could potentially be resolved more quickly as they were not tasked with long-lead equipment purchases or material procurement. After structures and equipment have been moth-balled, labor can be eliminated. Contracts of this structure include:

- Balance of Plant Mechanical
- Balance of Plant Electrical
- Duct & Steel Installation
- Site Preparation
- Foundations
- Construction Services
- Site Finalization

Materials

These vendor agreements are primarily for the procurement of equipment or materials. Materials would include items such as:

- Booster fans
- Duct isolation valves
- Ductwork fabrication and delivery
- Support steel fabrication and delivery
- Major electrical equipment

To determine future exposure, consideration was given to milestone payment schedules, delivery schedules and engineering and manufacturing costs.

E-Warehouse

E-Warehouse was completed and placed in-service in early 2008. Accordingly, the total cost is included.

Booster Fan Spares

The milestone payment schedule, delivery schedule and engineering and manufacturing costs were reviewed to estimate committed dollars for this long-lead material purchase.

Meeting Place

Material purchases and contractor labor associated with this building were reviewed. To determine future exposure, consideration was given to milestone payment schedules, delivery schedules and engineering and construction costs.

Electric Power Supply

Engineering, material purchases and contractor labor associated with the substation were reviewed. To determine future exposure, consideration was given to milestone payment schedules, delivery schedules and engineering and construction costs.

Secondary Waste Water Treatment System (SWWT System)

Engineering, materials and contract labor associated the SWWT system were reviewed. Materials would include AquaTech supply scope of work, structural steel supply, the DCS, major electrical equipment and miscellaneous materials. Contractor labor includes Burns & McDonnell engineering, Foundations & Underground work, BOP Mechanical Work, BOP Electrical Work, and miscellaneous contractor labor. To determine future exposure, consideration was given to milestone payment schedules, delivery schedules and engineering and construction costs.

Section 2: Termination Costs

General

This section considers costs that a contractor would be looking to recover if a contract was cancelled. The information contained in this section is based on years of experience with construction, consulting, and the contract cancellation process. These items would be included in a contract termination settlement and negotiated in accordance with specific contract termination language.

Demobilization

Detailed manpower and onsite equipment schedules are laid out in advance of construction. A ramp-up, peak, and wrap-up of these resources is planned, thus maximizing efficiency. To alter that plan would result in a more costly demobilization. The cost of demobilization was estimated based on the progress of the contract.

Final Invoicing

Invoicing complexity varies with the structure of the contract and through the course of a project is estimated and anticipated on a monthly basis. In the event of cancellation, all costs would be actualized resulting in an extensive final invoicing process. Contractors and vendors would require ample time to receive and compile subcontractor and vendor costs. Once final invoices were submitted, ample time would be needed to verify invoiced costs. Factory visits may be required to confirm the status of equipment and materials.

Recovery of Proposal Costs

An upfront cost to contractors is the proposal preparation. These costs, along with others, are built into the overhead component of the contract price and recouped over the life of the contract. Therefore, it is reasonable to compensate the contractor for proposal costs and expenses.

Missed Opportunity for Other Projects / Home Office Reassignments

Contractors schedule manpower to accommodate various jobs and schedules. When a job is awarded, staff is assigned to the project and when sufficient back log levels are achieved, contractors will not pursue or bid on other projects. If a contract is cancelled, staff re-assignments will be necessary and the contractor will seek recovery of costs to compensate the overheads of idle time while a new project is pursued.

Profit

As with any industry or business, profit is fair and customary expense. The contractors and vendors assume significant costs and risks, especially on large multi-year projects. Accordingly, it is reasonable to compensate the contractor a portion of profit and mark-up on completed or partially completed aspects of their contract. A judgment has been made in this analysis to not maximize profit but also not to ignore it.

Material Order Cancellations

Contractors would be fully reimbursed for material purchases that have not yet been invoiced, including any applicable freight, restocking fees, or cancellation penalties.

Subcontract Cancellations

Many aspects of the Project required primary contractors and vendors to engage subcontractors for portions of their work scope. In the event of cancellation, those subcontractors would recoup similar costs discussed above such as profit, demobilization, proposal preparation, and material order cancellation.

Section 3: Station Remediation and Project Area Moth-Balling Costs

General

This section considers costs required to preserve partially or fully installed equipment and structures as well as to restore a safe, working Station. The information contained in this section is based on years of construction and power plant operation experience. To the extent possible, these tasks would be completed by PSNH labor/resources. An overall estimate was developed, as this component is a Project wide expense, not based on individual contracts.

Material Storage of Unused Parts and Materials

Any unused materials belong to the owner and will need proper preparation and storage. There would be a large effort to find appropriate storage locations and facilities for thousands of items until a determination can be made on final disposition. Then these items could be resurrected locally with a project start or possibly used in a new application by NU/PSNH or sold to minimize storage charges. Storage fees would apply until the material was used or removed.

Site Cleanup

Cancelling any project mid construction would leave the site in disarray. The site would need to be restored to a safe, useable condition which may include closing excavations, finishing roads, completing drainage, stabilizing soils, and meeting all local, state, and federal permitting requirements.

Re-engineering of Unfinished Structures for Safety

Unfinished structures would require additional engineering and potential labor to ensure no failures would occur. Unfinished structures are susceptible to failure from snow loads, wind loads, and earthquakes due to a design's reliance on the completed structure.

Maintenance of Existing Station Equipment or Systems

Select Station equipment was slated for retirement as the Project would render those items obsolete. Cancellation would initiate maintenance and/or replacement of this existing equipment in order to maintain a safe and reliable operating facility.

Cancellation Cost Categories

STATION REMEDIATION & PROJECT AREA MOTHBALLING

- Place Project equipment into safe and preserved condition
- Satisfy all site permit requirements
- Re-engineer structures to maintain safe and effective plant operations
- Restore and clean-up Merrimack Station

TERMINATION COSTS

- Profit
- Demobilization
- Proposal Preparation
- Home Office Support
- Staff Reassignments

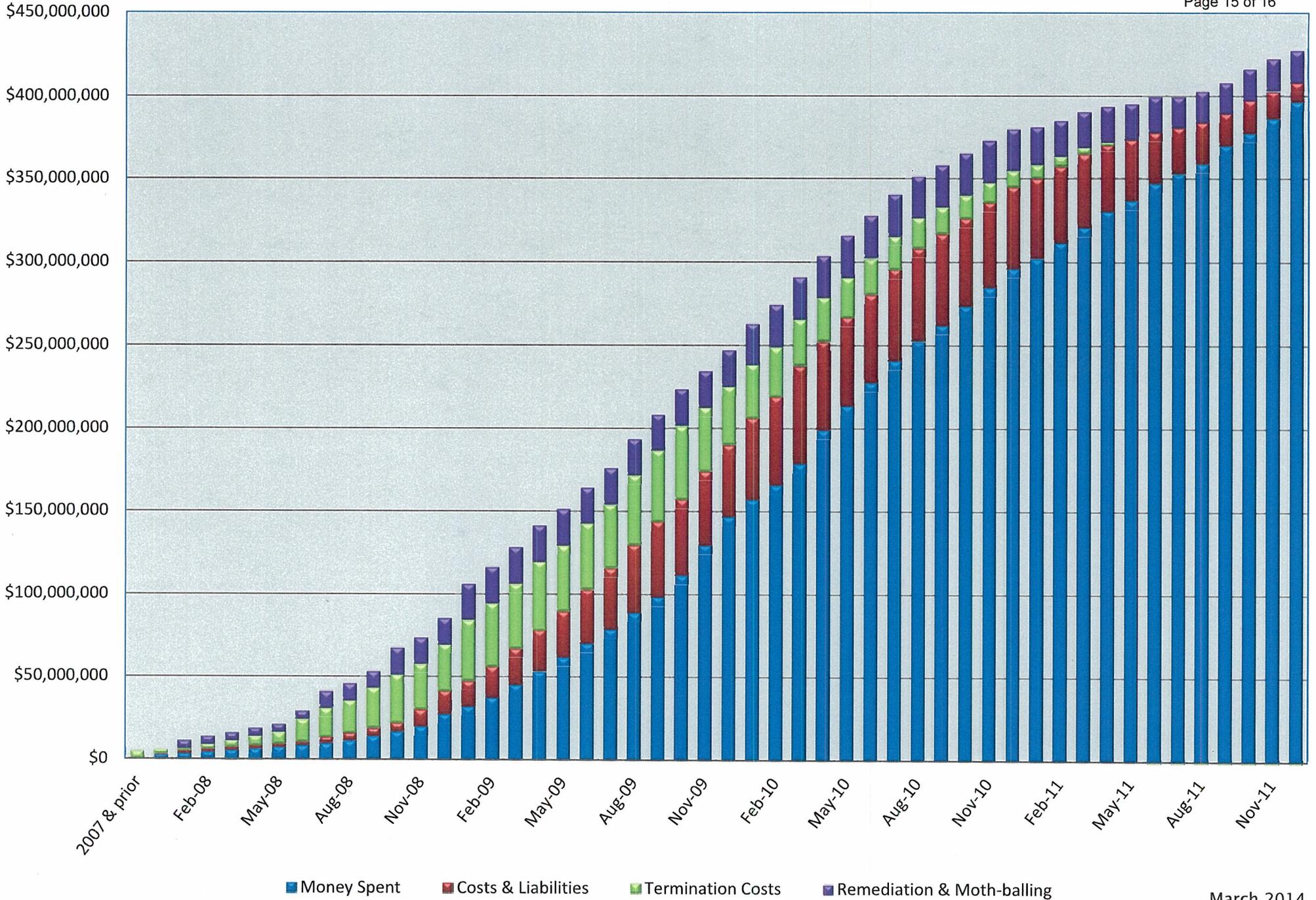
PROJECT COST LIABILITIES

- Subcontractor Payments
- Support staff to negotiate fair and reasonable contract cancellation terms
- Ordered or Unused Material

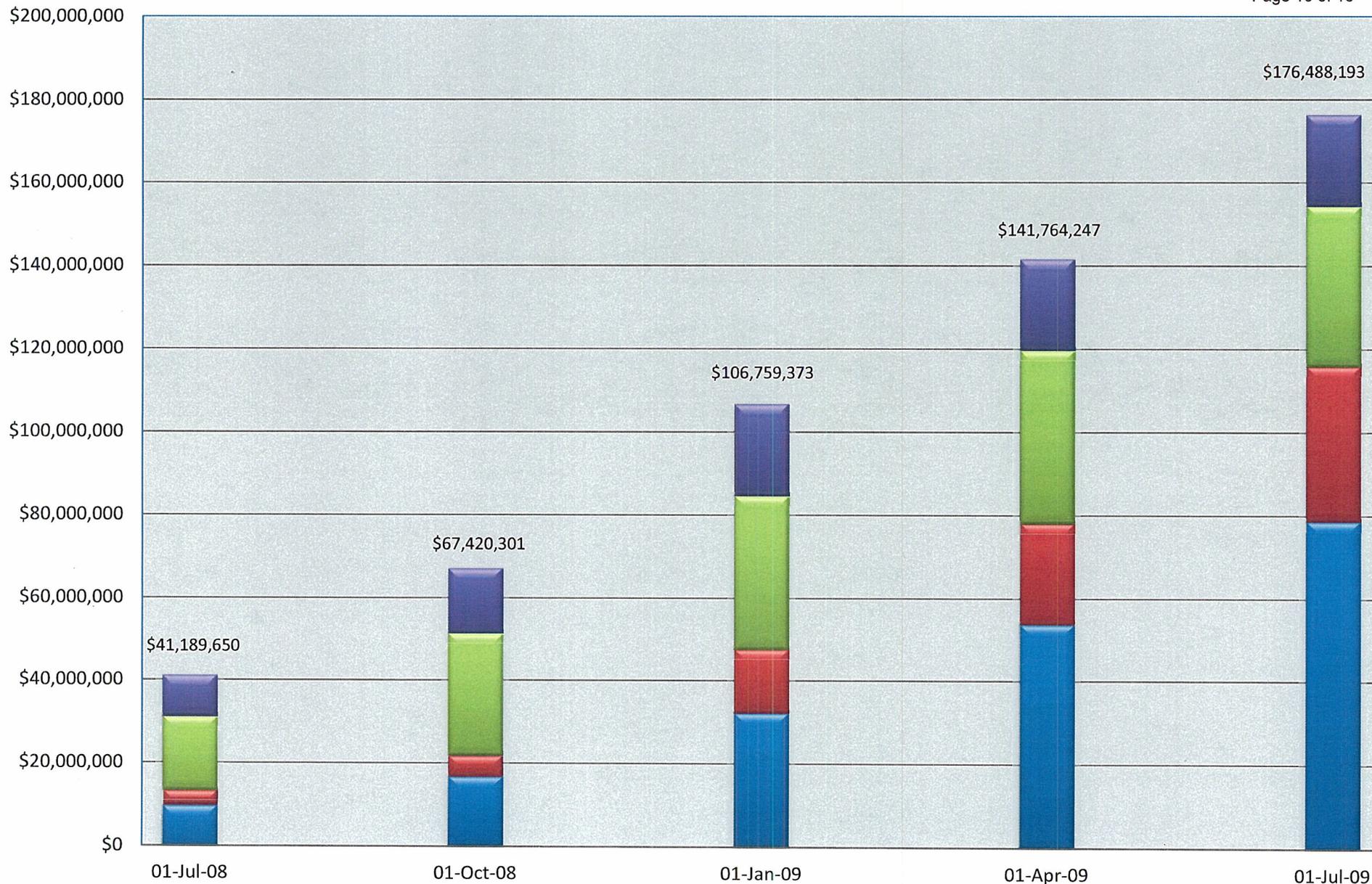
MONEY SPENT

- Contractor labor
- Materials
- AFUDC
- Fees and Payments
- NU Labor and Company Costs

Attachment 2: Total Cost Exposure



Attachment 3: Total Cost Exposure at Key Dates



■ Money Spent ■ Costs and Liabilities ■ Termination Costs ■ Remediation & Moth-balling