Audit of Nova Scotia Power, Inc.'s Fuel Adjustment Mechanism for 2012-2013

Public Version

Confidential Materials are Redacted

Presented to:

Nova Scotia Utility and Review Board

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I. Organization, Staffing and Controls

A. Background

This chapter addresses the topics of organization, staffing, and controls:

Organization *Staffing* *Procedures* *Risk Management* *Auditing*

B. Findings

1. Organization

a. Structure and Related Key Personnel Changes

The organization responsible for fuel and energy management at NS Power began to stabilize during the current Audit Period, following the multiple changes in personnel that occurred during the previous Audit Period. Nevertheless, a number of changes continued to take place, with the intent of creating a more stable and more effective organization.

The changes during this FAM Audit Period have been significant and have occurred throughout NS Power, both within and above the Fuels, Energy and Risk Management (FERM) organization. In September 2012, Emera Energy's President and Chief Operating Officer transferred to NS Power to become the utility subsidiary's Executive Vice President (EVP), Operations. Then, in January 2013, an executive who had spent more than a decade in various leadership roles within Emera affiliates became NS Power's President and Chief Executive Officer. He came to the position following a stint as the Executive Chairman of Barbados Light & Power Company.

During this period of time, the Director, FERM reported to the Vice President, Power Generation and Delivery, who in turn reported to the EVP, Operations for NS Power. Subsequently, in September 2013, reporting relationships changed, and the Director, FERM began reporting directly to the EVP, Operations, while the Vice President, Power Generation and Delivery continued to report to this same EVP, Operations. This change was made to elevate FERM within the organization, and also recognized the relevant experience of the EVP, Operations, and the value to be achieved from greater interaction with the Fuels Team. Liberty views these changes as substantive, and positive.

Throughout the Audit Period, positive changes continued within the FERM organization. In February 2012, as part of broader organizational responsibilities, the position of Manager of Fuels Testing and Optimization was eliminated. This individual had been responsible for the Fuels Testing Program and for Contract Administration of the Stevedoring contract for the Point Tupper Marine Terminal (PTMT). The responsibilities for this position were distributed to other individuals within NS Power.

In October 2012, the position of Logistics Administrator was created, and the responsibility for contract administration of operating contracts for both the PTMT and International Pier was centralized under the responsibility of the Senior Contract Administrator.

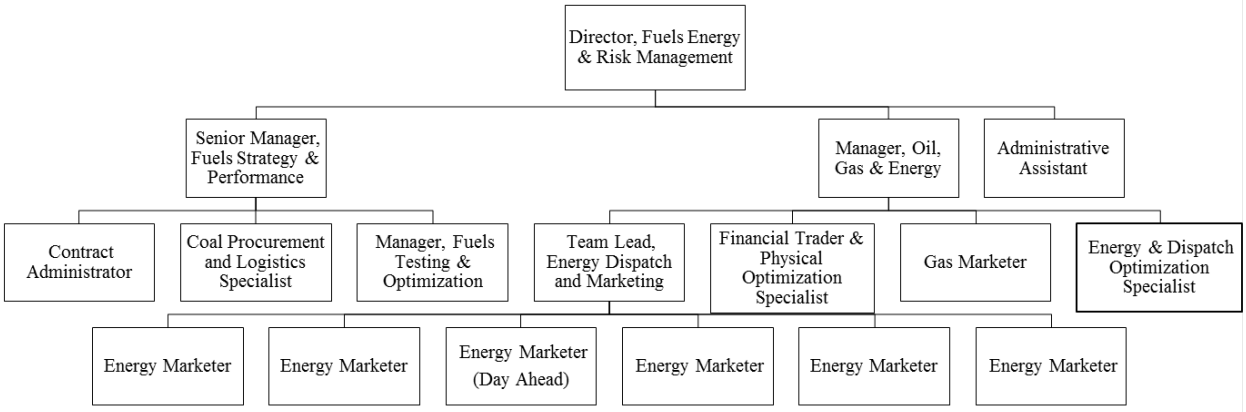
In March 2013, it was announced that six new positions were being created in FERM. The purpose of creating these positions was to correct deficiencies noted in the last audit, to manage new accountabilities for which FERM was responsible, and to increase stability within the department. The positions were not filled immediately, but over the balance of 2013, such that by the end of the year, all positions had been filled. These new positions were as follows, including the date filled:

- Fuels Special Projects Manager – August 2013
- Portfolio Manager – November 2013
- Contracts Manager – August 2013
- Fuels Engineer – June 2013
- Biomass Supply Manager – September 2013
- Tariff Administrator –June 2013.

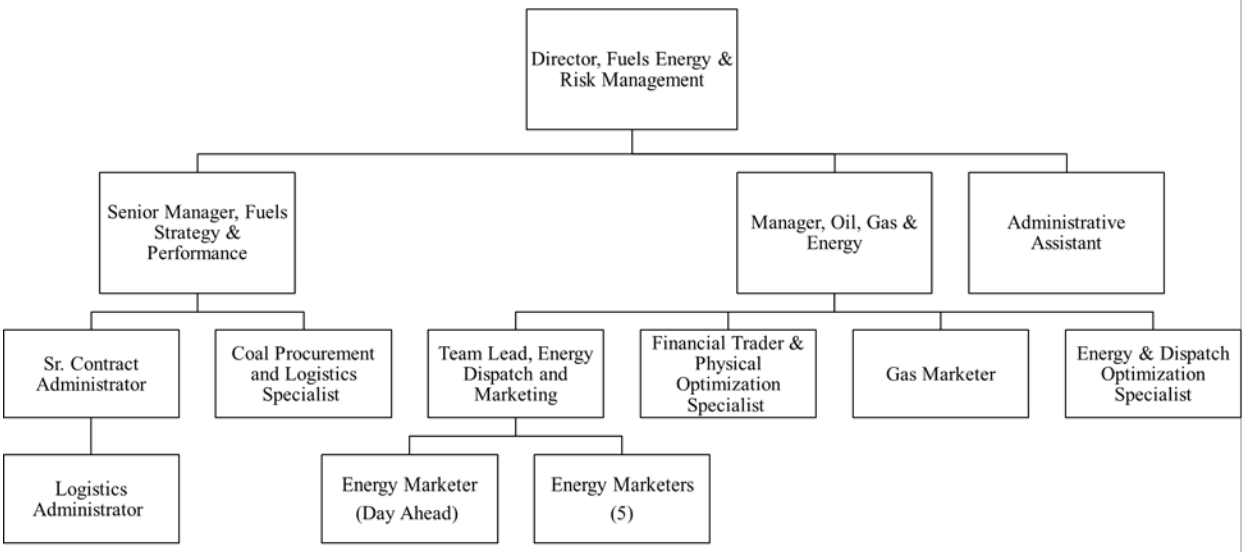
The organization charts which follow show the reporting relationships of these new positions. Following the charts are summary descriptions of the responsibilities for these new positions, as well as the key positions within FERM.

Comparing the next three charts shows the changes in organization over the two years covered by the Audit Period. The first shows the organization in effect at the beginning of the Audit Period; the second shows the organization in the middle of the Audit Period, and the third shows the organization at the end of the Audit Period.

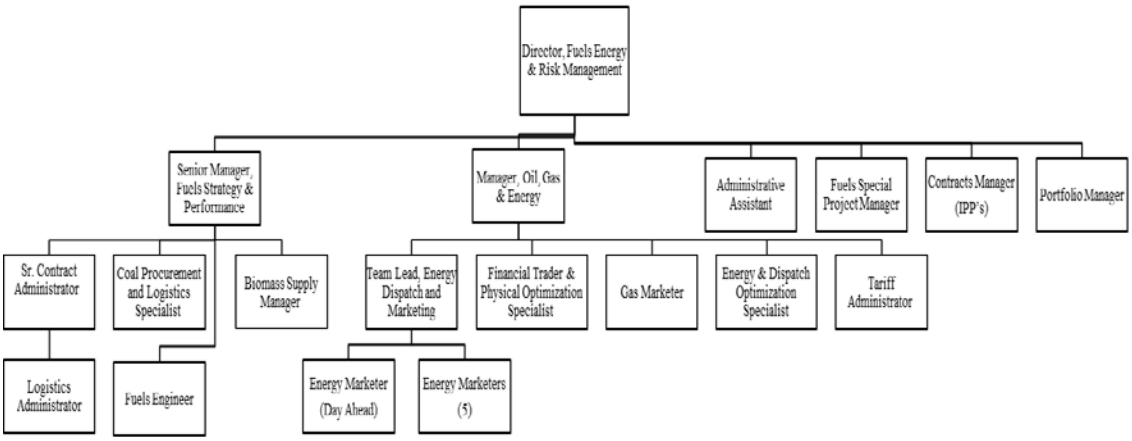
Fuels and Energy Risk Management
January 2012



January 2013



November 2013



The next paragraphs discuss the responsibilities of key FERM positions.

The Director, Fuels, Energy & Risk Management (FERM) has responsibility for fuel procurement and management and for power-trading activities affecting costs collected through NS Power's FAM. The above charts illustrate the organization of the Director, FERM, and how it has changed over the Audit Period. His responsibilities include scheduling and dispatch of 2,400 MW of installed generating capacity, development of fuel strategy, fuel budgeting, and risk management of the fuel portfolio (including derivatives, hedge management, and counter-party-risk management). The current incumbent transferred (within NS Power) to the Director's position and began work on a full time basis in January 2011.

The Senior Manager, Fuels Strategy & Performance has responsibility for all solid fuel (coal and Petcoke) management functions. Her solid fuel related responsibilities include:

- Procuring fuel as necessary to fill and maintain the fuel portfolio
- Procuring and managing fuel transportation
- Hedging financial exposure related to fuel positions
- Managing fuel inventory levels
- Forecasting fuel usage, emissions and budgets
- Administering fuel contracts.

The current incumbent transferred (within NS Power) to this position and began work on a full time basis in November 2010.

The Manager, Oils, Gas & Energy has responsibility for the procurement, management and transportation of fuel oil and natural gas and for the import and export of electricity. These functions for these fuel and energy sources include:

- Fuel procurement
- Contract administration
- Procurement and management of transportation
- Direction of oil and gas hedging strategies
- Management of the 24-hour desks responsible for trading energy, gas and oil.

The current incumbent transferred (within NS Power) to this position and began work on a full time basis in November 2011.

Responsibilities of each of the six new positions announced in March 2013, as referenced above are as follows:

The **Fuels Special Projects Manager** will assist FERM management with project management and managing regulatory requirements. Fuels Personnel are regularly called upon to lead or play a central role in a variety of projects. This position will serve as a project manager, or Fuels Team representative, for many of these projects, thereby limiting the time that Fuels Team Members will be drawn away from fuel procurement-related accountabilities.

The **Fuels Portfolio Manager** is responsible for:

- Identifying and analyzing strategic alternatives for fuel procurement in order to develop the lowest cost fuels and energy portfolio. This would include: pipeline development, natural gas storage, and transmission line development.
- Lead feasibility analysis of specific projects that have the potential to reduce fuel expense.

The **Contracts Manager** is responsible for:

- Managing IPP contracts for the benefit of NS Power's customers (NS Power currently has 37 contracts with Independent Power Producers.)
- Coordinating with the Provincial Renewable Energy Administrator to manage the NS Power's accountabilities for the addition of new renewable generation through the Community Feed-In Tariff (COMFIT) program
- Communicating with the Department of Energy to obtain information regarding the timing of COMFIT projects and providing input to forecasting process on COMFIT generation
- Assisting other members of the Fuels Team with Contract Administration
- Leading or participating in the negotiations of contracts as assigned
- Cross-training in the core accountabilities of the Coal Procurement & Logistics Specialist position.

The **Fuels Engineer** is responsible for:

- Overseeing the multiple functions/activities that collectively ensure compliance with mercury and sulphur emissions requirements. This includes monitoring the reliability, maintenance, and operations of the mercury additive (PAC) systems, and monitoring to ensure that sufficient PAC is on hand to meet forecast requirements.
- Working with other members of the solids fuel team to understand the impacts of changes in fuels forecasts on emissions and ensuring that the types and quantities of solid fuels available are such that total emissions caps can be met.
- Reporting within the Fuels Department on performance against the emissions caps, effectiveness of PAC capture, and current emissions against forecast.
- Testing fuels and additives to ensure that new potential coal sources are evaluated to determine whether they can produce a lower overall life-cycle cost for customers.
- Determining optimal PAC addition rates.
- Taking action to reduce the risk of non-compliance, while also ensuring that the fuels blends are optimized to minimize fuel expense.

The **Biomass Supply Manager** is responsible for:

- Managing the biomass supply to the NS Power Biomass Plant by coordinating the work of the Biomass Procurement Managers and other biomass suppliers
- Ensuring that biomass is sourced and harvested in a sustainable manner and in a manner which complies with all applicable regulations
- Monitoring the safety programs of the Biomass Procurement Managers
- Optimizing biomass fuel procurement and administering contracts to achieve the lowest sustainable cost to customer
- Ensuring administrative processes (e.g., payment, invoicing) function effectively for efficient biomass procurement
- Overseeing the Quality Assurance processes to ensure that delivered biomass meets specifications

- Working with the biomass supply managers to adjust volumes, inventory levels and fuel specifications to ensure that biomass supplied provides for the efficient operation of the plant
- Participating in negotiating biomass procurement contracts and related services as requested
- Communicating with Nova Scotia government departments regarding biomass procurement policy and regulations

The **Tariff Administrator** is responsible for:

- Acting as the primary operational contact with Load Retention Tariff (LRT) customer(s)
- Administering power purchase Request for Proposals (RFPs) related to the Load Retention Tariff
- Supporting LRT-related project activity
- Continuously Improving LRT-related processes
- Supporting any reconciliation processes
- Coordinating the activities and information flow between the Fuels department and other NS Power departments as it relates to the Tariff
- Participating in LRT audits and coordinating Fuels department activities arising from the audits
- Providing support to the billing process as requested.

It should be noted that with the addition of these new FERM positions, a number of job responsibilities within FERM were shifted in order to more evenly distribute workloads.

b. Performance Management

The FERM organization applies a performance management process having three major components. One of those components, the Balanced Score Card (BSC) system, has general applicability across NS Power. FERM uniquely uses a second component, termed the *Commercial Incentive* program. NS Power explains this FERM-only component as existing because of the importance of the activities of FERM to procuring and managing a reliable and competitively priced fuel supply and the need to attract and retain capable individuals within the FERM organization. The Personal Development Plan (PDP) forms the third component, operating as part of annual performance evaluations.

FERM management develops an annual incentive structure that forms the basis for evaluation of the performance of individuals within the organization for the coming year. This structure establishes the foundation for the BSC and Commercial Incentive components. NS Power begins with the annual business planning cycle, in particular the fuel forecast produced as part of that cycle. NS Power develops a business plan, from which flows a set of annual targets for FERM team members. NS Power then develops the components of the Balanced Score Card (BSC) system for the FERM team. This scorecard focuses on accomplishment of overall NS Power Business Plan targets and on FAM targets for the current year.

Robert Kaplan (Harvard Business School) and David Norton originated the BSC construct. It seeks to align the activities of particular business functions with overall corporate visions and strategies. It provides a performance measurement framework that complements traditional financial metrics with strategic, non-financial measures. Proponents consider this approach to provide a more "balanced" view of performance. The concept enjoys widespread use in business and industry and in government and nonprofit organizations.

Financial rewards driven by BSC metrics receive funding from the corporate incentive pool. Each individual within FERM undergoes yearly evaluation under a number of factors from both the BSC and Commercial Incentive programs. These factors include accomplishment of BSC objectives and personal measures based on the nature of the responsibilities of specific positions. The expression of the applicable measures typically takes the form of graduated sets of performance targets for the year (commercial targets). Depending on the individual's position, meeting BSC targets can result in up to [redacted] percent (of pensionable base pay) incentive payment. The Commercial Incentive program can add up to an additional [redacted] percent. The amount of incentive has been structured on the basis of percentages which are proportional to which positions have the potential to make the most significant impact on achieving fuel and power budgets, or savings compared to budget targets.

The HR Department conducts a random examination of the BSC process. Generally speaking, FERM employees make up two percent of total employees eligible for scorecard incentives, and this is roughly the percentage reviewed in this HR audit. Audits were conducted in 2011 and 2012, but not in 2013. A report summarizing the overall results of the review is prepared by the leader of the review process and provided to HR Management. Information in the reports identifies trends that can be used for ongoing improvement, in terms of how well scorecards align with corporate objectives, whether the goals are measureable, and whether goals are appropriately challenging. Issues with specific scorecards are taken verbally and directly to the appropriate managers for their consideration. Generally coaching is required, and the HR Client Services team works with their client groups to coach them on the process of BSCs, and to challenge them to re-review BSCs to ensure they are in line with Corporate Objectives and Goals.

Each FERM team member operates under a Personal Development Plan (PDP) tailored to an individual's specific needs and growth requirements. As the year progresses, management tracks the development of each individual with respect to the individual plan. Each individual's mid-year and end-of-year annual performance evaluations address growth with respect to the Personal Development Plan.

c. Development and Training

The PDP comprises a core element in identifying employee-improvement needs and opportunities. On-the-job training forms an important part of NS Power's training program. Persons new to a position move through a series of increasing responsibilities as guided by the experience of the individual currently holding that position. NS Power also supports formal business and technical training for employees in order to promote development of skills for both current and future positions. Examples of such training include workshops on such topics as hedge accounting, risk management, and fuel markets.

The FERM team also engages in peer-to-peer training. A team member will introduce his or her work specialty to other work groups. For example, a member of the gas desk team may make a presentation to the accounting team on the ways that gas markets function in order to create a broader and deeper understanding of FERM's differing but ultimately related and to some degree co-dependent activities.

d. Job Descriptions

Liberty attempted to review FERM job descriptions for the six new positions created during the Audit Period. This review found that traditional job descriptions do not exist for these positions. Liberty did obtain descriptions of typical responsibilities for each of these positions, which came from the original job "Justifications." Liberty investigated how the new employees knew what was expected of them, and found there was a satisfactory system in place for these new employees understanding what was expected of them, and that this understanding did not rely on a traditional job description. Guidance for these positions came from the employee BSC process and the employee reviews established at the start of each year, and then conducted at mid-year and at the end of the year. Also, the regular FERM meetings discussed accountabilities and assignments on a regular basis throughout the year.

2. Staffing

a. Personnel

Traditionally, the FERM organization has exhibited many specialties and typically has been staffed with many capable individuals who had been in their positions for reasonably long periods of time. However, as was discussed in the previous FAM Audit, the previous Audit Period witnessed what was without exaggeration described as massive turnover in key positions. During the current Audit Period, NS Power has responded very positively to this criticism and began to create a sound FERM organization. Senior personnel within FERM have been maintained in their positions, and a broader FERM organization has been structured to more soundly address FERM's high level of responsibility for a very large portion of the costs that a utility asks customers to pay for electricity.

The broader organization just referenced has included creation of six new positions within FERM. Responsibilities for these positions have been described above. Importantly, the personnel filling these positions have come from relevant positions either within the broader NS Power/Emera organization, or from outside, and bring important experience to these new positions. Additionally all six of the individuals filling these positions bring important educational backgrounds, and are highly qualified as either holding both Bachelor and MBA degrees, and/or Registered Professional Engineer certification.

b. Succession Planning

NS Power's succession planning program considers internal skills within the group or accessible from the overall organization. The program seeks to determine the capability to withstand the loss of a key employee without materially affecting the performance of the team. The succession planning program seeks to identify growth and progression needs and opportunities to support performance continuity. NS Power cannot expect to have a second person fully capable of moving into each FERM position. The Company uses cross-training and structured documents, such as the Fuel Manual and Process Documents, to promote the ability to make unexpected

transitions and to support end-of-career transitions. FERM seeks the capabilities to permit roles to be performed by multiple members of the team. Rotating FERM personnel, to the extent possible, through multiple roles serves as a primary method for building skill sets, and creating the ability to minimize succession disruptions. A person may also build skills outside the team, and be identified through the broader company succession planning as a good fit for a role on the FERM team.

3. Procedures and Models

FERM team members operate under a set of policies and procedures and models that guide the organization's activities. The NS Power Fuel Manual operates as the primary document to guide FERM activities. Other documents supplement this role.

a. NS Power Fuel Manual

NS Power has developed a Fuel Manual for all operations related to procurement and management of fuel required for power generation. The Manual remained in full effect during the Audit Period. The manual sets a number of overall goals:

> *NSPI will seek to procure and manage a reliable and competitively priced fuel supply with a diversified portfolio of fuel types, suppliers, contract terms and pricing structures that seeks to produce reliable energy for our customers, and that is consistent with regulatory and environmental requirements.*
>
> *NSPI's fuel procurement and hedging activities will comply with the NSPI Revised Code of Conduct Governing Affiliate Transactions.*
>
> *Hedging will be used to help stabilize fuel costs, recognizing that market forces determine ultimate pricing.*

The comprehensive Fuel Manual covers the fuel procurement process from many perspectives, combining in one document, what Liberty has often seen in the industry as a series of distinct procedures documents. The Fuel Manual structure follows:

1.0 NSPI Fuels Policy
2.0 Risk Management, Credit Policy and Affiliate Code of Conduct
3.0 Governance
4.0 Approval Authority and Reporting
5.0 Determination of Fuel Requirements
6.0 Fuel and Transportation Procurement Procedures
7.0 Allowed Fuel Procurement Transactions, Freight Procurement Transactions, Financial Derivatives
8.0 Fuel Procurement Strategy and Objectives
9.0 Determination of Financial Hedging Requirements
10.0 Fuel Hedging Strategy and Objectives
11.0 Quality Control of Fuel Suppliers
12.0 Procurement Administration
13.0 Plant Inventory Policy
14.0 Purchased Power and Export Power Sales

The Fuels Manual also contains appendices, which include additional detailed procedures, forms and templates. These appendices include:

A. NSPI's Fuels, Energy and Risk Management Group Organizational Chart

B. Allowed Fuel Procurement Transactions, Freight Procurement Transactions, Financial Instruments
C. Fuel Procurement Strategy and Objectives
D. Fuel Hedging Strategy and Objectives
E. Employee Acknowledgement
F. RFP Cover Letter Template
G. RFP (Coal and Petroleum Coke) Template
H. Supply Agreement (Coal) Template
I. Supply Agreement (Petroleum Coke) Template
J. RFP (HFO) Template
K. Supply Agreement (HFO) Template
L. Supply Agreement (Freight) Template
M. Confirmation Letter (Solid Fuel) Template
N. Supplier Performance Template

NS Power's established procedure for controlling changes to the Fuel Manual includes a mechanism for personnel within FERM to submit recommendations for change to the Manual. This mechanism includes a form for submission of changes that includes the following categories:

Change Number *Fuel Manual Section Number* *Fuel Manual Page Number*
Current Wording *Proposed Change* *Reason for Change*
Updated Wording

The current version of the Fuel Manual, as of the end of the current Audit Period, bears the date of November 2012, Revision #6. Changes during the Audit Period were primarily administrative in nature, and resulted from a collaborative effort facilitated by the Small Working Group (SWG). NS Power presented a number of substantive changes to the SWG near the end of the audit period. Further discussions with the SWG will take place in 2014.

NS Power's SharePoint Website provides all FERM employees access to a current version of the Fuel Manual. Liberty confirmed (through interviews with FERM employees) employee familiarity with availability of the Manual and with its requirements applicable to individual position responsibilities.

NS Power also maintains a Quarterly Fuel Manual Compliance system, designed to provide for employee familiarity with the Manual and for sign-off by Fuel team members, confirming that they understand and comply with the Manual. The compliance sheets for each FERM team member list the multiple responsibilities for that position, when action is required, and comments related to any explanations necessary as a result of the action actually carried out, or not carried out, by that team member. At the end of the form for each position is a place for signature, indicating that the employee understands, and has carried out the responsibilities for that period of time.

Liberty's review of details of this compliance system showed improvement compared to the previous Audit Period, but there were still the following areas for improvement:

- The signature page was not always signed, and the date of signature does not always correspond to the current quarter for some individuals. For example, several forms for the Senior Manager, Fuels Strategy & Performance were not signed. It is possible that such signatures were lacking because some of the pages were filed electronically. Signature

dates for the Director, FERM, and the Senior Manager, Fuels Strategy & Performance were anywhere from two to four months after the end of the quarter.

- For the Team Lead, Energy Dispatch and Marketing, the position was not filled for much of the Audit Period, and so the form was signed by the Manager, Oil, Gas & Energy. However the forms were signed three to four months after the end of the relevant quarter.
- The Manager, Oil, Gas & Energy had no forms assigned to him during the Audit Period.

b. Standards of Conduct Policies

The following four specific policies and procedures relate to ethical conduct of employees in the fuel and power procurement functions:

- Emera Standards of Business Conduct
- Emera Credit Policy (no changes during Audit Period)
- Open Access Transmission Tariff (OATT) Standards of Conduct (no changes during Audit Period)
- NS Power's Affiliate Code of Conduct and Affiliate Code of Conduct Guidelines.

Two of the above policies were not changed during the Audit Period, as noted. The Emera Standards of Business Conduct were amplified and strengthened several times during the Audit Period. The Affiliate Code of Conduct was changed during the Audit Period, and was the subject of a separate review.

The Owner (or their designate) of the above policies provides annual training on each of these policies to the Fuels Team. The training reviews the policy, and explicitly identifies: the location of the policy, examples of how the policy is applied within the Fuels Group, and who Fuels employees are to contact should they have any questions regarding the interpretation or application of the policy. Tracking sheets will document provision of the training. Finally, each employee must sign a statement confirming understanding of and adherence to the provisions of the policy.

c. Models

FERM uses five specific models in support of its operations. They comprise the primary tools for allocating and controlling fuel commitments among NS Power generating units. FERM assigns a specific employee the responsibility to act as the "owner" of each of these models. The owner's responsibilities include ensuring that the model is properly maintained, including communication with the vendor on model updates, answering questions related to the proper use of the model, and training as necessary on model features. Liberty used the output of each of these models and we found that output consistent and able to provide the necessary information. Liberty believes that each model adequately serves its intended purpose.

Strategist comprises the first model. The Director, Generation Asset Management serves as its NS Power owner. NS Power licenses *Strategist* from Ventyx. *Strategist* comprises an industry standard tool for integrated resource planning. Its use extends back many decades. Its modules include modeling forecasted load, production cost calculations and dispatch, conservation and marketing programs, and future resource optimization, among other capabilities. FERM uses

Strategist for long-term resource optimization, for year-ahead fuel and purchased power studies, and for optimizing dispatch, which determines fuel requirements across the generation fleet.

Two internally developed, Excel-workbook-based Coal Model and Coal Solver tools work together and use information from *Strategist* to determine lowest cost fuel blends for the fleet, while meeting unit operating constraints and emissions requirements. During 2013 there was a transition from the manual operations of the Coal Model to the more automated Coal Solver. At the end of the Audit Period, both models were being used, with the Coal Model serving as a reporting tool which receives pre-calculated optimized input from Coal Solver and *Strategist*, and provides the resulting accounting cost of fuel for the forecast period. The Senior Manager, Fuels Strategy & Performance serves as owner of both models.

Fuelworx/Aligne serve as the fourth model. At the beginning of the Audit Period, Fuelworx served to provide an accounting and inventory management system to allocate actual fuel deliveries and consumption to each of the generating units on its system. Beginning in early 2013, Fuelworx was replaced by Aligne, a more advanced system provided by the same supplier, and performing the same system for managing solid fuel receipt information at generating stations. The Senior Manager, Fuels Planning & Performance owns this model.

Plexos is a new model acquired by NS Power during the Audit Period, with the intent to have it eventually replace *Strategist* for fuel forecasting purposes. Both models were run in parallel during much of the Audit Period. Chapter II of this report provides a detailed description of Plexos, and the planned conversion to Plexos. The Director, Generation Asset Management serves as the owner of this model.

Discussion of the overall coordination and working relationships between each of these models is covered in detail in Chapter II, Forecasting and Supply Planning.

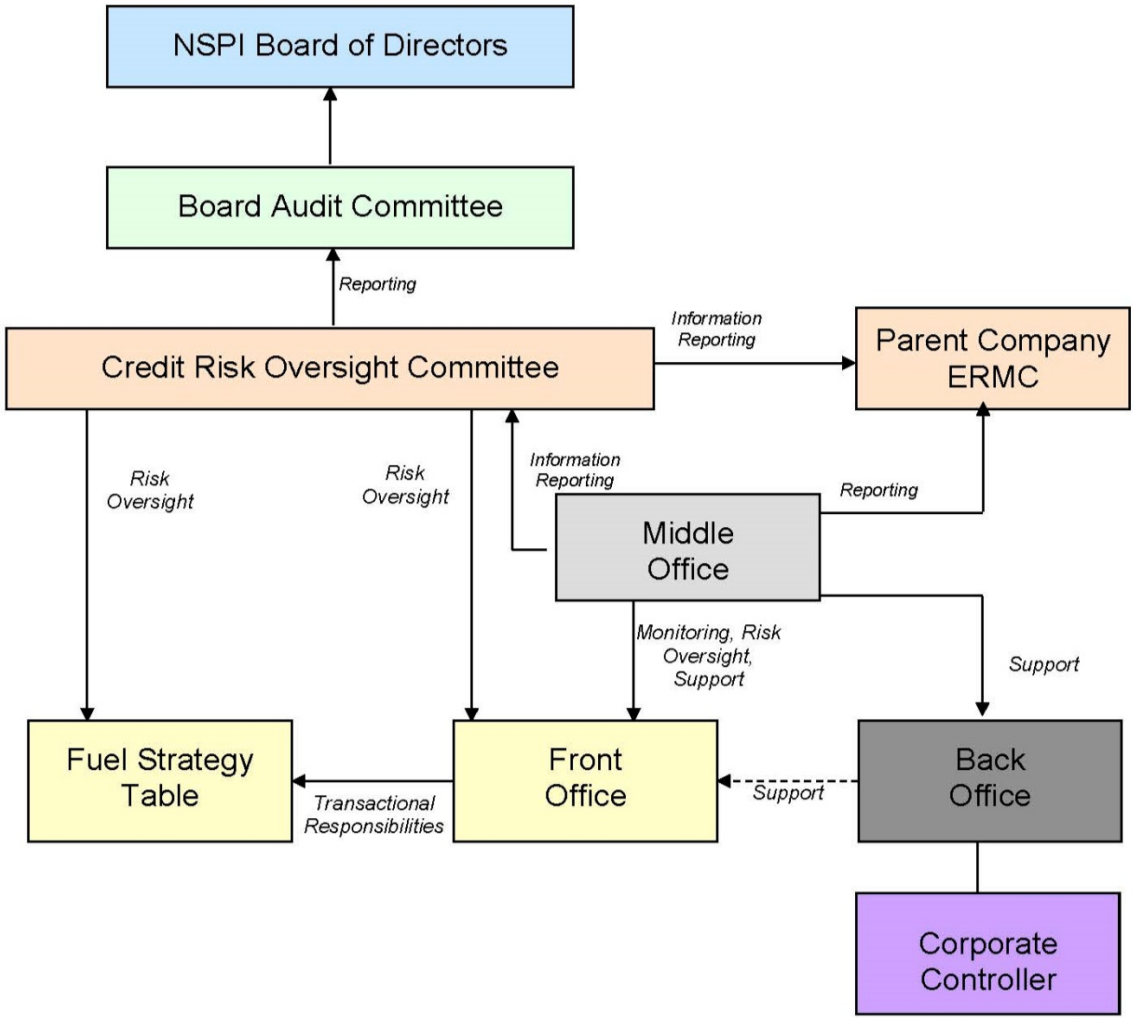
d. Goals and Objectives

The FERM organization operated during the Audit Period under specific goals and objectives developed by senior management and embodied in the NS Power Business Plan for the year. Employees receive these goals and objectives electronically and internal meetings discuss them. The NS Power Business Plan for each of the years of the Audit Period, 2012 and 2013, consisted primarily of financial plans related to Budgets, Net Earnings, Free Cash Flow, and the Capital Program. Each year's plan presented comparisons of forecast data with actual data for the previous year, as well as the plan for the present year. An Executive Summary introduced the Business Plan. The summary highlighted the primary factors influencing plans and expected results.

FERM develops specific commercial targets and specific plans that align with the NS Power Business Plan. These targets range from personal development plans to fuel cost targets.

4. Risk Management

The following chart depicts the relationships and functions of the various NS Power and Emera risk management entities.



a. NS Power Credit Risk Oversight Committee (CROC)

Each Business Unit within Emera has established committees or teams to oversee certain of the risks related to or specific to that Business Unit. A Credit Risk Oversight Committee (CROC) fills this role at NS Power. The CROC includes appropriate members of NS Power's leadership team; *i.e.*, the GM, Finance, NS Power chairs the committee, which meets at least quarterly. The CROC oversees the NS Power risk management program related to financial market and credit risks associated with FERM responsibilities. There are periodic updates to foreign-exchange positions.

The CROC operates under a Mandate dated November 29, 2013. The November 29th Mandate, which takes a form much like an organizational charter, addressed the following subjects:

Mandate Responsibilities Membership
Operation Reporting Mandate Update
Relationship with Risk Management Resources

The next chart lists the members of the CROC. Several other employees have invitations to attend meetings: the Director, FERM; the Director, Enterprise Risk Management; the Director, Internal Audit; the Director, Customer Care; and the Senior Manager, Fuels, Planning and Performance are invited to attend all CROC meetings.

GM, Finance, (Chair) *Executive Vice President, Operations*
GM Regulatory Affairs & Legal Services *VP Power Generation and Delivery*
Executive Vice President, Strategic Business & Customer Service

b. Emera Enterprise Risk Management Committee (ERMC)

The Emera ERMC oversees the risk management program within the Emera group of companies. It sets the applicable policies (subject to Board approval), and updates, through the Chief Risk Officer, the parent company Board of Directors and Audit Committee. The ERMC members (shown below) consist of parent-company business leaders, including the NS Power CEO. The Chief Financial Officer, who serves also as Chief Risk Officer, chairs the ERMC. The ERMC meets at least quarterly and is governed by a Mandate dated December 5, 2013.

*EVP CFO Emera & NS Power**	*President & CEO, NS Power*	*EVP & COO Emera*
President & COO Emera Maine	*Chief Legal Officer, Emera*	*Pres. & COO, CNG Emera*
President Emera Caribbean	*Chief Human Resources Officer, Emera*	*President & COO, Emera Utility Services*
EVP Business Development, Emera & CEO, ENL		*President & COO Emera Energy Services*

**Chair*

c. Front, Middle and Back Office

Each of the three offices (front, middle and back) has distinct reporting structures. The NS Power Front Office operates as part of FERM, and reports directly to the Director, FERM, who in turn reports to the EVP, Operations, NS Power. The Middle Office, operating as part of Enterprise Risk Management, reports to the Treasurer and in turn to the Chief Risk Officer, who chairs the ERMC. The NS Power Back Office operates as part of NS Power Corporate Finance, and reports to the GM Finance, NS Power.

d. Policies and Procedures

A number of policies and procedures address risk management. An NS Power Risk Policy applies specifically to the utility. This policy deals with risk management processes related to fuels activity. The most current version for this policy during the Audit Period is dated November 29, 2013. The Credit Policy sets out the credit practices and limits and, where applicable, applies them across the Emera group of companies on a consolidated basis. The Foreign Exchange and Interest Rate Policies govern the activities of the Treasury group in managing foreign exchange and interest rate risk respectively. Emera Energy also has its own Risk Policy.

e. Tracking Reports

The Enterprise Risk Management group tracks positions, including posted collateral, credit exposures, mark-to-market (MTM) positions and value-at-risk (VaR). MTM reporting covers all fuels in the solid fuel portfolio.

Collateral posted includes the amount of cash and letters of credit posted to a counter-party. The Middle Office generates this data on a monthly basis, and provides it to parent-level ERMC and to NS Power's CROC for their quarterly and any other meetings. A generally daily (business days) counter-party credit report tracks two principal sets of data for trading and financial counter-parties. Second is current credit exposure (including MTM) and remaining credit available for each counter-party.

NS Power has access to several MTM reports. The Middle Office calculates month-end MTM on NS Power's solid fuel contracts, including both physical contracts and financial hedging contracts. NS Power does not use the MTM data on these transactions in isolation as a key risk measure. Although Canadian Generally Accepted Accounting Principles (GAAP) require this particular MTM estimate, NS Power follows U.S. GAAP. Knowledge of the magnitude of the MTM on risk management positions can assist internal and external stakeholders with understanding of the exposure generated by management activity.

Value-at-risk ("VaR") serves as another critical risk measurement parameter. The Middle Office calculates the short-term VaR on a daily basis for certain Emera Energy's "marketing-related" transactions and financial hedges. The VaR measures the estimated potential change in the MTM of targeted transactions as a function of movements in overall market prices. The Middle Office uses the portfolio of underlying exposures and risk management instruments warehoused within the Nucleus risk management system to generate VaR calculations.

f. Provisions for Financial Security in Solid Fuel Agreements

NS Power has incorporated into its solid fuel supply agreements a provision requiring the posting of security in specified conditions. The provisions for financial security in solid fuel agreements are made at NS Power's request; [redacted] Section 9.2 of NS Power's standard agreement allows NS Power to demand security (*e.g.*, a letter of credit or a guarantee) upon "reasonable grounds for insecurity about the financial standing or creditworthiness" of the counter-party. Section 9.3 adds the further protection of allowing (irrespective of grounds for insecurity under Section 9.2) NS Power to request additional security in cases where the difference between market and contract price (applied to remaining delivery volumes under the agreement) exceeds $1 million. It should be noted that NS Power is in the process of making a transition from old contract language to the new language just referenced. Old contract language contains an additional provision related to a threshold amount of 50% of the product of Contract Price. This 50% provision is not part of new contracts, and as Master Agreements with counter-parties are re-opened, NS Power will update these contract provisions.

g. Violation of Risk Management Policies and Procedures

No violations of risk management policies and procedures occurred during the Audit Period.

5. Auditing

Section 5.0 of the FAM Plan of Administration (titled "Audit and Oversight") states that the UARB shall provide for FAM audits every second year. The Fuel Manual requires that Internal Audit conduct comprehensive fuel audits every five years and that it audit selected aspects of fuel management each year. Section 4.6 of the Manual ("Internal Auditing and Controls") states:

> *Internal Audit shall conduct an audit of the fuel procurement function at least every five years. Its scope shall include the fuel procurement function from solicitations and evaluations, through fuel receipt, to payment procedures. The audit shall also determine adherence to and adequacy of the policies and procedures in the Fuel Manual. Internal Audit shall identify the focus and conduct partial audits of the fuel procurement functions every other year, in years which do not coincide with the actual conduct of external FAM audits. Upon completion, internal audit shall prepare a report of the findings to be submitted to the FST and the NSPI Audit Committee. The VP, Power Generation and Delivery* [now the Executive Vice President, Operations] *and Director, FERM shall develop an action plan to address any problems identified. Internal Audit will monitor progress of these action plans.*

This auditing procedure reflects a change made through Revision #4 to the Fuel Manual during the Audit Period, which was designed to eliminate internal duplication of audits during FAM audit years.

During the Audit Period, NS Power's Internal Audit conducted two audits related to fuels. In 2012, Internal Audit conducted a compliance audit on targets established by the Renewables Electricity Standards. The audit found that NS Power has developed a formal documented Renewable Electricity Standard Compliance Quality Process which assists management in ensuring they are in compliance with the government established RES. Overall necessary processes are in place to assist management in meeting government targets. There were several areas needing improvement, but no unsatisfactory areas of operation were found.

In 2013, Internal Audit conducted a contract compliance audit for an operations support agreement between NS Power and General Electric Canada. The audit found that overall, NS Power was in compliance with the terms and conditions of the OSA, and the Amendment. There were several areas needing improvement, but no unsatisfactory areas of operation were found.

The fuel and energy cost-related examinations conducted during the Audit Period include:

- Review of the NS Power load forecast prepared by UARB consultant, Synapse Energy Economics, Inc. in 2013.
- Review of variable operating and maintenance costs prepared by Lummus Consultants International. The work was conducted during the Audit Period, but not available as of the end of the Audit Period. A plan will be developed by NS Power upon reviewing the recommendations.
- Review of hedging operations prepared by Concentric Energy Advisors (CEA). The work was conducted during the Audit Period. The Value at Risk (VaR) methodology was

approved by the FST on November 7, 2013 and by the Credit Risk Oversight Committee (CROC) on November 29, 2013. Final approval for the model input parameters was received at the January 15, 2014 FST meeting. NS Power also undertook an internal quality review of the hedging model which included a review by the new Director of Portfolio Optimization and by representatives of the Middle Office. Several model adjustments were made as a result of this review and the revised model was approved by the FST on February 25 - pending review with members of the Enterprise Risk Management Committee (ERMC). The review with the ERMC members was completed on March 18 and a hedging recommendation was prepared for the FST's scheduled meeting on March 26. The recommendation was approved by the FST. The VaR model was also presented to the FAM Small Working Group by Concentric Energy Advisors (CEA) on November 26, 2013. The VaR Model has been implemented and it will be reviewed after six months.

During the Audit Period, NS Power engaged the services of five different companies on matters related to fuel operations. Such assistance was essentially in the form of legal advice, and is described in detail in Chapter IV, Solid Fuel Procurement and Contracts, Section 6, Procurement Consultation.

NS Power did not provide for any audit of fuel supply procurement process by any external parties during the Audit Period. The Company continues to rely on the services of external fuel procurement experts in its fuel procurement activities. In addition to those external parties listed in Chapter IV, NS Power continued to use its long-standing fuel consultant EVA for specific solid fuel supply related issues.

The Internal Audit group consists of ten permanent employees. It is headed by a director, and consists of two audit managers, four senior internal auditors, and three internal auditors. The staff roughly divides between compliance (three full-time equivalent persons) and internal audit (three full-time equivalent persons). Certifications held by the Internal Audit Group include CA, CGA, CIA, CFE, CISA, CGEIT and CRISC. The above listing shows Internal Audit work related to fuels during the Audit Period.

C. Conclusions

1. Correction of the major personnel discontinuities in the FERM organization reported in the previous Audit Period forced considerable transition during the current Audit Period, but corrective action has been taken and was in a positive direction as multiple steps were taken to improve organization structure and stability.

Positive changes have been made throughout the NS Power organization, starting with selection of a new President and Chief Executive Officer of Nova Scotia Power, Inc. Reporting to him is a new Executive Vice President (EVP) Operations, for NS Power. Both of these individuals have shown positive interest in resolving the organizational problems reported by Liberty in the previous FAM Audit.

The FERM organization has begun to stabilize, with no changes at the top levels during the Audit Period. The FERM organization has also been expanded to more effectively deal with the

multiple dimensions of fuel related challenges, as well as expanded responsibilities, such as for biomass procurement and management. Six new positions were created, and six well qualified individuals were selected for these positions.

FERM has taken constructive steps to resolve the stability related problems identified in the previous FAM Audit, as follows: 1) new cross-training is in progress for the "key" positions; 2) succession plans have been developed for the three "key" positions, and successor candidates have been identified; and 3) Human Resources has started a review of compensation within the FERM group, to include both internal and external benchmarking, and it is anticipated that such review will be completed early in 2014.

2. The FERM organization uses a generally satisfactory set of performance measurement, training, and job description methods and tools for guiding and incenting its employees, and the Action Plan from the prior audit related to improvement in the Commercial Incentive program has been satisfactorily completed.

The Commercial Incentive program has been improved significantly to resolve issues outstanding from the previous FAM Audit, and has listed the aspects of performance by FERM position that are key to optimizing performance for the benefit of customers, has established measures for assessing the success in achieving them, and has identified specific targets now part of incentive awards.

3. The Fuel Manual continues to be improved, and provides the FERM organization with an effective set of procedures covering the important areas of fuel and energy procurement and management.

The Fuel Manual encompasses a broad and appropriate base of subjects, and provides sufficient detail in the important areas of fuel and energy procurement and management. This manual compares favorably with traditional electric utility policies and procedures covering these areas of operations. We found its combination of multiple procedures into one document a strength.

Formalized procedures, such as those embodied in the Fuel Manual, have importance for a number of reasons. They serve as the framework for guidance of day-to-day activities and they serve the important purpose of formalizing institutional memory. Formalized procedures provide a standardized basis and point of reference for performance evaluations. Procedures essentially provide the handbook and guide to operations that is important for training of individuals new to the organization, for guidance in operations when individuals are suddenly unable to perform their responsibilities because of illness, or other reasons, or when they leave the organization unexpectedly.

Liberty found employees in FERM well aware of the contents of the Fuel Manual. FERM employees regularly use and refer to the Fuel Manual, ensuring that the performance of their individual responsibilities is consistent with the requirements found in the Manual.

The current version of the Fuel Manual, as of the end of the Audit Period, bears the date of November 2012, Revision #6. Changes during the Audit Period were primarily administrative in nature, and resulted from a collaborative effort facilitated by the Small Working Group (SWG).

NS Power is undertaking substantive revisions to the Fuel Manual, which it plans to implement sometime in 2014.

4. **FERM has improved the administration of the Quarterly Fuel Manual Compliance since the last Audit Period, however continued improvement is still required.** (*Recommendation #1*)

Liberty found that the NS Power program for administering the Quarterly Fuel Manual Compliance program improved, but with continued improvement still required.

There were two significant problems with this program. The first was that numerous signatures were lacking, creating uncertainty as to the involvement of the corresponding management position. It is possible that such signatures were lacking because of electronic filing of these forms; nevertheless, the Company must demonstrate a sound method for ensuring administration of this program. The second was that there were no forms for the Manager, Oil, Gas, & Energy. This is a position within FERM with such significant responsibility that absence of compliance forms is not acceptable.

5. **The coal modeling process has been improved significantly through development of the new Coal Solver tool.**

The new Coal Solver tool, developed by NS Power, has greatly improved the coal modeling process and now enables the company to more effectively determine lowest cost fuel blends for the fleet, while meeting unit operating constraints and emissions requirements. The model is automated, performs calculations rapidly, and without the manual operations previously required by the Coal Model.

6. **NS Power did not make any changes to the FAM Plan of Administration during the Audit Period.**

NS Power discussed multiple changes to the FAM Plan of Administration (POA) with the Small Working Group (SWG) during the Audit Period, but such changes have not yet been made because all changes to the POA must be approved by the NSUARB, and proposed changes have not yet been submitted to the NSUARB. The last changes made to the POA were in the year 2011.

7. **The NS Power procedures related to Internal Auditing were clarified and improved during the Audit Period.**

NS Power has clarified the procedures in the Fuel Manual related to Internal Auditing through Revision #4 to the Fuel Manual. The procedures now state that internal audits related to fuel issues will be conducted every other year, and in years not coinciding with FAM Audits. Previously, it was possible for FAM Audits and internal audits to be conducted concurrently.

8. **NS Power's Internal Audit group conducted two audits during the Audit Period which related peripherally to FERM activities, and did not directly impact fuel procurement or management issues.**

During the Audit Period, NS Power's Internal Audit conducted two audits related to fuels. In 2012, Internal Audit conducted a compliance audit on targets established by the Renewables

Electricity Standards. Overall necessary processes are in place to assist management in meeting government targets. There were several areas needing improvement, but no unsatisfactory areas of operation were found.

In 2013, Internal Audit conducted a contract compliance audit for an operations support agreement between NS Power and General Electric Canada. The audit found that overall, NS Power was in compliance with the terms and conditions of the OSA, and the Amendment. There were several areas needing improvement, but no unsatisfactory areas of operation were found.

D. Recommendations

1. **Improve administration of the Quarterly Fuel Manual Compliance program and correct specific problems noted within this chapter.** *(Conclusion #4)*

The purpose of the Quarterly Fuel Manual Compliance program, and the data sheets within, is to ensure that the tasks specified in the Fuel Manual are taken seriously, completed appropriately, and in a timely manner. The deficiencies which Liberty has noted indicate that the program is not taken seriously, and should be a warning sign to FERM management that compliance with the Fuel Manual must be emphasized and is vital to the effective functioning of the organization. Administration of the program must be improved and the specific problems noted must be resolved.

II. Forecasting and Supply Planning

A. Background

NS Power's fuel supply planning begins with load forecasts covering the next ten years. The Integrated Customer Service department prepares each year a base-case forecast, and high- and low-demand cases. The department does so in the context of NS Power's business planning/budgeting process. NS Power prepares forecasts for Net System Requirements, defined as in-province billed sales plus associated system losses and changes to unbilled sales. NS Power also forecasts peak hourly demand on the basis of forecast energy requirements and expected load shapes. A Load Forecast Report, prepared annually, presents results. NS Power files this report with the NSUARB on April 30 of each year.

The next year's load forecast is used with a computer model that simulates generating-unit dispatch to forecast fuel requirements. The dispatch model uses the characteristics of NS Power's generating units, forecasts of fuel prices, and a number of other parameters to simulate the operation of the units over the forecast period. That simulation provides estimates of the amounts of each fuel required to operate the units over the period.

The quantities of each fuel multiplied by their respective prices yields an annual Fuels Budget. The Company uses that Budget and estimates of sales to each customer class to set the fuel component of NS Power's rates. Revenues generated by the rates are compared to actual fuel expenditures. Any difference between fuel revenues and fuel expenditures carry forward for inclusion in the succeeding year's fuel rates.

A long standing circumstance surrounding NS Power's fuel requirements forecasting and supply planning has been under-recovery of its fuel costs. Under-recovery during the Audit Period amounted to $15.8 million in 2012, and increased to $67.7 million in 2013. Accumulated interest increased those amounts to $17.0 million and $71.0 million, respectively, at the end of 2013. NS Power previously had large under-recoveries in 2010 ($80.3 million) and in 2011 ($40.1 million) as well.

Under-recovery can occur because estimates of fuel costs are too low, which would make the fuel component of the rate too low. Alternatively, under-forecasting load would cause under-recovery when higher-cost generating units become required to meet the added load. Both of these factors could also be at work. NS Power has maintained that the under-recoveries arose from unanticipated increases in fuel prices. Liberty conducted a preliminary inquiry into the 2010 under-recovery in the second quarter of 2011. At that time, we found that the shortfall arose from a combination of factors:[1]

- Diminished precipitator performance forced a derating of the coal-fired generating units at Lingan, causing the Company to substitute more expensive power.

[1] Liberty's report, dated July 25, 2011, was filed in Matter No. M03285, *P-887(2) NSPI 2011 Fuel Adjustment Mechanism (FAM) Hearing & Actual Adjustment (AA) and Balance Adjustment (BA) Proceeding*.

- An unanticipated increase in the difference between the price for natural gas at the delivery location in the commonly-traded natural gas futures contract (Henry Hub, Louisiana) and the market location referenced in NS Power's gas-purchase contracts (Dracut, Massachusetts) caused two effects:
  - Increased the price of gas used to generate power
  - Discouraged additional gas use as a means of offsetting the deration at Lingan.
- A delay in the return to service of a Tufts Cove generating unit forced the Company to import power to replace reduced generation at Lingan. The incremental import purchase was for delivery during the month of December, making the price of the power comparatively high.
- Mark-to-market adjustments for fuel-related foreign exchange increased 2010 fuel costs by $9.3 million.[2]

Liberty continued the investigation in the previous FAM Audit.[3] We examined fuel requirements forecasting, fuel supply planning, and fuel price hedging. Another NSUARB consultant, Synapse Energy Economics, Inc. periodically examines NS Power's load forecasting. We found that NS Power had changed its forecasting processes to improve its handling of large changes in load, which had occurred primarily because of financial difficulties encountered by its largest customers. We felt that the computer-modeling tools that the Company was using to forecast its fuel requirements were not well suited to their uses, however, and recommended changes. We also recommended that the scope of an anticipated review of fuel price hedging practices be expanded.

For this audit, Liberty has examined the changes that the Company has made in fuel-requirements forecasting and supply planning. We have also reviewed the Company's fuel price hedging programs.

B. Findings

1. Audit Period Production Sources

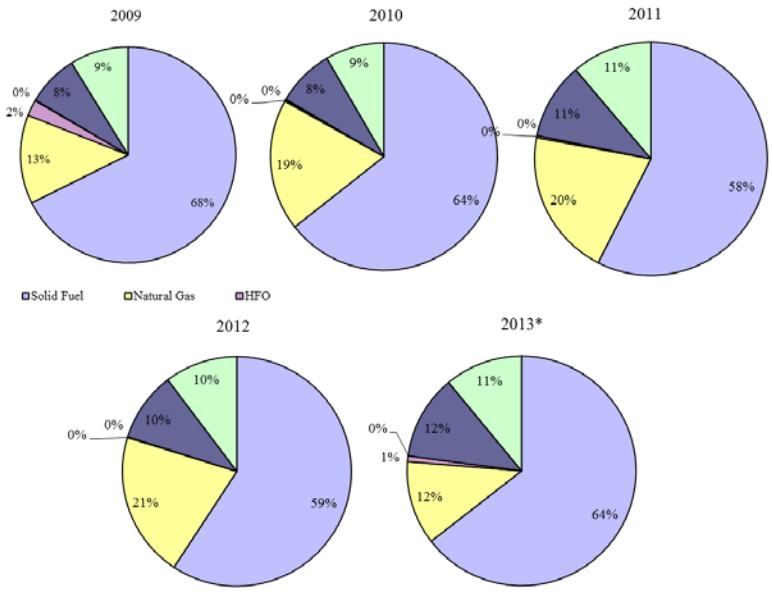
NS Power experienced a continuation of the shift in its generation mix from solid fuel to natural gas for much of 2012. By late in that year, however, increases in gas prices occasioned by reductions in supply to the Maritimes Region reversed that shift. Purchased power increased as a share of energy production, as wind-powered projects contracted under the 2007 RFP for renewable power continued to come on-line.

[2] The accounting treatment for these instruments changed effective January 1, 2011. After that date, no more adjustments for these changes flowed through the FAM. (The cost or benefit from settlement of the underlying hedges are counted as fuel costs when they settle, but month-to-month changes in their values are not flowed through the FAM.)

[3] The Liberty Consulting Group, "Audit of Nova Scotia Power, Inc.'s Fuel Adjustment Mechanism for 2010-2011," filed July 10, 2012, as Exhibit N-22(C) in Matter No. M04972, *In the Matter of an Application by Nova Scotia Power Incorporated for Approval of Certain Revisions to its Rates, Charges and Regulations, including the review of the Fuel Adjustment Mechanism Audit*.

The chart below shows the shift in generation fuels since the end of 2008. The proportion of generation fueled by coal decreased from 68 to 59 percent, before increasing to 64 percent in 2013. Gas correspondingly increased from 13 percent to 21 percent, before declining to 12 percent in 2013. Purchased power includes purchased wind power, power purchased from other independent power producers (primarily fueled with biomass), and power imports. Purchased power increased from eight to twelve percent. Power from NS Power's hydroelectric facilities increased from nine to eleven percent.

Proportions of Energy Production



*Note: In 2013 Biomass is included in the Solid Fuel number and COMFIT is included in the purchased power number.

The next table presents descriptions of NS Power's generating units, with each one's production during the Audit Period.

Generation Summary

Plant/Unit	Net Operating Capacity (MW)	In Service	Fuel Type	2012 GWh	2013 GWh
Lingan Unit 1	153	1979	Coal / Petcoke	838.2	873.0
Lingan Unit 2	153	1980	Coal / Petcoke	427.9	790.6
Lingan Unit 3	153	1983	Coal / Petcoke	637.1	756.1
Lingan Unit 4	153	1984	Coal / Petcoke	887.7	931.2
Tufts Cv Unit 1	81	1965	Natural Gas	462.1	129.2

Tufts Cv Unit 2	93	1972	Oil / Natural Gas	450.7	199.9
Tufts Cv Unit 3	147	1976	Oil / Natural Gas	664.3	568.7
Tufts Cv Unit 4 (LM 6000)	49	2003	Natural Gas	253.8	199.3
Tufts Cv Unit 5 (LM 6000)	49	2005	Natural Gas	259.9	199.3
Tufts Cv Unit 6	49	2012	Natural Gas	70.3	97.0
Pt Tupper	152	1973	Coal / Petcoke	849.8	814.3
Pt Aconi	171	1994	Petcoke / Coal	1,168.8	1,207.6
Trenton Unit 5	150	1969	Coal / Petcoke	277.0	635.6
Trenton Unit 6	157	1991	Coal / Petcoke	1,145.4	1,098.6
Port Hawkesbury Biomass	45	2013	Biomass	-	130.4
Burnside 1	33	1976	Light Oil	0.0	0.7
Burnside 2	33	1976	Light Oil	0.2	1.5
Burnside 3	33	1976	Light Oil	0.3	1.2
Burnside 4	33	1976	Light Oil	-0.2	-0.7
Victoria Junction 1	33	1976	Light Oil	-0.1	0.1
Victoria Junction 2	33	1975	Light Oil	0.0	0.1
Tusket 1	24	1971	Light Oil	-0.1	0.2
Hydro System	397.2	Various		827.8	973.3
NSPI Wind	82	Various		256.3	261.0

NS Power planned for Tufts Cove 6 to enter service in late 2010. The Company declared the unit in-service on August 1, 2012. The unit, however, still has not attained the full range of operational flexibility, due to conditions discussed in Chapter VIII of this report. That Chapter also discusses an extended outage experienced at Trenton Unit 5 during the Audit Period. The next table summarizes fuel costs in the two years of the Audit Period and the Budget for 2014, which excludes PHP load.

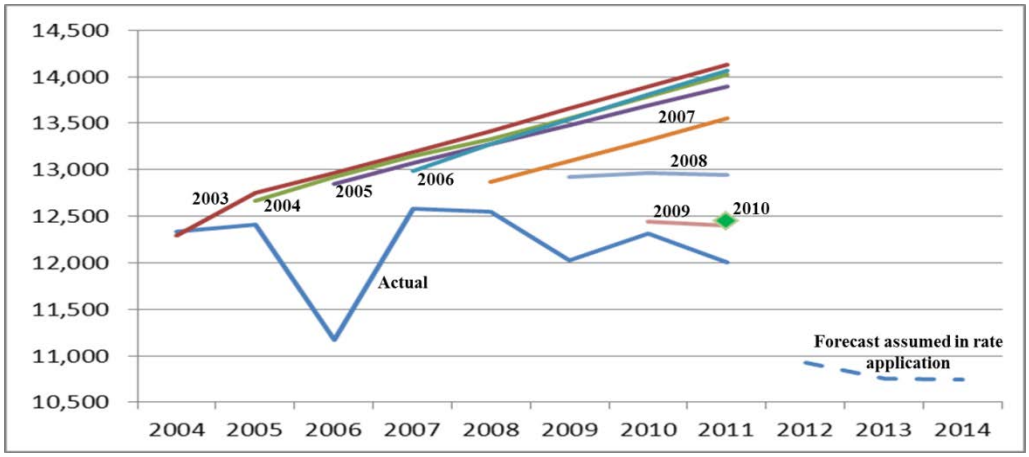
Audit Period Fuel Cost Summary

Properties	Actual 2012	Actual 2013	Budget 2014
Fuel for Generation - Domestic Load ($M)			
Solid Fuel	267.8	311.1	228.3
Natural Gas	128	106	93
Biomass	-	11.3	34.1
Bunker C	1.2	8.3	2
Furnace	3.2	3.4	2.4
Diesel	0.3	1.2	0.7
Additives	6.2	10.2	5.6
Subtotal	406.7	451.3	366.2
Purchased Power (incl. Point Tupper Wind)	86.3	104.6	81.9
Fuel for Resale Net Margin	-	-0.6	-
Exports	1.3	0.5	1.7
Fuel and Purchased Power	494.3	555.9	449.8
Water Royalties	0.9	1	0.9
MTM on HFO and Natural Gas	-0.4	-	-
Total Fuel and Purchased Power	494.8	556.9	450.7
Less: Export Revenues	-1.9	-1.3	-1.8
Less: Load Retention	-14.6	-57.5	-
Less: 1PT RTP	-	-	-
Less: Biomass Gas	-	0	-
Less: GRLF Fuel Costs	-4.1	-0.3	-0.8
Less: Mersey System Fuel Costs	-0.1	-	-
Loss / (Gain): Foreign exchange - Fuel Other	1.9	-0.6	0
Net Fuel and Purchased Power	**476**	**497.1**	**448**

2. Load Forecasting

Recent years have witnessed declining NS Power forecasts of load. The chart below shows the forecasts to 2011 in the years that each forecast was prepared. The chart also shows actual sales through 2011 and the forecast used to prepare the 2013 General Rate Application.

Power Requirements Forecast versus Year in Which Each Was Prepared



The biggest factor underlying the prior differences between forecast and actual sales has been the paper manufacturing plant at Port Hawkesbury (PHP) and the former Bowater plant in Queens County. The Port Hawkesbury plant suspended operations for an extended period in 2006, then shut down completely in late August 2011. The Bowater plant shut down in June 2012.

Liberty asked the Company to compare forecast and actual Net System Requirements (NSR) without the PHP and Bowater loads for the Audit Period and the two previous years. The table below shows the results. Adjusting to normal weather places forecast and actual NSR within one percent of each other, except for 2013.

Forecast versus Actual Net System Requirements

	2010	2011	2012	2013
FAM Load Forecast NSR (less PHP and Bowater)	10,007.8	10,050.9	10,098.4	9,861.9
Actual NSR (less PHP and Bowater)	9,900.1	10,031.2	9,947.4	10,113.9
NSR Variance to Forecast	-1.1%	-0.2%	-1.5%	2.6%
Weather Normalized NSR (less PHP and Bowater)	10,052.3	10,126.3	10,096.8	10,113.5
Weather Normalized NSR Variance to Forecast (less PHP and Bowater)	0.4%	0.7%	0.0%	2.6%

Prior to 2012, NS Power considered the large-volume industrial load as an undifferentiated component of total load for fuel-requirements estimation purposes. In early 2012, however, the Company switched to a "book-end" process that uses multiple dispatch model runs to put upper and lower limits on estimated fuel requirements. This process has evolved into the "with and without" forecasting process used to estimate fuel requirements for the revived PHP plant as part of administering the Load Retention Tariff that applies to that plant. Operation of that tariff is subject to a required audit, which was delivered to the NSUARB on February 28, 2014.[4] Chapter X of this report discusses the results of that other audit as they concern issues within the scope of this audit.

[4] Newton Energy Group and Synapse Energy Economics, Inc., "Audit of Port Hawkesbury Paper Load Retention Tariff," filed in Matter No. M05803, *P-203 – NSPI Port Hawkesbury Paper Load Retention Tariff Report*.

The Company continues to survey its other large-volume customers individually in preparing load forecasts. These surveys cover 27 large industrial customers and 12 large general-service customers. NS Power asks each such customer to estimate its power requirements by month for the next two to three years.

The NSUARB has occasioned a consultant review of NS Power's load forecasting several times since 2006. The most recent review[5] noted "major progress" in developing an end-use forecasting model for the residential and commercial sectors, and recommended that NS Power move rapidly to use this method for its forecasts.

3. Fuel Requirements Forecasting

a. Forecasting Process During the Audit Period

Appendix B to NS Power's FAM Plan of Administration presents its fuel-requirements forecasting methods, which has followed these steps:

- Load forecast: Produce a forecast of hourly power requirements for the forecast period (two years for the FAM forecasts). Convert this data into a typical-week load shape for each month of the forecast period, for use in developing monthly generation and fuel-requirements forecasts.
- Fuel forecast: Estimate the price of each fuel to NS Power, including the cost of delivery to NS Power's generating plants, over the forecast horizon using contract prices for fuel and transportation already contracted, and forward-market prices for fuel and transportation not yet contracted.
- Resource characterization: Input the characteristics and availability of each of NS Power's generating units, including hydroelectric units, and power-purchase contracts.
- Input other costs, which include, for example, emission fees, water use fees, solid fuel pile management costs, rail car leases, pier volume adjustments, and incremental trucking costs.
- Input assumptions for power exports and power imports.

NS Power has fed these inputs into a computer model which calculated the optimum dispatch of generation and power-purchase resources for satisfying the load at least cost. NS Power used Ventyx's *Strategist* for this purpose during the Audit Period. The Company used preliminary and subsequent runs to ensure consistence with external constraints, such as emissions limits. An estimate of the amount of each fuel required, by month, came as a corollary output of the calculation of optimum dispatch. Those amounts could be compared to amounts of each fuel under contract, with the uncontracted balance in each month representing amounts that NS Power needed to secure.

NS Power specified power from several sources to the model rather than permitting the model to solve for them:

[5] Synapse Energy Economics, Inc., "Findings Regarding the NSPI 2012 and 2013 Load Forecasts – Forecasting in an Uncertain Future." This report was furnished to Liberty as Attachment 1 to the Company's response to our Data Request No. 14.

- Independent Power Producers (IPPs) providing power to NS Power under power-purchase contracts: Monthly profiles of power supplied were specified, taken from volumes in the contracts; where contracts did not fix monthly volumes, the modelers used a simple average of monthly production in the last three years.
- Wind-powered energy: NS Power's estimate used averages of the last three years' production by each project.
- Hydroelectric power: The Company estimated the energy provided by each unit by using a 23-year rolling average. NS Power adjusted the average for unit additions, decommissionings, and unavailability for extended periods, due to factors such as inspections and maintenance, for example.
- Power imports: Imported energy forecasts used a 24-month rolling average of imports during the most recent 24 months, adjusted for known changes (such as transmission line maintenance), as necessary.[6]

NS Power decreased the load forecast specified to the model in each month by the volumes anticipated to be available from these sources. Following these adjustments to the load forecast, a preliminary *Strategist* run estimated how much each fossil fuel plant would run in each month of the forecast year. NS Power increased the forecast by the amount of anticipated power exports. The Plan of Administration (POA) specifies that the volume of export power would be assumed to comprise 50 percent of the unused on-peak capacity of Tufts Cove Steam Units 2 and 3 as calculated in the preliminary *Strategist* run.

NS Power also used the preliminary *Strategist* run to provide fuel requirements by generating station to a Coal Model developed in-house. NS Power used the latter to optimize blends of solid fuel across the generation fleet within the available emission limits. Coal Model outputs included costs and emissions factors by fuel blend by generating station for use in a final *Strategist* run. The final run produced estimates of required fuel quantities by generating station with all constraints satisfied.

Appendix D to the FAM Plan of Administration provides the annual schedule for these activities. The forecast process begins in July of the year prior to the one being forecast. NS Power has updated results three times during the forecast year, as it learned information on actual load, any new contracts for committed volumes of fuel and fuel price hedges, and fuel market conditions. In 2012, it added a fourth update, in November of the year prior to the one being forecast, to reduce the length of time between the initial forecast (July-August prior to the year being forecast) and the first update, in February of the forecast year. NS Power updated every assumption required for producing the forecast each time it performed one of these updates.

[6] The FAM Plan of Administration continues to contain this provision. NS Power over-rode it in its 2013 GRA Load/Fuel Update, due to a limit on firm power transmission on the Nova Scotia-New Brunswick tie line. For that filing, the Company stated that "These … factors make the use of historical averages unrealistic for forecasting purposes." NS Power 2013 GRA Load/Fuel Update, at page 2.

b. Liberty Findings in the Previous FAM Audit

After examining NS Power's use of *Strategist* in fuel-requirements forecasting in the previous FAM Audit, Liberty concluded that *Strategist* was not well suited for the role that it played in that process. Liberty recommended that NS Power replace *Strategist* with a model better suited to production-cost modeling and forecasting.

Liberty also found that *Strategist* did not adequately account for variable operation and maintenance (O&M) costs, nor did it adequately reflect the cost of cycling the Company's coal-fired generating units. In addition to recommending a different model, Liberty recommended that the Company perform or commission a study to identify better its own internal breakdown of the fixed and variable components of O&M costs, and another study of the costs of cycling its coal units.

Liberty also found weaknesses in the Company's Coal Model. It used an overly manual approach to populating data, solving and meeting constraints. Liberty recommended replacing or overhauling it.

c. Conversion to Plexos

The Company began inquiries to replace *Strategist* for dispatch modeling[7] in 2009. It acquired a license for *Plexos*, developed by the firm named Energy Exemplar, in December 2011. GE Energy Consulting used a combination of *Plexos* and GE MAPS in performing the "Nova Scotia Renewable Integration Study," commenced for NS Power in 2011, and completed in June 2013.

During 2012, NS Power personnel worked on comparisons between *Strategist* and *Plexos* in an effort to ensure that the new model accurately reflected the operation of NS Power's system. There were also some peculiarities of NS Power's system, such as the need to remove elemental mercury from the Company's coal-fired generating units' emissions, which had to be implemented in the new model.

NS Power personnel have been running the two models in parallel since the second quarter of 2013. This process has allowed NS Power to build confidence in the results of the new model. *Plexos* has also been used to "inform" *Strategist* because *Plexos* can calculate some parameters, such as the most economic quantity of power imports that *Strategist* cannot.

Plexos also optimizes solid fuel blends internally, rather than having to iterate (as *Strategist* made necessary) with the Coal Model. A new Coal Solver model has been developed, and now operates to verify blends calculated by *Plexos*. The old Coal Model continues to determine the accounting cost of solid fuel to meet the optimized dispatch, based on: (a) inventory available for consumption, (b) contracted fuel to be delivered, and (c) remaining open positions for fuel to be purchased.

[7] The Company continues to use *Strategist* for integrated resource planning, a use for which it is well suited. See the 2012 FAM Audit Report, at page II-7.

Company personnel presented progress reports on the conversion to a group of its stakeholders in March and in October 2013. The March presentation reported on a preliminary benchmarking exercise, conducted to compare dispatch forecasts prepared with the two models. The findings from that exercise were that when *Plexos* was supplied only the system assumptions that are present in *Strategist*, the dispatch forecasts were nearly identical. When *Plexos* was further enabled to include system constraints that it could handle but *Strategist* could not, the dispatch forecasts became significantly different. The Company advised the group that, since *Plexos* required a broader set of system assumptions, it would develop procedures to acquire and validate those assumptions.

The October presentation reported on two more benchmarking exercises. In particular, NS Power carefully compared forecasts prepared by the two models for the 2014 Fuels Budget.[8] The result was that, when all relevant constraints were introduced into the *Plexos* runs, estimated fuel and purchased-power costs increased by about four percent. Importantly, the two models also forecast different utilization of the Company's generating plants, only slightly different in the case of some plants, but with more substantial differences in other cases. As the different coal-fired generating plants use different fuel blends, these differences in operations imply different fuel requirements.

By the end of 2013, the Company had largely switched to *Plexos* for its fuel updates, which occur quarterly for fuel supply planning, but are not used in setting the fuel component of the Company's rates. In late November, the Company presented proposed changes to the forecasting appendix to the FAM Plan of Administration to the same group. In January 2014, the Company requested comments or suggestions regarding the changes, prior to filing them formally. The forecasting appendix specifies how the Company will calculate each year's Fuels Budget, and that Budget is one of the key inputs to calculating the Company's fuel rates. The appendix and any changes to it therefore require NSUARB approval.

Work to assess variable O&M costs began in late 2013 and is scheduled to be completed in the first quarter of 2014. The Company has undertaken a study of the impacts of cycling on the operation of its generating units, but has not yet focused on providing usable estimates of those costs to its dispatch modeling. Chapter VIII addresses this work.

4. Fuel Supply Planning

The Fuel Manual presents NS Power's general policies for fuel supply acquisition. The manual also provides more specific direction and guidance on processes for determining fuel requirements, fuel and transportation procurement procedures, allowed fuel procurement transactions and fuel procurement administration. Appendix C presents the Company's procurement strategy and objectives for the major fuel types: solid fuel and transportation services, heavy fuel oil (HFO), light fuel oils (LFO), and natural gas. Appendix D presents the

[8] The 2014 Fuels Budget for ratemaking purposes was established in a settlement between NS Power and most of its stakeholders in its 2013 GRA proceeding (Matter No. M04972). That settlement was approved by the NSUARB in its Decision in that proceeding dated December 21, 2012. The exercise here compared the results of the two models as if they had been used to compute a Fuels Budget in the normal cycle, *i.e.*, prepared in August 2013, using forward fuel prices observed on June 30, 2013.

Company's fuel hedging strategy and objectives for each of these four major fuel types. The next subsections present Liberty's findings regarding procurement planning for each fuel.

a. Solid Fuels

Solid fuels comprise the largest source of NS Power's generation. Solid fuels account for 50 to 60 percent of the annual fuels budget. These fuels vary the most in quality and burn characteristics and are subject to the most stringent emissions constraints. The variability in factors like these presents significant opportunities for improving performance through effective procurement planning.

The first *Strategist* run has estimated the amount of energy required from the solid fuel fleet and the amounts of emissions available. Those parameters provided inputs to the Coal Model, for optimization of fuel blends across the fleet and within available emissions limits. The Coal Model produced cost and emissions factors for use in a final *Strategist* run. That final run solved for the optimal dispatch to produce the lowest fuel cost for the forecast period. The results of the final *Strategist* run provided particular objectives for solid fuel competitions. The run produced an optimal fuel blend for each generating station, seeking compliance with applicable emissions constraints at the lowest overall cost. NS Power could compare these target fuel blends with inventories and fuel already under contract in configuring further solicitations.

Plexos, as modified by NS Power to reflect its system and extant emissions constraints, performs these optimizations internally. It will be used in the same way to estimate required fuel quantities for the forecast period. As happens with *Strategist*, those quantities will be compared with inventories and fuel under contract in determining whether and when to go to the market for additional supplies.

Existing commitments and prospective solicitations also bear on efforts to hedge the prices of coal supplies. NS Power prefers fixed-price supply agreements to hedge its exposure to price changes. Volume optionality at fixed prices comprises another preferred hedging technique. When those alternatives prove unavailable, however, the Company uses financial instruments in conjunction with physical delivery commitments to limit exposure to price changes.

b. Heavy Fuel Oil

NS Power faces periods when it burns gas rather than heavy fuel oil ("HFO") at Tufts Cove. Imperial Oil's refinery at Dartmouth has been able to provide much of the HFO supply that NS Power needs for the other generating stations at those times. NS Power's requirements for HFO vary widely, however, and depend on the HFO price relative to the price of natural gas. A relatively low price of HFO can produce HFO burns as high as 3.5 million barrels per year. The Dartmouth refinery could not supply all of NS Power's requirements when HFO offered comparatively more economical prices than did natural gas for extended periods, however. NS Power therefore conducted tenders for larger HFO quantities. The tenders sought a requirements contract, which gave NS Power the flexibility to avoid HFO purchases when natural gas was more economical to burn.

The Imperial refinery ceased processing crude oil in September 2013. Some of the processing equipment will be dismantled, but the site will be converted to a bulk terminal for petroleum products storage and distribution.

HFO will not be one of the products available from the terminal. The trade in that product will continue, and the firms that have previously competed for NS Power's requirements contract will continue to participate in that trade. The difference will be the disappearance of the Imperial refinery as a supplemental source of HFO.

NS Power has observed that other users will also be without that source of supply. Marine bunker fuel is another common use of HFO along the Atlantic coast. Press accounts report that 250 to 300 vessels per year have refueled at the Dartmouth refinery, some of them exclusively there.

Recognizing that need, and recognizing that the Company had more HFO storage at the Tufts Cove Generating Station than it was using, NS Power has begun exploring whether other suppliers might be interested in using NS Power's spare capacity to offer a refueling service. A Request for Expressions of Interest (REOI) was issued on October 3, 2013.

[redacted] responded to the REOI. Site visits and written requests for information from interested parties have been completed, and at the time that this report is being written NS Power is developing a Request for Proposals (RFP). NS Power reports that, due to the high price of natural gas, use of HFO at Tufts Cove has increased since the REOI was issued, and that the RFP will reflect the Company's increased usage when it is issued.

NS Power conducts procurements for lot sizes that fit the size of commercial vessels used to transport HFO. NS Power's storage for the fuel at Tufts Cove holds about a month's worth of maximum HFO consumption. NS Power uses a "rule of thumb" for ordering additional cargoes at certain inventory levels.

NS Power hedges its HFO according to its anticipated usage. Consider the case when the relationship between HFO prices and gas prices over the planning period (the next two years for FAM forecasting) indicates periodic burning of HFO in the Tufts Cove steam units. NS Power will then consider the hedging schedule specified in the Fuel Manual. NS Power does not hedge HFO when forward prices indicate burning gas at Tufts Cove even though some of that fuel is used at other generating stations. Those uses are not separately forecast; rather, quantities are estimated based on a rule-of-thumb relationship with solid fuel forecasts for each station. Use of that fuel with solid fuel is discretionary with each station manager, so the relationship is not the same across stations.

NS Power last hedged HFO for consumption in September 2010, the month before expiration of its long-term gas supply contract with [redacted]. Part of the pricing for the gas supplied under that contract was linked to the HFO price.

c. Light Fuel Oils

NS Power's requirements for light fuel oils ("LFOs") focus on furnace oil for boiler start-up and diesel fuel for combustion turbines. NS Power's use of them varies considerably, depending in particular on how much the diesel-powered combustion turbines run. These requirements, while substantial, remain moderate enough to permit management through the local distribution infrastructure. NS Power [redacted] suppliers to bid in the Company's most recent tender for supply. Given the standard nature and wide availability of these products, NS Power has required no special plans for the procurement of LFOs. The variability in LFO use has led NS Power not to hedge the price.

d. Natural Gas

NS Power uses natural gas to fuel the steam units at Tufts Cove when it finds natural gas prices low relative to the price of HFO. NS Power also uses gas to fuel the combined-cycle generators at Tufts Cove (two turbines and a heat-recovery steam generator, or HRSG). The turbines burn only gas. Therefore, the position of the units in the dispatch order determines the fuel amounts required. The combined-cycle units are highly efficient, and, depending on the relative price of coal and gas, they may move the units to a base-load position.

NS Power has not had access to gas storage; therefore, it maintains no inventory. When its fuel-requirements forecasts indicate a need for that fuel, the Company must buy the commodity in the markets to which it has access. Typically gas is purchased as a delivered product; therefore no transportation is required by NS Power to get it to Tufts Cove.

NS Power did not need a procurement plan *per se* for its gas requirements before November 2010. In the late 1990s NS Power had entered into long-term contracts for gas supply and transportation capacity in support of development of the Sable Offshore Energy Project (SOEP). NS Power used the gas provided under those contracts to fuel generation as the price level relative to HFO and the position of the turbines in NS Power's dispatch order dictated. The Company sold the balance available under the contracts into the Northeast (U.S.) Gas Market. Those contracts expired at the end of October 2010.

In 2008, NS Power began preparing for the end of those contracts. It issued a request for proposals (RFP) in the fall of that year for a base-load quantity of gas that it expected to use every day. Deliveries under a new contract were to start when the old long-term contract expired. That RFP resulted in [redacted] contract for a constant quantity ([redacted] MMBtu/day), with deliveries beginning [redacted]. That contract was later extended [redacted] (through [redacted]. It provided for delivery to the Tufts Cove Generating Station by [redacted].

NS Power issued a second RFP for gas supplies in the fall of 2009. That RFP resulted in a contract for quantities that varied [redacted]. That contract also provided for delivery by [redacted]

A third contract was negotiated through the first half of 2010 and entered [redacted]. That contract also provided for deliveries to commence [redacted], but extend through [redacted]. It provided a relatively small base-load quantity ([redacted] MMBtu/day) initially, [redacted] quantities once the Deep Panuke Field began steady production. [redacted] quantities were to include [redacted] a second quantity that would vary by [redacted] and 3) a third quantity that would be nominated (specified) [redacted] The [redacted]-varying quantities were to be specified in a once-per-year nominations process. The contract provided for delivery by [redacted]

Deep Panuke did not reach steady production during the term of the third contract. NS Power therefore had to seek additional supplies in order to obtain the quantities that were indicated by its fuel-requirements forecasting. The Company negotiated monthly and seasonal supply contracts for the necessary quantities through 2011 with suppliers that were active in the Maritimes Gas Market. It also issued an RFP for a particular quantity for the winter of 2011-2012. Quarterly and monthly purchases were negotiated through the second quarter of 2012, and then monthly through the third quarter of 2012. Delivery arrangements varied by supplier; some suppliers had NS Power take assignment of their capacity, while others sold to NS Power on a delivered basis. To that point, all three of the initial term contracts were still in force and delivering, although the quantities available under the second of those contracts were declining.

Throughout the period after expiration of [redacted] contract, NS Power would also enter what it refers to as "balancing" transactions. These transactions were purchases or sales of relatively small quantities, entered in order to make the Company's supplies match its requirements on a day-to-day basis. These transactions sometimes involved the principal suppliers, but more often were entered with other large users in the Maritimes Market, who had a similar requirement to balance their supplies with their consumption.

The fourth quarter of 2012 saw considerable disruption in the Maritimes Market. SOEP production declined significantly due to production problems. NS Power supplies under its term contracts were [redacted]. Two seasonal contracts for the winter of 2012-2013 were honored, but gas prices had increased to the point that gas was no longer favored as a generation fuel. The quantities indicated by NS Power's fuel-requirements forecasting declined considerably.

Since that time (Q4 2012), NS Power has met its requirements almost entirely with [redacted] supplies delivered to [redacted]. The exception has been [redacted] the winter of 2013-2014. By the time those supplies started, [redacted] Due to [redacted] quantities under the seasonal contracts were considerably [redacted] they had been through 2010, 2011 and 2012.

Appendix D to the Fuel Manual specifies the objectives and strategy for hedging. For natural gas, the Fuel Manual allows the use of the following financial instruments:

Fixed-for-floating swaps *Swing swaps* *Basis swaps* *Options (puts and calls)*

NS Power has since early 2008 used fixed-for-NYMEX last-day swaps. When its long-term gas purchase contract ended, it added swing swaps at the Henry Hub location where the NYMEX contract settles. In early 2012, the Company bought [redacted] at the Algonquin Market Center (ALG). Later that year, it added winter-period basis swaps for the difference between Henry Hub and ALG.

The next chapter of this report addresses NS Power's planning for gas supplies.

e. Planning for PHP

In the fourth quarter of 2012, Port Hawkesbury Paper Company (PHP) began taking service under a new Load Retention Tariff. That tariff provides that PHP will pay a rate for electric power based on NS Power's incremental costs of providing the power.

As part of that arrangement, NS Power estimates its fuel requirements both with and without the PHP load. The incremental fuel requirements for serving PHP are then acquired in short-term markets: 1) additional daily supplies for gas, and 2) solid fuel bought for consumption within the next three to six months. NS Power does not hedge these supplies.

5. Hedging

a. Initial Hedging Program

NS Power engaged a consultant in 2006 to assist the Company in addressing certain NSUARB findings regarding the Company's policies and procedures with respect to hedging generation fuels prices. The consultant recommended restructuring the Company's Fuel Manual to clarify and distinguish among policies, goals, and strategies. The consultant also developed specific hedging strategies by using a computerized assessment model customized to NS Power's operational parameters. Examples of those parameters include weather, plant outages, dispatch of all of NS Power's generation facilities, and fuel types. The next table summarizes the recommended hedging parameters for solid fuels, with volume expressed as proportions of annual tonnes:

Solid Fuels Hedging Objectives

Component	Contract Length	Volume Targets
Long-Term	[redacted]	[redacted]
Medium-Term	[redacted]	[redacted]
Short-Term	[redacted]	[redacted]

NS Power has sought to hedge its solid fuel exposure with fixed-price contracts. Fixed-for-floating swaps fix prices for supply agreements having indexed prices. NS Power also seeks volume optionality at fixed prices from its suppliers. When NS Power established these targets, it was finding suppliers were willing to provide [redacted]

The next table summarizes solid fuel freight hedging objectives again expressed as proportions of annual tonnes. Fixed-price contracts hedge transportation.

Solid Fuels Freight Hedging Objectives

Component	Fixed Price	Volume Targets
Long-Term	[redacted]	[redacted]
Medium-Term		
Short-Term		

The next table shows the HFO hedging schedule as proportions of barrels per year. NS Power has typically used fixed-for-floating swaps to fix the price of its HFO requirements. The Fuel Manual permits calls and puts (options), with the approval of the Fuel Strategy Table, to manage the uncertainty in the requirements of large-volume industrial customers.

Heavy Fuel Oil Price Hedging Schedule

Time Prior to Consumption Month	Quantity Hedged
>24 Months	[redacted]
22 to ≤24 Months	
19 to ≤21 Months	
16 to ≤18 Months	
13 to ≤15 Months	
Spot to ≤12 Months	

As requirements for HFO have been small, the Company has not hedged this fuel since late 2010.

The next table summarizes the natural gas hedging schedule, as proportions of contract volumes (MMBtu per day).

Natural Gas Price Hedging Schedule

Time Prior to Consumption Month	Quantity Hedged
>24 Months	[redacted]
22 to ≤24 Months	
19 to ≤21 Months	
16 to ≤18 Months	
13 to ≤15 Months	
Spot to ≤12 Months	

NS Power's long-term gas supply contract with [redacted] Dracut has operated as an active trading location in the Northeast U. S. When that contract was in force, NS Power typically [redacted]. It sometimes also used basis swaps to fix the difference in price between the Henry Hub and the Northeast U. S. The NYMEX-traded natural gas futures contract settles at Henry Hub. Since expiration of the [redacted] at the end [redacted], the Company has used fixed-for-floating swaps to fix the monthly price at the Henry Hub location. NS Power then uses

"swing swaps," again at the Henry Hub location, to limit its exposure to differences between the monthly price and the average of daily prices.[9]

In addition to swaps and swing swaps, the Fuel Manual, as with HFO, allows the use of calls and puts (options) for natural gas hedging, with the approval of the Fuel Strategy Table, to manage the uncertainty in the requirements of large-volume industrial customers.

b. 2010 Update

The same consultant re-evaluated NS Power's hedging schedules, following the issuance of Liberty's preceding FAM Audit Report. This late-2010 work added an estimate of expected daily wind generation in estimating the optimum hedging schedules.

Significant levels of wind-powered generation entered NS Power's system in 2010 and 2011. The consultant, however, did not have access at the time of its work to reliable wind production. Data from 2009 drove assumptions about expected daily wind generation for 2012 (*i.e.*, the test year for determining the benefits of alternative hedging programs). Forward fuel price data for 2011, 2012 and 2013 (observed on August 9, 2010) drove the analysis of price volatility and cross-correlation. The consultant assumed no hedges were already in place for 2012. Identifying the largest reduction in total fuel cost volatility relative to the costs of the hedges remained the objective, as in the initial study.

The results of the analysis were as follows:

- Solid fuels: [redacted] percent of the expected solid fuel consumption. Hedging of solid fuels was defined as fixed-price supply, obtained either through fixed-price contracts for physical delivery, or index-priced physicals combined with fixed-for-floating financials. The consultant did not provide a specific hedging schedule recommendation, due to the variations in the underlying contract structure.
- Natural gas and HFO: At the time of the analysis, NS Power's HFO- or gas-fired generating units tended to be "on the margin" within NS Power's generation portfolio. Thus, the degree of variability in wind generation translated directly into variation in HFO or gas requirements, depending on which fuel was lower-priced in the marginal units. Accordingly, the consultant recommended one of two price-hedging schedules, depending on the degree of variability in wind generation:
  - With low variability, the recommended schedule was the same as the previous one, except that an additional calendar quarter was allowed to complete the hedging program; *i.e.*, gas and HFO hedging should be complete [redacted]
  - With generation variability equal to the variability of the wind itself (2009 data), the consultant recommended reduced hedging targets, which the next table summarizes with proportions of daily contract quantities (MMBtu/day):

[9] Swing swaps trade a monthly price for the average of daily prices for the same month at the same location.

HFO and Natural Gas Price Hedging Schedule

Time Prior to Consumption Month	Quantity Hedged
>24 Months	[redacted]
22 to ≤24 Months	
19 to ≤21 Months	
16 to ≤18 Months	
13 to ≤15 Months	
10 to ≤12 Months	
Spot to ≤9 Months	

NS Power presented the Update Report to its Small Working Group (SWG) in December 2010. The Company noted the lowered hedging percentages for HFO and gas, but was reluctant to reduce the targets as much as the new schedule suggested pending acquisition of more data on actual wind generation. The Company undertook to keep its hedging proportions for HFO and gas at the lower end of the previously recommended ranges for the next 24 months, at which time it expected more wind production data.

c. The 2010 Basis Differential

In late 2010, two things happened that accentuated questions about NS Power's approach to natural gas hedging:

- [redacted] contract expired. Pricing under that contract had adjusted monthly, but the contracts that replaced it were priced daily.
- Daily basis for Northeast Market Centers "blew out" in mid-December.
- Daily basis for TGP Z6 went as high as US$15, Dracut went to US$10, and Tetco M3 went almost as high.

NS Power had been hedging at Henry Hub; prices there did not exhibit this behavior.

In early January 2011, NS Power's Manager, Oil, Gas & Energy prepared an analysis of the Northeast Basis Event. The analysis observed that, while monthly and average daily basis had been coming down since 2008, daily basis went up considerably in late 2010. The analysis also observed that swing swaps entered at Northeast Market Centers (Transco Z6 and Tetco M3) would have saved a lot of money for NS Power in the months of November and December, 2010: $4.9 million at Transco Zone 6, or $3.3 million at Tetco M3. She noted that it was too late to hedge for the balance of that winter (the winter of 2010-2011), but recommended that the Company engage a consultant to assist with basis-hedging evaluations for the next winter (the winter of 2011-2012), and that it present recommendations to its stakeholders in time to place any such hedges. Soon after presenting that analysis, that person transferred to another EEI affiliate.

The initial interchange with the consultant took place later in January 2011. The consultant's analysis was not initiated until April, however, and was not completed until December. The consultant found basis hedging to be of limited usefulness in reducing NS Power's fuel costs, but suggested some strategies for using basis hedging, in combination with swing swaps, to lower expected prices. The analysis showed that much of the potential benefit comes from swing swaps

at Northeast Market Center locations (ALG and TGP Z6). An analysis of recent history found that monthly basis swaps reduced costs only when priced low relative to historical prices.

d. Previous FAM Audit

In the previous FAM Audit, Liberty noted that the primary objective of the Company's fuel hedging strategy is cost stability, rather than reduced cost. NS Power observed as far back as 2006 that an optimal hedging program is one that delivers the largest change in fuel cost stability risk relative to the increase that it causes in fuel costs. It has long been observed that the Northeast U. S. Gas Market exhibits considerably more volatility than does the Henry Hub, which is the location where the Company's hedges had been placed during the Audit Period. We found no analysis of the relative volatilities of the Henry Hub and the Northeast U. S. market centers. We concluded that the Company's natural gas costs for November and December 2010 were unreasonably high due to the Company's failure to hedge Northeast Market basis, and recommended that the NSUARB require the Company to conduct a study of what basis hedges would have resulted under a properly designed hedging program for the winter of 2010-2011.

After considering our report and other evidence, the NSUARB concluded that NS Power "could not reasonably have foreseen the events commencing in December 2010."[10] The Board went on to say:

> *"On the question of a prospective study, the Board does not consider that a specific direction is necessary. The Board expects that NSPI should be continually undertaking any studies or analyses about any aspect of its fuel management practices, including hedging, if considered prudent or appropriate to lower or stabilize fuel costs."*[11]

e. Comprehensive Review

In May 2013, NS Power engaged a different consultant, Concentric Energy Advisors, to conduct a comprehensive review of its gas hedging program. This review recommended replacing NS Power's time-based strategy with one that uses value at risk (VaR) to measure and manage gas price risk. The new strategy was adopted by the Fuel Strategy Table in early November 2013. Parameter selection took place in mid-December, and trades to implement the new strategy were approved in January 2014.

C. Conclusions

1. Results suggest that load forecasting could be a major factor in NS Power's under-recoveries of its fuel costs. Changes in NS Power's load forecasting between 2012 and 2013 may have introduced inaccuracies. *(Recommendation #1)*

NS Power over-forecasted its load every year from 2003 through 2008. Since that time, load forecasts have improved considerably. Analysis prepared for this audit, however, suggests that

[10] Nova Scotia Utility and Review Board, "Decision," issued December 21, 2012, in Matter No. M04972, *In the Matter of an Application by Nova Scotia Power Incorporated for Approval of Certain Revisions to its Rates, Charges and Regulations, including the review of the Fuel Adjustment Mechanism Audit*, at page 89.
[11] *Ibid.*

changes to load forecasting between 2012 and 2013 may have introduced inaccuracies. The difference between forecast and weather-normalized actual Net System Requirements increased from less than one percent in 2010 through 2012 to 2.6 percent in 2013.

Differences of one percent or less between forecast and actual requirements are inconsequential. The increased difference in 2013 should be studied in connection with the findings of Synapse's audit of NS Power's Load Retention Tariff to see whether operation of that mechanism is affecting forecasts of other requirements.

The 2013 result reveals a slight under-forecasting of sales in that year. (Weather-corrected actual Net System Requirements, adjusted for the PHP load, were 2.6 percent higher than forecast.) NS Power notes that, when sales are higher than forecast, it may have had to run generating units with higher-than-average fuel costs in order to meet the extra load. In that event, the revenues generated by the extra sales might not cover the extra fuel costs, as those revenues would have been based on an average fuel costs.

2. The new refresh forecast should facilitate adjustments to changes in fuel requirements.

Between the middle of 2010 and early 2011, forward natural gas prices declined so much relative to NS Power's estimates of delivered coal prices that NS Power's forecast 2011 gas requirements went from 12.0 million MMBtu at the time of the Fuels Budget (August 2010) to 30.7 million MMBtu at the time of the first-quarter update (March 2011). The change reflects an increase of two and one-half times. Forecast coal requirements dropped from 88.6 million MMBtu to 72.3 million MMBtu, a decline large enough to change the timing of a competition for coal supplies.

The table below shows that the same thing happened between mid-2011 and early 2012. Forecast 2012 gas requirements went from 15.9 million MMBtu at the time of the Fuels Budget to 28.5 million MMBtu at the first-quarter update; *i.e.*, almost a two-fold increase. Forecast coal requirements dropped from 86.0 million MMBtu to 59.2 million MMBtu.

2012 and 2013 Estimated Fuel Consumption (MMBtu)

	2012 Budget	Q1 Update	Q2 Update	Q3 Update
Solid Fuel	[redacted]	[redacted]	[redacted]	[redacted]
Natural Gas	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]

	2013 Budget	Q1 Update	Q2 Update	Q3 Update
Solid Fuel	[redacted]	[redacted]	[redacted]	[redacted]
Natural Gas	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]

* Note that Solid Fuel only includes coal and petcoke. Biomass is excluded from this figure.

Between mid-2012 and early 2013, the situation reversed. Forecast 2013 gas requirements dropped from [redacted] MMBtu at the time of the Fuels Budget to [redacted] MMBtu at the time of the first-quarter update. Forecast coal requirements increased from [redacted] MMBtu to [redacted] MMBtu.

As noted, these large changes in forecast requirements of the two fuels occurred because of changes in their relative prices. The difficulties that those changes caused for fuel procurement were caused, at least in part, by the long time between the preparation of the Fuels Budget and the First Quarter Update. The Fuels Budget is initially prepared with forward prices observed on December 31 of the year prior to preparation of the forecast (December 31, 2010, in the case of the 2012 forecast), and then updated with prices observed on June 30 of the year prior to the one being forecast (June 30, 2011, in the case of the 2012 forecast). The First Quarter Update is prepared with prices observed on the last day of February (February 29, 2012, in the case of 2012). Thus, eight months effectively passed between the initial estimate of fuel requirements and the first update of those requirements.

In late 2012, FERM added a late-year refresh forecast to reduce this interval. Now, for fuel-requirements estimation purposes, an updated forecast is prepared in December, using prices observed on November 30, 2012. Thus, the eight-month interval is broken into segments of five months and three months. Liberty had expressed concern about the lengthy interval between the Budget and the First Quarter Update in our first FAM Audit Report,[12] and we are confident that having an updated estimate of requirements for each fuel three months sooner will facilitate fuel-procurement processes. Improved fuel-requirements forecasting should help NS Power reduce its fuel costs which, in turn, should help the under-recovery problem.

3. It is time to make the change to *Plexos* for the Fuels Budget, but additional tests should be run. *(Recommendation #2)*

The benchmarking exercises conducted in 2013 demonstrate that the simplifications used in *Strategist* have an impact on estimated fuel and purchased-power costs. Those exercises suggest that the forecasts prepared with *Strategist* are too low, which means that they could be one of the causes of NS Power's persistent under-recovery of its fuel costs.

An equally important finding of the benchmarking exercises is that the forecasts produced by the two models differ to some degree in their forecasts of operations at NS Power's generating stations. For the same Net System Requirements, for example, *Plexos* runs the gas-fired units less and the coal-fired ones more than *Strategist* does. Moreover, production by the different coal units differed between the two models. Since the fuel blends for each coal plant differ, which model is used affects which coals to buy. In view of these results, the Company has largely switched to *Plexos* for fuel supply planning. It is time to make the switch for preparing the Fuels Budget.

Effective use of models requires a structured program for checking results validity and accuracy. Accuracy testing of model algorithms can employ model runs that "back-cast" variables. A back-casting exercise populates production models with input data to reflect actual market and operational conditions that have occurred. Analysts then run the model in question, using this "actual data," for the purpose of comparing results to actual fuel burn and generation by unit. A

[12] The Liberty Consulting Group, "Audit of Nova Scotia Power, Inc.'s Fuel Adjustment Mechanism for 2009," filed on July 2, 2010, as Exhibit N-1(C) in Matter No.M03285, *NSPI – P-887(2) FAM 2011*, at page II-7.

back-cast thus enables the user to confirm that the model produces results consistent with the real-world actual results.

Isolation of variables is another useful exercise for model testing. A variable isolation study runs and stores a base case. A next run adjusts a key parameter, while holding all other variables constant; *i.e.,* isolating the single variable. The analyst then compares outputs to those of the base case. This enables the attribution of any variance from the base case to the isolated variable. This approach permits model use for reconciliation of forecast and actual values for unit generation and fuel consumption. Given the significant number of additional parameters required for operating *Plexos*, studies of the validity of those parameters seems warranted.

4. **The recently approved changes to the Company's gas price hedging program have come later than they should have.** *(Recommendation #3)*

The need for a comprehensive review of gas price hedging has been evident for some time. For example:

- The hedging program as far back as 2006 was developed for gas pricing based on a combination of gas prices and fuel-oil prices, and changed monthly. With the expiration of its legacy gas supply contract, NS Power began buying gas at prices linked to gas prices in the Northeast U. S. and re-priced daily. Daily price volatility, especially in the Northeast U. S., was (and remains) much different from monthly volatility.
- A hedging analysis done in 2007 by a consultant to NS Power showed a considerable reduction in winter-period VaR by moving the location of swing swaps from Henry Hub to a Northeast market center.
- An external review of the Company's hedging programs conducted in late 2009 concluded that the Company should start measuring VaR.
- Liberty's first FAM Audit Report (July 2010) identified areas where NS Power's approach to hedging HFO and natural gas price volatility were increasing its exposure to fuel-requirements volatility.
- The 2010 update of the Company's hedging program recommended large reductions in the proportions of marginal fuels (HFO and natural gas) hedged until the variability in requirements for those fuels caused by the introduction of substantial wind-powered generation could be evaluated.
- Early 2011 analysis by NS Power staff and one of its consultants identified that price correlations that were fundamental to NS Power's hedging program had broken down in the winter of 2010-2011.

Liberty believes that a program such as that implemented in early 2014 could reasonably have been expected to be in place by the start of the current Audit Period.

D. Recommendations

1. **Examine whether changes in load forecasting between 2012 and 2013 introduced inaccuracies.** (*Conclusion #1*)

The difference between forecast and actual Net System Requirements for the non-PHP load increased in 2013 after being within the generally accepted standard for accuracy (one percent difference) in the prior three years. The Company should examine those results to see whether a change in the forecast process caused the change in accuracy.

2. Conduct a structured validation program for the new parameters required for operating *Plexos*. (*Conclusion #3*)

In its October 2013 presentation to a group of stakeholders regarding its transition to *Plexos*, the Company listed the following as "examples" of assumptions required to operate *Plexos* that are not used by *Strategist*:

- Steam unit minimum up and down times
- Steam unit cold, warm and hot start-up costs/shut-down costs
- Average repair times when recovering from a forced outage
- Unit ramp rates
- Transmission system parameters and flow limits
- Transmission system stability generation restrictions (SPS)
- Spinning, 10-minute and regulation reserve requirements
- System stability parameters such as minimum steam generation
- Hourly localized load
- Hourly localized wind shape
- Hydro system model with physical parameters and operating constraints.

In our previous FAM Audit Report, we observed that the Company's variable O&M cost data, which is required to operate *Strategist*, was suspect, and that the costs of cycling the coal units was not accounted for.[13] *Plexos* clearly does require some cycling costs (steam unit start-up/shut-down costs). NS Power reports that it conducted a study of its procedure related to the calculation of variable O&M costs, and that it intends to implement the revised procedure by the end of the first quarter of 2014. Regarding cycling costs, the Company reports that it "understands" these costs, and uses that understanding "to inform asset planning and strategic planning based on anticipated unit utilization," but has provided no information regarding the source of the values to be used in *Plexos*.

The Company must have values for all of the newly-required parameters from somewhere in order to operate the model. Liberty recommends that the Company develop a validation program for those parameters, in an effort to avoid introducing errors into fuel-requirements costing and planning.

3. Sanction the Company for the long delay in revising its natural gas hedging program. (*Conclusion #4*)

[13] 2012 FAM Audit Report, at page II-8.

NS Power's failure to revise its gas hedging program in a timely way failed to address its recognized and appropriate need to address gas price volatility. We recognize that the Utility and Review Board has determined that it was not inappropriate for NS Power to have failed to adopt a program including basis hedging during the previous Audit Period. Whatever one concludes about the existence of basis risk by the winter of 2010 (when the basis blowout occurred), it is clear to us, as we think the Company itself acknowledged at the latest in early 2011, that it needed to conduct a reassessment of its gas hedging program. Despite that recognition and the clarity of basis as a material cost risk for customers, NS Power failed to complete that reassessment and respond comprehensively to it until roughly three more years had passed (and just after the end of the current Audit Period).

Traditionally, the calculation of harm to customers from unreasonable conduct lies in comparing actual costs with those that the Company would have incurred had it acted in a more appropriate manner. That approach raises the concern that the remedy (cost reduction) does not comport with the goal that hedging seeks (mitigation of cost volatility). Where one is measuring impacts over a multi-year period, an added concern is that mitigating volatility prudently might raise costs in one year, while lowering them in another. Recognizing the conceptual difficulties and challenges encountered in the last audit's treatment of the issue, therefore, we believe that a more direct and fair approach would be to impose a moderate but meaningful economic sanction to reflect the need, particularly in the case of costs recovered through an automatic adjustment clause, to induce management attentiveness to markets that are dynamic and uncertain.

A sanction in the range of $750,000 would in our view provide such inducement, while ensuring that, on the one hand, there is no disproportionate impact to the Company should markets happen to rise dramatically, yet, on the other hand, untimely performance does not go without penalty solely because markets happened to fall.

III. Gas Supply Planning

A. Background

The last two FAM Audits expressed concern about NS Power's approach to gas supply planning. The Company's historical supply planning framework assumed that gas would be available in the Maritime Region when NS Power needed it. Events in 2011 and 2012 presented major challenges to the Company's fundamental assumptions. The more important developments involved Maritimes gas production:

- The new Deep Panuke gas field was supposed to start producing in late 2010; it actually began on August 1, 2013.
- A routine maintenance outage at the Sable Offshore Energy Project (SOEP) revealed more serious problems. Production from that source in September 2012 was about half of what it had been in the previous month, and has yet to be fully restored.

Another important factor was the emerging shortage of gas pipeline capacity into New England. That region has become increasingly dependent on gas-fired power generation, but pipeline capacity into the region has not kept up with the increasing need to deliver that fuel to generating plants. Some projects to increase that capacity have been approved, but the amount of capacity to be added by those projects will not solve New England's problem. Moreover, most of the pipeline systems that serve New England cannot help the Maritimes directly because of the physical configurations of those systems. In particular, the Tennessee and Algonquin systems cannot flow into the Maritimes & Northeast Pipeline system because they operate at lower pressures than does M&NP.

Meanwhile, NS Power's gas supply planning problems have been made more complex by the emergence of new power supply options:

- Nova Scotia's increasing renewable energy standards (RES) reduce the role NS Power's conventional generation going forward.
- Approval of affiliate NSP Maritime Link's proposal to connect Nova Scotia's power transmission system to new power resources in Newfoundland and Labrador enables the Company meet the new RES, but it also introduces new power supply options that will compete with NS Power's on-system generation.
- NS Power's work with the Atlantic Energy Gateway project introduced the possibility of enhancing the transmission systems in Nova Scotia and New Brunswick to allow large-scale power imports from west of Nova Scotia, in addition to the import possibilities from Newfoundland and Labrador. Such imports present another alternative to NS Power's on-system generation.

Thus, NS Power's gas supply planning problem is one of improving access to gas in the near term, while maintaining the flexibility to take advantage of a range of options for the longer term.

Much work on NS Power's longer-term options will occur as part of the integrated resource plan (IRP) exercise, which is under way as this report is being written (Q2 2014). For this report, Liberty examined the Company's efforts to:

- Understand gas market developments as they unfolded during the Audit Period
- Develop strategies to improve its access to competitively priced gas in the near to intermediate term
- Improve its understanding of gas's possible roles in its future power supply resource mix
- At the same time, maintain the ability to increase or decrease gas use, depending on how gas-fired generation compared with other options in the future.

B. Findings

NS Power's gas-fired generation increased from 13 percent of its energy production in 2009, to 21 percent in 2012, before dropping back to 12 percent in 2013. Gas consumption increased from 16.8 million MMBtu in 2009 to 22.4 million MMBtu in 2012, then declined to 13.2 million MMBtu in 2013. The Company's most recent forecast of its gas requirements show [redacted].

(The following graph is confidential)

[redacted]

The principal driver of this change is the [redacted]. The chart below shows how the cost per MWh of the Company's principal generation fuels has varied over the last several years.

(The following graph is confidential)
Generation Cost per MWh by Fuel Type

1. Contacts with the National Energy Board

The regulatory regime for gas exports from Canada was an issue at the time of the last FAM Audit. During that Audit Period (2010 and 2011), deliveries to the Canaport LNG terminal increased. Including that supply, deliveries of gas into the Maritimes increased, yet the prices paid by NS Power for gas increased, rather than decreased. Perhaps more significantly, data published by the National Energy Board of Canada (NEB) showed that gas was being exported from the Maritimes to the U. S. at prices lower than those being paid by NS Power.

After Liberty's Gas Issues Report to the NSUARB,[1] the Company held a meeting with NEB staff to discuss conditions in the Maritimes Gas Market, and the application of the NEB's statutory and regulatory authorities to those conditions. That meeting was followed by additional meetings in the spring of 2012 and then again in the spring of 2013. The Company also sought external legal advice regarding potential complaints to the NEB and the Competition Bureau of Canada. The Company did not proceed with complaints because it could not find evidence of discrimination against Canadian gas buyers.

[1] The Liberty Consulting Group, "Nova Scotia Power, Inc. Natural Gas Activities," filed July 25, 2011 in Matter No. M03285, *NSPI – P-887(2) FAM 2011*. Revised October 7, 2011.

2. Contacts with Pipeline Project Sponsors

In late 2012, NS Power started to look beyond the U.S.-Canada border in thinking about gas supplies. At that time, Company representatives had initial meetings with representatives of pipeline systems that supply the Northeast U. S. Region and that had expansion projects under consideration. In its 2012 Natural Gas Report to the NSUARB,[2] the Company acknowledged that "[i]ncreased pipeline capacity into the M&NP region is required to balance supply and demand,"[3] and that:

> *NS Power is not large enough on its own to underpin these projects, but may play an important role in the future, if these projects are economically viable for customers. Existing projects and future projects will be evaluated and commitments will be made in order to secure* ***long-term*** *supply in the most economical way available.* (Page 36. Emphasis added)

The Government of Nova Scotia sponsored a study of gas supply alternatives for the province in the first quarter of 2013.[4] That study found:

> *…a strong argument for Maritimes Canada consumers to contract for firm pipeline capacity on one of the proposed pipeline expansions into New England that would allow shippers to buy gas at one of the Marcellus basin hubs [and transport it] to an interconnection with M&NP.* (At page 6)

NS Power reported to us that it supplied information to that study, but did not participate in it.

In the second quarter of 2013, NS Power engaged a consultant to examine the various pipeline expansion proposals from the perspective of the Company and its customers. Through the summer and fall, NS Power held further meetings with the pipelines, in an effort to inform them about NS Power's requirements, and to continue a dialogue about those companies' offerings. NS Power continues to evaluate a number of these projects to determine if they present viable options.

The Company continues to meet with the pipelines, individually and through the Maritime Shippers Group (discussed below). The pipelines' proposals continue to evolve and NS Power wants to stay informed about them.

3. Decision Analysis Process

Also in the second quarter of 2013, the Company engaged in a structured decision analysis process as part of developing a long-term natural gas strategy in conjunction with its forthcoming integrated resource planning (IRP) exercise. The IRP process was initiated in the first quarter of 2014. A framing exercise, involving developing objectives, identifying alternatives, and identifying particular decisions to be made, was conducted in May 2013. This exercise provided context for evaluation of strategic alternatives.

[2] Nova Scotia Power, Inc., *Natural Gas Report*, filed in NSUARB Matter No. M05449 on December 21, 2012.
[3] Page 36.
[4] ICF Consulting Canada, Inc., *The Future of Natural Gas Supply for Nova Scotia*, March 28, 2013. This study is referred to in this report as "the NSDOE Study."

4. Storage Analysis

The other principal option identified in the study for the Nova Scotia Department of Energy was gas storage. The consultant's modeling work suggested intensive use of Canaport in winter to meet Maritimes and Northeast U. S. demand. This result occurred because, in all of the consultant's cases, gas prices in New England were high enough to attract LNG from Europe to that region.[5] As the Maritimes' gas supply processes and patterns are linked to those of New England, they too would benefit from the additional supplies.

Liberty asked NS Power whether it had considered the option of [redacted] for use when prices were high. The answer was that [redacted] Rather, for those periods [redacted] therefore, NS Power declined the offer.

The Nova Scotia Department of Energy (NSDOE) Study also referenced a storage project being developed in Nova Scotia. If that facility were operational, gas could be purchased in the U. S. and transported to the Maritimes for storage in the summer, when M&NP is not so full. The gas could be withdrawn in the winter, when requirements are high.

NS Power studied storage initially in 2008. The Alton Gas Storage Project had begun development some years earlier, and another project was under consideration in New Brunswick. NS Power reports that it has had continued discussions with Alton since 2008.

Alton came forward with a proposal in the second quarter of 2013. NS Power engaged the consultant who had done the original work in 2008 to update that work. The consultant also supported NS Power in evaluating and responding to Alton's proposal.

NS Power and the consultant worked through the last half of 2013 with Alton, but were not able to complete negotiations successfully. NS Power has before it a new proposal, and feels it requires considerably more information before proceeding.

In discussions at the initiation of this audit, NS Power's stakeholders referred to evidence in NS Power's 2013 GRA proceeding regarding the possible use of storage to avoid the spikes that have characterized natural gas prices in the Northeast U. S. and the Maritime Region for the last several winters. They asked us to explore whether NS Power's failure to enter into an agreement with Alton was a foregone opportunity to avoid these spikes.

Liberty met with Alton representatives to pursue this question. Those representatives referred us to Alton's responses to information requests put to it by NS Power during the GRA proceeding as the best source for the project's history. Their assessment was that project development issues – organization, financing, permitting, etc. – had been more of a problem for project progress than participation by any potential customer for storage service, including NS Power.

[5] *Ibid.*, page 6.

5. Contacts with Provincial Government and Other Large Users

NS Power reports that the Nova Scotia Department of Energy (NSDOE) began raising the question of possible collaborative action in support of improved access to natural gas for the province soon after its study report was issued. In the summer of 2013, NS Power and other large gas users began discussing the gas situation in the course of their occasional meetings with that agency. In December a Shippers Group, including NS Power and other large users located in both Nova Scotia and New Brunswick, convened to receive consultants' presentations regarding pending pipeline expansion projects, and to discuss possible opportunities for collective action. In addition to NS Power, members of the Group include approximately 10 of the region's significant gas users.

Since that initial meeting, NS Power has continued to participate in the Group.

6. Pieridae/Goldboro LNG

Pieridae Energy Canada has proposed an LNG export project to be located in the Goldboro Industrial Park in Guysborough County, Nova Scotia. The project would export up to 1.4 million Mcf per day to international markets. It would have on-site storage capacity of 690,000 cubic meters of LNG, and a gas-fired power plant that would primarily be used to power the liquefaction process, but would also have power available to sell into Nova Scotia at times.

The significance of the project from a gas-supply planning perspective is the large size of its gas requirements. Recognizing this fact, Liberty met with a representative of the project to inquire about it.

Pieridae has not prepared detailed plans for gas supplies, as other matters in development of the project must be settled before gas supply becomes an issue. It has, however, met with the sponsors of the large pipeline expansion projects seeking to serve New England, to inform them about its proposed project.

Pieridae is looking at three "prospective sources" of gas:

- Offshore Atlantic Canada
- Onshore Atlantic Canada
- U. S.-based supply, particularly from the Marcellus Producing Region.

Regarding the latter source, Pieridae has requested authority to export up to 1.0 million Mcf/day from the U. S., and to import the same amount into Canada. Any export of gas from the U. S. would be to Canada; therefore, it would not require the same type of authority currently being requested by the large number of LNG export proposals in the U. S.

Nova Scotia's environment minister approved the project on March 21, 2014. "Front end engineering and design" (FEED) is expected to begin soon, and to be complete by the end of this year (2014). Upon receipt of the environmental approval, Pieridae said that it will make a final investment decision in 2015. If it decides to proceed, the project would be scheduled to be operational in 2020.

C. Conclusions

1. NS Power has become active in the quest for competitively priced gas supplies in the Maritimes. *(Recommendation #1)*

In the previous two FAM Audits, Liberty expressed concern that, despite the Company's position among the largest users of gas in the Maritimes, it was not actively engaged in efforts to obtain competitively priced supplies. It has now become engaged. It began by reaching out to the gas pipeline companies that were sponsoring expansion proposals to increase service to the Northeast U. S., and has followed those contacts up with continued discussion of NS Power's requirements and the companies' plans. NS Power has also initiated contacts with gas suppliers that are active in the Northeast U. S., but have not previously been active in the Maritimes Gas Market.

NS Power has also joined the Maritimes Shippers Group, formed recently to explore the possibility of joint action by Maritimes gas users to improve access to gas. Liberty believes that the Company is an important contributor to that group.

2. NS Power has added significant energy markets expertise to its fuels function.

The new Executive Vice President, Operations, brings considerable energy markets expertise to NS Power's Fuels function. Formerly the Chief Operating Officer of Emera Energy, he also brings considerable knowledge of the regional gas and power markets.

As reported in Chapter I, the Company has added a significant number of positions to the Fuels function, and is expected to add more. New positions added during 2013 brought depth in the performance of existing functions, plus resources to cover expansions of those functions. Positions being added in 2014 are adding analytical capabilities, and a strategic dimension to fuel supply planning that has not been there to date.

3. NS Power has made important progress in understanding the role of gas in its resource mix.

Well into 2012, NS Power viewed gas as a resource of diminishing value. Even as gas-fired generation increased as a proportion of its resource mix, the view that "gas is going away" kept the Company from considering anything other than [redacted].

The Renewables Integration Study[6] and studies that the Company conducted as part of its efforts in support of the Maritimes Link Project[7] demonstrated the need for flexibility in its resource mix. Those studies, and others, have also demonstrated the limitations of the Company's solid-fuels plants in providing that flexibility. As the Company has considered where the necessary flexibility will come from, its appreciation for gas-fired generation's potential role in providing it has increased.

[6] GE Energy Consulting, *Nova Scotia Renewable Energy Integration Study*, June 28, 2013.
[7] See, *e.g.*, Nova Scotia Power, Inc., *Challenges of Large Scale Wind Integration in Nova Scotia*, January 21, 2013, submitted as Appendix 6.02 to NSP Maritime Link's Application to the NSUARB.

The Renewables Integration Study was especially enlightening. A Study Case that estimated the 2020 resource mix with the Maritimes Link and with Net System Requirements comparable to 2013 showed gas-fired generation at 1,118 GWh.[8] That amount was 20 percent less than 2013, but still 11.2 percent of total generation plus purchases. "Plan A" from the 2009 Integrated Resource Plan Update, by contrast, had gas essentially gone by 2020.[9]

The amount of gas-fired generation in any projection is driven by the assumptions used to produce the projection, both assumptions about gas and assumptions about the power sources that compete with gas. The integrated resource planning exercise under way now provides an opportunity for the Company to explore the influence of different assumptions, thereby deepening its understanding of the competition among its power supply options going forward. In particular, whether the Company buys gas and generates power, or imports more power, or uses some combination of self-generation and imports, may well be driven by the costs of additional gas delivery infrastructure versus the costs of access to additional power imports.

4. Further out, the future of all of NS Power's "conventional" generation is uncertain.

The Province's aggressive goals for renewable energy are diminishing the role of conventional generation, including gas-fired generation. The case from the Renewables Integration Study cited above suggests 20 percent less gas-fired generation in 2020 than in 2013, and 2013 was down considerably from the two years before that.

Increased access to power from outside the province could reduce in-province generation even more. In particular, the studies cited above for the Atlantic Energy Gateway project introduce the possibility of importing emissions-free power from the west, as well as from Newfoundland. Hydroelectric resources in both places offer the possibility of energy storage and balancing the wind without emissions. These possibilities demand that NS Power's options remain open while they are pursued.

5. NS Power has not maintained contact with the National Energy Board. *(Recommendation #2)*

The Company had some contact with the National Energy Board (NEB) Staff after the very large gas price increases experienced in the winter of 2012/2013. Company representatives discussed conditions in the Maritimes Gas Market, and inquired about possible NEB assistance in making additional supplies available in that market. Direct contacts largely stopped after April of 2013, however.

Liberty understands the Company's reluctance to spend time and effort in a cause that has yielded so little to date. Failing to urge continuing NEB attention to the Maritimes seems unwise, however. Liaison with the NEB could perhaps be shifted to the Maritime Shippers Group.

6. NS Power could have pursued Alton Gas Storage more aggressively, but the project had other issues.

[8] Case 9A. See page 14 of the Final Report.
[9] See Nova Scotia Power, "2009 IRP Update, Modeling/Analysis Results," at Slide 47.

Development of the Alton Project has proceeded in fits and starts since 2004.[10] Due primarily to changes in the ownership of its principal sponsor, [redacted] When it did, NS Power engaged the consultant that had performed the initial storage evaluations in 2008 to update that work in response to the new proposal. As noted above, NS Power and the consultant worked through the last half of 2013 in response to Alton's proposal.

Liberty would have had NS Power pursue the Alton project more aggressively, as we share the view that access to natural gas storage could provide NS Power with a "tool" for its use in lowering its gas costs. We cannot conclude that having done so would have made a difference, however. As the Maritimes Region's largest single gas user, NS Power's participation in the project as a customer may be important to its eventual success, but NS Power alone will not "make-or-break" the project. As with pipeline projects, NS Power's requirement for storage service could be substantial, but it would not likely be sufficient to ensure the project's viability.

In November 2013, Heritage Gas Limited, the Province's gas distributor, applied to the NSUARB for a determination regarding whether prudently incurred gas storage costs could be included in Heritage's cost of service.[11] The Board has recently responded affirmatively.[12]

Liberty regards this determination as a major step forward for the project. It clarifies access for an important customer for storage services to recovery of the costs of those services through its rates for natural gas service. This determination provides credit support for the storage project from a customer who is likely to contract for a considerable portion of its capacity. In the course of the NSUARB proceeding, the project was also endorsed by the Nova Scotia Department of Energy.[13] Heritage's request for jurisdictional treatment of storage costs was also supported by Port Hawkesbury Paper, based on its interest in natural gas prices paid by NS Power.[14]

The story with Pieridae is different. The Executive VP, Operations reports regular contact with Pieridae on a number of items, but primarily relating to gas supply and transportation in the region. NS Power sees any potential benefit of working with Pieridae for the Company and its customers as coming in the area of gas supply. Pieridae's priorities for its efforts have not been in gas supply, however; rather, it is focusing its efforts on the issues that it views as critical to its progress, namely obtaining necessary permits and obtaining financing.

D. Recommendations

1. Remain abreast of the activities of the Maritime Shippers Group. *(Conclusion #1)*

[10] Indeed, a predecessor project was initiated in 2002.
[11] NSUARB Matter No. M05989, *In the Matter of an Application by Heritage Gas Limited requesting that the Board determine whether the prudently incurred costs of natural gas storage should be regulated by the Board and included with Heritage's cost of service.*
[12] Decision 2014 NSUARB 42 in Matter No. M05989, issued February 20, 2014, at page 8. The Board also stated "that the prudency of any arrangement entered into by Heritage can and will be tested in a future proceeding." Page 9.
[13] Letter, dated February 3, 2014, from Andrew Younger, Minister of Energy, to the Board.
[14] Letter, dated February 3, 2014, from Bevan Lock, Energy Manager for Port Hawkesbury Paper, to the Board.

Liberty regards the formation of this group as a hopeful sign for improving the region's access to natural gas. Liberty is hopeful that the group's deliberations will lead to actions that will have a positive impact on gas prices and supplies.

The first meeting of the Group occurred at about the same time as issuance of NS Power's Natural Gas Report for the summer months of 2013 (December 20, 2013). Thus, the Shippers Group's activities had not yet begun when the Report was being prepared. Liberty recommends that NS Power keep the NSUARB generally informed, recognizing the need for confidentiality of the issues being addressed by the group, as they have the potential to address NS Power's access to natural gas.

2. Maintain contact with the National Energy Board. *(Conclusion #5)*

Given the NEB's commitment to "ongoing monitoring of the Maritime gas market by meeting with buyers, sellers, producers, pipeline and government representatives,"[15] it is important that NS Power be aggressive in keeping the agency's staff informed about market conditions. NS Power needs to ensure that it is working to define the agenda of discussion, rather than addressing only those matters that the agency determines are important.

As a regulatory agency, the NEB is oriented toward receiving specific proposals from project sponsors, and hearing arguments for and against those proposals from interests that will be directly affected by them. It is less well situated to reflect on the downstream consequences of its actions after it has taken them. Maritimes gas users have a keen interest in relevant consequences being considered, however. Moreover, particular NEB approvals may be required for projects that address Maritimes Gas Market problems, and Maritimes Gas users should be keeping that body informed about possibilities.

Liaison with the NEB seems an appropriate function for the Maritime Shippers Group. Irrespective of their views on specific projects, members of the Group share an interest in ensuring that the NEB is informed about the state of the Maritimes Gas Market, and that it considers Maritimes interests when appropriate. Appropriate liaison activities need not include formal intervention in particular proceedings, although formal interventions should not be precluded. Liaison could certainly include invitations to Group meetings, and reports on concerns raised and actions taken as appropriate.

[15] National Energy Board, "Reasons for Decision" in *Province of New Brunswick*, Matter No. MH-2-2002, issued September 2002, at page 42.

IV. Solid Fuel Procurement and Contracts

A. Background

This chapter addresses the following solid fuel procurement, pricing, and contracts subjects:

Solid Fuel Burned	*Solid Fuel Prices*	*Contract Purchases*
Contract Actions	*Environmental*	*Transportation*
	Other Procurement	

B. Findings

1. Solid Fuel Forecasted Versus Actual Burns

The following NS Power generating stations burn solid fuel:

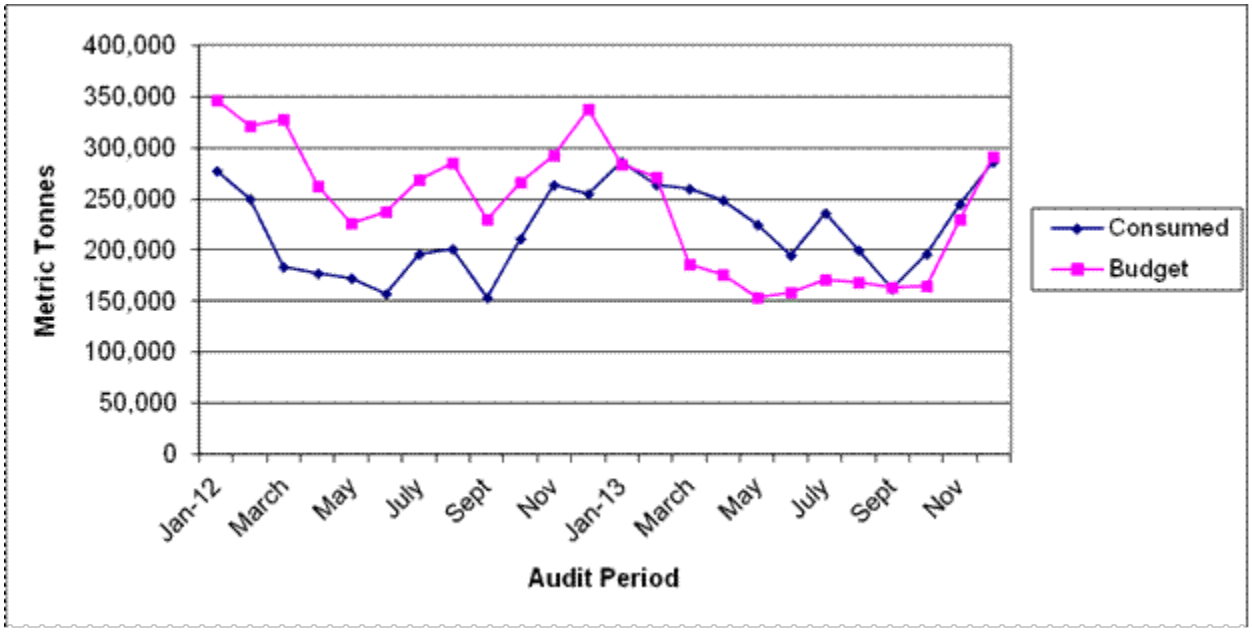
Lingan Units #1 through #4 *Point Aconi #1* *Point Tupper #2* *Trenton Units #5 and #6*

Total solid fuel consumption for 2012 at the eight generating units of these four NS Power stations amounted to 26.6 percent less than forecast (2,499,110 actual tonnes, compared to the forecast of 3,403,600 tonnes). For 2013, the actual consumption was 2,805,078 tonnes compared to the forecast of 2,418,100 tonnes, or 16 percent greater.

Ocean-going vessels provide the primary transport method for solid fuel consumed by NS Power to generate electricity. Rail and truck deliveries supplement water delivery. NS Power receives solid fuel under a combination of long, medium, and short term (or "spot") contracts. Long term contracts comprise those agreements, whose term equals or exceeds four years. Medium term contracts have a term between one and four years; short term contracts have a term of less than one year.

NS Power burns low-, mid-, and high-sulphur coals and petroleum coke (petcoke). All four stations can burn each of these fuels. Petcoke consumption occurs primarily at Point Aconi. The next graph shows Audit Period total solid fuel consumption in metric tonnes by month. The graph also compares actual burn information with NS Power's forecasts for each month.

Solid Fuel Consumption



The graph shows that actual solid fuel consumption under-ran the forecast until March 2013. From that time through the end of the Audit Period, solid fuel burned exceeded forecast amounts because changes in the price of natural gas as compared to coal made it more economical to burn coal far more frequently than NS Power had anticipated.

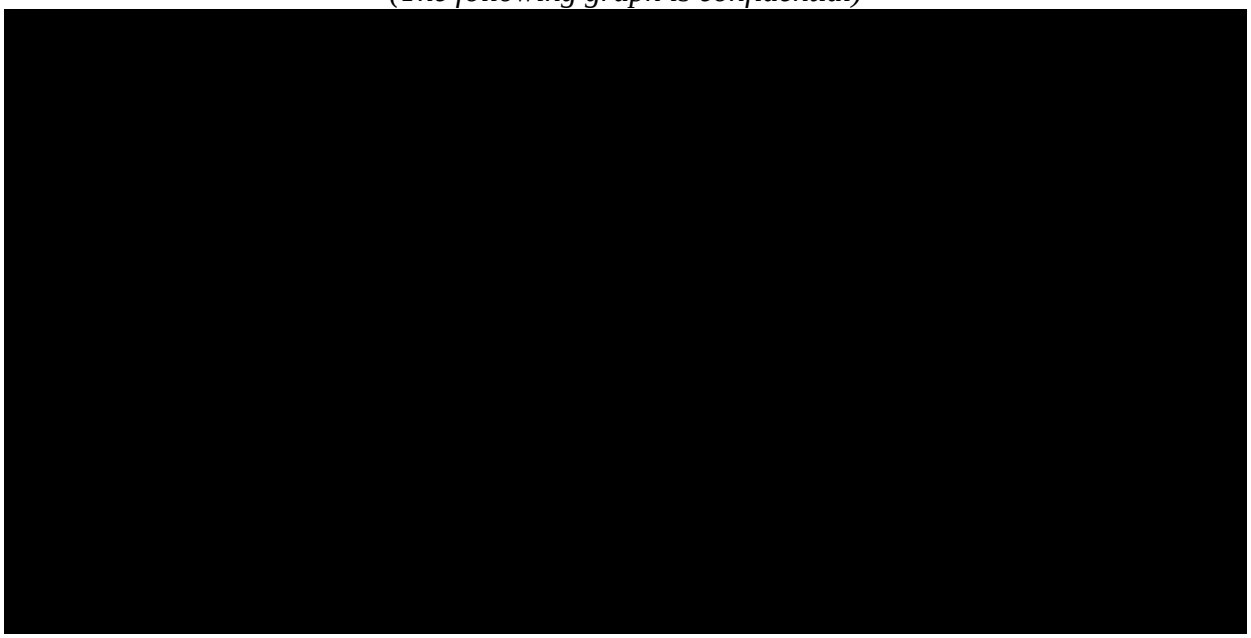
The forecast numbers for 2012 came from the 2012 Fuel and Purchased Power Budget of the 2012 General Rate Application (filed in May 2011). The forecast numbers for 2013 came from the Fuel and Purchased Power Budget of the 2013 General Rate Application (filed in May 2012, and updated in August 2012). NS Power found the comparative economics of fuel and purchased power alternatives through the Audit Period difficult to predict, particularly the reversal of the gas/coal price relationship in March 2013. Report Chapter VI discusses the causes and consequence of this difficulty more fully.

2. Solid Fuel Sources

NS Power's solid fuels originate from a number of locations. The Company uses Nova Scotia coal, U.S. coal and petcoke, and low sulphur coal from South America. The next graph shows the contribution of each to the total solid fuel mix. Import coal represents the majority of solid fuel consumed by NS Power. Monthly consumption volumes varied from 89,000 to 208,000 tonnes across the Audit Period. The graph demonstrates that NS Power can normally anticipate a reduction in quantities of solid fuel consumed over the summer months, when overall system load is lower.

Components of Solid Fuel Consumption

(The following graph is confidential)



Petroleum coke comprised the [redacted] component of the solid fuel mix. Its monthly consumption ranged from [redacted] tonnes. The low consumption months came primarily as a result of outages at Point Aconi and Trenton #6, which burns mainly petroleum coke. NS Power was also able to burn petroleum coke at Lingan, Trenton 6 and Point Tupper. NS Power addresses sulphur issues at the plants by limiting petroleum coke to less than 20 percent of the fuel blend. Years earlier NS Power had made petroleum coke as much as [redacted] of the fuel blend. Installation of low NOx burners, however, has reduced the efficiency of petroleum coke burn.

Domestic coal comprised [redacted] of the solid fuel mix. Its monthly consumption in the Audit Period ranged from [redacted]. Domestic coal burns remained relatively constant, as the Company balanced domestic coal use against sulphur content and the mercury capture program. Domestic coal characteristically has higher sulphur content. High sulphur interferes with the mercury capture capabilities of the activated carbon sorbent used for mercury capture.

NS Power began procuring biomass for the Port Hawkesbury Biomass Plant (PHB) during 2013. Operation of PHB started on July 15, 2013 and continued for the balance of the year. This unit has a peak electricity output of 60 MW and an average output of 43 MW. Full output requires biomass of 500,000 Metric Tonnes per year. PHB's Audit Period output totaled 130,444 MWh (1.5 percent of system generation). Through the end of 2013, PHB biomass costs were [redacted], other solid fuel costs were [redacted], and natural gas costs were [redacted].

The solid fuel types that NS Power consumed over the Audit Period varied widely from station to station, and sometimes from unit to unit within a station. The next graph illustrates this

variation, which several factors influenced. They include boiler design, pollution control equipment, unit age, and unit location.

Solid Fuel Consumption by Station/Unit

(The following graph is confidential)

Lingan station consumed the most solid fuel ( ). One would expect this result, given its size relative to other NS Power resources. The station consists of four individual generating units that have capacities of 153, 153, 158 and 153 MW. Import coal provided over 89 percent of Lingan's consumption ( ). The balance of solid fuel consumed came from domestic coal and petcoke (of domestic coal, and of petcoke). The station's units must burn low sulphur coal to support NS Power compliance with overall utility sulphur emission requirements. NS Power blended limited quantities of higher sulphur domestic coal and petcoke with low sulphur coal, in order to optimize its compliance activities, and overall costs, given .

Pt. Aconi, a 171 MW fluidized bed unit, consumed the vast majority of the petcoke burned at NS Power's generating units. The unit consumed of petcoke during the Audit Period. Pt. Aconi consumed much smaller amounts of import coal and of domestic coal The unit's fluidized bed operates effectively in removing sulphur from fuels. This capability equips the unit well to burn significant quantities of petcoke, which has comparatively high sulphur content.

The 150 MW Trenton 5 unit consumed only import coal during the Audit Period. Its burn for the period totaled The 157 MW Trenton 6 unit consumed more domestic coal than did any other unit. Its consumption totaled . Trenton 6 also consumed of petcoke and of import coal.

The 152 MW Pt. Tupper unit consumed [redacted] of import coal and [redacted] of petcoke in the Audit Period.

3. Solid Fuel Prices

The next graph shows Audit Period costs ($/tonne) for the solid fuel (excluding biomass), consumed at NS Power generating stations. Total solid fuel costs were relatively consistent with the Forecast throughout the Audit Period until April of 2013. From that time on, the unit costs of solid fuel held steady, while forecast prices dropped. NS Power had forecasted [redacted] of the solid fuel mix. That forecast depended on relatively low gas prices, which would have the effect of permitting NS Power to burn [redacted]. Higher than expected gas prices required NS Power to burn more solid fuel overall, and in doing so, to replace some cheaper [redacted] with more expensive, but lower sulphur coals. Thus, the unit price of solid fuel ($/tonne) came to exceed forecast costs starting around April 2013.

Actual versus Forecast Solid Fuel Prices

(The following graph is confidential)

[redacted]

The next graph shows contributions to total solid fuel costs by import coal, domestic coal, and petcoke. The graph illustrates that import coal comprised [redacted] Domestic coal and petcoke were [redacted]. [redacted] typically been NS Power's most expensive solid fuel. The following graph shows that its costs remained relatively stable during most of the Audit Period. They ranged from a high [redacted] in early 2013 to [redacted] late in 2013.

Average cost for the period for import coal was [redacted]. Much import coal was priced on the basis of indices. Domestic coal prices [redacted] averaging [redacted] Petcoke prices showed considerable volatility, ranging [redacted] to more than [redacted]. They averaged

[redacted] over the Audit Period. NS Power purchased petcoke on the international market under both short and medium term contracts, using [redacted] in order to moderate price volatility.

Components of Solid Fuel Price

(The following graph is confidential)

[redacted]

The next figure shows that solid fuel prices also varied widely by station. The differences resulted from wide variation in fuel mix among stations. Trenton 6 experienced [redacted]. Pt. Aconi prices [redacted] the station burned significant quantities of [redacted] petcoke. The content of the Trenton 6 and Pt. Aconi blends, however, differ significantly. Trenton 6 blends [redacted] domestic coal, [redacted] international coal, [redacted] petcoke. Pt. Aconi burns a multi-part blend consisting of [redacted] petcoke, [redacted] international coal, [redacted] domestic coal.

Total Solid Fuel Costs by Station

(The following graph is confidential)

Trenton 5 and Pt. Tupper experienced [redacted] overall fuel costs. They burn the [redacted] international coal. Trenton 5 costs exceed those of Pt. Tupper, because of extra rail transportation costs required to deliver solid fuel from the Pt. Tupper marine terminal to the Trenton Station. Pt. Tupper does not suffer these added costs. Conveyors bring solid fuel directly to the station from the marine terminal and Pt. Tupper's use of small petcoke quantities help to moderate its fuel costs.

Lingan experienced the [redacted] fuel costs. The station burns a blend of international coal, petcoke, and domestic coal. International sources comprise [redacted] of its burns. [redacted] coal, however, moderate overall Lingan fuel costs. Petcoke comprises [redacted] and domestic coal [redacted] of Lingan blend.

4. Audit Period Contract Purchases

NS Power changed its solid fuel procurement processes during the Audit Period, as it faced the need to address comparatively high natural gas prices. Those prices caused coal to be cheaper more often than expected, thus increasing solid fuel purchases, as it decreased those of natural gas. Two other circumstances introduced the need for changes in solid fuel procurement as well. First, the Port Hawkesbury Paper Mill (PHP) returned to operations at the end of September 2012, requiring NS Power to procure additional solid fuel in order to support loads at the mill. PHP also consumed biomass fuel as part of its internal operations. PHP procured its own biomass fuel for this purpose. Second, the Port Hawkesbury Biomass Generator (PHB) started operations in July 2013, requiring NS Power to create new procurement program elements to secure the entirely new (for NS Power) source of fuel required.

Since PHP's return to operations, NS Power's fuel procurement actions have had to address the potential for swings in mill operations, and thus NS Power's obligation to provide electricity to enable those operations. PHP can represent 10 percent of NS Power's total load. Small-lot and

short term (one to two quarters in advance) purchases have become more common, as NS Power seeks to avoid over-purchasing for PHP loads that can vary widely. The resulting greater use of such purchases can have a material effect on the balance of contract durations that comprise the overall solid fuel portfolio.

The next subsections describe Audit Period purchases in more detail.

a. Portfolio Considerations

The factors that NS Power's solid fuel procurement processes must address include things like generating unit type (fluidized bed vs. conventional coal fired), unit age, sulphur emission limits, plentiful low cost, but high sulphur domestic coal, and generating unit designs that limit ability to capture sulphur emissions. None of NS Power's generating units employ scrubbers. Pt. Aconi's fluidized bed enables it to use more sulphur coal, but the other units must use a blend whose majority consists of low sulphur coal to comply with sulphur emission requirements. Within these operating parameters, NS Power has sought to maximize use of low cost, high sulphur, domestic coal.

The Fuel Manual's contract duration guidelines govern the composition of NS Power's overall solid fuel portfolio. The next table summarizes these portfolio guidelines. The Fuel Manual does not cover biomass procurement. The short term contract maximum requirement changed from [redacted] in May 2012.

Solid Fuel Portfolio Guidelines

Category	Definition	Minimum	Maximum
Long Term	≥ 4 Years	[redacted]	[redacted]
Medium Term	1 – 4 Years	[redacted]	[redacted]
Short Term	< 1 Year	[redacted]	[redacted]
Country Risk			[redacted]
Supplier Risk			[redacted]
Mine Risk	@Contract minimums		[redacted]

The following table compares NS Power's actual and guideline portfolio balance on a quarter by quarter basis across the Audit Period. NS Power remained within the guidelines it applied for defined risks. Actual contract term mix fell outside of guidelines, as the table demonstrates. During the first two quarters of 2012 the long term contract percentages exceeded the [redacted] guideline. This variance occurred because consumption fell below forecast amounts for those six months, causing the portion inventory (which falls under the long term category) to increase. NS Power did not add new contracts during this period, making the increase in long term percentages simply a reflection of lower than predicted levels of solid fuel consumption.

Solid Fuel Portfolio Composition

Category	Limits	2012-Quarterly Actuals				2013-Quarterly Actuals			
	%	*1*	*2*	*3*	*4*	*1*	*2*	*3*	*4*
Long Term									
Medium Term									
Short Term									

Solid fuel contract base quantities drive the quarterly percentages shown in the table above. Many NS Power contracts contain options to increase or reduce takes by specified percentages. The exercise of "minus" options could bring the percentages down a few points. The big increases in percentages of short term contracts shown in the latter portion of the Audit Period corresponded with the return of PHP and its potentially variable supply.

b. Contracts Existing at the Beginning of the Audit Period

A total of NS Power solid fuel contracts existed at the beginning of the Audit Period. None covered biomass. The next table summarizes them. NS Power entered additional contracts over the course of the Audit Period. We discuss actions related to new solid fuel contracts below. Our examination of each procurement listed found all conducted in accordance with Fuel Manual guidance. NS Power selected in each case the supplier offering fuel at the lowest cost on a total evaluated delivered cost basis.

Solid Fuel Contracts at Beginning of Audit Period

(Quantities shown in thousands of metric tonnes)

Supplier	Term	2012	2013	2014
Low Sulphur Positions				
Mid & High Sulphur Positions				
Domestic Positions				
Petroleum Coke Positions				
			-	

c. Contracts Entered During the First Quarter of 2012

NS Power entered no new solid fuel agreements during the first quarter of 2012. NS Power reported differently, however, in its First Quarter 2012 FAM Report. This report incorrectly

identified [redacted] new solid fuel contracts (with [redacted]) during the period. The next table shows how NS Power reported these [redacted] "new" contracts in the quarterly report:

"New" Contracts Reported in Q1 2012

Supplier	Product	Quantity	Term
[redacted]	[redacted]	[redacted]	[redacted]

NS Power had actually entered the contracts with [redacted] in 2011. The [redacted] covered delivery of [redacted] of coal in 2012; the [redacted] agreement covered delivery of [redacted] of coal per year for [redacted] beginning in [redacted]. NS Power chose to list these two agreement in the 2012 First Quarter Report because it elected to draw up individual confirmation letters (treated as new contracts for reporting purposes) for individual cargos under the contracts, pending continuing negotiations of new master coal agreements with the vendors during the first quarter of 2012.

The contract with [redacted] did not represent a new contract, but rather an amendment under an existing [redacted] contract designed to correct an error in the quality adjustment provision. Liberty discussed this reporting issue with NS Power some time ago. The Company made reporting more consistent and accurate over the ensuing quarters.

d. Contracts Entered During the Second Quarter of 2012

NS Power entered into [redacted] during the second quarter of 2012. The next table summarizes these [redacted] agreements. The agreement with [redacted] settled an outstanding contract dispute dating back to 2010 - 2011 and concerning a claimed tonnage shortfall. [redacted] agreed in the settlement to [redacted]. With arbitration (and the associated costs) as the alternative, the settlement's value was [redacted], as evaluated by NS Power's outside counsel.

Q2 2012 [redacted] Agreements

Supplier	Product	Term	Quantity	Price
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

e. Contracts Entered During the Third Quarter of 2012

The next table summarizes NS Power's new, third quarter 2012 contracts.

Q3 2012 Agreements

Supplier	Product	Term	Quantity	Price
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The [redacted] agreement resulted from a June 2012 RFP that NS Power issued to evaluate low sulfur coal supplies across a three-year period. [redacted] suppliers offered proposals for low sulphur coal supply. Three factors led NS Power to restrict its alternatives to coal supplies with proven plant and environmental performance. Those factors were: (a) the recent loss of a major industrial customer (Bowater), (b) the changing relationship between coal and gas prices in the market, and (c) high coal inventory levels. Generating units needed to have greater flexibility to respond to new system impacts. Coals resulting in plant operational constraints either due to lower Btu content or elevated ash content were not considered. Such coals would have reduced the operational flexibility that was important when it became clear that load would be lower. This change reduced fuel supply blend options, coal and gas price relationships were changing, and high inventory levels reduced coal supply juggling options. NS Power thus eliminated offers from [redacted]. NS Power negotiated with [redacted] before finally reaching agreement with [redacted] on optimum volume and pricing considerations.

The [redacted] agreements resulted from an August 2012 RFP designed to: (a) address petcoke positions that were [redacted] for 2013 and 2014, and (b) seek an economical way of using 2012 transportation entitlements stranded by the [redacted]. NS Power ended up with more PRB coal than it could use effectively, due to reduced 2011 and 2012 coal burns. The Company can burn only limited amounts of PRB coal. The resulting agreements ameliorated the stranded transportation cost issue, avoiding dead freight costs. The agreements also made sense from an inventory management perspective. Securing petcoke (with a higher Btu content than all other coals) gave inventory a higher Btu content. The result was enhanced plant performance and reduced inventory volume. In addition, reduction of PRB coal in inventory addressed the spontaneous combustion characteristic of PRB coal. Longer storage periods at the International Pier threatened smoldering fires, loss of coal Btu content, thus requiring frequent intervention and pile management. [redacted] offered the most economic terms from among [redacted] responding to this RFP.

NS Power also received an unsolicited offer for a cargo of 55,000 MT of [redacted] coal during the third quarter of 2012. Circumstances made the seller desirous of transferring the coal at distress prices. Taking the coal would have further raised NS Power inventory above portfolio guidelines for short term contracts. There was no extra inventory space at Point Tupper, where the coal was to be delivered. The Company would also bear extra carrying costs. There was also uncertainty about coal burn levels for the near term, especially considering lack of definition on the schedule for operation of PHP. The expected carrying costs and anticipated contract unwind costs (should coal burn not increase) caused the evaluated costs of taking the

distressed coal to prove excessive. NS Power therefore decided to decline the offer of distressed cargo.

f. Contracts Entered During the Fourth Quarter of 2012

NS Power entered into multiple solid fuel contracts for coal and for petcoke during the fourth quarter of 2012, as part of efforts to manage fuel supply in light of PHP requirements. The next table summarizes this quarter's new agreements.

Q4 2012 Agreements

Supplier	Product	Term	Quantity	Price
[redacted]				

The [redacted] purchase resulted from an October 11, 2012 RFP addressing supply to Pt. Aconi for inventory over the coming winter. The winter purchase would provide additional low cost inventory to bridge the period between January and April 2013, when already contracted deliveries from [redacted]. [redacted] the lowest evaluated cost from among the [redacted] bids.

The next [redacted] purchases (from [redacted]) resulted from an October 15, 2012 RFP seeking low sulphur coal supply for the first quarter of 2013. Proposals came from [redacted] suppliers. NS Power chose to contract with the [redacted] offering the lowest evaluated costs. NS Power conducted a thorough evaluation that considered multiple alternatives from perspectives including coal quality impacts on plant performance and inventory issues. [redacted] deliver a scheduled November cargo, due to labor issues at its source in Venezuela, thus underscoring the positive aspect of the Company's approach to evaluate competitive offers for Venezuelan coals not relied upon for immediate consumption requirements. Given ongoing difficulties in procuring coal from Venezuela, NS Power would only procure competitively priced coal from this country when it was not immediately required, and could be accepted over

a more flexible schedule in the future. The [redacted] met Point Tupper and Trenton 5 needs. The [redacted] agreement supplied Lingan's requirements.

The [redacted] coal agreement (the second from this vendor that the above table lists) resulted from a November 7, 2012 RFP seeking to obtain coal for Lingan, and to replace inventories of the high Btu coal, which NS Power was expecting to become depleted with high burns to serve PHP load. NS Power evaluated [redacted] offering as the most economical from among the [redacted] proposals received from [redacted] offerors. The second purpose of this RFP was to compare current market pricing [redacted] pricing for 2013 contract deliveries. The information gained from RFP responses would assist NS Power in determining the size of volume declarations to issue [redacted]. The RFP produced price proposals competitive with those [redacted] prices, which led NS Power to nominate the minimum volume of 2013 purchases [redacted].

The next four low sulphur coal procurements (from [redacted]) resulted from a December 5, 2012 RFP seeking coal for the first quarter of 2013. The return of loads at PHP made these procurements necessary. NS Power received [redacted] proposals from [redacted] (of Columbian, Venezuelan and Central Appalachian (CAPP) origin). NS Power accepted offers for delivery to both the PTMT and INP NS Power ports. NS Power evaluated [redacted] (from a Venezuelan source) as the lowest cost offer. The Company selected it because it was not relied upon for immediate consumption requirements, but rather presented an opportunity to add a [redacted] coal to inventory.

The [redacted] resulted from a December 5, 2012 RFP seeking to obtain petcoke for the first quarter of 2013. NS Power received [redacted] suppliers. Its evaluations showed the [redacted] to be the most competitive. NS Power has been increasing the amounts it secures under short term purchases in recognition of the special requirements associated with variable PHP load, seeking to meet one to two quarters in advance requirements to serve PHP load.

g. Contracts Entered During the First Quarter of 2013

The next table summarizes the contracts NS Power entered during the first quarter of 2013.

Q1 2013 Agreements

Supplier	Product	Term	Quantity	Price
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The first four contracts for low sulphur coal resulted from a February 8, 2013 RFP that sought short, medium and long term low sulphur coal supplies. The next two contracts for petcoke resulted from a February 8, 2013 RFP that sought short and longer term petcoke supplies. Petcoke proposals came from [redacted], with the most economical as evaluated [redacted]. This was not the first or last economical [redacted]. This seller's offers under three separate RFPs over a several month period had prices in the range of [redacted] less than the offers actually accepted. NS Power has not accepted these offers for this product, because the Company has not tested it in any of its units. However, during the Audit Period, the Company did begin to conduct investigations as to the long-term suitability [redacted] as a fuel. [redacted] made the lowest price offer for traditional petcoke, and included a [redacted] NS Power accepted the [redacted], which mitigated the risk of historically volatile petcoke prices. NS Power also accepted the second most economical offer, from [redacted]. It offered options to ship into either PTMT or INP.

h. Contracts Entered During the Second Quarter of 2013

The next table summarizes the contracts NS Power entered during the second quarter of 2013.

Q2 2013 Agreements

Supplier	Product	Term	Quantity	Price
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Biomass				
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The [redacted] resulted from a May 29, 2013 RFP seeking for mid sulfur coal. NS Power issued the RFP for several reasons. Mid-sulphur coal's sulphur and Btu contents approach Lingan's design conditions. When emission limits permit, such coal presents a cost effective component of the plant fuel blend. Mid-sulphur coal inventories had fallen at Lingan because of first quarter supply interruptions resulting from force majeure events and coal burns in excess of forecast. NS Power sought early delivery in order to ensure mine and port availability for delivery prior to the high demand months of December and January. The Company also sought early delivery to avoid potential supply interruptions from a fall 2013 mine workers strike. NS Power received [redacted] for supply of mid-sulphur coal, and [redacted], which provided the lowest evaluated cost.

On April 25, 2013, NS Power entered into a short term agreement with [redacted] for supply of [redacted] Green Metric Tonnes (GMT) of biomass intended as supply for startup activities at the biomass generation facility. [redacted] offered in response to a RFP the lowest cost evaluated cost. The product offered consisted of a blended supply of chips and secondary biomass. Secondary biomass consists of bark, sawdust, and shavings from forest product manufacturing. As startup continued, NS Power and [redacted] reached agreement, with FST approval, on an [redacted] supply at the previously agreed price.

Biomass fuel supply has a number of components:

- Primary Forest Biomass – chips, originating from stemwood
- Secondary Forest Biomass – bark, sawdust, shavings from forest product manufacturing
- Hardwood chips from sawmill operations

All biomass must meet the definition of "Clean Wood"; *i.e.*, comprised of natural, untreated and uncoated wood and wood waste, which, at no stage in its lifecycle, has been treated with organic or inorganic substances to change, protect or supplement the physical properties of the materials. Biomass must also be free of contaminants, such as gravel, soil, metal or plastic.

NS Power had issued in September 2012 a Request for Expression of Interest (RFEI) in supplying biomass. [redacted] responses followed. One of them, [redacted], offered to supply [redacted]. NS Power found the offer attractive in price, on the basis that it priced [redacted] from the Company's consultant. Following FST approval on November 23, 2012, the Company began negotiations, entering an agreement in June 2013.

i. Contracts Entered During the Third Quarter of 2013

The next table summarizes the contracts NS Power entered during the third quarter of 2013.

Q3 2013 Agreements

Supplier	Product	Term	Quantity	Price
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Biomass				
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

NS Power has consistently cited the total biomass fuel supply requirement as 670,000 GMT/year (required for both PHP and PHB at full output). The fuel purchase commitment of NS Power would be 500,000 GMT for PHB, and the Port Hawkesbury Paper purchase commitment for PHP would be 170,000 GMT. The breakdown of fuel supply is as follows, considering all current contracts:

Volume	Supplier
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
Total: 670,000 GMT	

The contracts with [redacted] resulted from a June 24, 2013 RFP for low sulphur coal for 2013 and 2014. NS Power's evaluation of the responses considered scenarios including and excluding PHP load. Other factors considered included the need for lower mercury coals, plant reliability and coals with proven performance, and coals with interchangeability among plants to facilitate inventory management. [redacted] bids came [redacted] suppliers, and addressed low and high Btu coals. The selected suppliers offered the lowest evaluated cost coals. Moreover, the [redacted] coals would provide interchangeability among plants. The [redacted] offer was competitive with that [redacted] and provided the opportunity to diversify suppliers. NS Power selected [redacted] for testing at Lingan in 2014.

The [redacted] resulted from a June 24, 2013 RFP for petcoke requirements for 2013 – 2015. Offers came from [redacted], with [redacted] as the most attractive. [redacted] supply from [redacted].

The biomass procurement resulted from a March 2013 RFP seeking to select Biomass Supply Managers to manage biomass procurement for NS Power. This request sought delivery of 500,000 GMT of biomass per year, over a term of [redacted], with deliveries to start in mid-2013. The Company had formed a Biomass Evaluation Team, consisting of the Director of Fuels, Energy and Risk Management, the Point Tupper Plant Manager, the Biomass Supply Manager, the Leading Commercial Superintendent (Hydro), and an Independent Forestry Consultant.

This team concluded that NS Power did not have the requisite skills, personnel and experience in the forestry sector to manage a procurement effort of this size. Therefore the Company determined that it should enter fee for service agreements with separate companies to procure biomass. Following receipt of [redacted] bids, the Team developed six supply scenarios categorizing the various methods of supplying biomass power.

After evaluation of these scenarios, the Team selected Alternative E, which would provide a balanced approach between [redacted] split between the two providers' [redacted] in order to [redacted]. The six different scenarios considered were as follows:

Alternative	Name	Distribution	Biomass Expense
A	[redacted]	[redacted]	[redacted]
B	[redacted]	[redacted]	[redacted]
C	[redacted]	[redacted]	[redacted]
D	[redacted]	[redacted]	[redacted]
E	[redacted]	[redacted]	[redacted]
F	[redacted]	[redacted]	[redacted]

The two companies selected met the following established criteria: (a) cost effectiveness, (b) security of supply, (c) sustainability and regulatory compliance, (d) avoidance of competition, (e) experience, and (f) safety. The two agreements secured the 500,000 GMT/year of biomass required for both PHP at full output. Both companies had proposed to supply the requested 500,000 GMT per year. The Company's Biomass Evaluation Team conducted reasonably detailed examination of [redacted].

The evaluations considered multiple factors. [redacted] Its proposal included provision of [redacted].

[redacted]

NS Power decided to weight procurement volumes heavily in the direction of [redacted] Through negotiations, prices were finalized with [redacted] The Company justified this decision on the basis of: (a) uncertainty about [redacted] (b) concern that [redacted] (c) lack of clarity from [redacted] (d) concern about [redacted] NS Power's forestry consultant determined that a price in the range of [redacted] would be required to provide necessary services.

Despite these concerns, however, NS Power did award about [redacted] of required biomass supply [redacted], determining to monitor performance closely during the first few months. NS Power made the awards on July 3, 2013. Formal contracts have yet to be executed. Each provider continues to supply biomass to NS Power under Letters of Intent, and at pricing levels negotiated. The forestry consultant's view of required revenue appears to have been far wrong.

Deliveries started in early September 2013 from both suppliers. Over the balance of the year, target deliveries, and actual deliveries, from each supplier were as follows:

Supplier	Target Deliveries	Actual Deliveries
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

Both suppliers had difficulty providing target deliveries during late 2013, because much of the infrastructure necessary to support the requested NS Power biomass supply was no longer in place following the shutdown of the PHP paper machine, the closure of sawmills and the closure of Bowater Mersey Paper Company. Harvesting companies had gone out of business, and harvesting equipment had been sold. In many cases the equipment had left the Province. Thus, the long term commitments of NS Power to buy biomass under [redacted] contracts were necessary to begin a gradual rebuilding process for the industry. By the second quarter of 2014, [redacted] suppliers were [redacted] target levels, and were in positions to supply required biomass on an ongoing basis. Now, as negotiations are still underway to finalize contracts with these two suppliers, [redacted] are being added to the draft agreements.

j. Contracts Entered During the Fourth Quarter of 2013

The next table summarizes the contracts NS Power entered during the fourth quarter of 2013.

Q4 2013 Agreements

Supplier	Product	Term	Quantity	Price
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The [redacted] contracts resulted from an October 16, 2013 RFP. NS Power received bids from [redacted]. Evaluation of the responses considered scenarios including and excluding PHP load. The Company found [redacted] attractive for a number of reasons, including low cost, high Btu and January delivery for the [redacted] portion, usability within either the PTMT or INP circuits, and low sulphur and mercury content. A high Btu [redacted] from Central Appalachia had [redacted] for delivery to the PTMT terminal.

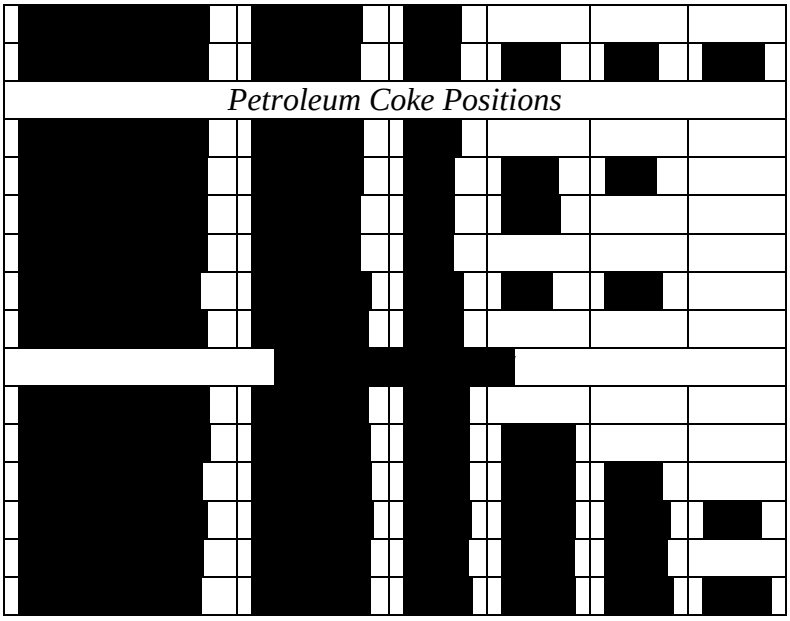
FERM also began, in the fourth quarter of 2013, negotiations with [redacted]. NS Power was prepared to purchase up to [redacted] This price target came from an outside review of changes in [redacted]. On December 17, 2013 NS Power entered a new three-year contract for supply from this source. The pricing under this new contract was [redacted]. This price was determined to be an [redacted] The contract includes provisions to compensate NS Power for a shortfall [redacted] in deliveries from [redacted]. The vendor will bill the first [redacted] under the new [redacted] contract at the contract price from [redacted]. This amount [redacted] new contract prices by somewhat [redacted].

k. Contracts Existing at the End of the Audit Period

Solid Fuel Contracts at End of Audit Period

(Quantities in thousands of metric tonnes)

Supplier	Term	2013	2014	2015	2016
Low Sulphur Positions					
[redacted]					
Mid & High Sulphur Positions					
[redacted]					
Domestic Positions					



l. Audit Period Purchase Practices

NS Power procured solid fuel through well-documented, controlled processes designed to ensure broad market solicitations and comprehensive, objective evaluations of bids. Requests for Proposal (RFP) went to large numbers (as many as 50) of potential suppliers, depending on the type of product desired. NS Power's Fuel Manual provides detailed fuel procurement procedures. Our review confirmed the proper execution of these procedures. NS Power held all incoming solid fuel bids in the Procurement Department without opening until the designated time, in order to ensure fairness of evaluation. At the time for bid opening, documentation was forwarded to FERM for opening and bid evaluation. NS Power performed evaluations of all bids using an appropriate combination of factors, incorporating transportation costs and quality variations in order to evaluate bids for cost competitiveness at the bus bar. Often, NS Power engaged in negotiations with potential suppliers in order to obtain the best possible prices, terms and conditions.

m. Hedges for Index-Priced Contracts

NS Power made some procurements on the basis of price indices. In these cases, NS Power promptly executed a related hedge transaction that would essentially fix the price of the solid fuel acquired. NS Power used "swaps" (fixed for floating indexed price indexed at an approved market price) with [redacted] to hedge coal prices during the Audit Period. The counterparties were [redacted].

NS Power's [redacted] coal hedges in 2012 covered [redacted] of coal. Settlement of these hedges resulted in net payment by NS Power of [redacted] to its hedge transaction counterparties. During 2013, NS Power undertook [redacted] hedging transactions, involving [redacted] of coal. These hedges resulted in net payment by NS Power of [redacted] to its hedge transaction counterparties.

NS Power enters such hedges to reduce volatility, not to produce direct economic value. This objective is the appropriate one. In rising markets, the net payments would be to, rather than from, NS Power. For example, while settlement of hedges added about [redacted] in FAM costs during the current Audit Period, customers actually benefitted by a net of [redacted] in the previous Audit Period.

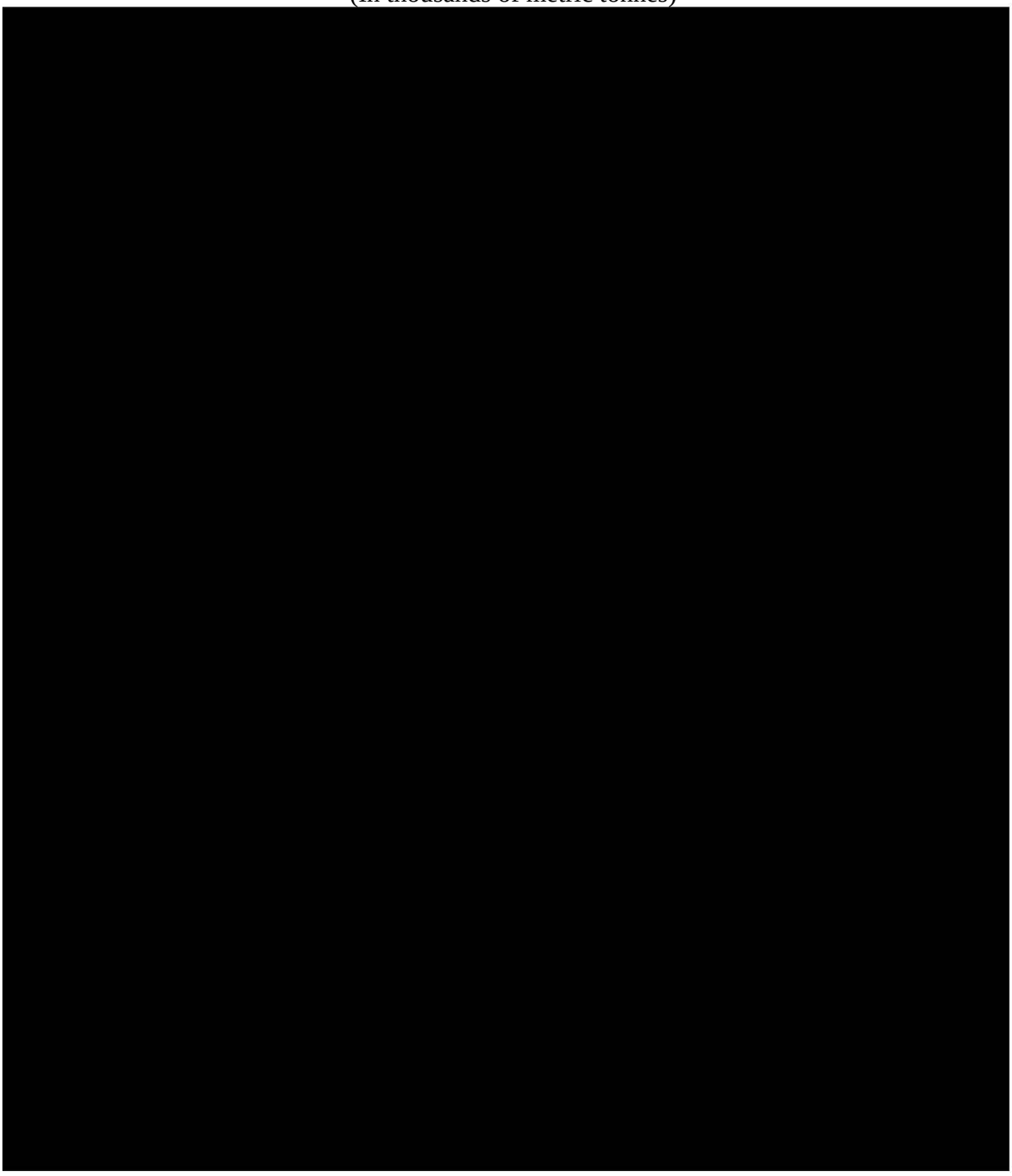
5. Solid Fuel Contract Summary

NS Power maintains the following charts regularly, and considers them as part of each procurement decision, in order to determine compliance with portfolio guidelines from the Fuel Manual. The first two portfolio status charts display the solid fuel portfolio at both the beginning and the end of the Audit Period. The last chart shows the specific risk categories, as spelled out in the Fuel Manual, and includes the status for both 2012 and 2013. These charts do not include biomass information.

(The following chart is confidential)

Summary of Portfolio Status – December 31, 2011

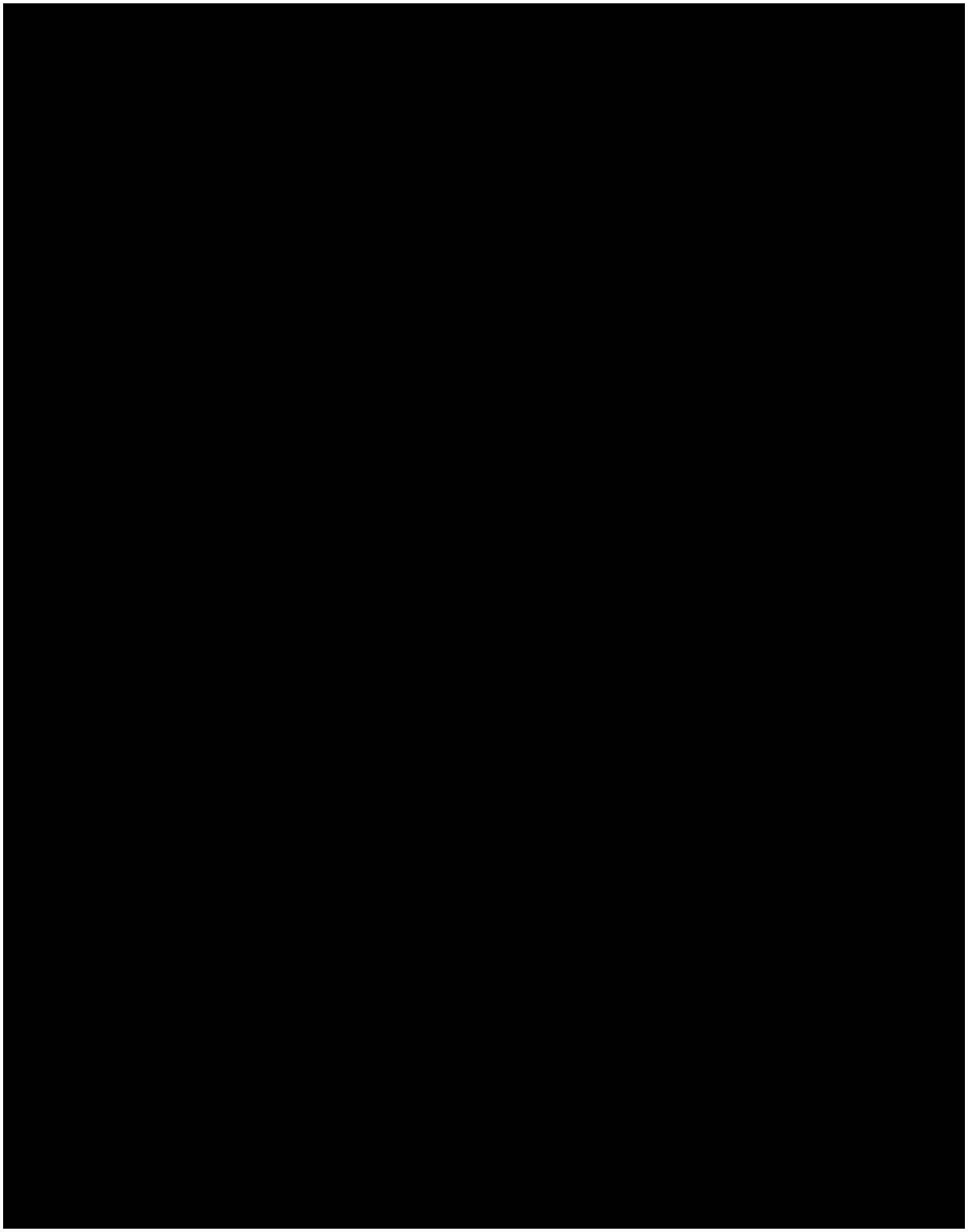
(In thousands of metric tonnes)



(The following chart is confidential)

Summary of Portfolio Status – December 31, 2013

(In thousands of metric tonnes)



Portfolio Risk Requirements & Status at End of 2012 & 2013

[redacted]

6. Procurement Consultation

Throughout the Audit Period, and essentially since 2005, NS Power has used the services of an outside consultant to provide an independent perspective on NS Power's solid fuel, associated marine freight, and procurement decisions. NS Power involves the consultant in each solid fuel procurement, providing the consultant with copies of all bids submitted. The consultant conducts a separate analysis, and summarizes it in a memorandum to NS Power.

During the previous Audit Period, the consultant was especially active for NS Power. This was a time of significant change in senior personnel within FERM; specifically, the Director of FERM, and the Senior Manager Fuels Strategy and Performance, who had not had previous experience in the area of fuel procurement and management. However, since that time, these individuals have gained significant experience.

7. Procurement Documentation

During the previous Audit Period, NS Power assembled for each solid fuel procurement the package of supporting information specified in the Fuel Manual, and identified as the Record of Approval ("ROA"). The contents of the ROA includes the following appendices:

Appendix A – Recommendation Memo	*Appendix B – Evaluation*
*Appendix C – External Evaluation****	*Appendix D – Portfolio Chart*
Appendix E – Credit Review	***If required***

During the current Audit Period, the Company began a transition to maintaining all of this information in electronic format. Procurement information began to be placed on the "K Drive," available to personnel in FERM, and intended to serve as the repository of all procurement information. However, some information, such as email correspondence between the Company and Bidders, was not placed on the K Drive, but was available separately in an email archive. As part of the overall transition of procurement documentation to electronic format, during 2013, NS Power created a fuel Contract Database on the Company's SharePoint site. However the complete transition of all procurement information to SharePoint will not be completed until sometime in 2014.

Liberty's review of fuel procurement information found much, but not all, of this information appropriately assembled on the K Drive. We did not find document control to be fully sufficient. In order to obtain explanations for a number of items and to obtain documents, such as Confirmation Letters, FERM management found it necessary to contact a former employee of FERM who had created the electronic database, and was most familiar with it. Eventually, necessary explanations and documents were obtained.

During the Audit Period NS Power did maintain a hard copy of each RFP, its distribution list, and details of the solicitation. The documentation retained includes the formal Record of Procurement Approval, as signed by the Fuel Strategy Table, and a summary of the procurement and the decision as approved by the FST. Liberty reviewed this documentation for actions taken during the Audit Period for procurement of solid fuel. We found the documentation scopes generally supportive of the procurement decisions made.

8. Contract Actions

NS Power experienced an unusually high number of contract events during the Audit Period. They arose from force majeure declarations, temporary mine or port shutdowns, low drafts in the Mississippi River, and guerilla warfare activity on rail lines in Columbia.

a. Resales or Swaps

NS Power did not engage in resales or swaps of solid fuel contracts or entitlements during the Audit Period.

b. Price Redeterminations

Chapter VI, Section 4.b. of this report (Quality Administration) discusses two instances where NS Power negotiated more favorable prices from suppliers, as part of efforts to address coal quality issues. The changes consisted of adjustments not provided for in the standard coal quality adjustment provisions of the coal contracts.

c. Litigation Related Contract Issues

[redacted]failed to deliver [redacted] tonnes of petcoke in 2010 and did not make up the shortfall in 2011 deliveries. The shortfall constitutes a default under the Master Petroleum Coke Supply Agreement. On November 2, 2011, NS Power submitted a final demand [redacted] for compensation for the shortfall. NS Power has reached a settlement [redacted], which provided NS Power with a shipment of [redacted] of petcoke at USD [redacted].

[redacted] paid the demurrage owed on a [redacted] at [redacted], prior [redacted] of force majeure in April 2012, as described in the section immediately below. NS Power calculated that the total demurrage owed up to the time of [redacted] force majeure on April 16, 2012 is [redacted] calculation of demurrage owed differs from NS Power's view. [redacted] demurrage time starting from the date of the accident at the port. The accident occurred five days before they declared force majeure. [redacted] includes in its calculation of demurrage a credit for loading time, even though no loading occurred. Both parties are positioned to enter arbitration. NS Power withheld payment of USD $500,000 on a cargo from [redacted], and is applying it as a set off for the demurrage payment. The two parties are working toward resolution.

[redacted]. Following the end of the Audit Period, a ruling adverse to NS Power appears to have ended the arbitration.

d. Force Majeure

[redacted] force majeure in connection with a shipment of coal at [redacted] on April 16, 2012 as a result of a force majeure being declared by the Port. The force majeure ended on May 31, 2012. At the time, NS Power's vessel was already on demurrage. NS Power subsequently negotiated a make-up shipment, but has a claim against [redacted] demurrage incurred prior to its declaration of force majeure.

On February 12, 2013, [redacted] force majeure at the [redacted] due to a [redacted]. The circumstances involve two issues, whose resolution was:

- The force majeure resulted in the February and March 2013 cargoes not being loaded. Amendment 3 to confirmation letter [redacted] effective June 24, 2013 details the agreement of cancelling one cargo and rescheduling the other cargo to the third quarter of

2013. The 2013 contract quantity is reduced to [redacted] to accommodate vessel size. The parties agree that [redacted] of coal delivered to NS Power in December 2012 will be deemed to have been delivered in 2013. NS Power shall take delivery of [redacted] to accommodate vessel size in Q3 2013. The remainder of tonnage is to be loaded between July and December 2013.

- The force majeure also resulted in February and March 2013 cargoes not being loaded under this contract. Amendment 1 to confirmation Letter [redacted] effective June 24, 2013 details the agreement of cancelling one cargo and rescheduling the other cargo to a laycan from March 26 – April 4, 2013. The 2013 contract quantity is reduced to [redacted] +/- 10% shipping tolerance. The delivery period is March 1 – April 30, 2013 inclusive.

On December 18, 2013 notice of force majeure was received [redacted] under confirmation dated August 26, 2013 as a result of adverse weather and ice conditions, resulting in the inability [redacted] vessel to reach [redacted], causing [redacted] fail to deliver the final contracted cargo for the year 2013.

e. Terminations

NS Power did not terminate early any solid fuel contracts during the Audit Period.

f. Renegotiations, Amendments or Extensions

The following changes occurred during the Audit Period:

- A June 2012 amendment with [redacted] the substitution of one cargo of low sulphur low Btu coal with one cargo of mid-sulphur high Btu Northern Appalachian coal.
- A confirmation dated June 1, 2012 with [redacted] a makeup shipment got rescheduled as a result of a force majeure event declared [redacted] per a letter dated March 1, 2010.
- An agreement [redacted] for a quality specification adjustment for a July 2012 cargo was made to reflect a quality upgrade from a low sulphur low Btu cargo to a low sulphur high Btu cargo.
- An amendment dated July 20, 2012 with [redacted] confirmation dated March 4, 2009, providing for postponement of delivery of one cargo of [redacted] tonnes from the 2012 Contract Quantity to the first calendar quarter of 2013.
- A July 2012 second amendment [redacted] substitution of one cargo of low sulphur low Btu coal by one cargo of mid-sulphur high Btu Northern Appalachian coal.
- A fourth quarter of 2012 amendment of the Parent Guaranty [redacted] clarified that the Parent Guaranty covers transactions entered into prior to the expiration of the Parent Guaranty.
- A fourth quarter 2012 first amendment with [redacted] unwound four vessels of [redacted] each from 2012 commitment; a second amendment added Parent Guaranty and Financial Information and Financial Assurance provisions to the Agreement.
- A March 14, 2013 Amendment #10 [redacted] extended the Parent Guaranty to April 7, 2014.

- A January 30, 2013 amendment to the Letter of Intent with [redacted] December 24, 2012 extended the term of the Letter of Intent to February 17, 2013.

9. Environmental Matters

NS Power fuel procurement and management must comply with government limits on emissions from thermal (coal, oil and natural gas-fired) generating stations. These regulations impose annual limits on emissions of CO_2, SO_2, NO_x and Mercury (Hg). The next table compares annual limits and actual emissions for the Audit Period. The caps operate as system-wide caps, without specific limits on emissions from individual generating units.

Annual Environmental Emissions

Item	Measure	2012	2013
CO_2	Limit	See explanation below	See explanation below
	Actual	7,468,762 tonnes	7,643,821 tonnes
SO_2	Limit	72,500 tonnes	72,500 tonnes
	Actual	50,120 tonnes	67,806 tonnes
NO_x	Limit	21,365 tonnes	21,365 tonnes
	Actual	15,640 tonnes	16,999 tonnes
Mercury	Limit	100 Kg	85 Kg
	Actual	94 Kg	72.51 Kg

The emission limit related to CO_2 is specified in terms of Greenhouse Gases. The limit is 18,500,000 MTs total for the two years of 2012 and 2013.

A significant change in Mercury emissions occurred in July 2010. The 2010 Mercury cap started the year at 65 Kg; the Nova Scotia government changed the cap to 110 Kg in July. Subsequently, the emissions cap continues to fall, leading to an ultimately much stricter 35 Kg/year target for 2020. For 2012, the cap is 100 Kg; for 2013 it is 85 Kg; 2014 it is 65 Kg; and for 2020 it is 35 Kg. NS Power must by the year 2020 make up for any emission over 65 Kg per year in the years 2010 through 2013.

The cap for SO_2 will remain at 72,500 tonnes per year for each year through 2014, and then will reduce to 60,900 tonnes in 2015, with a further reduction to 36,250 tonnes in 2020. The cap for NO_x will continue at 21,365 tonnes for each year through 2014, and then will reduce to 19,228 tonnes in 2015, and in 2020 the cap will further reduce, to 14,955 tonnes.

During the Audit Period, four citations or government authority contentions or investigations of environmental non-compliance related to fuel use or waste storage and disposal arose in connection with NS Power generating stations. On June 26, 2012, NS Power was fined $687.41 for the failure of its contractor to adhere to all conditions identified for culvert installation at the Abercrombie Ash Site expansion. As a result, remediation activities were undertaken. The area was remediated. NS Power installed the culvert following all approval conditions; work at the entire site was halted, an environmental action plan was developed; and the contractor action plan was reviewed with Nova Scotia Environment (NSE).

On March 12, 2013, NS Power received an Inspection Report and Environmental Warning Report related to a March 11 opacity event for Trenton #6. The event resulted from a trip of the electrostatic precipitator. The trip was caused by failure of a feedwater control valve, which resulted in two 6 minute opacity exceedences of 60% and 41%. The regulations state that "the opacity of stack emissions will be maintained at or below 20%, except that the opacity may increase to 40% for not more than 6 minutes in any 60 minute period." The NSE reported in its Inspection Report on March 12 that over the last 30 days, this was the third opacity exceedence from Unit #6. On February 16, the opacity exceedence was related to a precipitator trip. This was investigated and found to be an intermittent failure in the trip circuit for the precipitator. One of the electromagnetic relays was replaced and the system appeared to be restored to full operation. On February 23, the precipitator de-energized again, with once again intermittent faults in the trip circuit. Wire connections were checked for looseness, and a second electromagnetic relay was replaced. The system was tested and put back in service. There were no fines associated with any of these three events, and there were no environment department inspection or warning reports for the first two incidents.

On August 20, 2012, NS Power received an Inspection Report and Environmental Warning Report related to sedimentation at the Abercrombie Ash Site. The issue was not with the previously reported culvert installation, but now related to erosion and sedimentation control problems at the site. Mitigative actions associated with the Environmental Warning Report were carried out, and additional long term control measures were implemented.

On February 28, 2013 an Environment Act Directive was issued to Logistec Stevedoring in regards to a coal dust event at the International Pier in December 2012. Logistec submitted a response to NSE and the matter was resolved.

10. Other Procurement

a. Water-borne Transportation

Nova Scotia is remotely located with respect to the world's major solid fuel market supply regions. This factor makes ocean freight the Company's primary delivery method. NS Power receives approximately seventy five percent of its solid fuel from ocean-going vessels. The balance of solid fuel deliveries come from domestic coal, which arrives by truck from coal mines near the generating stations.

Ocean-going vessels unload solid fuel for NS Power at either of two unloading ports in the northern part of Nova Scotia. Both lie in the Cape Breton area. The International Coal Pier in Sydney on the northern shores of Cape Breton can accommodate self-unloading vessels. The Point Tupper Marine Terminal located in Point Tupper on the Strait of Canso, can accommodate self-unloading vessels and gearless Panamax vessels. Deliveries to the International Coal Pier generally go to the Lingan and Pt. Aconi generating stations. Deliveries to the Point Tupper Marine Terminal are generally destined for the Pt. Tupper and Trenton generating stations.

On June 28, 2013, NS Power acquired the International Pier. This acquisition was based on a plan that was set in motion over ten years ago. On December 31, 2002, NS Power entered into a 10-year agreement that conveyed certain assets at Sydney International Pier to Logistec Inc. These assets are used in the operation of the Pier. Under this original agreement, Logistec

employed the assets at the pier to manage solid fuel (coal and petcoke) and subsequently deliver it to the Lingan (by rail) and Point Aconi (by truck) generating stations.

Under the original agreement, NS Power had two options to repurchase these assets at the end of the 10-year term (December 31, 2012). First, it could purchase the Rail Maintenance Centre and its associated assets for $500,000. Second, it could purchase the assets at Sydney International Pier for $6,300,000. The assets represent the collection of buildings, equipment, and rolling stock needed to offload, store and transport the solid fuel.

The NSUARB is examining NS Power's purchase of this Pier. Liberty is assisting the NSUARB in this effort, and such evaluation will be conducted separately from this current FAM Audit.

Long term supply agreements with a number of different marine freight providers cover marine freight services for solid fuels delivered to NS Power during the Audit Period. The next subsections discuss them.

[redacted]

NS Power's ocean freight agreement with [redacted] during the first year of the Audit Period comprised [redacted] running from [redacted]. The 2010-2012 contracted tonnage [redacted] to [redacted] per annum. NS Power had options to declare [redacted] of these annual quantities. By [redacted] of each year of the contract term, NS Power was required to declare the anticipated annual tonnage for the following year to within [redacted] For the year 2012, the Fuel Strategy Table approved a volume declaration of [redacted] under the existing contract.

Facing expiration of the [redacted] at the end of 2012, NS Power solicited the ocean freight market on October 26, 2012, releasing a Request for Proposal (RFP) for ocean freight for a three-year term for the period from 2013 through 2015 for freight service to the Point Tupper Marine Terminal (PTMT) and the International Pier (INP). The RFP went to brokerage firms and independent shipping firms (24 firms in all). The Company received multiple proposals, conducted detailed analyses, and undertook negotiations with suppliers. NS Power's reviews included a net present value analysis over a [redacted] period under various scenarios with several shippers. [redacted] had a competitive advantage, [redacted]. On January 23, 2013 the FST approved an agreement with [redacted] for the 2013 - 2015.

[redacted]

On March 28, 2013, NS Power executed a shipping agreement with [redacted] for shipping solid fuel from [redacted] to either INP or PTMT. The term of the agreement was from the beginning of the navigation season in 2012 (the Navigation Season being approximately from March 25 to December 31) to the end of the navigation season in 2014. The annual quantity of coal to be transported under the agreement in each calendar year during the current Audit Period is 100,000 tonnes. The RFP for this procurement had been issued during the previous Audit Period. The proposal submitted [redacted] had been evaluated at that time as satisfactory.

[redacted]

On July 16, 2012 NS Power formally executed a shipping agreement with [redacted] for shipping coal from [redacted] to either INP or PTMT. The term of the agreement is from [redacted]. The annual quantity of coal to be transported under the agreement in each calendar year during the current Audit Period is [redacted]. The RFP for this procurement had been issued during the previous Audit Period. The proposal submitted by Seaway Marine had been evaluated at that time as being satisfactory.

b. Rail Transportation

During the previous Audit Period, NS Power negotiated a [redacted] with [redacted]. The term of this contract is from [redacted] The final version of this contract was executed by both parties on March 2, 2012. Liberty reviewed this document during the previous Audit Period, and found it to be satisfactory.

c. Other Solid Fuel Services

[redacted]

During the period of 2011 and 2012, load port representation and quality assurance/quality control (QAQC) was handled by [redacted] for South American load ports, and by [redacted] for North American load ports. On December 7, 2012, NS Power solicited the market of these services and the RFP specified all load port facilities where NS Power is contracted to load (both North and South America) during the years 2013 and 2014. These services include the following:

- Providing updates on loading prospects to NS Power before and during loading operations
- Inspecting the loading equipment, as well as the cargo and the vessel to be loaded
- Witnessing the loading/preparation of the test samples, and issuing post-loading reports to NS Power.

In response to the RFP[redacted] were received from [redacted]. [redacted] from consideration because there was no indication that all necessary services requested in the RFP would be provided. Further, [redacted] employed by NS Power's coal suppliers to conduct the coal analysis, and therefore faces barriers to impartiality. The [redacted] proposal, and pricing, was [redacted]. NS Power therefore selected the firm to provide QA/QC services for both 2013 and 2014.

[redacted]

In 2010, NS Power entered into a [redacted] contract with [redacted] for Powder River Basin (PRB) coal, [redacted], and supplying 200,000 tonnes per year of coal to the Lingan Plant. At the time of the procurement decision, coal consumption overall was forecast to be strong in forward years. Since 2010, lower coal consumption than forecast has led to growing inventories of PRB coal. Large inventories of PRB coal are restricting the ability to receive staple fuels, such as low sulphur Colombian coal for Lingan, which are [redacted].

NS Power has taken several steps to resolve the problems of PRB coal under contract and in inventory. NS Power has problems in finding sufficient inventory space to accommodate necessary staple fuels for winter generation. One step has been to enter into a contract [redacted] in 2012. The [redacted] lowered inventories of PRB coal by 100,000 tonnes. A [redacted] was sought, but the supplier did not agree. As an alternative, [redacted] proposed that NS Power owned coal would be stored at the [redacted], without NS Power having to pick up the cargoes. The NS Power FST evaluated this option, and concluded that it was unacceptable because it carried too much uncertainly. NS Power would have its coal [redacted]. Supplier solvency risks were another factor. Runs of NS Power's Coal Solver Model eventually led to the conclusion that the Company can experience savings if it [redacted]. Currently several such [redacted] opportunities are being explored.

NS Power evaluated the option of storing PRB coal at the [redacted]. [redacted] ability to offload and to load vessels, and can accommodate a higher draft than INP. NS Power has successfully negotiated an agreement [redacted] covering vessel discharge and terminal services [redacted] of PRB coal. In addition, the agreement includes the option to receive [redacted] from INP, in order to free additional space for staple coals at INP. NS Power's analysis of all of these costs and options was thorough, and considered unloading, handling, storage, and pile maintenance fees, concluding that there was cost savings associated with the [redacted] option, compared to alternative double-handling plus [redacted] costs associated with standard INP services.

C. Conclusions

1. NS Power's unit prices for solid fuel remained relatively stable during the first half of the Audit Period, and were generally consistent with the forecast; during the second half of the Audit Period actual prices were consistently, and significantly, above the forecast.

NS Power solid fuel prices for fuel consumed in generating stations were relatively consistent with the forecast for the first half of the Audit Period, but beginning in April 2013 the actual prices were consistently and significantly above the forecast. Natural gas prices increased, and it became more economical to consume more coal. In order to stay within sulphur emission limits, NS Power reached the upper limits of its ability to use low priced domestic coal and petcoke, which both have high sulphur content. The resulting changes in composition of NS Power's coal blend produced significantly higher costs.

2. NS Power's solid fuel consumption during the Audit Period was less than forecast until March of 2013, when consumption consistently exceeded the forecast.

Actual solid fuel consumption under-ran the forecast through the Audit Period until March 2013. Beginning in March 2013, and through the end of the Audit Period, solid fuel burned exceeded the forecast due to changes in the price of natural gas, compared to coal, when it became more economical to burn coal instead of gas.

3. NS Power's hedging program for coal has contributed to the appropriate goal of reduction price volatility.

NS Power found itself faced in a number of situations with offers requiring prices based on published indices, such as API 2 or API 4. Typically these coals have been international low sulphur coals. Such pricing introduces volatility and uncertainty at levels not typical of historical conditions, where firm pricing prevailed. NS Power fixed the prices under such contracts through "fixed for floating swaps."

NS Power transacted with a third party [redacted]) in these swaps, making them whenever it made a procurement that involved coal priced on the basis of indices. NS Power entered the coal purchase agreements and the hedging transactions essentially contemporaneously, which served to transform floating prices to fixed ones for the duration of the swaps. FERM presented a description and analysis of the effects of these swaps to the FST for approval.

The nature of the swap requires payments from or to NS Power from the financial counterparty, based on market price fluctuations. The net effect to NS Power over the Audit Period was a net cost of some $4.4 million, as compared with $12 million in cost savings during the previous Audit Period. The reversal between the two periods shows that reducing volatility will have cost consequences determined by the direction that prices take in the relevant markets

4. NS Power documentation demonstrated the propriety of solid fuel contract selections made during the Audit Period.

NS Power has dedicated considerable effort to establishing a comprehensive set of documents that support its fuel procurement process. The documentation captures all of the necessary support for each procurement, and generally exceeds the scope and quality we have observed at other electric utility fuel procurement organizations. Our review of major procurement decisions found them to be based on comprehensive, accurate, and convincing analysis. Please see the next Conclusion which describes deficiencies in the organization and control of such documentation.

5. NS Power's document control system experienced some gaps during the Audit Period with respect to solid fuel procurement information. (*Recommendation #1*)

During the previous Audit Period, we observed that the necessary document control system was effective, and maintained the appropriate documents in one location. However, during the current Audit Period, the Company began a transition to an electronic document control system, and all appropriate documents were not found in the same location. Considerable effort was necessary to collect some documents for review.

6. NS Power solid fuel procurement during the Audit Period was at slight, but acceptable, variance with the portfolio requirements as established in the NS Power Fuel Manual.

The NS Power Fuel Manual sets forth certain guidelines for the NS Power solid fuel portfolio. These bands seek to ensure balance among the many factors involved in overall solid fuel management, including fuel types, fuel suppliers, contract terms, and pricing structures. NS Power's portfolio fell within the bands applicable to the diversity objectives of Country Risk, Supplier Risk and Mine Risk. The portfolio fell slightly outside the bands applicable to contract length. However, overall contract diversity met the intended parameters of portfolio design.

The percentages comprising the bands use solid fuel contract base quantities. Some NS Power contracts have plus or minus option percentages. Exercise of the minus options could bring the percentages down a few percentage points. Moreover, forecasting solid fuel requirements over the Audit Period has been difficult. Forecasts have to change rapidly in markets such as those seen in the coal and natural gas industry recently. By contrast, once fixed, contract obligations substantially affect the ability to respond immediately. NS Power has seen its ongoing reviews of solid fuel requirements changing regularly in response to both changes in load, and changes in natural gas pricing.

The degree to which this phenomenon has occurred make NS Power's moderate gap relative to the duration bands understandable and acceptable. Nevertheless, there remains a need for vigilance on NS Power's part, in order to preserve needed flexibility to respond to changing circumstances, while continuing to fix a large enough portion of its portfolio to mitigate delivery and price risk.

7. The shortfall in delivery of [redacted], as reported during the previous Audit Period, has been satisfactorily resolved in conjunction with negotiation of a new coal contract for delivery of additional [redacted].

In Liberty's report for the previous Audit Period, in Chapter IV, Conclusion #8, Recommendation #1, a shortfall in delivery of [redacted] was reported. Conclusions regarding final solution of this issue were left open. In November 2011, [redacted] to NS Power its inability to meet delivery obligations, stating that only [redacted] could be delivered in 2012.

The settlement with [redacted] involves a supply and pricing mechanism covering the 2012 shortfall delivery [redacted] and also involves agreement between the parties on a new [redacted] for the years [redacted]. The previous shortfall of [redacted] shall be delivered under this new contract at a price reduction of [redacted], which shall be deducted from the new contract price as the appropriate agreed upon settlement arising out of [redacted] its 2012 obligation under the [redacted] contract. Liberty believes that the settlement is reasonable.

8. NS Power effectively procured necessary marine freight services for transportation of solid fuels to its generating stations.

With expiration of the [redacted] agreement at the end of 2012, NS Power solicited the ocean freight market with release of a RFP for ocean freight for a three-year term for the period from 2013 through 2015 for freight service to the Point Tupper Marine Terminal (PTMT) and the International Pier (INP). Multiple proposals were received, and NS Power's detailed analyses and negotiations with suppliers resulted in a three-year agreement with [redacted]. The agreement was especially attractive because of the [redacted].

NS Power's execution of a shipping agreement with [redacted] on March 28, 2013 for shipping solid fuel from [redacted] to either INP or PTMT was

the result of a RFP process conducted during the previous Audit Period, which Liberty evaluated at that time as being satisfactory.

NS Power's execution of a shipping agreement with [redacted] on July 16, 2012 for shipping solid fuel from [redacted] to either INP or PTMT was the result of a RFP process conducted during the previous Audit Period, which Liberty evaluated at that time as being satisfactory.

9. NS Power effectively procured necessary solid fuels unloading and storage services at [redacted] for excessive Powder River Basin Coal.

NS Power demonstrated that a cost effective solution to resolving excessive Powder River Basin coal was to reach agreement with [redacted] for unloading and storage services associated with this PRB coal. Previously, NS Power had taken effective steps to [redacted], in order to lower inventories by 100,000 MT, as part of the overall strategy to [redacted], and to free necessary solid fuel inventory space at INP and Lingan for staple fuels.

10. NS Power engaged in a significant increase in solid fuel procurement activity as a result of efforts to supply fuel necessary to support the electrical load of the Port Hawkesbury Paper Mill, and such activity continued at an increased level because of the policy to only procure fuel one to two quarters in advance. (*Recommendation #2*)

NS Power engaged in a new approach to supplying necessary solid fuel to support the electrical load of the Port Hawkesbury Paper Mill because of the significant difference between fuel requirements between the forecasts for supply with PHP in and PHP out of the forecast, as well as the unpredictable changes in operation of the PHP facility. Consequently, NS Power engaged in a new approach to fuel procurement as necessary to support PHP operations, and only procured such fuel one to two quarters in advance. This resulted in a significant increase in activity, and changed the normal routines of operation within FERM.

11. NS Power received over the Audit Period [redacted] bids that have offered the lowest cost, but the Company has not accepted them, citing the lack of results from testing the product in its plants. (*Recommendation #3*)

NS Power received multiple bids during the Audit Period related to [redacted] Such bids were generally [redacted], but could not be accepted because such fuel had not been tested in any NS Power generating facility. The Company did begin investigations as to the suitability of this fuel, from both an operational and a cost perspective, but had not yet proceeded to the testing phase of such consideration.

12. NS Power has utilized an appropriate fee for service approach for procurement of biomass fuel supply for the Port Hawkesbury Biomass Facility through selection [redacted] Biomass Procurement Managers (outside firms) who will manage the procurement of biomass on behalf of NS Power.

NS Power formed a Biomass RFP Evaluation Team, consisting of the Director of Fuels, Energy and Risk Management, the Point Tupper Plant Manager, the Biomass Supply Manager, the Leading Commercial Superintendent (Hydro), and an Independent Forestry Consultant. This

team concluded that NS Power did not have the requisite skills, personnel and experience in the forestry sector to manage a procurement effort of this size. Therefore the optimum means of procuring the necessary biomass for the PHP facility would be to engage in a fee for service approach which selected [redacted] companies to procure biomass fuel for NS Power. The [redacted] companies selected, [redacted], met the established requirements for the following factors: 1) Cost effectiveness, 2) Security of Supply, 3) Sustainability and Regulatory Compliance, 4) Avoidance of Competition, 5) Experience, and 6) Safety.

Contract were awarded to [redacted] on July 3, 2013, and these two companies began operating under Letters of Intent. As of the end of the Audit Period, formal contracts have not yet been signed between NS Power and [redacted] suppliers, and operation continues under Letters of Intent. As a few months of experience has indicated during the last part of the Audit Period, [redacted] are performing in a satisfactory manner.

D. Recommendations

1. **Demonstrate that a satisfactory document control system has been created in order to provide a complete set of fuel management procurement information in one readily accessible location.** (*Conclusion #5*)

NS Power must demonstrate that it has created a satisfactory document control system which provides in one location a complete set of fuel management procurement information. Such system must contain all of the necessary fuel procurement information in order to support analysis of fuel procurement decisions, and must be in one readily accessible location.

2. **Reevaluate the current policy of only procuring solid fuel one to two quarters in advance as necessary to support operation of the Port Hawkesbury Paper Mill, with a future objective of including support of PHP requirements in traditional solid fuel procurement so that extra procurement activities do not continue.** (*Conclusion #10*)

The current policy of only procuring solid fuel one to two quarters in advance as necessary to support operation of PHP is causing extensive extra effort on the part of FERM staff. NS Power should undertake a specific study to evaluate how procurement of fuel for PHP can be integrated in what have been traditional fuel procurement activities for FERM, without incurring the additional costs and expenditures of resources required to provide adequate fuel supply for PHP.

3. **Complete the investigations into use [redacted] as necessary, in Company power plants in order to determine if this [redacted] fuel can be successfully used in order to economize on overall fuel costs.** (*Conclusion #11*)

Complete the ongoing investigations into suitability of [redacted] as a fuel, from both an operational and economic perspective, and conduct the necessary tests in order to evaluate the feasibility of burning [redacted] in any NS Power generating facilities, in order to have the option of accepting future bids for supply [redacted] which are evaluated as attractive on a total evaluated cost basis.

V. Gas & Oil Procurement and Contracts

A. Background

1. Natural Gas

a. Contracts

NS Power began buying natural gas under a long-term contract [redacted]. That contract provided [redacted]. Companion transportation contracts on M&NP-CA accompanied the gas supply contract, and provided for the same quantity. NS Power entered these contracts in the late 1990s, in support of development of the Sable Offshore Energy Project (SOEP). NS Power also had a smaller, 4,000 MMBtu/day "put" option contract, under which [redacted] offered gas to NS Power every day that it was obliged to buy. The [redacted] included delivery to whichever M&NP-CA delivery point NS Power specified.

The [redacted] had a unique pricing provision. The price was computed at Goldboro, Nova Scotia, the location where the gas comes ashore from the SOEP production and gathering facilities. The price consisted of [redacted] of which was specified in the contract. [redacted] gas price was [redacted] equal to [redacted] NS Power had contracts for transportation [redacted] so the cost to it of the gas delivered to the Tufts Cove Generating Station [redacted].

The pricing under the [redacted] was similar. It used a [redacted] M&NP-CA has a "postage-stamp" rate structure; therefore, the price on the Canada side of the U. S.-Canada border was the same as the price delivered to NS Power's Tufts Cove Station [redacted]

The [redacted] at the end of October 2010, [redacted] one nine months later. In 2008, NS Power began the process of replacing them. That process culminated in two contracts [redacted]

The first contract, entered in early 2009, provided for [redacted] The parties extended the contract's initial one-year term (November 1, 2010 through October 31, 2011), for a second year through an option exercised in October 2009. It was priced [redacted]

[1] [redacted]

[redacted] The formula for the gas component of the price under the [redacted] used a [redacted] the new [redacted] contract continued to use the [redacted] but it re-priced the gas [redacted]

The parties entered the second contract in November 2009. It scheduled a seasonal profile of quantities for the months of November 2010 through April 2013. Those quantities generally fit within NS Power's then-current estimates of then-uncommitted remaining requirements for those months. It was also priced at [redacted] Both contracts required NS Power [redacted]
Both contracts resulted from NS Power's RFP processes, which generated multiple offers.

During 2010, NS Power negotiated a third contract for replacement supply with [redacted] the competition for NS Power's "excess" gas under the [redacted] for the last year of that contract, but had [redacted] the 2008 or 2009 competitions to replace the old contract. NS Power initiated discussions [redacted] about a supply relationship after the close of the 2009 RFP. NS Power received an initial proposal in February 2010, and concluded [redacted] in July 2010.

[redacted] provided for an initial quantity of [redacted]

The "commodity price" under the contract [redacted] The latter, however, called for a [redacted] whereas the price under the [redacted] was computed [redacted] That price applied to [redacted] for which the quantity was [redacted] The price for the [redacted] for which volumes [redacted] had a [redacted] The [redacted] were effectively the [redacted]

[2] [redacted]

At the time that the [redacted], Deep Panuke was expected to begin production before the end of 2010. Thus, in the summer of 2010, NS Power would have been expecting to receive supply under all three contracts before the end of 2010.

One RFP offer that NS Power did not accept [redacted] and added thereto similar contracts for another [redacted] that [redacted] Both of the gas supply contracts had [redacted]. The NSUARB found that NS Power should have taken the [redacted], and disallowed $903,000 of its fuel costs for the period November 1, 2010, through December 31, 2011.[3]

NS Power uses the North American Energy Standards Board ("NAESB") standard form contract incorporating the Canadian Addendum. Confirmations (in the form prescribed by Exhibit A) cover individual trades. Resales make NS Power a creditor for contract purposes; it provides gas first and receives payment later. NS Power uses a Collateral Annex in these cases. NS Power attaches these documents to the procurement RFPs that it has issued, permitting offerors to propose changes.

b. Counterparties

The 2010 FAM Audit found NS Power's credit evaluation and contracting processes insufficiently timely, with the effect of discouraging prospective counterparties from participating in its gas supply competitions. NS Power undertook an Audit Action item to include updated lists of its counterparties in twice-yearly reports to the NSUARB on its gas supply activities.

The table below shows the counterparties with whom NS Power had master agreements for gas transactions at the time of its most recent Gas Supply Activities Report, and the effective dates of those agreements.

Natural Gas Master Agreement Counterparties

Counterparty	Master Agreement Effective Date
[redacted]	[redacted]

[3] Nova Scotia Utility and Review Board, "Decision," issued December 21, 2012, in Matter No. M04972, *In the Matter of an Application by Nova Scotia Power Incorporated for Approval of Certain Revisions to its Rates, Charges and Regulations, including the review of the Fuel Adjustment Mechanism Audit*. See pages 69-73.

[redacted]			[redacted]	
[redacted]		January 1, 2009		

* Contract was entered with [redacted]., which was acquired by [redacted]

2. Heavy Fuel Oil

NS Power has for some time used a requirements-type contract to buy heavy fuel oil (HFO). NS Power uses No. 6 fuel oil (sometimes referred to as "Bunker C"). This type of contract includes product quality specifications, delivery requirements, and other terms and conditions, but not quantities. NS Power's contract provides for delivery to the Company's receiving facilities at Tufts Cove. NS Power generally requests pricing with respect to a well-recognized benchmark (usually a New York Harbor price). This approach allows NS Power to secure a price hedge readily. NS Power's contract commits to buying its requirements for the product from the winner of the competition, but accepts contingencies and HFO bought from Canadian sources. Refineries along the Atlantic and Gulf Coasts of North America comprise this product's other sources.

NS Power was able to work out an arrangement with [redacted] to provide competitively priced, smaller lots directly from [redacted] A typical commercial vessel for transporting HFO sourced from one of the East Coast or Gulf Coast locations carries about 250,000 barrels. This volume compares with a 420,000-barrel storage capacity at the Tufts Cove HFO storage tanks. NS Power could buy barge loads of 10,000 and 20,000 barrels [redacted] NS Power filled all of its 2010 and 2011 requirements with purchases from [redacted] The Company purchased these barge-sized lots for Tufts Cove, and tank trucks sent directly [redacted] distributed HFO to the solid fuel plants requiring it.

NS Power contracts with trucking companies to move HFO from storage facilities at Tufts Cove to the solid fuel generating plants using it as an auxiliary fuel. [redacted] trucking companies have Maritime-Province operations large enough to accommodate NS Power's requirements. NS Power typically requests proposals for the service every other year. The Company has awarded contracts for one year, with an option for a second year.

3. Light Fuel Oils

NS Power has bought light fuel oils (LFOs) under a combined solicitation that has included the following products:

Furnace Oil for Steam Boiler Start-Up	*Diesel Fuel for Combustion Turbines*
Low Sulfur Diesel Fuel for Plant Vehicles	*Furnace Oil for Office Heating*

Multiple Maritimes region vendors offer these standard products. NS Power has therefore used a standard form solicitation for routine procurements of commonly available products. The form solicitation includes:

Instructions	*Standard Agreement*
General Terms	*Product Specifications*

NS Power has sought product offers on a delivered basis. The RFP specifies the approximate size of requested deliveries, delivery locations, and required response times. The RFP also specifies special conditions that apply to particular fuels. Suppliers of fuel for the combustion turbines, for example, must be able to deliver specified minimum quantities during the winter months (December, January, and February). The RFP provides estimated annual delivery quantities by location. NS Power requests pricing relative to the Bloomberg Oil Buyers Guide (OBG) Halifax Rack Price.

4. Hedging

NS Power uses, as do most companies, the International Swaps and Derivatives Association (ISDA) standard form contract to govern its relationships with its hedging counterparties. ISDAs use a Credit Annex, which states the maximum amount of credit that NS Power may extend to that counterparty, and how that amount will change if the counterparty's credit rating changes.

Prior to the last FAM Audit, Liberty had expressed concern that the Company did not have sufficient counterparties to assure competitive pricing for its hedge transactions. NS Power addressed that concern. The table below lists firms engaged in hedging transactions with which NS Power has an effective ISDA contract.

Hedging Counterparties

Counterparty	ISDA Effective Date
[redacted]	November 23, 1995
	March 11, 1993
	March 7, 2008
	April 9, 1997
	March 8, 2001
	July 12, 1999*
	February 20, 1997
	December 1, 2000

* Amended August 22, 2005, November 27, 2006, November 25, 2008, and November 1, 2010

NS Power needs to be assured that its hedging counterparties have sufficient financial strength to honor any hedge contracts they enter. NS Power addresses this need by establishing credit limits with each active hedging counterparty. The table below shows NS Power's active counterparties and their respective credit limits. NS Power enters some hedging transactions with [redacted]

Counterparty Credit Limits

Counterparty	Credit Limits ($)
[redacted]	[redacted]

[redacted]

B. Findings

1. Natural Gas

NS Power approached the end of 2010 with [redacted] however, the increased supplies [redacted] as Deep Panuke failed to start. Through most of 2011, it was difficult to determine when production would start. Accordingly, through late 2010 and most of 2011, NS Power supplemented the supplies available under its [redacted]. Those supplies came through bilateral negotiations, rather than through RFPs, because only a limited number of suppliers had incremental supply available. As reported in our 2012 FAM Audit Report, prices crept up throughout the year to [redacted] price in October 2011.

NS Power did conduct a competition for the winter of 2011-2012. It sent an RFP to [redacted] responses were received [redacted] The Company bought gas from [redacted]. The large paper plant at Port Hawkesbury was shut down during this period, reducing system requirements sufficiently to make fuel supplies ample. By this time gas prices were [redacted] but they remained low enough to displace coal-fired generation. Thus, gas consumption was still well above the level forecast in the 2012 Fuels Budget.

a. 2012 Purchases

In late 2011, press reports suggested that Deep Panuke would not start before the second quarter of 2012, and perhaps later. During the second quarter of 2012, the Company bought gas on a quarterly basis, and on a monthly basis. The suppliers, volumes bought and prices paid are given in the tables below:

Q2 2012 Quarterly Gas Purchases

Supplier	**Quantity Bought** (MMBtu/day)	**Price Paid** (US$/MMBtu)
[redacted]	[redacted]	[redacted]

Q2 2012 Monthly Gas Purchases

Month	**Supplier**	**Quantity Bought** (MMBtu/day)	**Price Paid** (US$/MMBtu)
[redacted]	[redacted]	[redacted]	[redacted]

The quarterly purchases were for [redacted] were made through an RFP. The RFP went to [redacted] potential suppliers. [redacted] were received, [redacted] were selected. As relative prices were continuing to favor gas-fired generation, NS Power added the monthly supplies through bilateral negotiation as available.

By the third quarter, press accounts regarding Deep Panuke were discussing production start in "late summer," "sometime in the fall," and "by the end of the year." Relative prices were continuing to favor gas-fired generation. Accordingly, the Company continued to buy gas on a monthly basis from whoever had it. Purchases during the third quarter were as follows.

Q3 Monthly Gas Purchases

Month	Supplier	Quantity Bought (MMBtu/day)	Price Paid (US$/MMBtu)
[redacted]	[redacted]	[redacted]	[redacted]

In September, SOEP suspended production for maintenance. Significant problems were discovered in flow lines connecting producing areas to the central platform. Production has only recently (Q1 2014) been fully restored.

That loss of supply had a significant impact on the New England (U. S.) and Maritimes Gas Markets. Prices paid by NS Power showed the effects almost immediately, as the Company's suppliers had to search other markets for supply. New England experienced a series of gas price "spikes" beginning in November and occurring frequently through the winter of 2012/2013. Under the terms of NS Power's gas supply contracts [redacted]. Prices increased considerably, as the preceding table of [redacted] prices shows.

Requirements for gas declined, as production economics favored a shift back to coal. NS Power [redacted] then issued an RFP for the winter of 2012-2013. Again, the RFP went to [redacted] potential suppliers, [redacted]

Seasonal Gas Purchases

Supplier	Quantity Bought (MMBtu/day)	Price Paid (US$/MMBtu)
[redacted]	[redacted]	[redacted]

Production problems at SOEP continued through the fourth quarter of 2012. [redacted]. Deliveries were reduced on every day of the quarter, but do not appear to have stopped completely on any day.

b. 2013 Purchases

Forecast gas requirements for 2013-2015 declined dramatically with the December 2012 re-forecast. The third quarter forecast, prepared in August 2012, estimated 2013 gas consumption at 25.3 million MMBtu. The December re-forecast reduced that number to 10.0 million MMBtu.

NS Power [redacted] committed under its [redacted] in the first quarter [redacted] NS Power also had [redacted] under its [redacted] because Deep Panuke had still not started. Those contracts were priced [redacted] Deliveries under them were [redacted] however. Deliveries under the [redacted] pursuant to the terms of that contract and [redacted] for all three months of the quarter.

NS Power had supplemented those supplies with the [redacted] winter season (November-March), noted above. [redacted] NS Power reported no interruptions of supplies under those contracts.

With the increase in gas prices, NS Power switched fuels as much as possible. There was a switch to HFO at Tufts Cove in January and February. Production from solid fuel plants could not be increased in January or February, but were almost 40 percent above Budget in March. Power imports were also many times higher than Budget in all three months of the first quarter.

In February, NS Power issued an RFP, for the period April-October 2013. At the time that the RFP was issued, EnCana was suggesting that Deep Panuke would begin production at the end of the first quarter of 2013. The RFP went to [redacted] presented multiple offers [redacted] Some were priced with respect to [redacted] NS Power rejected all offers, because it concluded that pricing exceeded what it had been seeing in the daily market.

In August, Deep Panuke finally started, but did not reach the level at which the [redacted] would start before the [redacted] NS Power had [redacted] under its [redacted] but deliveries under it were [redacted] Deliveries under the contract were [redacted] NS Power met the balance of its requirements for gas with daily purchases.

Beginning sometime in the second quarter, NS Power began trying to negotiate a replacement for [redacted] It was also in touch routinely [redacted] as those [redacted] available in the Maritime Region. NS Power negotiated winter-period (November 2013-March 2014) contracts with [redacted]

[redacted]

2. Heavy Fuel Oil

a. Commodity

In late 2011 the Company issued an RFP for a requirements contract for 2012, as it had done in previous years. The RFP went to [redacted] suppliers.

The suppliers were aware that no cargoes had been taken under this contract since 2009 [redacted] The Company evaluated [redacted] against the prices that it had been quoted in previous years, and entered into a contract. NS Power's RFP for this product includes its standard form contract, complete with product and delivery vessel specifications. The supplier largely accepted it. No cargoes were taken under this contract.

By late 2012, NS Power had developed an interest in trying to increase utilization of the HFO tanks at Tufts Cove. Due to HFO's high price relative to natural gas, the Company's requirements for HFO at Tufts Cove had declined considerably, and were not expected to increase. The use of HFO in the solid fuel plants has been served by trucks hauling the product directly from a source to the plants; therefore, the tanks at Tufts Cove were not used in serving those plants either.

Because of the pendency of a Request for Expression of Interest (REOI) for using the tanks, the Company decided not to issue an RFP for a requirements contract. Instead, it negotiated an extension of the 2012 contract [redacted] the end of 2013.

An REOI was issued in early October 2013. [redacted] were received. [redacted]

Throughout the period, the Company moved relatively small quantities of "Boiler Grade Oil" from its field depots to its generating stations for use as fuel. (Boiler Grade Oil is used transformer oil from the Company's transmission and distribution operations.) Quantities were generally less than 1,000 bbl per quarter. The exception was the first quarter of 2013, which saw a fuel switch due to the high price of natural gas. The Company took 105,000 bbl under the [redacted] in that quarter.

In June 2013, Imperial announced that the refinery would cease refining operations. Most of the site is to be converted to a storage and distribution terminal for gasoline, diesel, home heating oil, jet fuel, and kerosene. HFO is not one of the products to be stored and distributed from there. The refinery stopped processing crude oil in mid-September 2013.

NS Power does not anticipate a significant impact from the loss of that supply of HFO. The Company could [redacted] which is supplied from refineries all along the East and Gulf Coasts of the U. S. In summer, some product also comes from refineries [redacted].

Pricing is also not likely to be affected. Even the supplemental supply from the Imperial Oil refinery was priced with respect to the New York (U. S.) Harbor, a widely-used benchmark for fuel oil prices in the Northeast U. S. and the Maritimes. The price of that supply was [redacted].

b. Trucking

In the fall of 2011, NS Power conducted its usual competition for HFO trucking service to the Lingan and Point Tupper plants during calendar 2012 and 2013. [redacted] trucking firms qualified to provide the service responded.

NS Power provides a template for quotation, which makes the responses directly comparable. The competing offers were evaluated, and [redacted].

3. Light Fuel Oils

A competition in early 2010 selected a supplier for these products for Quarters 2, 3 and 4 of 2010, and Quarter 1 of 2011. Pursuant to the terms of that contract, it was extended for one year. The requirement was competed again in Q1 2012, for the balance of that year and Q1 2013. Again, pursuant to the terms of the contract, it was extended through Q1 2014. [redacted] There have been competitions every other year, with RFPs sent to [redacted] were received in 2010 [redacted] 2012.

NS Power's Procurement Department structured and managed the 2010 and 2012 competitions. The competitions included the same four products (furnace oil for steam boiler start-up, diesel fuel for combustion turbines, low-sulfur diesel for plant vehicles, and furnace oil for office heating) from the prior LFO competitions. The RFP solicited supply for one year, with an option to extend for a second year. Product specifications were vetted with the NS Power locations using the products, prior to sending the tender documents. NS Power requested pricing relative to published price benchmarks. The Company based estimated quantities of each product on historical and forecasted volumes. Estimated total value of the tender came [redacted]

Most of the firms who respond to the RFP have sourced their products from the Imperial Oil refinery at Dartmouth. NS Power reports that, based on indications from its suppliers, the conversion of the Imperial refinery to a products terminal is not expected to affect the supply of LFOs.

4. Hedging

During the Audit Period, the Company entered into the following types of natural gas hedges:

- NYMEX Last-Day-for-Fixed-Price Swaps: To fix the price of gas at the Henry Hub (settlement location for the NYMEX futures contract for natural gas)

[4] [redacted]

- NYMEX Last-Day-for-Gas-Daily Swing Swaps: To hedge against the difference between a monthly price (NYMEX Last Day) and the average of the daily prices at the same location (Henry Hub)
- Fixed-Price-for-Gas-Daily Swap at Henry Hub: Same purpose as Last-Day-for-Gas-Daily Swing Swap, but entered after NYMEX contract had settled; *i.e.*, after NYMEX Last Day price was known
- Inside-FERC-for-Fixed-Price Basis Swap at the Algonquin City Gates Market Center (ALG): To fix the difference between the monthly price at the Henry Hub and a monthly price (from the publication *Inside FERC*) at ALG
- Inside-FERC-for-Gas-Daily Swing Swap at ALG: To hedge against the difference between a monthly price (from *Inside FERC*) and the average of the daily prices at the same location (ALG).

The Fuel Strategy Table (FST) reviewed hedge positions quarterly. FERM Staff developed spreadsheets that showed estimated fuel requirements pursuant to the most recent fuel forecasts, and hedge position at the time of the forecast, but prior to any adjustments. The information presented to the FST also contained recommended hedge transactions to bring the hedge position into alignment with the schedule in the hedging strategy.

NS Power reports that the prices for natural gas hedges change frequently, and that counterparties do not commit to hold a price for some period. Thus, the Company's traders rely on market-price information to inform themselves regarding fair prices for those instruments. Prices on electronic trading platforms like the Intercontinental Exchange (ICE) and Reuters are monitored as part of the traders' regular duties. Price quotes from hedging counterparties are compared to those sources to ensure that they are reasonable and close to market.

In 2012, [redacted] transactions of the first type (NYMEX Last-Day-for-Fixed-Price Swaps) were entered, covering [redacted] MMBtu. For 2013, [redacted] such transactions were entered, but [redacted] of those were reversals of prior hedges. Reversal transactions take place when the Company becomes over-hedged, as forecasts and estimates change following the entry of hedging transactions. The net amount hedged was [redacted] MMBtu. In both cases, the hedges were entered over a period of [redacted] pursuant to the [redacted] hedging strategy in effect through 2013.

There were [redacted] of the other types of transactions, for [redacted], as the next table shows. These transactions were entered at the discretion of FERM Staff; *i.e.*, without the specific approval of the FST.

Other Hedging Transaction Types

	2012		2013	
Hedge Type	**Number**	**Volume**	**Number**	**Volume**
NYMEX Last-Day-for-Gas-Daily Swing Swap	[redacted]	[redacted]	[redacted]	[redacted]
Fixed-Price-for-Gas-Daily Swap at Henry Hub			[redacted]	[redacted]
Inside-FERC-for-Fixed-Price Basis Swap at ALG	[redacted]	[redacted]	[redacted]	[redacted]
Inside-FERC-for-Gas-Daily Swing Swap at ALG	[redacted]	[redacted]		

No hedging transactions for HFO were entered for settlement during the Audit Period.

C. Conclusions

1. NS Power should adjust Audit Period gas costs to reflect the consequences of the NSUARB's conclusion from that last audit concerning the [redacted] *(Recommendation #1)*

The NSUARB found that NS Power did not properly analyze the risks and benefits associated with the contracts (the "foregone contracts"), and disallowed $903,000, for the period from November 1, 2010 through December 31, 2011, due to the failure to take assignment of the contracts. The Board stated that:

> *As this was a longer term contract the impact of this finding on any future test years will be the subject of consideration in future audits.*[5]

Liberty discussed extensively with the Company an approach and set of assumptions for use in determining the amount by which fuel and energy costs for the current Audit Period exceeded what NS Power would have paid had it secured access to the foregone contracts and associated transportation. We reached an agreement on many (but not all) of the elements required to make that calculation.

The calculation that Liberty determined to be appropriate substituted the gas supply and transportation that would have been available for the same quantity of gas and transportation actually taken by NS Power, but that would have been avoided on each day of the Audit Period. We then asked NS Power for data that would permit a calculation of the difference in cost. We tested the accuracy of that data. The total of those differences is from $5.8 million to $4.7 million.

The calculation required a number of determinations. Major ones included:

1. What prices NS Power would have paid for gas from the foregone contracts, recognizing two principal price-affecting contract provisions:

[5] Decision, dated December 21, 2012, in Matter No. M04972, at page 72.

   a. The ability under the contracts for the buyer to elect what pricing basis to use for the earlier part of the current Audit Period
   b. The provision for a price redetermination covering the later part of the current Audit Period. [6]
2. The sources, amounts, and costs of gas for which the volumes under the foregone contracts would have substituted; *i.e.*, what gas would NS Power not have purchased during the Current Audit Period.
3. In some cases, the volumes that NS Power would not have purchased during the current Audit Period consisted of daily purchases. On the days where daily purchases comprised what we determined were the avoided volumes, there could be some current Audit Period days where NS Power did not actually buy as much gas as was available under the foregone contracts. We therefore needed to find a means for accounting for the difference between actual daily purchases and the amounts available that day under the foregone contracts.
4. The Audit Period days and amounts during which NS Power would have experienced curtailments (to which NS Power would have been subject under foregone contracts).
5. During those days of curtailment, what NS Power could have done to mitigate the costs it would have experienced for pipeline capacity ("stranded pipeline capacity") it would not have used due to the curtailed portion of the foregone contracts.

We needed to make Determination 1.a above because the supply contracts gave the buyer an annual option to specify proportions of reported index prices to be used in determining the price of the supply. The buyer could choose from: (a) an average of [redacted] indexes, and (b) an index for the [redacted]. We consider the [redacted] index option to be the one that NS Power would clearly have chosen at the time.

We needed to make Determination 1.b because the supply contracts provided an opportunity (once every five years) for the buyer or the seller to propose a new contract price. If the two could not agree on the new price, the contracts provided for arbitration. Under the terms of the contracts, the renegotiation would have taken place in early 2012, with the new price to be effective on August 1, 2012. We calculated a range for our recommended adjustment, based upon the price determinations that could have resulted from a request for a pricing change at that time.

The foregone contracts allowed for repricing under different standards: (a) selection of a different [redacted] to replace the one [redacted] in use at the time, or (b) consideration of the market for [redacted]. NS Power was frequently in the market for term supplies from 2008 through 2012. The FERM group through 2011 and as late as August of 2012 was continuing to observe to senior management that short-term prices had diverged from essentially [redacted] pricing; *i.e.*, the [redacted] less the cost of [redacted]. During this period, NS Power made a number of short-term purchases, but declined to make term

[6] The issue of the price redetermination did not arise during the prior audit. We believe it was not relevant to the circumstances that existed at the time when NS Power had before it the potential for securing supply under the foregone contracts.

purchases. The FERM group's thinking reflected the view that term prices would move [redacted]. In hindsight, [redacted]

This thinking appears to be behind the decision by [redacted] The agreement that NS Power signed with [redacted] for deliveries starting in November 2010 was the last term agreement entered by the utility through the time relevant for repricing the supply under the foregone contracts.

We believe that the low end of the range of prices that might have resulted from the repricing clause is the pricing under the 2010 Repsol contract. Recognizing the need for the supplier to secure [redacted] it would have been reasonable to conclude that [redacted] was consistent with the use of [redacted] allowed to the arbitrator in resolving a pricing dispute.

Considering long-term market as the pricing basis, one could have reached the same conclusion. First, as FERM personnel and [redacted] both recognized, [redacted] on a long-term basis. Second, the supplier under the foregone contracts would have needed to [redacted]

We therefore made a calculation of effect on NS Power customers on the basis of [redacted]

Of course, conditions in the Maritimes market, as NS Power has observed in the past, [redacted] While time would make that expectation increasingly unrealistic, the key period for our consideration is very early 2012. Those with [redacted]

[redacted] but it fundamentally contravenes what FERM told management to conclude that this was clearly the way to look at the market dynamic at the time. Moreover, and even more critically, that dynamic assumes that [redacted] The supplier under the foregone contracts would have had to [redacted]. That supplier could not realistically have persuaded an arbitrator that it should get more than [redacted].

Nevertheless, we did perform a calculation that would effectively "split the difference" by assuming [redacted] in order to determine the difference in consequences had a [redacted] price resulted. We used for this second calculation [redacted]

Determination 2 of the calculation required identification of what gas NS Power would not have purchased, had it had access to supply under the foregone contracts. NS Power had a supply mix that changed materially during the current Audit Period. We determined that the displaced gas would have come from varying sources across the period:

- For January 1, 2012 through October 31, 2012, the foregone gas would have displaced part of the gas that NS Power bought under the contract that it entered with [redacted] in the competition that presented the option to take the foregone contracts.
- For November 1, 2012, through October 31, 2013, the foregone gas would have displaced spot-market purchases. On many of those days, NS Power bought more than [redacted] MMBtu. We used NS Power's weighted-average price of spot-market purchases on each day.
- For November and December of 2013, we used the price agreed to for a winter-period purchase (winter 2013-2014) from [redacted]

For those days addressed under Determination 3 above, we assumed that NS Power would have sold any excess gas at prices equaling or exceeding the prices it paid. We assumed for simplicity that such resales would have produced no net loss or gain.

The source of the gas under the foregone contracts was production from the [redacted] encountered production difficulties during the current Audit Period. We needed to recognize that reduced [redacted] production could produce curtailments under the foregone contracts. After extensive discussion with NS Power about curtailment priorities, we agreed that the best approach would be to assume curtailments of the foregone contracts on a *pro rata* basis with [redacted].

Our recommended adjustment includes a reduction in benefits to customers due to "stranded" transportation capacity. NS Power would have had to take M&NP-CA capacity in volumes and for durations equal to the supply amounts under the foregone contracts. NS Power would have had to pay for, but might not have used portions or all of that capacity for delivering the supply; *i.e.*, the amounts curtailed as permitted under the supply contracts due to [redacted]. NS Power would not, however, have faced stranding of all of the capacity corresponding to the amounts of supply curtailment. The Company bought gas at the U. S.-

Canada border on some of the current Audit Period days during which curtailment occurred. At least some of that gas could have been moved with the transportation contracts (up to the amount not used to transport gas from [redacted] under the contracts on Audit Period curtailment days.

Our adjustment considered only the amounts NS Power actually purchased at the U. S.-Canada border on Audit Period curtailment days. The Company would have tended, where it could, to purchase more than these amounts when available, because it would have avoided purchases on a delivered basis (for which the supplier arranged transportation). Had NS Power had the supply under the foregone contracts and associated transportation, it would have had the incentive to seek such arrangements, which would have mitigated supply costs. Because it never had those contracts, the need for this particular form of mitigation did not exist. Therefore, one can conclude that the amount of U. S.-Canada border purchases it would have made during the Audit Period would have been even greater than they actually proved to be.

We estimate the Audit Period cost of the potentially stranded capacity was $1,370,537, based on: (a) assumptions about how [redacted] production limits would have caused curtailment of supply under the foregone contracts, and (b) the cost of transportation per MMBtu. The cost of the capacity that could have been used to move purchases made at the U. S.-Canada border on Audit Period curtailment days was $511,333. Thus, the net stranded capacity cost was about $900 thousand. Subtracting that from the gas cost savings yields a recommended reduction in allowed Audit Period FAM costs of $4.9 million to $3.8 million.

The Company expressed concern that net cost reductions under the foregone contracts to date could end up producing net cost increases should supply no longer remain available to ship under those contracts. [redacted] production has been and remains subject to material questions, but we believe it is far too speculative at this juncture to make forecasts of production reliable enough to calculate the economic effects of future production changes.

Moreover, the transportation capacity contracts authorized transportation on a secondary basis from all receipt points on M&NP-CA (including the U. S.-Canada border) to all delivery points, including Tufts Cove. M&NP-CA offers transportation service under a "postage-stamp" rate structure. Therefore, all transportation service from all receipt points to all delivery points costs the same amount. M&NP-CA has also generally charged the same price for interruptible service as for firm. Thus, NS Power would either have to be shipping no gas, or would have to have access to transportation service that is not currently available, in order to render valueless portions (or all) of the transportation rights associated with the foregone contracts. We thus consider it equally speculative to assume that even a significant drop in [redacted] production would render the transportation benefits valueless while the obligation to pay for the capacity remains.

Thus, calculation of the present value of the supply and transportation contracts in future years requires two very speculative sets of assumptions: (a) future [redacted] production, and (b) the value in the future of the ability to use the pipeline capacity for deliveries from all other receipt points on M&NP-CA, including the U. S.-Canada border. That speculation is not necessary or appropriate at this time. NS Power's fuel costs undergo examination at least every two years. As we have done this year, someone in the future can make any required calculations based on historical, actual data. Doing so then, as opposed to speculating now, will give the UARB a

much stronger basis for determining if, when, and by how much to offset possible net negative future economic consequences against the benefits that assuming access to the foregone contracts provided customers in the prior and the current Audit Periods.

2. NS Power's gas purchase contracts going into the Audit Period reflected its view that [redacted].

NS Power entered the Audit Period with [redacted]. When asked by Liberty in 2011 about possible involvement in the U. S. gas market, FERM's response was that such involvement was not necessary because Maritimes-area gas supply options were sufficient.

As late as mid-2010, others shared this view. [redacted] willing to enter into [redacted] contract at [redacted] We have to conclude that [redacted] Maritimes supplies would be sufficiently in excess of Maritimes requirements that the Deep Panuke gas would have to leave the Maritimes to find a market.

3. NS Power's gas contracting decisions in early 2012 reflected a continuation of the view that Maritimes sources would be sufficient.

Deep Panuke did not commence production when planned (late 2010). There was no reliable information about when it would start, but there was no suggestion that it would not. NS Power [redacted] therefore, its gas supply decisions assumed that it would be available in the not-too-distant future. The fundamental perception that Maritimes production would be sufficient continued into early 2012.

Throughout 2011, NS Power [redacted]. The exception was a [redacted] contract for [redacted]. Gas prices increased above [redacted], which had been a ceiling under the paradigm that guided NS Power's perception of the Maritimes Gas Market, but notes from the FST meetings continually refer to press accounts, etc., about when Deep Panuke would start.

4. By the time that NS Power started to look more broadly for gas, there were no near-term options.

By the second half of 2012, NS Power's perceptions about gas supply options had changed. The Company presented evidence in its 2013 GRA proceeding about "fundamental changes" to the Maritimes Gas Market, from one of exporting to the U. S. to one of importing from the U. S. Deep Panuke was regarded as a "temporary respite" from the SOEP declines, but the Company decided that it was going to have to look beyond its traditional suppliers for gas. In late 2012, it started to meet with new suppliers from outside the Maritimes, and with sponsors of projects proposing to bring additional supplies to the Northeast Region.

By that time, however, there were no near-term options. When SOEP failed to return to full production after a maintenance outage in September 2012, the numbers of suppliers declined, and the pricing in offers of supply reflected sourcing upstream of the New England market centers. By early 2013, so few offers were received in response to an RFP that NS Power elected

to stick to the daily market through the summer, returning to a seasonal RFP only for the winter of 2013-2014.

5. More work needs to be done to verify that daily versus monthly pricing for natural gas comprises the most effective approach for NS Power. *(Recommendation #2)*

FERM Staff use monthly forward prices for both daily-priced and monthly-priced offers when comparing them. FERM Staff informally track the behavior of the monthly and daily index prices. On the basis of that tracking, they believe that the average of the daily index prices generally turns out to be not much different from the monthly indexes. They acknowledge that the average of the dailies sometimes diverges from the monthlies, but attribute that to temporary market disruptions. They believe that, over time, the two are "about the same." Since monthly-priced offers come with higher premiums over the referenced index, they always "lose."

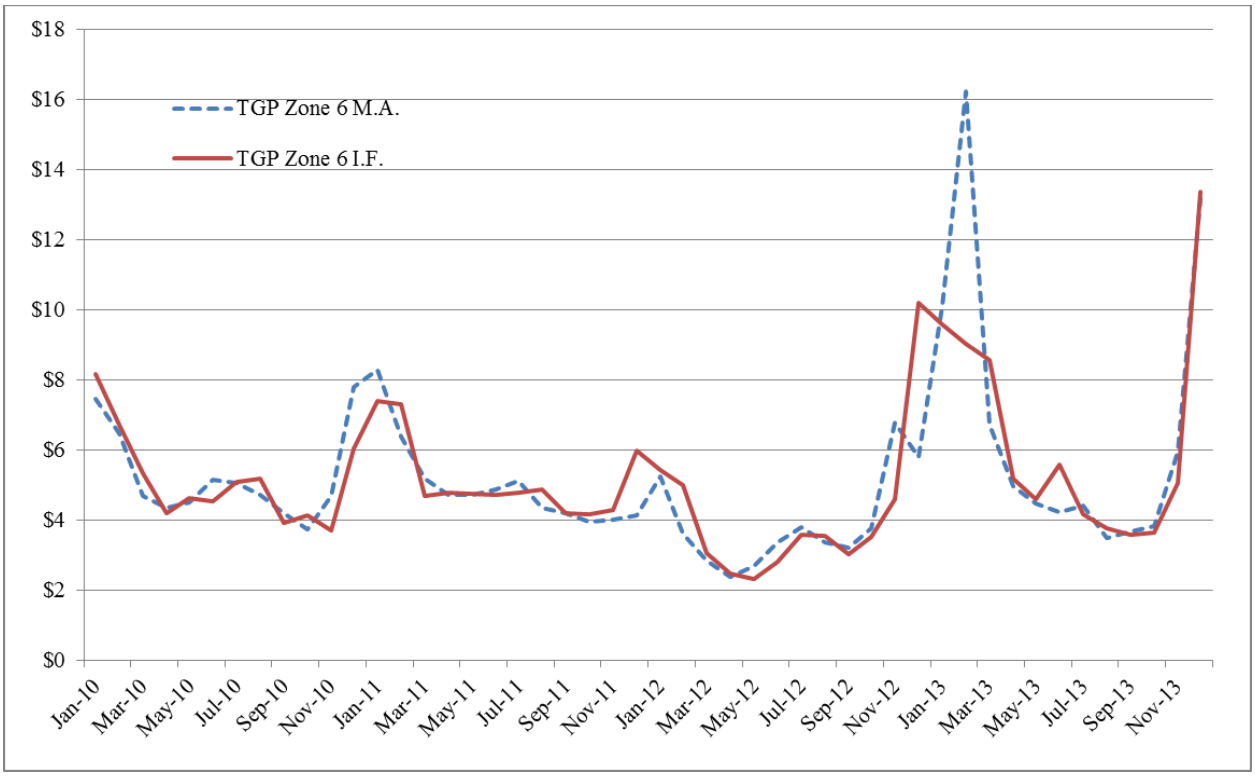
In September 2012, SOEP went down for maintenance. It has only recently returned to full production. With that reduction in supply, prices increased dramatically. The table below shows the average prices that NS Power paid through that winter.

Average Natural Gas Price
(C$/MMBtu)

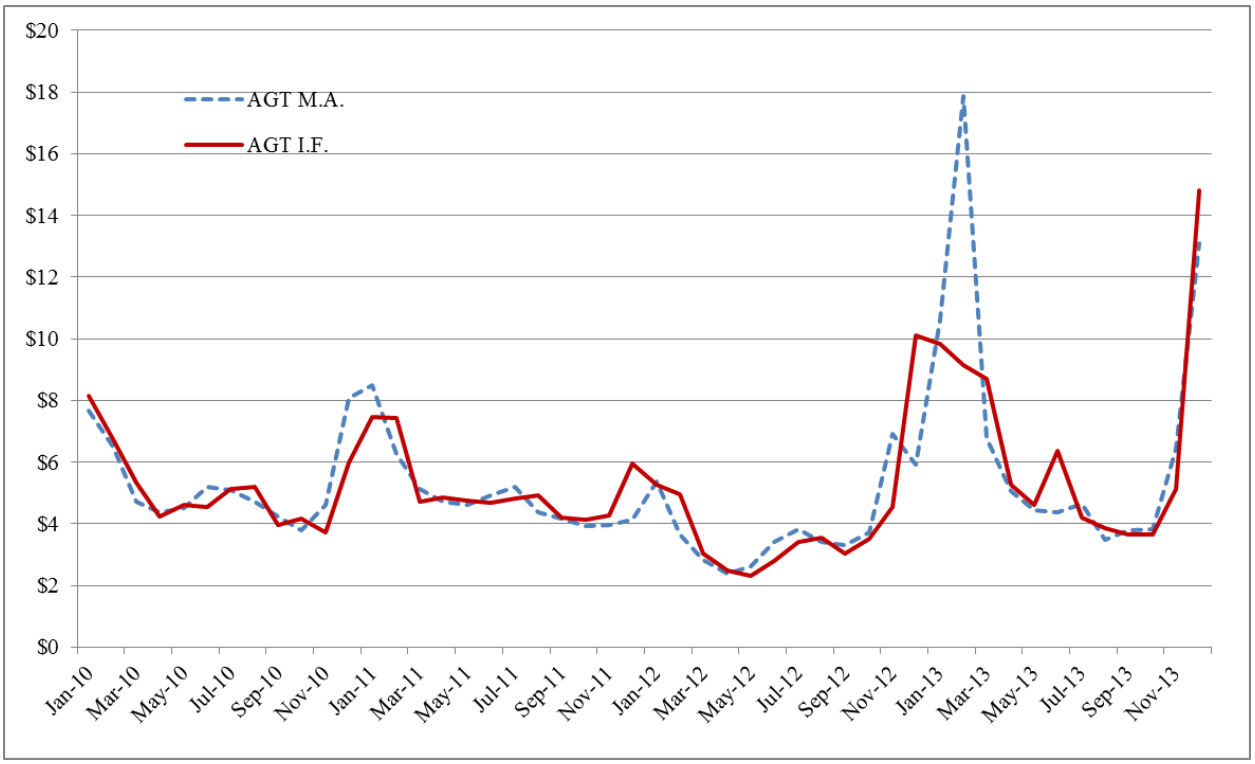
November 2012	[redacted]
December 2012	[redacted]
January 2013	[redacted]
February 2013	[redacted]
March 2013	[redacted]

Liberty obtained data for the actual first-of-the-month prices for the two indexes now used in NS Power's gas purchase contracting; *i.e.*, the [redacted], for the years 2010 through 2013. We also obtained the data for the average of the daily prices for the same period. The next two charts plot those prices.

TGP Zone 6: Monthly Index and Average of Daily Index Prices



AGT: Monthly Index and Average of Daily Index Prices



The results suggest that buying the average of the dailies can result in approximately the same average price as the monthlies over the entire period, but was much better in some months, and much worse in others. NS Power does not, however, buy the same quantity in every month. Buying larger quantities in months when the average of daily prices exceeded monthly prices would make the monthly prices better. Conversely, buying more in months when the average of daily prices fall below monthly prices would make daily prices better.

Volume variation in gas purchases can significantly drive the variability of NS Power's gas costs. When Black & Veatch updated the original hedging studies, it recommended much lower hedge proportions in response to variations in fuel requirements caused by the introduction of wind-powered generation. The possible use of monthly-priced purchases for a portion of NS Power's gas purchases comprises another dimension of gas-cost variation warranting study. The objective is to find the largest reduction in fuel-cost stability risk relative to any increase caused by a measure taken to increase stability. The Company should determine following a structure review whether monthly pricing for at least a portion of NS Power's gas purchases would help to satisfy this objective.

6. The Company continued to place natural gas hedges at the Henry Hub for too long. *(Chapter II, Recommendation #3)*

Essentially immediately after the winter 2010-2011 New England basis "blowout," FERM's Manager, Oil, Gas & Energy prepared an analysis of the performance of NS Power's hedging program through that event. That analysis explained why, even though NS Power's gas purchase contracts were priced at [redacted] the Company had continued to hedge its gas purchases at Henry Hub. It also showed, however, that the correlation that was central to that practice, between prices at Henry Hub and those at Northeast Market locations, broke down during the blowout. The memo went on to observe that it was too late to hedge basis for the balance of that winter, due to the impact of the blowout on the market for the proper hedge instruments. It recommended exploring options for hedging the following winter (the winter of 2011-2012), and engaging stakeholders during the second and third quarters of 2011 to present recommendations.

Nothing was done. Later in the fourth quarter of 2011, the Manager, Oil, Gas & Energy transferred to an affiliate. Discussions with a consultant regarding basis hedging were initiated in April, but that work was not completed until late December 2011.

In August 2012, NS Power issued an RFP for gas supplies for the winter of 2012-2013. [redacted] responded, with [redacted] All offers based pricing [redacted].

The Company hedged the selected offers with fixed-for-floating swaps (to fix the price for each month) and with swing swaps (to hedge for any difference between the monthly price and the average of the prices). The premiums for the "fixed" side of the swing swaps cost [redacted]. The problem was that all hedges were entered at Henry Hub.

The FST addressed the question of basis hedges at meetings in April, June, July, August and September 2012. The April meeting resulted in a decision to purchase basis hedges for the Algonquin City Gates location (AGT) for 5,000 MMBtu/day for each of the five months of the forthcoming winter. An amount of 5,000 MMBtu/day was about 25 percent of the quantity estimated to be consumed during that period. No additional hedges were purchased.

There were no discussions of this matter with stakeholders in 2011. In February 2012, the FAM Small Working Group was told that NS Power had been in touch with Black & Veatch regarding an update to its prior hedging study "in view of the additional wind generation that has been added to the system."[7] (Black & Veatch had developed NS Power's initial hedging strategy and program in 2006, and provided an update in 2010.) NS Power expected to provide necessary data to Black & Veatch in April 2012, and reported that the consultant required two to three months after that to complete the review. Nothing about hedging was discussed with stakeholders until a presentation to the FAM Small Working Group in November 2013 by a different consultant. That presentation reported on a recently completed comprehensive review of NS Power's gas hedging program that resulted in a completely different strategy.

7. The ICFI study did not lay, and may not even have been intended to lay, a foundation for determining whether to hedge basis. *(Chapter II, Recommendation #3)*

The Basis Hedging Analysis conducted by ICFI for the Company in the second, third and fourth quarters of 2011 focused on cost reduction, rather than on reducing volatility. ICFI's description of the analysis states:

> *First, a modeling analysis focused on the extent to which executing swap hedges at … locations [other than the Henry Hub] would reduce NS Power's natural gas costs given potential price and gas use uncertainties. The second approach involved reviewing recent history to determine whether there were times when basis hedges might have been successful.*[8]

NS Power's Fuel Manual states "Hedging will be used to help stabilize fuel costs."[9] Appendix D, stating the Company's Fuel Hedging Strategy and Objectives, states "NS Power will utilize a dollar-cost-averaging hedging strategy to obtain fuel cost stability for solid fuels, HFO and natural gas."[10] Nowhere in NS Power's policy statements regarding hedging is reducing costs identified as an objective of that activity.

ICFI's description of its modeling analysis states that it focuses on finding hedges that "would **reduce** NS Power's natural gas costs."[11] The second analysis:

> *... examines the behavior of basis swap prices … relative to average daily prices.*
> *… This approach reflects how trading companies … examine pricing behavior. It*

[7] Meeting Notes, prepared by NS Power, for February 23, 2012, FAM SWG Meeting, at page 3.
[8] ICF International, Memorandum, dated December 29, 2011, to the Financial Trader & Physical Optimization Specialist, Nova Scotia Power, regarding Basis Hedging Analysis, at page 4.
[9] Nova Scotia Power, Incorporated, *Fuel Manual* (November 2012 edition), at page 5.
[10] *Ibid*., page 44.
[11] ICFI Memorandum, at page 4.

> *also develops some rules-of-thumb for determining when a basis hedge may be desirable.*[12]

Both analyses examine whether to take a position with respect to basis at Northeast U. S. market centers (Tennessee Gas Pipeline Zone 6 (TGP Z6) and Algonquin City Gates (AGT); neither addresses price stability at those points, which is the stated objective of NS Power's hedging program.

8. NS Power undertook sound HFO commodity and trucking procurement actions during the Audit Period.

RFPS were well constructed; bidders' lists were appropriate, and the selections appeared objective and proper. Presentations to the FST were proper and complete, and authorities sought fit the circumstances. The results of the competitions covered the Company's requirements, while preserving the flexibility to supply those requirements in the most advantageous manner. Documentation of results was satisfactory.

9. LFO procurement again comprised a particular strength.

NS Power's Procurement Department conducted a well-structured tender process. Tender documents were clear and NS Power effectively and thoroughly analyzed its offers. The presentation of the results of the competition to the FST was also impressive. The analysis of the bids was thorough and complete, and details of the procurement process (purchase orders against signed contracts) formed part of the file, to give the FST a complete presentation regarding the procurement, but also to record, for anyone who might not remember, details of the process as it was configured at the time of the award.

10. Documentation of contracting activities is generally adequate.

Documentation of the procurements done by NS Power's Procurement Department is excellent. Documentation prepared by FERM is not as careful or complete as that prepared by Procurement, but is generally adequate.

Documentation of hedging actions for natural gas is somewhat thin. Quarterly presentations to the FST are included in the procurement binders, but those presentations consist of spreadsheets showing fixed-for-floating swap positions before and after new transactions. Cover sheets for the procurement record list the transactions entered after each quarterly review.

Swing-swap transactions are not included in the procurement binders, as they are not reviewed with the FST. Those transactions are left to the discretion of FERM Staff. The only documentation of those decisions is the record of the actual transactions in the Company's transaction-tracking system.

[12] ICFI Memorandum, at page 8.

D. Recommendations

1. **Reduce NS Power's recoverable Audit Period gas costs by an amount between $3.8 million and $4.9 million, which reflects the net value of the foregone gas contracts for this period.** *(Conclusion #1)*

This sum reflects Liberty's calculation, formulated after extensive discussion with NS Power, of the amount by which gas costs in the current Audit Period would have been reduced, had the Company secured access to the foregone contracts.

2. **Use the Company's new tools for evaluating gas price hedging to study daily versus monthly pricing for gas.** *(Conclusion #5)*

The higher premiums that suppliers require for monthly-price gas supplies compensates for the risk involved. An important question for analysis by NS Power is whether that premium is worth it for the additional predictability and stability that monthly pricing would provide. Liberty recommends that this question be studied, using the tools acquired as part of the Company's new hedging program. The study should be conducted in time to guide gas supply contracting and hedging for the winter of 2014-2015. Results should be presented in the Company's next Natural Gas Report to the NSUARB.

Liberty recommends that the study use actual data on pricing and the cost of hedges for the winters of 2012-2013 and 2013-2014. Daily gas prices at the New England market centers seem destined to remain volatile until that region has access to significant additional gas in the winters.

VI. Solid Fuel Supply Management

A. Background

This chapter addresses the following areas related to fuel supply management:

Receipt Information	*Weighing, Sampling, and Analysis*	*Contract Administration*	*Inventory Management*

B. Findings

1. Receipt Information

During the first year of the Audit Period, NS Power used *Fuelworx*, a solution offered by Sungard Financial Systems to manage solid fuel receipt information at generating stations. NS Power replaced *Fuelworx* in early 2013 with a more advanced Sungard system known as *Aligne*. Both systems provide a data base for managing contract information, coal weights received, coal analysis, and shipping information. Throughout this chapter, reference to these two systems will be as *Fuelworx/Aligne*, to reflect that Fuelworx was used in 2012, and that Aligne was used beginning in early 2013.

NS Power collects solid fuel receipt and unloading information and solid fuel weights in the coal unloading area, where personnel record the data on paper logs. Plant staff members entered coal types and weights unloaded at the plant site into *Fuelworx*/*Aligne*. The Logistics Administrator entered vessel numbers and vessel information into the system. Data for each vessel was also received in hard copy, as well as electronically, and included the volume received.

Contract administration personnel in the headquarters office building will earlier have entered the shipping information into the system. NS Power therefore can match data on solid fuel as received at the stations with data provided by suppliers on an as-shipped basis. The *Fuelworx*/*Aligne* system contains a complete record providing quantities of solid fuel shipped by supplier, solid fuel received at the stations and waiting to be unloaded, and solid fuel unloaded.

Solid fuel unloaded at the Sydney International Pier transships either to the Lingan by rail or to Point Aconi generating station by truck. NS Power management contracts with [redacted] covered unloading activities at the pier during the Audit Period. An original agreement with [redacted] for a [redacted] period had an expiration date of [redacted]. A short-term Transition Agreement covered operations between this date and the effective date of a new agreement with [redacted], which became effective on [redacted], and covers operations through [redacted].

[redacted], formerly a subsidiary of [redacted], serves the Sydney International Pier. [redacted] delivers coal from the International Pier to Lingan Generating Station. [redacted] moves solid fuel from the pier to Lingan in 21-car, leased trains. Each rail car can hold approximately 85 tonnes of coal. NS Power provides [redacted] with a weekly delivery schedule. Normal deliveries comprise about 35,000 tonnes per week, shipped by four unit trains per day, five days per week. NS Power has also made provision for additional premium deliveries: (a) on weekends, and (b) for more than four daily trains during weekdays. The parties

established rail rates during the negotiation of the service agreement. The rates remain subject to an annual inflation index adjustment.

Under the new Agreement, NS Power owns the locomotives, rail cars, and trackage, as well as the land under the tracks. The agreement also requires [redacted]. This purchase was part of the $6.589 million International Pier strategic asset purchase by NS Power.

NS Power unloads coal at the Lingan Station with a rotary dumper, after which the unloaded coal moves to the units or to reclaim piles. The various Lingan coal types require segregation into as many as seven station reclaim piles. NS Power also maintains four long-term dead storage piles at Lingan (LTDS). These four piles separately hold low sulphur coal with Btu greater than 12,000 Btu, low sulphur coal with Btu less than 12,000 Btu, Domestic coal, and PRB coal.

Solid fuel unloaded at the PTMT moves directly to the Pt. Tupper station by conveyor and to the Trenton station by rail. A management contract between NS Power and [redacted] covers fuel unloading activities at the pier. The Pt. Tupper station has no inventory pile of its own, but relies on coal stored at the PTMT, from which the station directly receives coal by a conveyor system.

The [redacted] delivers coal to Trenton from Point Tupper Marine Terminal, under the terms of a [redacted] agreement. This agreement was negotiated during [redacted], and signed on [redacted]. The parties established rates for these movements during negotiation of the service agreement. Those rates [redacted]. A [redacted] also exists. The agreement runs from [redacted] through [redacted]. NS Power provides [redacted] used for these shipments under a lease agreement with [redacted]. The cars under this agreement have a capacity of approximately 88 tonnes (the railway limit is 119.3 tonnes).

Two modes of rail delivery exist for Trenton. The first consists of dedicated deliveries of 25 to 30 cars daily, five days per week (cars loaded Sunday through Thursday and delivered to Trenton Monday to Friday). A dedicated train crew loads and delivers the cars. This mode requires two sets of cars. Prior to the new railway service agreement signed in March 2012, this mode was run during the winter months for faster delivery to avoid coal freezing in the cars prior to arrival at the Trenton Generating Station. A premium is paid for this mode. In the new rail services agreement, NS Power negotiated a change to the normal mode of operation (General Freight) to help avoid this premium. General Freight comprises the second rail transport mode for Trenton, which, under the new agreement is now used almost exclusively year round. It consists of adding coal cars to the daily General Freight train. This mode provides daily deliveries of a maximum of 19 cars, and requires three sets of cars. However, by negotiating extended loading times, even in winter the coal is in the cars less than 12 hours and thus freezing can be avoided without paying the premium of dedicated freight. NS Power provides the railroad with a delivery schedule for the coming two weeks. The cars used for movement of coal are rapid discharge cars, which are leased by NS Power. These cars are bottom-dumped at Trenton. Coal unloaded at the Trenton station goes directly to the units or to reclaim piles. Three reclaim piles serve Trenton 5 and three serve Trenton 6. Under the port-management contracts with [redacted], NS Power employs detailed procedures to address the unloading of ocean-going vessels at the PTMT and at

the Sydney International Pier. Such procedures resulted from close coordination with [redacted]., which serves NS Power as the contractor responsible for management of PTMT operations, and with [redacted] at the International Pier.

NS Power does not apply procedures specifically applicable to moving solid fuel by rail from either of the two piers to its generating stations, or for loading and unloading trains. The Company relies on the experience of its personnel for effective operation of the overall transportation system, including loading and unloading operations.

2. Weighing, Sampling, and Analysis

a. Weighing

Solid fuel weight and quality information for NS Power's international contracts comes from weights, samples, and analyses performed by the suppliers at the time of fuel loading. Vessel draft surveys conducted at the loading ports determine solid fuel weights. NS Power contracts for the services of third parties to observe vessel loading at the load ports, both in North and South America. The observations of these third parties include oversight of the cargo sampling conducted by the supplier during vessel loading, a check of the cargo holds, and a check of proximate and caloric value (CV) analysis of the contractual sample. In 2012, [redacted] performed South America services, and [redacted] served North America shipments. NS Power conducted an RFP process that resulted in selection of [redacted] for South and North American services in 2013. Both [redacted] and [redacted] provide NS Power a report, for each vessel loading, that addresses all of the weight and quality parameters monitored. The reports also provide commentary on overall loading processes and conditions. These contracted third parties use lab services from [redacted] (for 2012 only) and by [redacted] in the U.S. Conduct of vessel draft surveys is certified, in accordance with The Code of Practice for Draft Surveys. The labs e-mail reports directly to NS Power's Coal Procurement and Logistics Specialist.

Certified truck scales at the mine sites determine coal weights for domestic coal, [redacted]. Truck scale certifications are submitted to the NS Power Contract Administrator on an annual basis, and after any repair or modification to the scale. Should the mine site scale become inoperable, there have been occasions when the certified generating station truck scale provided the transactional weights for a short period of time. The alternative would have been to stop deliveries, pending site scale repair/calibration.

Lingan, Point Aconi and Trenton stations randomly weigh (loaded and empty) some trucks delivering domestic coal. The plant truck scales take these weights. NS Power compares results of these random weigh checks to the supplier-provided weights on a monthly basis. The mine site and plant scale weights for these loads of domestic coal are submitted to the Contract Administrator, who conducts the comparison. Action is taken as warranted. The generating station truck scales undergo certification annually and after repairs or modifications.

Truck scales at the Port Hawkesbury Paper Mill (PHP) weigh arriving biomass. NS Power has contracted with PHP to use their scales and associated software. The scales are regularly certified. Biomass arriving by barge is weighed on barges at the time of loading, by official marine surveys.

b. Sampling and Analysis

The governing samples for all NS Power international solid fuel purchases take place at the loading facilities and by suppliers. The suppliers have responsibility for analyzing the samples, whose results they e-mail to NS Power for use in contract administration and for entry into NS Power's *Fuelworx*/*Aligne* system. The suppliers use ASTM-certified sampling systems for coal and for petcoke. They take samples during vessel loading. ASTM International operates as one of the world's largest voluntary standards development organizations. It specializes in the development of technical standards for materials, products, systems, and services. ASTM was known, at its founding more than 100 years ago, and until 2001, as the American Society for Testing and Materials. ASTM's open membership policy has produced over 30,000 members, including over 1,100 organizational members, consisting of technical experts representing producers, users, consumers, government and academia from over 120 countries. ASTM is a globally recognized source and "the standards forum of choice" for technical standards in a wide range of areas, including solid fuel testing.

NS Power implemented a new set of solid fuel sampling and analysis procedures in early 2011. Determination of the transactional samples and analyses for domestic coal forms the primary focus of these procedures. They do specify that all transactional analyses for domestic coal, as burned at Lingan, Point Aconi and Trenton, will be performed by the NS Power laboratories at these locations. These procedures have been improved over time. These new procedures also incorporate random sampling and analysis by [redacted] of international shipments.

A local firm, [redacted], provides a number of sampling and analysis for NS Power:

- Random sampling and analysis of selected vessel cargoes
- Random sampling and analysis of domestic coal deliveries (monthly or quarterly) for deliveries to Lingan, Point Aconi and Trenton
- Proximate and calorific value (CV) analysis of the sample splits taken from selected cargoes at the load ports
- Sample composting and analyses, for both proximate and CV analyses, of samples for the mercury program
- Proximate and chlorine content analysis of imported sawmill bark
- Proximate analysis of fuels to biomass boiler (upon request from NS Power).

In conjunction with the first listed service, [redacted] takes periodic samples of coal being offloaded from international ports. The quality measurements of these samples undergo cross-checking against measures taken at the load port. [redacted] also monitors the product being discharged in Nova Scotia, and has responsibility for reporting any anomalies or contaminants observed. The second and third [redacted] services have the purpose of cross-checking solid fuel quality parameters against results from samples taken at the loading locations. In conjunction with the fourth [redacted] service, NS Power also used the external laboratory [redacted] to provide analytical services for the analysis of coal, fly-ash and bottom-ash samples (mercury, carbon, chlorine and total metals) received from [redacted] for the mercury program.

The last two services listed above were added to [redacted] responsibilities during the Audit Period in conjunction with NS Power's entry into biomass fuel operations. Liberty cross-checked reports provided by [redacted] for all of the above services, and found them to be appropriate.

The procedures for sampling and analysis of domestic coal deliveries comply with ASTM procedures. These procedures require manual sampling of truck deliveries to be performed by truck drivers at the NS Power stations. [redacted] trains the drivers. NS Power site personnel at Lingan, Point Aconi and Trenton, with training by [redacted], also provide quality control observations of the sampling conducted by the truck drivers.

Samples from Nova domestic coal deliveries to Trenton come from the coal unloaded from each truck. Personnel seal sample bags in the Security Building. The bags then go to the Westville laboratory, and are stored in the Nova lab building. These individual samples are prepared the following day at the Nova lab facilities, so as to produce three representative daily composite samples. One sample is delivered to the Trenton site, one is used by Nova for daily process control, and the third is saved to produce a weekly composite sample. The weekly composite sample is then delivered to Trenton, and analyzed at its lab to produce the weekly transactional analysis results.

For Nova domestic coal deliveries to Lingan and Point Aconi, the coal unloaded from each truck is sampled. The samples are taken to the plant Security Building, where they are sealed and stored. At the end of the day, plant lab staff collects the individual truck samples, and prepares from them a daily composite sample. These daily composite samples are saved and composited to produce a weekly sample for transactional analysis conducted by the plant lab staff.

The difference in handling of coal samples between Trenton, Lingan and Point Aconi derives in part from to the contract between NS Power and Nova. The Nova mine operation (serving Trenton) requires prompt feedback on delivered coal characteristics, in order to ensure proper quality control. This prompt feedback proves especially important in light of the use of four different coal seams to achieve specified quality delivery to NS Power. This procedure has also enabled Trenton to operate with fewer coal handling staff than it would otherwise have.

While all biomass deliveries during the Audit Period were covered by letters of intent, and contracts were still being negotiated, the primary provisions of such draft contracts related to quality were as follows:

- Target moisture content of 50.3%
- Penalty for moisture content above 54%
- Shipment may be rejected based on:
  - Presence of extraneous materials, high levels of chlorides or metals that may damage or interfere with the operation of the boiler,
  - Biomass has a moisture content of 58% or more.

For many years, NS Power did not have an ASTM-certified solid fuel sampling system at any generating station. The Company therefore did not have a sound method for determining accurately the quality of solid fuel being burned. It relied on samples and analyses taken by solid

fuel suppliers at loading ports. The lack of accurate solid fuel quality information had led to inaccuracies in NS Power's calculations of heat rate information and of the quantity of fuel in inventory. Heat-rate and quantities-consumed calculations become inaccurate if either the applied Btu content or the assumed moisture content of solid fuel suffers inaccuracy resulting from weaknesses in sampling techniques.

NS Power addressed the issue by installing at Lingan an ASTM certified fuel sampling system that became operational on January 1, 2011. Since that time, the Company has been gaining experience with operation of this system, and learning the differences between the results of coal sample taken at load ports and coal samples taken at Lingan. NS Power has determined that solid fuel picks up moisture on its way to Lingan. Measurements at Lingan show that coal has on average two percent more moisture than shown by measurements at the loading ports. During the third and fourth quarters of 2013, in response to a recommendation from the previous Liberty Audit, NS Power reviewed inventory reconciliations, evaluating the standard method in parallel with a new method of applying a moisture correction factor to inventory measurements. Based on this review, a new procedure for application of a moisture correction factor will be developed and applied to inventory adjustments beginning in the first quarter of 2014. Continued monitoring of the results from Lingan sampling equipment and evaluation of the variances will form part of the updated procedure.

NS Power has its own fuel analysis laboratories at the Lingan, Point Aconi and Trenton generating stations. NS Power uses these labs for analysis of solid fuel samples. These samples provide the bases for the transactional analyses needed for contract administration purposes in the case of domestic coal deliveries. None of these labs has ASTM certification. NS Power conducts a quarterly, round-robin series of analyses among its labs to confirm and maintain accuracy of sample results. NS Power also delivers weekly samples from the NS Power labs to [redacted] at random intervals through the year.

c. Station Feeder Calibrations

Measurement of the fuel actually fed to station boilers provides an important link in relating solid fuel received under contract with solid fuel inventories. Gravimetric feeders measure fuel fed to station boilers. These feeders essentially measure the weight of coal being fed into the boilers. They receive coal from the station bunkers, and feed it into the station coal mills (pulverizers) prior to injection of pulverized coal into the boilers.

Liberty examined the Audit Period's calibration records for the gravimetric feeders for each station, finding them not standardized and subject to wide variance among stations. We found this result surprising. One of the recommendations from our prior audit addressed this issue. The previous audit recommendation stated:

"NSPI must standardize the calibration process between generating stations for solid fuel feeders, to include the following:

- *Standardized procedures for all stations*
- *Standardized forms for all stations*
- *Computerized storage of calibration data*
- *Requirement for semi-annual calibration of feeders.*

FERM management must be involved in this process and establish mechanisms to ensure that the process becomes standardized in a way that will use the expertise of personnel at all generating stations to incorporate optimum features of all calibration methods. Also, management must ensure that there is an ongoing method for monitoring and enforcing reliable calibration schedules."

NS Power reported to Liberty that response to this recommendation has been completed.

Feeder calibration forms submitted were different for each of the generating stations, and some of the records indicated that calibrations were every 52 weeks, instead of every 26 weeks.

One aspect of feeder calibration which has improved relates to installation of the Direct Line maintenance work order system installed during the Audit Period. This system schedules and issues work orders, and provides a classification system that provides an auditable trail classifying work orders as Completed, Completed Late, Not Completed, Cancelled, Cancelled for Acceptable Reason, and Skipped. Liberty found data from this system well presented, and with good graphical summaries of work order status.

3. Contract Administration

The Senior Manager, Fuels Strategy and Performance, who reports directly to the Director, FERM, administers solid fuel contracts for NS Power. Day to day contract administration activities within FERM fall under the responsibility of the Coal Procurement and Logistics Specialist, who reports directly to the Senior Manager, Fuels Strategy and Performance. This Specialist daily administers international solid fuel contracts, and provides regular input of fuel information into the *Fuelworx*/*Aligne* system. This Specialist schedules and monitors international vessel shipments, and monitors the quantities and qualities of fuel shipped on each of these vessels. On a weekly basis, this individual conducts a conference call with CSL regarding management of vessel shipments.

This Specialist works out of the main NS Power office, but regularly visits installations and meets with field personnel to keep up-to-date on status at those locations. Such visits include each of the two NS Power unloading ports twice per year and meetings with Savage and Logistec quarterly.

Part of the responsibility related to fuel contract administration relates to making visits to the coal mines which supply fuel to NS Power. The following table shows the mines visited during the Audit Period by NS Power personnel.

Audit Period Mine Visits

Date	Coal Mine	Location	Supplier
January 2012	[redacted]	[redacted]	[redacted]
March 2012	[redacted]	[redacted]	[redacted]
April 2012	[redacted]	[redacted]	[redacted]
May 2012	[redacted]	[redacted]	[redacted]
May 2012	[redacted]	[redacted]	[redacted]
August 2012	[redacted]	[redacted]	[redacted]
August 2012	[redacted]	[redacted]	[redacted]
August 2012	[redacted]	[redacted]	[redacted]

September 2012	[redacted]	[redacted]	[redacted]
December 2012	[redacted]	[redacted]	[redacted]
April 2013	[redacted]	[redacted]	[redacted]
May 2013	[redacted]	[redacted]	[redacted]
May 2013	[redacted]	[redacted]	[redacted]
September 2013	[redacted]	[redacted]	[redacted]

The Director, FERM and the Senior Manager, Fuel Strategy and Performance visited [redacted] Coal Mine, [redacted], and [redacted] Coal Mine. The Fuel Logistics and Procurement Specialist visited the [redacted], the site for [redacted] facility, and the [redacted] Mine. The Senior Contract Administrator visited [redacted] Mine and [redacted] Mine. The Operations Superintendent Point Aconi visited [redacted] and the [redacted] facility on behalf of FERM to assess the potential suitability of a new product, [redacted], for the Point Aconi plant. A consultant from [redacted] was contracted by FERM to visit [redacted], and provide a third party assessment.

The Senior Contract Administrator maintains his primary office in the field in Sydney and has responsibility for field contract administration activities. His primary activities focus on management of solid fuel inventory levels at the two port facilities and at the associated generating stations. The Logistics Administrator reports to him.

The Logistics Administrator has primary responsibility for field invoice processing, and verification of all related information on quality and quantity for solid fuel received prior to sending verified information electronically to the Fuel Administrator/Specialist in the Fuel Finance group. Individually prepared Excel spreadsheets are used for each invoice. These spreadsheets form the basis for field contract administration, as well as input of certain data into *Fuelworx*/*Aligne*. NS Power uses the *Fuelworx*/*Aligne* system for collection, storage, and presentation of fuel contract information as related to quantities, qualities and scheduling. Fuelworx/Aligne contains all of the necessary contract information to monitor quantity and quality requirements, and to examine actual quantity and qualities of coal delivered and the timing of deliveries.

Multiple staff meetings throughout the month support contract administration functions. The next paragraphs describe them.

Morning Call: The morning call takes place every weekday at 9:30 am. The Day-Ahead Marketer chairs the meeting, with representatives from the power plants, the system operator, and power production staff participating by phone. The energy marketer and gas marketers participate in person. The group discusses overall system status, fuel prices, and daily scheduling issues. The Coal Logistics and Procurement Specialist, Fuels Engineer, FERM Managers, and the Director, FERM regularly listen. The EVP Operations also attends the call as his schedule permits. Each of the plant representatives report on issues that might impact dispatch/scheduling, and the marketing participants provide feedback on preferred timing of plant requests for derations or short maintenance outages. Performance of the mercury capture systems, plant capabilities and fuel blends are among items that are also reported and discussed on the call.

Projects and Priorities Review Meeting: Every two weeks a meeting chaired by the Director, FERM, with attendance by the two senior managers reporting to him and the Fuels Special Project Manager reviews the relative priority of FERM projects, and addresses new projects and initiatives.

Monthly FERM Team Meeting: On a monthly basis there is a meeting of the FERM department, and the FERM Finance Team. This is a meeting of the entire department, with the exception of the Energy Marketers who work shift and are on their day off. Those remotely located dial into the meeting. Information being shared widely within NS Power (such as progress on Company initiatives, the Company balanced scorecard, safety program information, policy changes) is communicated at these meetings. These meetings also review FERM specific information (such as Fuel Expense relative to budget and the status of FERM projects and initiatives), in order to keep all team members apprised of progress towards objectives and activities by other members of the team.

The Manager Oil, Gas & Energy holds at least quarterly, separate meetings with the shift Energy Marketers at least quarterly, who attend on their day off. Information from the monthly meetings is shared with the marketers at these meetings. Periodically, the Director, FERM attends the meetings with the Energy Marketers.

Safety and training meetings: Such meetings address safety program and Fuel Manual/FAM objectives and requirements. These meetings occur throughout the year; all FERM employees attend.

PO Status Meeting: Approximately every two weeks, there is a meeting to review the status of fuel and fuels-related goods and services procurements. This meeting is chaired by the Manager Fuels Accounting and Reporting, with members of the Fuels, Fuels Finance and Procurement in attendance, as well as the Director, FERM. These so-called PO Status Meetings seek to track the progress of fuel procurements, in advance of and following FST approval. This agenda promotes a broad awareness of when the internal processes of RFPs, requisitions, and purchase orders will be required. Typically over 100 Fuels purchase orders are created annually.

Weekly Inventory Meeting: This meeting is chaired by the Coal Logistics and Procurement Specialist, and attended by the Senior Contracts Administrator, and representatives from all of the power plants.

Coordination Meetings: Given the increased competitiveness of coal versus gas costs, the two senior managers in FERM have initiated regular Coordination Meetings. Their staffs meet to discuss key trends and issues, to ensure that this information is shared between the energy desk, the oil/gas desk, and the solid fuel team.

Outage Coordination Meeting: The meeting is chaired by the Manager, Oil, Gas & Energy, with representatives from Fuels, the NS System Operator and Power Production attending. The intent of the meeting is to coordinate plant and transmission system outages, with the objective of minimizing fuel expense.

4. Contract Compliance

a. Quantity Administration

NS Power experienced good overall delivery performance under its solid fuel contracts, with performance being better in 2013 than in 2012. The next two tables show actual 2012 and 2013 delivery volumes of solid fuel, compared to contract quantity ranges, and indicate the variations.

Actual Solid Fuel Contract Deliveries – 2012 (quantities in metric tonnes)

Supplier	Contract Base	Contract Maximum	Contract Minimum	Actual Tonnes	Amount Over/Under Limit	Contract Specification
[redacted]						

* [redacted] and NS Power agreed to apply additional tonnes in 2012 to 2013 contract amounts. Additional tonnage arose from vessel availability and sizing restrictions.

** [redacted] had light tonnages because of low draft conditions [redacted], which prevented vessels from loading to their full capacity.

*** [redacted] overage because of swaps of originally contracted [redacted], resulting in contract amendments for [redacted].

Actual Solid Fuel Contract Deliveries – 2013

All quantities in metric tonnes

Supplier	Contract Base	Contract Maximum	Contract Minimum	Actual Tonnes	Difference Over/Under Limit	Contract Specification
[redacted]						

* [redacted] and NS Power agreed to apply additional tonnes in 2012 to 2013 contract amounts.

** [redacted] labour contract was up for renegotiation with an earliest strike date of [redacted]. As contingency to secure [redacted] supply and avoid Force Majeure/delivery interruptions such as occurred in [redacted] and its labour strike NS Power implemented efforts with freight provider [redacted] to receive all remaining deliveries from [redacted] prior to this date. As a result, there was less flexibility in vessel sizing when advancing these deliveries.

*** Both [redacted] indicated an inability to fulfill delivery of one [redacted] cargo by the [redacted], or [redacted] due to a supply shortage of [redacted] coal. In [redacted], [redacted] advised NS Power that it had a small window of opportunity to supply a cargo in [redacted] NS Power's freight provider was unable to secure a vessel in the short notice provided. A new Confirmation Letter was executed to

supply the cargo in CIF terms with [redacted] supplying freight, and the cargo was supplied in [redacted] The new Confirmation Letter reflected an updated vessel size from the original Confirmation Letter. [redacted] has proposed a shipping date for [redacted]. NS Power does not have an immediate need for the coal and is assessing the request.

b. Quality Administration

International fuel suppliers met fuel quality requirements at a notably high level during the Audit Period. NS Power monitored solid fuel quality closely during the Audit Period, and made several adjustments with suppliers when quality of fuel delivered was not as required.

NS Power reached an agreement with [redacted] to swap contracted vessels of [redacted] coal for a [redacted] at [redacted] as in the contract. NS Power understood that the [redacted] cargo could contain higher sulphur and higher ash than specified in the contract. This was acceptable to NS Power because the higher Btu products perform better in the generating stations, and there was room available in the annual sulphur cap. Further, the higher Btu product would produce savings in transportation costs. NS Power pays for transportation on a per tonne basis, and consumes coal on the basis of its energy content. Solid fuel containing higher energy content per tonne is therefore less expensive to transport.

Vessel	Supplier	Quality Difference From Specification	Minimum	Maximum	Actual
1201	[redacted]	Sulphur		[redacted]	0.83
1202	[redacted]	Ash Sulphur		[redacted]	9.23 0.95

A [redacted] cargo of [redacted] did not meet contract minimum specifications for Btu content. NS Power did not [redacted]. The supplier [redacted] NS Power beyond the quality adjustment clause in the contract. NS Power subsequently [redacted] for the cargo to [redacted]. NS Power [redacted] by consuming the cargo and was [redacted] by the contract quality adjustment. However, NS Power continues to [redacted] supply contract, as discussed in detail in Chapter IV, Section 8.c (under Litigation Related Contract Actions). Liberty's review of the calculations found them satisfactory.

Vessel	Supplier	Quality Difference From Specification	Minimum	Maximum	Actual
1243	[redacted]	Btu	[redacted]		11,823

In 2013 [redacted] delivered two separate [redacted] cargoes that exceeded contract maximum moisture specifications. In both cases, NS Power negotiated settlement in lieu of rejection [redacted], in addition to the existing quality adjustment in the contract. [redacted] also delivered a single cargo of [redacted] in 2013 that, at [redacted] percent, contained ash slightly above contract limits, as shown in the transactional sample collected at the load port. The ash was not high enough to result in handling or operational issues for NS Power. The existing

quality adjustments in the contract provided adequate compensation, but NS Power still discussed the issue with [redacted] before accepting the vessel. [redacted] identified that the ash reading might have been caused by surface material scraped from the loading pad during one point in the vessel loading. NS Power examined and sampled the cargo at discharge and found the ash to be closer to spec ([redacted] percent on average). A small amount of extraneous material in one of the sample sublots was also observed; again, not expected to cause issues in the NS Power facilities. [redacted] assured NS Power that its quality assurance would improve in the future. Subsequent cargoes received to date have been within specification. Liberty's review of the calculations found them satisfactory.

Vessel	Supplier	Quality Difference From Specification	Minimum	Maximum	Actual
1371	[redacted]	Moisture		[redacted]	10.77
1385	[redacted]	Moisture		[redacted]	11.76
1377	[redacted]	Ash		[redacted]	1.83

Two [redacted] cargoes of [redacted] coal did not meet the minimum specification for Btu. In both cases, NS Power negotiated settlement in lieu of rejection [redacted] in addition to the existing quality adjustments for Btu in the contract. Liberty's review of the calculations found them satisfactory.

Vessel	Supplier	Quality Difference From Specification	Specification		Actual
			Min	Max	
[redacted]	[redacted]	Ash		[redacted]	10.04
		Btu	[redacted]		12,509
[redacted]	[redacted]	Btu	[redacted]		12,903

[redacted] deliveries in the Audit Period routinely failed to meet specifications on an overall basis. A majority of deliveries failed to meet at least one of the parameters (Btu, Ash, Sulphur or Moisture). Adjustments were made monthly, and were not always in the same direction. The tables below indicate whether adjustments for Btu, Ash, Sulphur and Moisture were positive (favorable) or negative (unfavorable). Deliveries in 2013 were of somewhat better quality than deliveries in 2012.

2012 [redacted] Quality Adjustments

Station	Btu	Ash	Sulphur	Moisture	Total - $
Trenton 6	-	-	-	+	($1,468,778.47)
Pt. Aconi	-	-	-	-	($910,374.98)
Lingan	-	-	-	-	($375,487.32)

2013 [redacted] Quality Adjustments

Station	Btu	Ash	Sulphur	Moisture	Total
Trenton 6	-	-	+	+	($16,879.15)
Pt. Aconi	-	+	+	+	$18,417.43
Lingan	-	-	+	+	($11,310.53)

The following two tables show the coal quality averages for deliveries of [redacted] to each of the three NS Power locations, for both 2012 and 2013.

2012 [redacted] Quality Averages

Station	Btu	Ash	Sulphur	Moisture
Trenton 6	[redacted]	[redacted]	[redacted]	[redacted]
Pt. Aconi	[redacted]	[redacted]	[redacted]	[redacted]
Lingan	[redacted]	[redacted]	[redacted]	[redacted]

2013 Domestic Coal Quality Averages

Station	Btu	Ash	Sulphur	Moisture
Trenton 6	[redacted]	[redacted]	[redacted]	[redacted]
Pt. Aconi	[redacted]	[redacted]	[redacted]	[redacted]
Lingan	[redacted]	[redacted]	[redacted]	[redacted]

Shipments to Trenton from the Nova Mine had the following contractual quality specifications.

Parameter	Minimum	Typical	Maximum
Moisture %		[redacted]	
Ash %		[redacted]	
Volatile %		[redacted]	
Sulphur %		[redacted]	
Calorific Value Btu/lb		[redacted]	
Size		[redacted]	
Grindability (HGI)		[redacted]	

Shipments to Lingan, Point Aconi, and the International Pier were from the [redacted], and had the following contractual quality specifications.

Parameter	Minimum	Typical	Maximum
Moisture %		[redacted]	
Ash %	[redacted]	[redacted]	
Sulphur %		[redacted]	
Calorific Value Btu/lb	[redacted]	[redacted]	
Chlorine %			[redacted]
Mercury mg/kg			[redacted]

5. Coal Inventory

a. Targets

NS Power applies a range of [redacted] days (of average daily burn forecast) as its system solid fuel inventory target. The calculation considers as inventory all solid fuels located at transfer terminals and at generating stations. This range reflects an estimate of the replacement time for a lost vessel. NS Power uses this guideline because the majority of its solid fuel arrives by ocean-going vessel.

The NS Power solid fuel inventory targets for its generating stations do not address specific unit requirements, except for Trenton 5 and 6. Coal use there differs enough to require individual targets. Trenton 5 burned [redacted] during the Audit Period. Trenton 6 burned [redacted] making up by far the largest percentage of solid fuel burned. NS Power also treats coal inventory as existing for emergency purposes only. It does not apply a "surge bin" approach, under which delivered coal flows into inventory on receipt, and then gets taken back out of inventory as required. NS Power adopted its approach because sending coal directly to the units from vessels and trucks proves more economical. We found this approach consistent with our experience in the utility industry.

NS Power bases its inventory targets on a number of factors, including its historical experiences in inventory management, the likelihood of ocean vessel delivery interruption, vessel unloader outages, the inventory of critical unloader parts, the experiences of other utilities and industrial coal users, and the availability of off-system power purchases at times of low coal inventory. A number of events occurring at the same time during the first quarter of 2013 led NS Power to conclude that changes in its inventory management philosophy should be considered. Essentially, the Company concluded that the 2012 end of year inventory was too low because of supply disruptions related to the following factors:

- Extreme weather events
- Force Majeure declarations
- Temporary mine or port shutdowns
- Low drafts in the Mississippi River
- Guerilla activity on rail lines in Columbia.

NS Power has undertaken a project to revise its inventory management philosophy. Such changes did not take place during the Audit Period, but the changes being contemplated aim to assure NS Power of reliable supply of staple fuel, support winter readiness, and allow quick response to ebbs and flows in coal demand, while taking advantage of economic fuel switching, and optimized blend changes. When the final change in inventory management philosophy is presented, it will be evaluated at that time.

NS Power considered whether or not it should engage a consultant to conduct a study on appropriate inventory levels, and whether inventory levels above target levels would be reasonable. The Company concluded that the best information on this subject was its actual experience during the Audit Period. Consequently it is developing an updated coal inventory strategy, including new inventory targets, described immediately above.

b. Audit Period Inventory

NS Power's solid fuel inventory remained above the maximum target inventory level for the majority of 2012. During the last two months of the year, coal consumption increased due to natural gas price increases and increased industrial load. Inventory during the first quarter of 2013 dropped significantly because of the combination of force majeure and winter weather related delivery delays as discussed earlier. For the balance of the year, inventory levels grew, and became harder to predict because of changing markets and provincial load.

The logistics associated with solid fuel delivery ports and the generating stations nearest to these ports has caused NS Power to group inventory monitoring into two distinct locations. One location consists of inventory at the International Pier, Lingan and Point Aconi. The second location consists of inventory at the Point Tupper Marine Terminal (PTMT), Pt. Tupper, Bear's Head, and Trenton 5 & 6. The following figures display the 2012 and 2013 solid fuel inventory at each of these locations. Discussion of inventory levels at each location follows after these graphs.

(The following charts are confidential)

Solid Fuel Inventory, Intl. Pier, Lingan & Pt. Aconi-2012

Solid Fuel Inventory, PTMT, Pt. Tupper, Bear's Head and Trenton-2012

Solid Fuel Inventory, Intl. Pier, Lingan & Pt. Aconi-2013

Solid Fuel Inventory, PTMT, Pt. Tupper, Bear's Head and Trenton-2013

NS Power experienced difficulty in bringing solid fuel inventory between the low to high target levels because of several factors. Coal requirements were variable because of the changing relationship between prices of natural gas and coal during the Audit Period. At the beginning of the Audit Period, inventories were above the targets currently defined in the Fuel Manual. This result was related to the decision to burn natural gas because of the sharp decline in natural gas pricing relative to coal at certain points in time. FAM costs over the Audit Period in the form of trucking to and from the Lingan Long Term Dead Storage area (LTDS) and the PTMT Bear Head storage area were incurred. Such costs in 2012 were $453,185 and in 2013 were $1,360,000.

In addition during the early part of 2013, as discussed earlier in this report, NS Power coal supplies were negatively affected during the winter of 2012 due to a number of factors all occurring at the same time. These factors included force majeure events, winter weather, and increasing load. Such changes made inventory levels hard to manage, especially considering existing contracts under which the Company was obligated to take certain tonnages. The following tables show how actual inventory levels compared to forecast inventory levels, on a quarterly basis, and for the two locations. In most quarters of the Audit Period, at the International Pier, Lingan & Point Aconi location, the actual inventory from quarter to quarter was less than the inventory forecast in the previous quarter, except for one quarter.

Solid Fuel Inventory – Difference Between Quarterly Forecast and Actual
International Pier, Lingan & Pt. Aconi

Quarter Ending	Forecast from Previous Qtr	Actual for Current Qtr	Difference	Percent Difference
6/30/2012	[redacted]	[redacted]	[redacted]	[redacted]
9/30/2012	[redacted]	[redacted]	[redacted]	[redacted]
12/31/2012	[redacted]	[redacted]	[redacted]	[redacted]
6/30/2013	[redacted]	[redacted]	[redacted]	[redacted]
9/30/2013	[redacted]	[redacted]	[redacted]	[redacted]
12/31/2013	[redacted]	[redacted]	[redacted]	[redacted]

Note: The percent difference is the percentage above/below the forecast. Units are in metric tonnes.

Inventory variations at PTMT, Pt. Tupper, Bear's Head, and Trenton 5 & 6 were more equally balanced where half of the variations showed actual inventories greater than forecast, and half of the variations showed actual inventories less than forecast.

Solid Fuel Inventory – Difference Between Quarterly Forecast and Actual
PTMT, Pt. Tupper, Bear's Head, Trenton 5 & 6

Quarter Ending	Forecast from Previous Qtr	Actual for Current Qtr	Difference	Percent Difference
6/30/2012	[redacted]	[redacted]	[redacted]	[redacted]
9/30/2012	[redacted]	[redacted]	[redacted]	[redacted]
12/31/2012	[redacted]	[redacted]	[redacted]	[redacted]
6/30/2013	[redacted]	[redacted]	[redacted]	[redacted]
9/30/2013	[redacted]	[redacted]	[redacted]	[redacted]
12/31/2013	[redacted]	[redacted]	[redacted]	[redacted]

Note: The percent difference is the percentage above/below the forecast. Units are in metric tonnes.

NS Power has reduced its solid fuel inventories from the high levels of over 1,000,000 tonnes experienced during the previous Audit Period, but has been increasing inventory levels from the very low levels experienced during early 2013 of only 472,000 tonnes. As discussed earlier, this low level was caused by a combination of disruptions in the fuel supply chain, and has prompted NS Power to reconsider its inventory strategy. Also, NS Power has increased inventory levels overall since the beginning of the Audit Period when the inventory level was 779,000 tonnes, and the end of the Audit Period when the inventory level was 816,000 tonnes.

NS Power is moving toward a position of maintaining between [redacted] tonnes of "Staple" (versus "Adder") fuel going into the winter season, in order to avoid the low levels experienced in early 2013. Staple fuels are defined as fuels that the plants can consume in high percentages (of up to 100 percent) in the blends necessary for reliable generation while meeting environmental emission requirements. In addition, there would be additional quantities of Adder fuels, which can only be used in proportionately low quantities. Liberty found NS Power's inventory approaches over the Audit Period reasonable, recognizing the unusual circumstances.

We expect, however, to evaluate later inventory-related changes to the Fuel Manual now under consideration.

c. Blending Requirements

NS Power uses as complex a set of solid fuel blends as Liberty has seen at an electric utility of its size. The complicated blends result because of a number of factors, including NS Power's location, the types and vintages of NS Power generating facilities, the variety of solid fuels available on an economic basis, the large spread in prices between various available fuels such as petcoke, high sulphur domestic coal, low Btu/low sulphur PRB coal and international coal, and the applicable environmental regulations addressing emissions of SO_2 and mercury. The mixes and number of inventory piles have increased since the last Audit Period, reflecting increasing efforts to improve solid fuel blends, despite limited space to accommodate this approach. The next paragraphs discuss the many inventory piles.

Lingan Generating Station

[redacted]

Point Aconi Generating Station

[redacted]

Point Tupper Marine Terminal (PTMT)

[redacted]

Trenton 5 Generating Station

Trenton 6 Generating Station

One of the challenges of managing so many inventory piles at each location in the limited spaces available arises from the need to maintain the boundaries of each. Liberty's inspections of generating station operations discovered many cases where inventory piles run together, clouding the boundaries between coals with different attributes. This situation makes proper inventory accounting more difficult. We discuss that issue in more detail in the next section of this chapter. The situation also complicates the ability to produce the precision needed to optimize station operation through proper fuel blending.

6. Physical Inventory Measurements

NS Power conducts quarterly physical surveys of solid fuel stockpile inventory levels. The surveys employ data collected at the coal pile surface, density testing, and moisture analysis to quantify stockpile quantities. NS Power's Fuel Manual guides the measurement of physical volumes of solid fuel inventory. The provisions for accounting adjustments to the physical inventory, based on survey results, provide that, if the physical inventory (by quality and type) is less than 95 percent or greater than 105 percent of the book inventory for two successive three month periods, an adjustment shall be made to the book inventory for the repeating portion of the variance, and corrective actions taken as outlined. If physical inventory is zero, accounting adjustments can be made at this time, if the book inventory does not match the physical inventory. The adjustment to book inventory for the repeating portion of the variance shall equal the difference between the physical inventory and the book inventory. No adjustments are to be made if the physical inventory is within 5 percent of book inventory.

As an example of these inventory adjustments, where inventory variation does run in the same direction for two successive quarters, NS Power applies an adjustment equal to the lesser of the two variations. For example, assume a Q1 variation of 5,859 MT and a Q2 variation of 12,609 MT. NS Power will first make a Q2 adjustment of 5,859 MT. It will then carry forward the

difference between the figures from the two quarters (12,609 - 5,859 = 6,750 MT) to the next quarter as a possible adjustment quantity if the survey for the next quarter indicates a variation in the same direction. Continuing with this example, it would not matter whether the two applicable variance quantities were reversed. The actual adjustment for Q2 would still only equal the lesser of the two amounts, or 5,859 MT. These additions to inventory adjustment procedures are sound. Liberty observed that NS Power routinely and properly follows them.

The Fuel Manual specifies the corrective action for certain adjustments as follows:

> *If the physical inventory calculation for any stockpile or heavy fuel oil tank is less than 95 percent or more than 105 percent of the book inventory, the Sr. Manager, Fuels Planning and Performance, will initiate evaluation of potential sources of discrepancies including weight scales, quality determination, heat rate calculations, and station security and make a recommendation to the VP Power Generation and Delivery who is responsible for implementing corrective actions. Corrective actions will be implemented.*

Variations sufficient to require accounting adjustments under NS Power's policy occurred in each quarter during the Audit Period. Appropriate reports were sent to the VP Power Generation and Delivery each quarter, describing the results of the most recent survey, of corrective action taken, and of future actions planned.

A NS Power "Inventory Team" provides regular consultation on matters related to solid fuel inventory, inventory measurement, and inventory adjustments. This Team consists of representatives from FERM, Fuels Planning & Performance, and Station representatives. The group meets by phone after issuance of each quarterly set of solid fuel inventory measurements, in order to discuss causes of inventory variation and corrective actions. A formal charter for this Team brings routine, detailed focus on solid fuel inventory measurement results, and promotes identification of any needed actions.

The following tables show the quarterly inventory adjustments for each of NS Power's solid fuel fired generating stations.

Lingan Inventory Adjustments

Adjustments	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Q1-2012-MT		(12,457)				
Q1-2012-$		[redacted]				
Q2-2012-MT		(7,024)				
Q2-2012-$		[redacted]				
Q3-2012-MT		(6,657)				
Q3-2012-$		[redacted]				
Q4-2012-MT	1,505	(11,040)	2,047	(6,426)		
Q4-2012-$	[redacted]	[redacted]	[redacted]	[redacted]		
Q1-2013-MT	2,735		847	410	1,543	
Q1-2013-$	[redacted]		[redacted]	[redacted]	[redacted]	
Q2-2013-MT		(1,414)			921	
Q2-2013-$		[redacted]			[redacted]	
Q3-2013-MT		1,219				(832)
Q3-2013-$		[redacted]				[redacted]
Q4-2013-MT		2,429			(257)	(7,758)
Q4-2013-$		[redacted]			[redacted]	[redacted]

Pt. Aconi Inventory Adjustments

Adjustments	[redacted]	[redacted]	[redacted]	[redacted]
Q1-2012-MT	(3,358)		(1,896)	
Q1-2012-$	[redacted]		[redacted]	
Q2-2012-MT			(15,508)	
Q2-2012-$			[redacted]	
Q3-2012-MT	857		(3,510)	
Q3-2012-$	[redacted]		[redacted]	
Q4-2012-MT		656	(10,226)	(4,415)
Q4-2012-$		[redacted]	[redacted]	[redacted]
Q1-2013-MT	(532)			
Q1-2013-$	[redacted]			
Q2-2013-MT				336
Q2-2013-$				19,696
Q3-2013-MT		(530)		1,354
Q3-2013-$		[redacted]		[redacted]
Q4-2013-MT		(600)	4,315	
Q4-2013-$		[redacted]	[redacted]	

Trenton 5 Inventory Adjustments

Adjustments	[redacted]
Q1-2012-MT	
Q1-2012-$	
Q2-2012-MT	
Q2-2012-$	
Q3-2012-MT	
Q3-2012-$	
Q4-2012-MT	
Q4-2012-$	
Q1-2013-MT	
Q1-2013-$	
Q2-2013-MT	
Q2-2013-$	
Q3-2013-MT	
Q3-2013-$	
Q4-2013-MT	2,976
Q4-2013-$	[redacted]

Trenton 6 Inventory Adjustments

Adjustments	[redacted]	[redacted]	[redacted]	[redacted]
Q1-2012-MT		416		
Q1-2012-$		[redacted]		
Q2-2012-MT			3,769	
Q2-2012-$			[redacted]	
Q3-2012-MT				
Q3-2012-$				
Q4-2012-MT		(8,956)		2,657
Q4-2012-$		[redacted]		[redacted]
Q1-2013-MT	(2,733)			
Q1-2013-$	[redacted]			
Q2-2013-MT	(6,013)			
Q2-2013-$	[redacted]			
Q3-2013-MT	(1,003)			
Q3-2013-$	[redacted]			
Q4-2013-MT	(5,528)			3,202
Q4-2013-$	[redacted]			[redacted]

PTMT/POT Inventory Adjustments

Adjustments	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Q1-2012-MT	5				
Q1-2012-$	[redacted]				
Q2-2012-MT			(1,116)	(736)	
Q2-2012-$			[redacted]	[redacted]	
Q3-2012-MT					
Q3-2012-$					
Q4-2012-MT					(1,670)
Q4-2012-$					[redacted]
Q1-2013-MT					(199)
Q1-2013-$					[redacted]
Q2-2013-MT	(1,160)				
Q2-2013-$	[redacted]				
Q3-2013-MT					
Q3-2013-$					
Q4-2013-MT	(1,036)	629			
Q4-2013-$	[redacted]	[redacted]			

The preceding tables evidence a number of trends. Adjustments at Lingan Station [redacted], ran in the same direction for five quarters, but then reversed for the last two quarters of the Audit Period. For the first five quarters, the physical coal piles proved larger compared to the data in the fuel tracking system (Fuelworx and then Aligne as of early 2013). Thus, for five of the eight Audit Period quarters, physical surveys demonstrated that Lingan burned less low sulphur coal than suggested by Fuelworx/Aligne data. This continued the trend noted in the last two FAM Audits. Adjustments for all other Lingan coals exhibited fewer adjustments and multi-directionality. Adjustments for [redacted], and for [redacted], always exhibited variances in a positive direction, indicating that Lingan burned more of these coals than suggested by Fuelworx/Aligne. There were two adjustments for [redacted], one in each direction, and two adjustments for [redacted], both in the direction where the pile was heavier compared to Aligne.

Point Aconi experienced inventory adjustments very similar to those at Lingan, in terms of frequency and direction of adjustments. For four quarters, adjustments for [redacted] always ran in the same direction, with the physical coal piles showing more coal than did Fuelworx/Aligne, requiring negative adjustments to the data in Fuelworx/Aligne. Then, for the last quarter of the period, the adjustment was in the opposite direction. Other fuels at Point Aconi experienced two or three adjustments, but not with a consistent pattern.

Trenton 5 only experienced one adjustment over the eight quarter Audit Period, a relatively small adjustment in the last quarter of the period.

Trenton 6 experienced consistent inventory adjustments for [redacted]. For the last four quarters of the Audit Period, adjustments reflected that the pile was heavy compared to Aligne, requiring negative adjustments each quarter. There were a few other adjustments for other coals, but not of significant magnitude, and not reflecting a particular pattern.

PTMT/POT experienced a few adjustments over the Audit Period, but not in a consistent pattern, or of significant magnitude.

Liberty summarized the total (all locations combined) of all solid fuel adjustments for each of the eight quarters examined, as the next table shows. The total of all inventory adjustments each quarter, with two small exceptions, was always in the same direction, showing that surveys indicated more fuel was on the ground than indicated in Fuelworx/Aligne, demonstrating consistently that less fuel had been burned than indicated by the data in the fuel tracking system. This is the same trend as was demonstrated in the previous Audit Period. Theoretically, three factors could underlie this result:

- NS Power is putting more solid fuel into inventory than shown by procurement records.
- NS Power is taking less solid fuel out of inventory than shown by consumption records (Fuelworx/Aligne).
- There is a consistent bias in solid fuel physical survey measurements.

Summary of Inventory Adjustments

Quarter	Metric Tons	Dollars
Q1-2012	(17,290)	(1,991,626)
Q2-2012	(20,615)	(1,992,002)
Q3-2012	(9,310)	(832,708)
Q4-2012	(37,218)	(3,435,246)
Q1-2013	2,071	431,280
Q2-2013	(7,330)	(631,257)
Q3-2013	208	53,926
Q4-2013	(1,628)	221,463
Total	(91,112)	(8,176,170)

There is also the question of whether quarterly inventory surveys should continue, or if they should be conducted on an annual basis. Liberty believes that quarterly surveys should continue. Annual surveys would suffice if adjustment trends ran in both directions from quarter to quarter. However, as the data shows, the trends seem to be in the same direction. Annual surveys would therefore tend to produce particularly large adjustments. Quarterly surveys and adjustments will keep inventory accounting more in line with actual physical inventory status.

C. Conclusions

1. NS Power processes and procedures for the weighing, sampling and analysis of international solid fuel shipments delivered to its generating stations are sufficient.

NS Power provides for appropriately controlled sampling and analysis of fuel delivered to NS Power's Point Tupper Marine Terminal and the Sydney International Pier under ASTM procedures conducted by the suppliers at the loading ports. Solid fuel weights are determined through vessel draft surveys, also conducted at the loading ports. NS Power has satisfactory representation on site at loading locations through its contractor.

NS Power uses [redacted] appropriately to cross-check the weights of vessels through independent draft surveys in Nova Scotia. NS Power also uses [redacted] to take ASTM samples of solid fuel as it is unloaded from ocean-going vessels as a cross-check on samples taken at the loading ports.

2. NS Power has appropriate procedures for sampling domestic coal.

NS Power's procedures for sampling domestic coal deliveries comply with ASTM requirements. The procedures are periodically updated, as necessary, and such updates have been satisfactory.

3. NS Power has effectively administered its solid fuel contracts.

Contracts must be managed in ways that ensure delivery of the appropriate quantities and qualities of solid fuel in accordance with agreed upon schedules, while at the same time maintaining appropriate relationships between the Company and its many coal suppliers. The job requires experience and skill, and good communication. Overall, NS Power has demonstrated that it has been effective in all aspects of solid fuel contract administration during the Audit Period.

NS Power has acted appropriately to manage the various quality provisions of its coal contracts, and has taken action as necessary to monitor quality and assess penalties, or award premiums, when coal quality variations have warranted such actions. NS Power's vigilance in monitoring solid fuel contract quality has been apparent. When there were unusual quality situations, NS Power was effective in negotiating with suppliers to obtain settlements which were beyond the normal solid fuel contract provisions, and which resulted in benefit to NS Power.

NS Power has also been effective in monitoring and administering the quantity provisions of its solid fuel contracts. There were six cases where deliveries varied from contract minimum or contract maximum quantities. NS Power conducted the appropriate economic analysis, justifying acceptance of such deliveries. When appropriate, current deliveries at low prices were maximized, in order to avoid higher prices for solid fuel required in the future.

4. The system for sampling coal fed to Lingan, installed during the previous Audit Period, has been beneficial, and is being used to develop new procedures related to coal quality.

The new ASTM certified fuel sampling system at Lingan became operational on January 1, 2011. Since that time, the Company has been gaining experience with operation of this system, and learning to understand the differences between the results of coal samples taken at load ports and coal samples taken at Lingan. NS Power has determined that solid fuel picks up moisture on its way to Lingan. During the third and fourth quarters of 2013, in response to a recommendation from the previous Liberty Audit, NS Power reviewed inventory reconciliations, evaluating the standard method in parallel with a new method of applying a moisture correction factor to inventory measurements. Based on this review, a new procedure for application of a moisture correction factor will be developed and applied to inventory adjustments beginning in the first quarter of 2014. Continued monitoring of the results from Lingan sampling equipment and evaluation of the variances will be part of the updated procedure.

5. The current version of the Fuel Manual has improved the procedure for adjusting solid fuel inventory as a result of physical measurements of solid fuel inventory.

The new procedures for adjusting solid fuel inventory levels, as a result of physical inventory measurements, were approved by Liberty as a result of the previous audit, and incorporated during late 2012. Included in these procedures are details on how to make inventory adjustments as a result of physical surveys of solid fuel inventory. For example, NS Power only makes adjustments to inventory when the variation is in the same direction for two successive quarters. NS Power has also established an additional component of adjustment procedures such that if the inventory variation is in the same direction for two successive quarters, then the actual adjustment will be the lesser of the two variations.

6. NS Power has presented substantive revisions to the Fuel Manual, but the bulk of the adjustments made to the Manual during the Audit Period were administrative in nature.

Liberty reviewed all of the adjustments made to the Fuel Manual during the Audit Period, and found them to be acceptable. Liberty is aware of further major revisions to the fuel inventory management portion of the Fuel Manual which have been submitted for SWG feedback.

7. Calibration records for the coal gravimetric feeders at the generating stations have not been improved since the last audit. (*Recommendation #1*)

Calibration records for the coal gravimetric feeders at the generating station were found to be in the same condition as during the previous audit. This is troubling because NS Power has stated that its Action Plan item from that audit was satisfactorily completed.

Coal gravimetric feeders at the generating stations comprise the primary link in measurement of the quantity of coal burned. As such, they are also vital in accounting for coal inventory levels as well as correlating overall solid fuel contract requirements with coal burned. Therefore, consistent and standardized calibrations of these coal feeders are critical to an effective overall process of solid fuel management.

Liberty's examination of feeder calibration records indicated that they are not standardized between stations, with records presented from each being different. There appear to be different calibration approaches, and different data management practices, as well as different calibration frequencies.

8. The conduct of quarterly solid fuel inventory surveys with quarterly adjustments continues to be the most logical frequency.

Liberty believes that quarterly solid fuel inventory surveys, with accompanying adjustments, should continue. Surveys less often, such as annually, would be logical if adjustment trends were in varying directions from quarter to quarter. However, as the data shows, the trends over the previous Audit Period, and over the current Audit Period, are in the same direction from quarter to quarter, such that if surveys were only conducted annually, with annual adjustments, such adjustments would be very large. Thus, quarterly surveys and accompanying adjustments will keep inventory accounting more in line with actual physical inventory status, and should be continued.

D. Recommendations

1. Standardize the calibration process and forms among generating stations for solid fuel feeders, develop and adhere to a consistent calibration schedule. *(Conclusion #7)*

NS Power should standardize the calibration process between generating stations for solid fuel feeders, to include the following:

- Standardized procedures for all stations
- Standardized forms for all stations
- Computerized storage of calibration data
- Requirement for semi-annual calibration of feeders.

FERM management should be involved in this process and establish mechanisms to ensure that the process becomes standardized in a way that will use the expertise of personnel at all generating stations to incorporate optimum features of all calibration methods. Also, management must ensure that there is an ongoing method for monitoring and enforcing reliable calibration schedules.

VII. Natural Gas and Fuel Oil Supply Management

A. Background

This chapter examines how NS Power has managed its fuel oil and natural gas supplies. Natural gas fuels management involves supply contract management, including measurement of quantities received, nominations and scheduling of pipeline capacity, daily and monthly gas purchases and sales to match supply to requirements, and management of pack-and-draft capacity on the pipeline. Management of heavy and light fuel oils (HFO and LFO) involves supply contract management, including quantity measurement and quality assessment, inventory management, and transportation management.

Some NS Power generating units burn only natural gas; the three steam units at the Tufts Cove Generating Station can burn gas or HFO. Fuels management must accommodate switching between natural gas and HFO. The fuel decisions for those units change as prices of the two fuels move relative to each other. Natural gas prices declined so much during 2009 that gas-fired units began to displace significant amounts of coal-fired generation. This circumstance continued through much of 2012, but reversed toward year-end. The Company invested considerable 2013 effort trying to reduce gas consumption, including shifting generation to the solid fuels plants as much as possible, and switching to HFO in the steam units at Tufts Cove for periods in late 2012 and 2013.

Fuels management also involves management of hedge positions. NS Power generally places hedges consistent with its fuel supply contracting commitments. Changes in load and other factors, however, cause corresponding changes in the quantities of fuel required during particular time periods. These changes in turn can cause financial instruments acquired to hedge a fuel price to no longer remain in a valid hedging relationship. Hedge positions then require adjustment.

Liberty examined natural gas and fuel oils management processes and procedures, and how effectively the Company responded to developments in the pricing and supply of those fuels. We also inquired into how the Company reviews its own performance as part of efforts to improve effectiveness and efficiency.

B. Findings

1. Natural Gas

Managing the Company's gas supply resources involves several operations:

- Obtaining suppliers' estimates of quantities to be supplied each day
- Maintaining coordination with the power desks to adjust estimated fuel requirements appropriately for each day's generation
- Nominating to the pipeline the quantities to be delivered to Tufts Cove and to the delivery point for any resale gas
- Buying or selling gas each day in order to balance supplies with requirements at Tufts Cove
- Tracking and adjusting hedge positions to maintain the desired level of price stability.

NS Power's Day-Ahead power desk creates a day-ahead power supply forecast to balance provincial load with in-province generating units and power imports. The day-ahead forecast includes a Tufts Cove generation forecast. NS Power nominates gas to Tufts Cove to supply the forecast generation, with the balance available under any gas supply contracts nominated to a resale point.

The Tufts Cove generating units frequently operate at the margin for NS Power in 2013. This status as the most expensive operating units often requires unit output changes as load changes, or as problems occur at other sources of power. Consequently, NS Power often requires intra-day gas purchases or sales to meet changed generation requirements. Any difference between quantities delivered and quantities consumed remain on the pipeline as "pack" (quantity delivered in excess of quantity consumed) or "draft" (quantity delivered less than quantity consumed).

Until late 2010, the Company bought gas at [redacted] and transported it to the Tufts Cove station on its own contracts for pipeline capacity. Those contracts [redacted] Since that time, the Company has [redacted].

NS Power continues to buy and sell gas on a daily basis, in order to make delivered quantities match quantities required for generation as closely as possible. NS Power undertakes some of these so-called "balancing" transactions on an intra-day basis when load or system conditions change after the pipeline's deadline for nominations. NS Power enters these transactions with a variety of counterparties active in the Maritimes Gas Market depending on who has or needs gas on a particular day. The Gas Marketer enters those transactions pursuant to an established process developed to fit within parameters that include, for example, the System Operator's schedules, daily operational meetings for the Company's power plants, and pipeline nomination schedules.

NS Power experienced a significant increase in natural gas prices in the winter of 2012-2013. Beginning in the late spring of 2013, the Company undertook a review and system studies to reduce the requirement to generate at Tufts Cove. Study continued through the summer, and implementation began in the fall.

a. Quantities in 2012 and 2013

The transporting pipelines generally assess fuel quality. Each pipeline tariff sets quality standards that gas must meet to qualify for transportation. Pipeline operators assess gas quality at points where it enters the pipeline. Gas quantities, bought, sold and consumed, are determined by the pipeline's meters.

The tables below show the quantities of gas bought and sold in 2012 and 2013, and the resale margins for each of the two years. The normal explanation for substantial differences between Budgeted quantities and actual quantities is that relative fuel prices changed between the time the Budgets were prepared (generally in August prior to the year being forecast) and the time the

fuel was consumed. NS Power updates its forecasts four times during each year for the purpose of adjusting its commitments for fuel supplies and hedge positions. The Fuels Budget used for FAM reporting is not updated, however.

NS Power Gas Transactions

Purchased and Sales (MMBtu)		**2012**			
		Q1	**Q2**	**Q3**	**Q4**
Gas Bought	Budget	[redacted]	[redacted]	[redacted]	[redacted]
	Actual	[redacted]	[redacted]	[redacted]	[redacted]
Gas Sold	Budget	[redacted]	[redacted]	[redacted]	[redacted]
	Actual	[redacted]	[redacted]	[redacted]	[redacted]
Resale Margins ($M)	Budget	[redacted]	[redacted]	[redacted]	[redacted]
	Actual	[redacted]	[redacted]	[redacted]	[redacted]

Purchased and Sales (MMBtu)		**2013**			
		Q1	**Q2**	**Q3**	**Q4**
Gas Bought	Budget	[redacted]	[redacted]	[redacted]	[redacted]
	Actual	[redacted]	[redacted]	[redacted]	[redacted]
Gas Sold	Budget	[redacted]	[redacted]	[redacted]	[redacted]
	Actual	[redacted]	[redacted]	[redacted]	[redacted]
Resale Margins ($M)	Budget	[redacted]	[redacted]	[redacted]	[redacted]
	Actual	[redacted]	[redacted]	[redacted]	[redacted]

The preceding chart makes the Company's response to the increase in gas prices that began in the fourth quarter of 2012 apparent. Gas purchases had been running at or above Budget for the first three quarters of the year. They dropped to about 80 percent of Budget in the fourth quarter, and then continued to drop, to as low as 26 percent of Budget in the second quarter of 2013. They climbed back above 80 percent in the fourth quarter, as colder-than-normal weather required operation of all available capacity, despite continued high gas costs.

The next table shows the pipeline transportation charges incurred in delivering the gas to Tufts Cove. The table includes data for 2010 and 2011, for comparison purposes. [redacted] contracts.

NS Power Gas Pipeline Transportation Charges

	2010	**2011**	**2012**	**2013**
Fixed transportation (Reservation Charge)	[redacted]	[redacted]	[redacted]	[redacted]
Variable transportation	[redacted]	[redacted]	[redacted]	[redacted]
Pipeline imbalance fees	[redacted]	[redacted]	[redacted]	[redacted]
Pack-and-Draft penalties	[redacted]	[redacted]	[redacted]	[redacted]

Variable gas transportation charges represent additional transportation purchased in excess of firm transportation.

The [redacted] 2010 to 2011 shows the effect of the [redacted] The Company continued to incur [redacted]

[redacted] provided for it to [redacted] to deliver those volumes. Other explanations for the variations in the transportation charges include the following:

- The two contracts [redacted] had imbalance tolerances that were [redacted] than the transportation that was [redacted] Thus, while reservation charges went down, imbalance charges and pack-and-draft penalties went up
- The variable transportation services that the Company had to use after [redacted] were [redacted].

2. Heavy Fuel Oil

NS Power uses HFO to power the steam units at Tufts Cove when it is less costly than gas. The Company reports that, when operating on natural gas, the Tufts Cove steam units can, on average, switch to HFO within 45 minutes. The time required to switch back is 90 minutes, because burners have to be purged on three levels.

HFO also supplements solid fuels at other generating stations in three circumstances:

- If a coal-fired generating unit is unable to achieve full design load on coal, but is able to do so with the addition of HFO, NS Power's Generations Operations dispatch software (*GenOps*) will call for injecting a quantity of HFO into the unit. *GenOps* only calls for the use of HFO if it is the most economical solution when compared with other choices.
- The Supervisor of a coal-fired generating unit may determine that it requires HFO to provide additional stability to the unit due to current operating conditions. In that circumstance, the Supervisor determines the amount of HFO required based on an assessment of what is required to provide the additional stability.
- The Nova Scotia System Operator (Ragged Lake) may determine that HFO is required to provide additional stability or to satisfy current system load requirements. In that circumstance, the amount of HFO is determined by the amount necessary to provide the additional stability or the additional output to satisfy the system load requirements.

Tufts Cove has HFO storage capacity of 420,000 barrels. Commercial-size vessels for delivering the product contain about 275,000 barrels. When Tufts Cove is using a lot of HFO, NS Power's rule of thumb for ordering additional product is to order in a delivery window wherein the forecasted usable inventory is about 100,000 barrels on the first two days of the delivery window.

Storage capacity at the other stations is as follows:

Lingan: 122,000 bbl *Trenton: 35,800 bbl* *Point Tupper: 45,000 bbl*

Meters on the storage tanks measure volume daily, and the information is stored electronically. For inventory control purposes, a third-party contractor performs a physical dip of the level of fuel in the tanks at Tufts Cove each month, and occasionally at the other stations. Inventory at the solid fuel plants is monitored daily. If there is a need to move some product from Tufts Cove to one of those stations, one of the Gas/Oil Marketers at FERM coordinates the transfer with

Tufts Cove, the respective solid fuel plant, and the trucking company that NS Power has under contract for this purpose.

NS Power monitors the forward prices of coal, HFO and natural gas delivered to marginal generating units. Updates issued at the end of each month address the next 24 months. Observing these comparisons, NS Power conducts hedging activities, but watches for potential fuel-switch opportunities. If fuel-switching is indicated, then increasing the level of inventory in anticipation of the switch may also be indicated.

NS Power's standard contracts for its fuel purchases contain quality specifications. For HFO in the larger vessels, fuel quality is sampled and tested at the load port, using established ASTM procedures. NS Power contracts with a quality control and assurance company to witness the loading and sampling of each vessel, and requires that company to report on the results of the quality tests before the product arrives at NS Power's facilities.

The next table shows purchases, consumption and ending inventory for 2012 and 2013.

HFO Purchases and Consumption 2012 (barrels)

	Q1	Q2	Q3	Q4
TUC Purchases	[redacted]	[redacted]	[redacted]	[redacted]
TUC Consumption	[redacted]	[redacted]	[redacted]	[redacted]
Transfers to Other Stations	[redacted]	[redacted]	[redacted]	[redacted]
Ending Inventory at Tufts Cove	[redacted]	[redacted]	[redacted]	[redacted]
Purchases at Other Stations	[redacted]	[redacted]	[redacted]	[redacted]
Consumption at Other Stations	[redacted]	[redacted]	[redacted]	[redacted]
Boiler Grade Oil Inventory	[redacted]	[redacted]	[redacted]	[redacted]
Transformer/Waste/Fish Oil				
Ending Inventory at Other Stations	135,559	132,788	128,243	127,156

HFO Purchases and Consumption 2013 (barrels)

	Q1	Q2	Q3	Q4
TUC Purchases	[redacted]	[redacted]	[redacted]	[redacted]
TUC Consumption	[redacted]	[redacted]	[redacted]	[redacted]
Transfers to Other Stations	[redacted]	[redacted]	[redacted]	[redacted]
Ending Inventory at Tufts Cove	[redacted]	[redacted]	[redacted]	[redacted]
Purchases at Other Stations	[redacted]	[redacted]	[redacted]	[redacted]
Consumption at Other Stations	[redacted]	[redacted]	[redacted]	[redacted]
Boiler Grade Oil Inventory	[redacted]	[redacted]	[redacted]	[redacted]
Transformer/Waste/Fish Oil				
Ending Inventory at Other Stations	124,083	119,436	115,814	113,881

3. Light Fuel Oils

Management challenges for light fuel oils [LFOs] are similar to those for HFO. LFOs play a limited, but essential role in maintaining power supplies. Tufts Cove, Lingan, Trenton, Point Aconi and Point Tupper all use furnace oil for the following purposes:

- Start up and shut down of fuel milling systems
- Start up and shut down of HFO systems
- Support energy for the boiler during combustion
- Fuel supply to auxiliary boilers
- Fuel supply to air pre-heaters
- Fuel to small auxiliary equipment
- Fuel to boost power output up to the Machine Continuous Rating (MCR) of each generating unit.

Point Aconi has no HFO capability; it therefore uses furnace oil for start-up and shut-down of the main boiler, in addition to the uses noted in the preceding list. Diesel fuel powers the four combustion turbines at Burnside, the one at Tusket, and the two at Victoria Junction. The combustion turbines provide rapid-start generation when necessary for peak-shaving or back-up of other generation. The following tables show purchases, consumption and use of the two LFO fuels in 2012 and 2013.

Furnace Oil Purchases and Consumption 2012 (Gallons)

	Q1	Q2	Q3	Q4
Purchases	[redacted]	[redacted]	[redacted]	[redacted]
Consumption	[redacted]	[redacted]	[redacted]	[redacted]
Ending Inventory	135,383	131,511	131,289	138,636

Furnace Oil Purchases and Consumption 2013 (Gallons)

	Q1	Q2	Q3	Q4
Purchases	[redacted]	[redacted]	[redacted]	[redacted]
Consumption	[redacted]	[redacted]	[redacted]	[redacted]
Ending Inventory	128,488	141,748	135,659	112,979

Diesel Fuel Purchases and Consumption 2012 (Gallons)

	Q1	Q2	Q3	Q4
Purchases	[redacted]	[redacted]	[redacted]	[redacted]
Consumption	[redacted]	[redacted]	[redacted]	[redacted]
Ending Inventory	1,046,790	1,041,016	1,034,151	973,218

Diesel Fuel Purchases and Consumption 2013 (Gallons)

	Q1	Q2	Q3	Q4
Purchases	180,659	302	16,331	0
Consumption	[redacted]	[redacted]	[redacted]	[redacted]
Ending Inventory	[redacted]	[redacted]	[redacted]	[redacted]

The following table shows the amount of LFO storage capacity at each location using those fuels (in terms of volume and of days of consumption at maximum usage).

LFO Storage

Fuel/Location	Volume	Days
Furnace Oil		
Tufts Cove	20,000 imperial gallons	0.43
Lingan	135,000 litres	0.01
Trenton 5	38,000 litres	0.48
Trenton 6	80,000 litres	0.58
Point Aconi	500,000 litres	1.38
Point Tupper	15,216 imperial gallons	0.3
Diesel Fuel		
Burnside	1,018,249 imperial gallons	5.6
Tusket	110,952 imperial gallons	2.07
Victoria Junction	299,106 imperial gallons	2.64

Furnace oil tanks are sized to meet start-up requirements, including start-up at the commissioning of the plant, which is the time of heaviest use. Plants with multiple generating units have tanks sized to meet full plant requirements. For the combustion turbines, tank sizes ensure that the generating units at each location can perform at their intended capacities.

Inventory management differs among the plants:

- Tufts Cove: Inventory is metered each night at midnight and recorded in the shift supervisor's log book. A manual dip is taken at the end of each month.
- Lingan, Trenton, Point Tupper: Tank levels are read daily and recorded at the plant. A manual dip is taken at least quarterly.
- Point Aconi: The tank is metered and the level tracked in the control system. Daily readings are recorded on an inspection sheet.
- Combustion turbines: Operations staff takes physical measurements daily. These measurements are compared to measurement equipment on each tank. A manual dip is taken at least quarterly.

Suppliers provide supply measured on a delivered basis. Day-ahead delivery supply contracts exist to maintain continuous supplies. Should unexpectedly high usage occur before the scheduled delivery, local suppliers remain on call to provide at least some supply within four hours.

Each plant's shift supervisor places orders. Each plant has slightly different "rules of thumb" for ordering product, due to the differing tank size and logistics of product delivery:

- Tufts Cove: Product orders issue when inventory gets to about 33,000 litres.
- Lingan: Shift supervisors order product when required. If total inventory drops below 11,990 imperial gallons, an alarm sounds in the Control Room.
- Trenton: Product orders issue when the tank at Unit 5 gets below 14,000 litres; for the tanks at Unit 6, product orders issue when each tank gets below 20,000 litres.
- Point Tupper: Product orders issue when the tank is below 50 percent of capacity.

- Point Aconi: Product orders issue when the inventory level drops below 300,000 litres (60 percent of capacity).
- Combustion turbines: Product orders issue when tank levels approach a specified minimum. Each specified minimum is determined based on the following:
    - Estimated hours of running based on weather and plant status
    - Total turbine numbers at the location (Burnside, 4; Victoria Junction, 2; Tusket, 1)
    - Time of year
    - Minimum usable amount of fuel in the tanks (5 to 6 percent)
    - Minimum levels required to prevent starvation of operating units
    - Scheduled tank or fuel-line maintenance.

NS Power's combustion turbines generally only produce small amounts of power, because they comprise the most expensive power supply resource. In 2012, they ran briefly in March, November and December. They were started in May and July, but only for testing. In 2013, they ran considerably more than Budget in January and December, but only occasionally in other months. Overall, they produced at 123 percent of Budget in 2013, but Budget was only 2,444 MWh, or 0.02 percent of Net System Requirements.

4. Hedging

NS Power's hedge positions for fuel require active management, just as the supplies themselves do. Two circumstances give rise to a requirement to adjust those positions:

- Changes in the estimate of load: Requires more fuel for increased load or less fuel for reductions in estimated load; a requirement for more fuel could require additional hedges, while a downward adjustment in fuel requirements could result in "excess" hedges
- Changes in the relationship between HFO prices and natural gas prices: A change large enough to cause a fuel-switch at Tufts Cove causes NS Power to adjust its hedge positions accordingly.

Hedge positions remain subject to quarterly adjustment for changes in effectiveness. NS Power examines hedge positions each quarter to ensure that they remain effective in providing the protections for which the Company acquired them. Accounting tests apply and effectiveness adjustments occur as appropriate. Effectiveness adjustments occur in response to changes in fuel quantities required, and in forward prices for fuel commodities, but not as a result of discretionary management decisions.

FERM manages NS Power's hedge positions for fuel commodities. Treasury personnel acquire and manage exchange rate hedges for fuel commodities bought in currencies other than the Canadian dollar. The U.S. dollar is the primary other currency involved. Any warranted findings of excess or insufficient hedges occur as part of the quarterly update of the fuel forecast. When one occurs, FERM takes the finding to the FST, with a recommendation for corrective action. Changes in the relationship between HFO prices and gas prices can happen at any time. In such cases, FERM would request a special FST meeting to consider responsive courses of action.

NS Power's preferred method for dealing with surplus hedges is to purchase offsetting hedges, in order to fix any gain or loss that might be incurred from the original hedge. Surplus hedges are

not usually carried to maturity without action, nor are short positions not covered, as to do otherwise could constitute speculating on fuel prices.

a. HFO

Prior to the expiration [redacted] contract, NS Power had two forms of exposure to fluctuation in the price of HFO:

- Price fluctuations for HFO that is going to be consumed in generating plants (recall that the solid fuel plants use some HFO, as well as the steam units at Tufts Cove)
- Price fluctuations that affect the price of natural gas that the Company bought under [redacted] contract [redacted]

The latter of those two activities ended with [redacted] contract, with the last of those hedges settling in [redacted]. The other HFO hedging activity has also ended, because the Company's requirements for the product have declined to such a low level.

b. Natural Gas

During the Audit Period, NS Power [redacted]. NS Power uses its most-recent fuels forecast to start the hedging process, whose [redacted] 22 to 24 months [redacted].

For the Audit Period Fuels Budget preparation started in January of the year before consumption, using fuel prices observed on December 31. This forecast is submitted to the UARB in May as part of the GRA filling. A fuels update was later submitted in August using June 30th pricing data of the year prior to the one being forecast. Starting in 2012, NS Power also produces an additional forecast in December, using end-of-November prices for the forthcoming year. It is then updated three more times: in March, using end-of-February prices; in June, using end-of-May prices; and in September, using end-of-August prices. The Company adjusts hedge positions after each re-forecast.

The next two tables show forecasted gas purchases, the quantity hedged and the proportion hedged at the time of the Fuels Budget and each of the updates for 2012 and 2013. In August of 2011, NS Power's largest customer, NewPage Port Hawkesbury (NPPH) suspended operations indefinitely. Forecast gas requirements did not go down, however, because the Lingan generating units were on the margin at that time. The first update in 2012 showed reduced gas requirements in the second quarter. The table shows that NS Power was just over the top end of its target range for proportion hedged (75 to 100 percent) in that quarter. Another large downward revision came in the Q3 Forecast, after the Bowater paper plant in Queens County had also shut down. After that adjustment, NS Power was near the middle of the target range for the fourth quarter. No offsetting hedges were purchased in 2012.

The 2013 data shows the effects of the dramatic increase in gas prices that the Company experienced in late 2012, continuing into 2013. In the face of that increase, the Company reduced gas-fired generation as much as possible, including switching the steam units at Tufts Cove to HFO at times. The chart shows, with the early Q1 update (December 31, 2012 prices), hedging levels for all four quarters near the top of the target range. The Q2 update, using June 30, 2013 fuel prices, also showed significant over-hedging for Q3, again due to reductions in quantities required. A number of offsetting hedges were purchased in 2013.

2012 Hedged Gas Amounts

Forecasted Purchases (Gbtu)					
Forecast	*Effective Date*	*Q1*	*Q2*	*Q3*	*Q4*
GRA Refresh	July 31, 2011	[redacted]	[redacted]	[redacted]	[redacted]
Internal Budget	December 31, 2011	[redacted]	[redacted]	[redacted]	[redacted]
Q1 Forecast	March 31, 2012		[redacted]	[redacted]	[redacted]
Q2 Forecast	June 30, 2012			[redacted]	[redacted]
Q3 Forecast	September 30, 2012				[redacted]
Quantity Hedged (Gbtu)					
Forecast	*Effective Date*	*Q1*	*Q2*	*Q3*	*Q4*
	July 31, 2011	[redacted]	[redacted]	[redacted]	[redacted]
	December 31, 2011	[redacted]	[redacted]	[redacted]	[redacted]
	March 31, 2012		[redacted]	[redacted]	[redacted]
	June 30, 2012			[redacted]	[redacted]
	September 30, 2012				[redacted]
Proportion Hedged (%)					
Forecast	*Effective Date*	*Q1*	*Q2*	*Q3*	*Q4*
	July 31, 2011	[redacted]	[redacted]	[redacted]	[redacted]
	December 31, 2011	[redacted]	[redacted]	[redacted]	[redacted]
	March 31, 2012		[redacted]	[redacted]	[redacted]
	June 30, 2012			[redacted]	[redacted]
	September 30, 2012				[redacted]
Settlement of Hedges ($M)					
		Q1	*Q2*	*Q3*	*Q4*
	(Gain) or Loss	[redacted]	[redacted]	[redacted]	[redacted]

2013 Hedged Gas Amounts

Forecasted Purchases (GBtu)					
Forecast	*Effective Date*	*Q1*	*Q2*	*Q3*	*Q4*
GRA Refresh	July 31, 2012	[redacted]	[redacted]	[redacted]	[redacted]
2013 Refresh	December 31, 2012	[redacted]	[redacted]	[redacted]	[redacted]
Q1 Forecast	March 31, 2013		[redacted]	[redacted]	[redacted]
Q2 Forecast	June 30, 2013			[redacted]	[redacted]
Q3 Forecast	September 30, 2013				[redacted]
Quantity Hedged (GBtu)					
Forecast	*Effective Date*	*Q1*	*Q2*	*Q3*	*Q4*
	July 31, 2012	[redacted]	[redacted]	[redacted]	[redacted]
	December 31, 2012	[redacted]	[redacted]	[redacted]	[redacted]
	March 31, 2013		[redacted]	[redacted]	[redacted]
	June 30, 2013			[redacted]	[redacted]
	September 30, 2013				[redacted]

Proportion Hedged (%)					
Forecast	*Effective Date*	*Q1*	*Q2*	*Q3*	*Q4*
	July 31, 2012	[redacted]	[redacted]	[redacted]	[redacted]
	December 31, 2012	[redacted]	[redacted]	[redacted]	[redacted]
	March 31, 2013		[redacted]	[redacted]	[redacted]
	June 30, 2013			[redacted]	[redacted]
	September 30, 2013				[redacted]
Settlement of Hedges ($M)					
		Q1	*Q2*	*Q3*	*Q4*
	(Gain) or Loss	[redacted]	[redacted]	[redacted]	[redacted]

The next graph shows the effect of the gas hedging activity for the two years of the Audit Period. The Swap Trade Price is the price that NS Power "bought" with fixed-for-floating swaps. The Expiry Price, or Settlement Price, is the price at which the hedge settled. For natural gas, NS Power generally uses financial instruments that settle on the last-day settlement price of the NYMEX gas futures contract. Note that this hedging activity was all done at the Henry Hub.

(The following chart is confidential)

[redacted]

C. Conclusions

1. Gas supply management became considerably more difficult in 2013.

The next charts show the degree to which delivered volumes (both consumed and sold) matched nominated volumes in 2012 and 2013. Differences between nominated quantities and delivered

quantities are referred to as "imbalances." Pipelines assess imbalance fees, pursuant to a tariff schedule, when substantial imbalances occur.

Imbalances and imbalance fees declined considerably from 2008 to 2009, as NS Power experienced less variability in gas use. Those measures declined further from 2009 to 2010, then remained about the same in 2011 as in 2010. Gas use continued at high levels during this time. Imbalances and fees in 2012 were similar to 2011 through October, but increased significantly after that. Imbalances and fees remained high throughout 2013. As noted in the Findings section, these fees were higher after loss of the relatively liberal tolerances available under the transportation contracts associated with the gas supply contracts [redacted].

NS Power reports that M&NP-CA reports gas transportation from the U.S.-Canada border to Tufts Cove differently from transportation from the pipeline inlet at Goldboro to Tufts Cove. That difference explains the two lines for Interruptible Transportation that appear in the tables.

(The following tables are confidential)

2012 Pipeline Imbalances

[redacted]

2012 Pipeline Imbalance Fees

[redacted]

2013 Pipeline Imbalances

2013 Pipeline Imbalance Fees

2. NS Power has continued to manage fuel oils effectively.

Comparison of HFO consumption and inventory data for Tufts Cove shows that, even though consumption has declined considerably from what it was in 2009, inventories have not risen. Similarly, at the other stations, inventories have not risen, even though use varied over the two years of the Audit Period. These measures indicate effective management. The same observation holds true for furnace oil. Consumption varied considerably over the Audit Period, but inventories have remained within a narrow range.

Diesel Fuel is the one LFO for which there is considerable storage (over five days at maximum consumption at Burnside, for example). In 2013, consumption outpaced purchases, allowing inventories to decline to about four days' consumption. Inventories have been maintained at Tusket and Victoria Junction, as those locations have less storage, and are more remote than Burnside.

NS Power maintains relatively large inventories of diesel fuel for reasons of reliability. The turbines at Burnside are the Company's "last resort" for dealing with contingencies. In winter, when demand for power is highest, NS Power would be competing with users of heating oil for the trucking service required for replenishing inventories. To avoid that, the tanks are filled going into the winter.

3. The natural gas hedging program was costly in 2012. *(Chapter II, Recommendation #3)*

In the first four months of 2012, the benchmark price for natural gas in North America, the Henry Hub price, fell to lows that had not been seen for 15 years, as a warm winter and the shale gas boom combined to drive prices lower. NS Power had hedged its gas purchases at Henry Hub, so the hedges added to its gas costs, rather than decreasing them. In the second quarter of 2012, NS Power paid more in settlement of its hedges than it did for the gas commodity that it purchased, even though gas use was high.

The last FAM audit report noted that, "Hedging provides benefits when prices are increasing, but increases costs when prices are falling,"[1] as they did through 2010, 2011 and the first quarter of 2012. The price impacts become magnified when over-hedged positions are not reduced. Over-hedged positions were reduced in 2013, but the principal reason for reduced losses was the increasing price at the Henry Hub.

Liberty concludes that management of the gas hedging program during the Audit Period was not strong, but a larger problem was the Company's failure to revise the program in a timely way. An appropriate remedy for that failure was presented as Recommendation #3 in Chapter II.

D. Recommendations

Liberty has no further recommendations in this area.

[1] The Liberty Consulting Group, *Audit of Nova Scotia Power, Inc.'s Fuel Adjustment Mechanism for 2010-2011*, filed July 10, 2012, as Exhibit N-22(C) in Matter No. M04972, *In the Matter of an Application by Nova Scotia Power Incorporated for Approval of Certain Revisions to its Rates, Charges and Regulations, including the review of the Fuel Adjustment Mechanism Audit.* See page VII-14.

VIII. Power Plant Performance

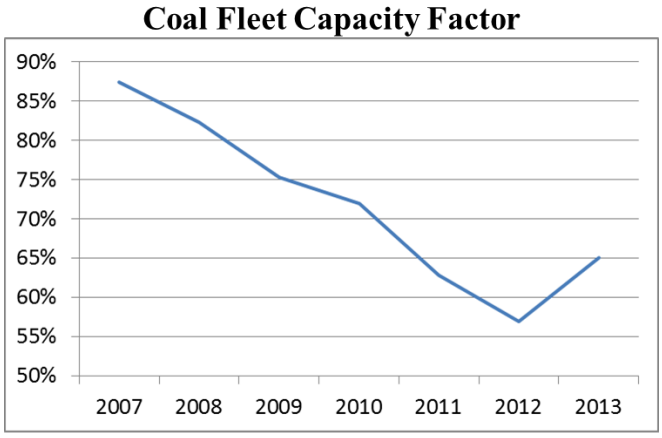
A. Background

1. Introduction

A number of industry trends have been affecting coal-fired generation throughout North America. These trends include: (a) declining natural gas prices, (b) requirements to use renewable energy that frequently displaces base load coal-fired units, and (c) continuing pressure to minimize the environmental impact of coal burning. The result has been a significant and continuing decline in coal-fired generation, with plants being retired or dispatched less frequently. The North American trends have also been present in Nova Scotia.

While the "green" benefits of these trends are positive, they come at a price, not the least of which is an effective loss-of-use of some of NS Power's base load generating capacity. Base load units generally have a higher initial (capital) cost, which is justified by the anticipation of substantial generation at low fuel costs. Accordingly, such units are expected to be on line and at full power most of the time. They are specifically designed for such operation, and they are built with the presumption that the more they run the more benefits they provide for customers.

This paradigm has changed, however, not only in Nova Scotia but throughout North America. The accompanying chart of capacity factors for NS Power's coal fleet makes the results evident. The large initial and continuing investments in these plants impose revenue requirements for decades, even as their output continues to decline. The question for this FAM audit is the degree to which the Company is effectively managing its production resources and associated energy costs during this transition to reduced use of certain key generation assets.



Source: DR 63, Attachment 4

Liberty has conducted many reviews of the effectiveness of power plant management. Through the years, we have developed and sought to apply a consistent set of criteria upon which to judge the effectiveness of utility management. Those criteria generally conform to a well-managed utility's own expectations, as well as those of its regulators. The changing industry use of coal-fired units, however, makes it timely to revisit those expectations for utilities, like NS Power, whose generation portfolio is heavy on coal.

2. New Expectations

We will review the key elements of power plant performance in detail, but first we see to lay a sound foundation for that evaluation. This foundation consists of evaluation criteria, expectations, standards, and other descriptions relating to performance, but they all mean the same thing: the set of rules by which management can be fairly judged.

Society's commitment to greener generation which directly displaces coal, the abundance and competitiveness of natural gas, a significant slowdown in electric load growth, and relentless environmental pressure on coal units have produced a solid trend that is not likely to be abated; rather it increasingly appears headed toward a seemingly inevitable conclusion. That conclusion will take longer to reach, perhaps many decades, in some jurisdictions even while it has already been reached in others. Ontario is a notable example.

The test of management is therefore not how it facilitates or resists these trends, but how it optimizes the value of its resources for the benefit of its customers within this new framework. The investments in the generation fleet comprise "sunk costs" that may remain in rates far into the future, regardless of how often those plants run or how effectively they produce power. Retiring a non-productive unit early may be appropriate in some circumstances, but the remaining capital costs associated with that unit remain to be addressed.

The future of NS Power's coal units and the eventual choices of what type of generation will replace them fall outside the scope of this audit. NS Power has recently started an Integrated Resource Plan that may answer the difficult long-term questions. That study will have a great influence on the evolution of NS Power's fleet and the role for embedded costs in determining a future generation mix. In the meantime, the challenge to manage the existing fleet in changing times will be difficult. Our focus is on how NS Power has adapted to this challenge, specifically as evidenced in its management actions and results in 2012-2013.

3. Study Scope

Liberty's principal objective in this analysis was to evaluate NS Power's power plant performance as it relates to costs associated with the FAM. We concentrated our efforts on the large units, including all of the coal fleet and the three gas (and at times oil) units at Tufts Cove (Units 1-3). We examined Units 4-6 at Tufts Cove on a more limited basis.

Our analysis addressed the following specific areas of power plant performance:

- Unit performance as measured by the traditional metrics applied to power plants: These measures include capacity factor, forced outages, planned outages, availability, and heat rates.
- Outage management: The steps the Company takes to plan and manage its outages for minimal cost and downtime.
- OM&G costs: The annual costs to operate the units and the manner in which NS Power manages them.
- Capital investment: The degree to which the Company is making sufficient investment in the units.

- Trenton 5 incident: A major incident at Trenton 5 in 2012 made the unit unavailable for 7 months, causing costs for repairs and replacement power; we examined the circumstances surrounding the incident and the associated costs.
- Tufts Cove 4-6: Problems at the new combined cycle operation continued; we examined how these problems occurred and how the added cost should be treated.
- Plant visits: Prior Audit included examinations at the sites of all of the fossil fleet; because these visits occurred only two years ago, we visited only those where new developments made a visit beneficial.

4. NS Power's Thermal Fleet

Our analysis is focused on the large thermal units in NS Power's generation fleet. The fleet consists primarily of coal units ranging in age from 20 to 45 years. For coal units of this size, this portfolio does not exhibit comparatively advanced age. Averages of 50 years typify North American experience.

The newest addition to the fleet is the biomass unit at Port Hawkesbury. The unit provides steam to the on-site paper mill as well as 52 MW. It lies adjacent to the Point Tupper unit, and shares many resources with that plant.

Plant	Nameplate Capacity (MW)	In Service Year	Fuel Type
Lingan Unit 1	153	1979	Coal / Petcoke
Lingan Unit 2	153	1980	Coal / Petcoke
Lingan Unit 3	153	1983	Coal / Petcoke
Lingan Unit 4	153	1984	Coal / Petcoke
Tufts Cv Unit 1	81	1965	Oil / Natural Gas
Tufts Cv Unit 2	93	1972	Oil / Natural Gas
Tufts Cv Unit 3	147	1976	Oil / Natural Gas
Tufts Cv Unit 4 (LM 6000)	49	2003	Natural Gas
Tufts Cv Unit 5 (LM 6000)	49	2005	Natural Gas
Tufts Cv Unit 6 (LM 6000)	49	2012	Natural Gas
Pt Tupper	152	1973	Coal / Petcoke
Pt Aconi	172	1994	Petcoke / Coal
Trenton Unit 5	152	1969	Coal / Petcoke
Trenton Unit 6	155	1991	Coal / Petcoke
Port Hawkesbury Biomass	52	2013	Biomass

Source: NSPI Annual FAM Report

All of NS Power's coal units employ conventional technology, with the exception of Point Aconi, which uses a circulating fluidized bed (CFB) in its boiler. This early version of "clean coal" technology has significant environmental benefits, but entails more complex operations, including the need to feed limestone into the boiler.

NS Power originally intended that several of the units burn oil, but converted them as changing fuel economics indicated. The Company converted Point Tupper to coal in 1987. It converted Tufts Cove 1-3 to allow gas firing, as well as oil, in 2000. The low gas prices of recent years had caused the units to depend predominantly on gas, but oil use became more prevalent when gas prices spiked in 2013.

The Tufts Cove 4 and 5 units consist of large gas turbines (GE LM6000), which are in widespread use in the industry. Evolving technology has allowed such units to reach higher efficiencies than in the past. Low gas prices led to much higher usage of the turbines recently. All such units, despite their relatively high efficiency, fail to make use of considerable energy that takes the form of exhaust heat. NS Power recently constructed Tufts Cove 6 to recapture some of the energy lost this way. This new unit takes the waste heat from the turbines, and uses

it to make steam to run the Unit 6 turbine. The change essentially provides free fuel for 25 MW. The unit can generate another 25 MW by burning gas to increase the energy in the waste stream.

B. Findings

1. Analysis of Unit Performance

a. Performance Data

i. Data Sources

The Generator Availability Data System (GADS) and the Equipment Reliability Information System (ERIS) make performance data for power plants available. The North American Electric Reliability Corporation (NERC) manages GADS. The Canadian Electricity Association (CEA) manages ERIS, but its population of plants is far smaller.

The GADS database provides a valuable source of information, but NERC apparently does not agree. It has discontinued the availability report with the 2011 update. The industry data is therefore two years old, and will not be able to fulfill its purpose much longer. With so many units declining so quickly, the available data will surely become outmoded in the next year or two, unless updates are once again published. Based on our conversations with NERC, we do not sense any interest in their addressing the issue. The website continues to sit dormant, providing old data.

ii. Performance Factors

Power plants participating in GADS offer substantial data defining their operations. We focused on the basics:

Availability *Forced outage rate* *Capacity factor* *Heat rate*

Availability factor (AF) represents the percentage of time the unit was available for service, regardless of load.

$$\text{Availability} = \frac{\text{Hours the unit is capable of operating}}{\text{Total hours}}$$

Many units require an outage of two to three weeks every 12-18 months. These outages make an availability factor in excess of 95 percent difficult to attain, making that level an indicator of very good performance. A more attainable target is the lower 90s. Older coal units of the NS Power size generally exhibit AFs in the high 80s.

The forced outage rate (FOR) measures the time that the unit is in a forced outage condition when it would otherwise be expected to be running. This means that any hours in which the unit is shut down for economic reasons or planned outages are excluded from the calculation. As a result, the FOR at units that operate infrequently may appear very high, because the denominator is much lower than a highly utilized unit. For base load or near base load units, one should expect lower rates, perhaps five percent on average.

$$\text{Forced Outage Rate} = \frac{\text{Hours in a forced outage condition}}{\text{Synchronized hours} + \text{Forced outage hours}}$$

The de-rating adjusted forced outage rate (DAFOR), also known as the equivalent forced outage rate (EFOR), adds the hours in which the unit is online, but forced to operate at reduced load. This measure is favored by NS Power.

$$\text{De-rating Adjusted FOR} = \frac{\text{FO Hrs + Equiv. Forced De-rated Hrs}}{\text{FO Hrs + Equiv. Forced De-rated Hrs + Synchronized Hrs}}$$

Capacity factor (CF) perhaps supplies the economically most important indicator for a base load unit. Such units are expensive to build, and their effectiveness in justifying the original investment will depend on how much they produce. Large, efficient base load coal plants tend to have capacity factors in the 80 percent range; high performing units can range higher. Since the nature of coal plants causes them more partial de-ratings than many other types of plants, they are unlikely to have capacity factors approaching their availability.

$$\text{Capacity Factor} = \frac{\text{MWh of Generation}}{\text{Unit Capacity X 8,760}}$$

The efficiency of a power plant is defined as its heat rate (HR), which measures the amount of energy input to the unit that is required to produce one unit of electricity. Note that HR is inversely proportional to efficiency; *i.e.*, a higher heat rate means a lower efficiency. HR represents a critical parameter; any change in heat rate has a corresponding change in unit output and fuel cost.

$$\text{Heat Rate} = \frac{\text{BTUs of Heat Energy Input}}{\text{kWh of Electric Energy Output}}$$

b. Availability

In order to fully understand NS Power's performance in maintaining its fleet as available and ready to run, we looked at several factors:

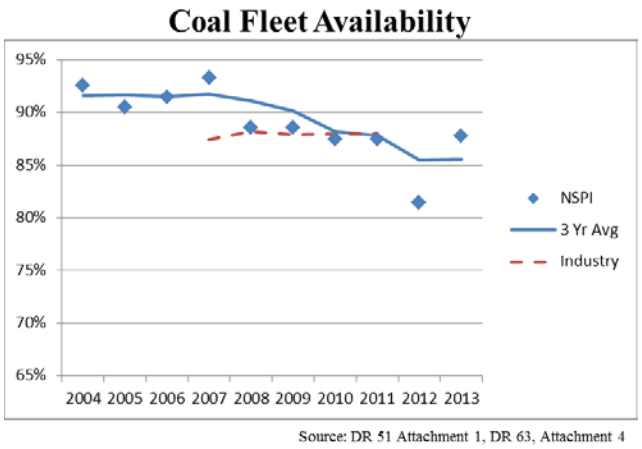
- The bottom line availability factor
- Forced outages and the de-rating adjusted forced outage rate
- Planned outages.

Industry patterns for units similar to NS Power's fossil plants indicate that availability factors average in the upper 80th percentiles. Traditionally, reaching levels as high as possible has been the goal for operators in the industry. Recent industry experience, however, makes it appropriate to consider whether that remains an appropriate goal. One can question the wisdom of spending large sums and effort to maximize availability. The changing role of coal as a source of electricity, however, can make this question an appropriate one.

A decline in availability may no longer represent a necessarily bad outcome for coal units, although acceptance of that result would have been nearly unheard. Conversely, producing a very high availability factor through high spending may no longer be effective economically. The new strategic view needs to seek optimization, rather than simple maximization, of availability, as opposed to maximization of availability.

We found NS Power aware of the appropriateness of a shift in thinking about the availability of its fossil units. Two examples exemplify this shift. First, we observed an increased willingness to allow outages to extend provided that: (a) expediting completion of the outage would impose

additional costs, and (b) those added costs would not be offset by lower cost energy from the out-of-service unit.



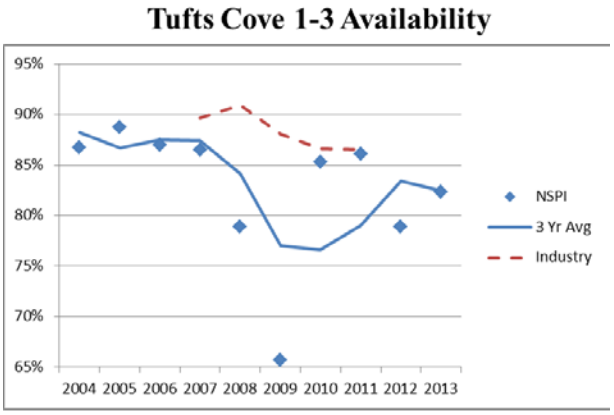
Source: DR 51 Attachment 1, DR 63, Attachment 4

Second, we observed a sense that the Company considers the timing of a unit's availability more important than its availability across a full year. For example, 80 percent year round availability may prove less critical than winter month availability approaching 100 percent. The more critical measure has much to do with unit running costs, which makes the issue more likely applicable, for example, to Trenton 5 than to Trenton 6. In any event, it has clearly become more important to focus not solely on possible decline in annual reliability, provided that: (a) the peak months remain protected, and (b) the cost penalties for lack of availability in the off-months are zero or minimal.

i. Availability Factor

Coal unit availability has declined in recent years. Performance peaked in 2007, and before that, at above 90 percent, exceeded industry averages. Availability has since been under 90 percent, but at about the same as the industry. The 2012 Trenton 5 outage contributed significantly to that drop. Excluding the effects of that outage would produce for the past six years a roughly flat amount in the high 80th percentiles. Perhaps the most significant observation is that 2007 marked the beginning of declining capacity factors at NS Power. One would expect availability to decline with more frequent cycling of the units.

The accompanying chart shows that performance of the three Tufts Cove gas boilers has been somewhat erratic in recent years. Fairly stable levels before 2007 gave way to lower availabilities (extreme in several years). Tufts Cove 2 and 3 have each averaged less than 80 percent availability from 2008 through 2013. One or two prolonged outages can drive availability down significantly, but it is noteworthy that these units fell beneath 80 percent in three and four of the six years, respectively.



Source: DR 51 Attachment 1, DR 63, Attachment 4

Unit Availability

	2010	2011	2012	2013
Lingan 1	81%	97%	94%	86%
Lingan 2	91%	90%	64%	87%
Lingan 3	96%	92%	88%	93%
Lingan 4	98%	89%	94%	94%
Tufts Cove 1	94%	83%	85%	99%
Tufts Cove 2	92%	90%	75%	64%
Tufts Cove 3	70%	85%	77%	84%
Trenton 5	66%	92%	35%	85%
Trenton 6	86%	94%	92%	87%
Pt. Aconi 1	88%	88%	88%	92%
Pt. Tupper 2	95%	57%	96%	78%

Source: DR 51 Attachment 1, DR 63, Attachment 4

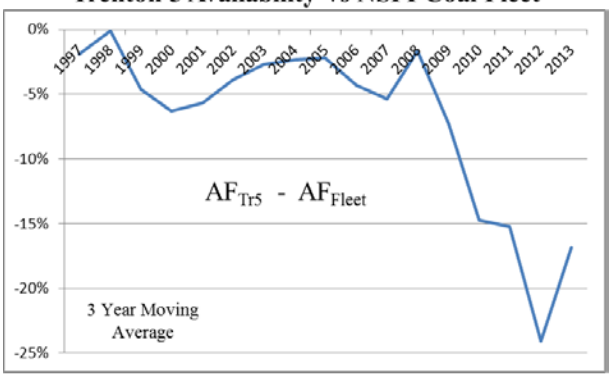
Very High >90%

Very Low <80%

We concluded in the last audit that overall thermal fleet availability had been good, but expressed concern about then-recent trends. A comparison of each unit's availability for the two audit periods suggests that the warning signals arising from recent trends remain. The accompanying table shows that the current Audit Period exhibited few units at the high (green) range and more at very low levels (among the red blocks).

Considering the data collectively, availability can be considered average compared to industry data. On an individual unit basis, however, attention falls particularly on Tufts Cove and Trenton. Tufts Cove 1-3 availability has been weak since 2007.[1] Trenton 5 has lagged for a long time. The accompanying chart illustrates the degree to which Trenton 5 has under-performed the balance of the coal fleet. Across 17 years, the unit has equaled the performance of the rest of the coal fleet in only three. The major deviations since 2008, while significant, may not be as illuminating as the unit's weak comparative performance over what is now a very long period of time.[2]

Trenton 5 Availability vs NSPI Coal Fleet

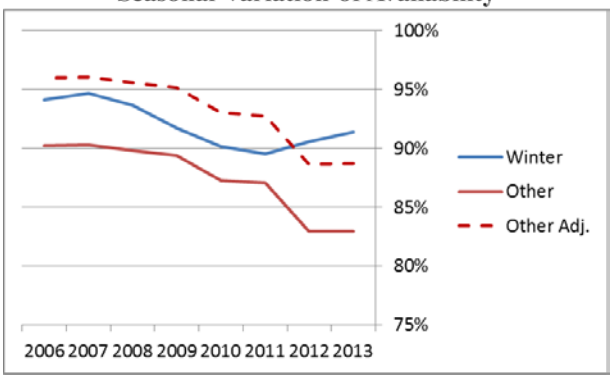


Data Source: DR 63, Attachment 4

We examined availability not just across the full year, but in the winter-month period. We constructed the next chart using the following assumptions:

- The peak months in each year were assumed to be January, February, March and December with the other eight months considered off-peak.
- Outages are never planned in the peak months, thus requiring adjustment for the off-peak months; we therefore added back two weeks of available hours during the eight-month period (which raises the AF by 5.8 percent).

Seasonal Variation of Availability



Data Source: DR 63, Attachment 4

[1] The Company notes that Tufts Cove Units 2 and 3 underwent significant life extension work in response to a third-party assessment, which "significantly contributed to the availability of TUC 2 and TUC 3 in 2012/2013."

[2] The chart depicts a three-year moving average, which masks the two higher availability years in 2011 and 2013, given extremely low availability in 2012.

Interestingly, the notion of a particular focus on winter months does not appear from the data to exist. After our adjustment, non-peak availability was actually higher, except for 2012 and 2013 (where the Trenton 5 data distorts the results). Nevertheless, winter availabilities have improved in the last two years. This change reflects meaningfully positive results.

Overall, we continue to believe that recent availability trends continue to call for attention. On average, NS Power's availabilities remain in line with the industry, and the data indicates conformity with the new environment in which coal units operate. Some units, especially Tufts Cove, however, bear closer attention.

ii. Forced Outages

The forced outages rates of both Trenton units exceed both: (a) the industry average number of outages, and (b) the time that the units remained unavailable due to forced outages. The other coal units (see the next table) generally showed consistency with overall industry performance. The Trenton 5 data raises particular concern, because the data presented understate the issues it has experienced. Trenton 5 suffered a seven-month outage in 2012 due to the major operating incident (discussed later in this chapter). This affects consideration of the forced outage data in the following ways:

- NS Power classified only about the first month of the outage as "forced," recording the remaining six as a planned outage. The 1,593 "hours out" does not consider those added six months, thus understating the number on the table by thousands of hours. The Company considers its classification correct based on Canadian Electricity Association ground rules, but such a classification here masks an important point. This unit was out of service and the outage was not an option. The unit was unavailable due to forced circumstances.
- With the unit out for 7 months, it had only far less time than the other units to accumulate forced outages, yet still exceeded them.
- Very surprisingly, if the incident-driven outage is removed (695 hours), Trenton 5 still remained the worst performer in the Audit Period (from the perspective of number of hours out).

Coal Unit Forced Outages versus Industry Data (2012-13)

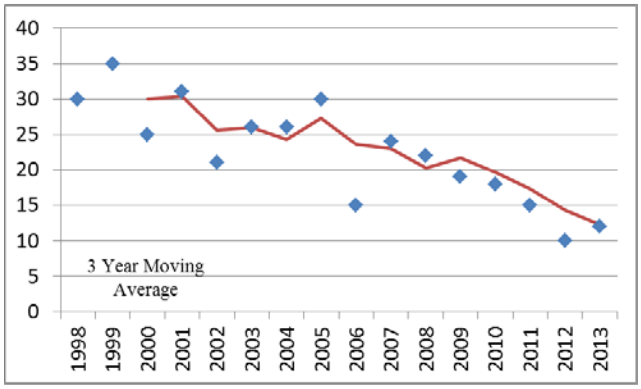
	Coal 100-199	Lingan 1	Lingan 2	Lingan 3	Lingan 4	Trenton 5	Trenton 6	Point Aconi	Point Tupper
Forced Outages	12.4	11	8	15	7	17	18	5	3
Hours Out	630	892	305	296	40	1,593	701	143	162

Source: 2012 and 2013 NSPI FAM reports

A closer examination of the 17 forced outages at Trenton 5 led to a number of observations. Specifically, five boiler tube leaks occurred within about a year after the unit's return to service. We found this result unusual, given NS Power's excellent performance in reducing boiler tube leaks throughout the remainder of the fleet, which averaged a little over one boiler tube failure per unit-year. The five BTFs at this one unit are striking.

The 2012 Trenton 5 incident resulted in salt-water intrusion, which necessitated the lengthy outage (in part, to clean the boiler, feedwater, and condensate systems). Continuing and long-term tube failures triggered by the initial chemistry problem comprise a major risk of such intrusions (hence the reason for a thorough cleaning). Management had reported to Liberty that it did not consider this risk problematic and that the Company's metallurgical consultant reported to management that the failures were not related to the 2012 intrusion.

Annual Boiler Tube Failures



Data Source: DR 63, Attachment 4

The Company revised its position after reviewing a draft of this report. NS Power reported that its consultant did associate the failures of at least two tubes to the intrusion incident. Further, subsequent failures in a feedwater heater were also attributed to the event by another Company consultant. This revised information underscores Liberty's initial concerns that the effects of the Trenton 5 incident may continue to impose costs well into the future.

The concern about Trenton 5, while important, should not obscure what otherwise has been a strong level of performance with respect to tube failures. The tube failure chart above shows an overall decline since 2007, which corresponds with the advent of lower capacity factors. One would ordinarily expect more tube failures when units cycle more frequently. The fact that the opposite result was obtained indicates that management initiatives in addressing such leaks have produced strongly positive results.

Forced Outages at Tufts Cove 1-3 versus Industry Data

	Gas 0 - 99 MW	Tufts Cove 1	Gas 100-199	Oil 100-199	Tufts Cove 2	Tufts Cove 3
Forced Outages	3.3	10	6.0	4.6	14	10
Hours Out	892	577	568	297	823	175

Source: Calculated from NSPI FAM 2012 and 2013 Reports

We also examined the comparatively high forced outage rates Tufts Cove. We have less confidence in the significance of comparative industry data for small gas units. Nevertheless, the number of outages (and for Unit 2, the number of hours out) are substantial.[3, 4]

Forced Outages at TC 4-5 versus Industry Data

2012-13	Gas Turbines - GADS		TC4	TC5
	20-49 MW	50+ MW	49.5 MW	49.5 MW
Average Age	40	25	11	9
Forced Outages	5	6.2	49	43
Hours Out	824	424	794	673

Source: Calculated from NSPI FAM 2012 and 2013 Reports

The LM-6000 units at Tufts Cove 4 and 5 have also had significant reliability issues. We discuss the problems at Tufts Cove below in this chapter.

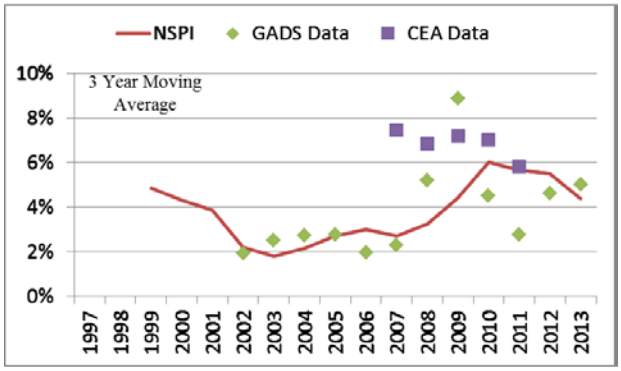
[3] The Company believes that Tufts Cove Units 2 and 3 have performed given the number of two shifts and the "associated value they have delivered for many years." We note however that the service seen by the Tufts Cove units is not likely to be substantially worse than the industry units to which it has been compared.

[4] The Company notes that a portion of these outages resulted from leaks caused by bio-fouling of the condensers, and that a significant investment has been made to reduce such issues.

iii. Forced Outage Rates

Our last FAM audit report focused on forced outage rates (FOR). NS Power has based most of its reports on a forced outage rate adjusted for de-ratings, or DAFOR. In GADS terminology, DAFOR is equivalent to the effective forced outage rate (EFOR). A FOR rate considers only two alternatives; *i.e.*, the unit is on or off. For example, if a unit loses a mill and is forced to run at 50 percent output, a simple FOR calculation does not count that circumstance as an outage. The reduction, however, does count in DAFOR or EFOR calculations. The analyses that follow use DAFOR, as applied by NS Power.

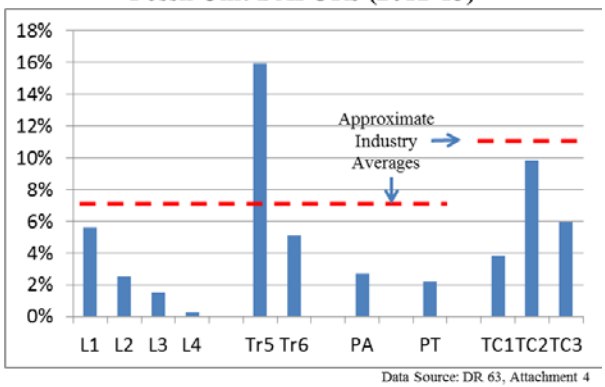
Coal Fleet DAFOR



Data Source: DR 63, Attachment 4

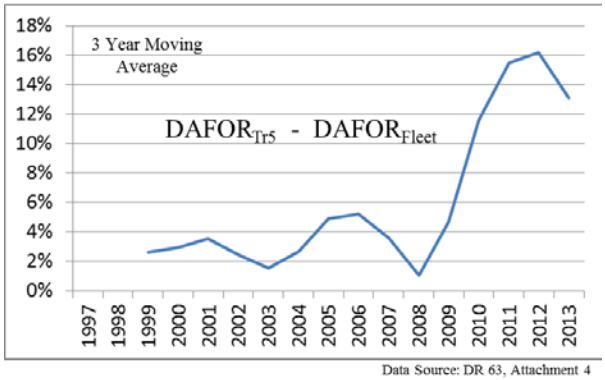
The data on the accompanying chart indicates the long-term DAFOR performance of NS Power's coal fleet. The Company has compared this data to CEA data. We have added the GADS data for 2007-2011. We prefer the GADS data, which comes from a much larger data base, and permits analysis on the basis of similarly sized units. GADS includes data from over 200 coal units of sizes similar to the NS Power fleet. The Company's data is about in line with the Canadian data and superior to the U.S. data. Again, note that NS Power has treated much of the 2012 Trenton 5 outage as "planned," which thus means inclusion of only a small part of that outage in DAFOR statistics. The erratic DAFORs for Tufts Cove 1-3 (not shown) show no patterns through the years; they fluctuate in an average range of one to nine percent. The GADS data exceeds 10 percent in recent years, meaning again that NS Power units perform better than average versus the American data. The Canadian data (which applies to the total fleet, as opposed to just gas units) is lower, causing NS Power units not to look as good in comparison. We consider the GADS comparisons more meaningful.

Fossil Unit DAFORs (2012-13)



Data Source: DR 63, Attachment 4

Trenton 5 DAFOR vs NSPI Coal Fleet



Data Source: DR 63, Attachment 4

In examining individual units, only Trenton 5 stands out, with all other units beating our approximation of the GADS averages. Coal unit performance has been especially good with five of the eight units in the zero to three percent. All but Trenton 5 performed better than the industry average. The gas units are higher than coal, but they, too, beat the averages.

We do not believe that Trenton 5 performance should be viewed as an anomaly. The unit's performance is: (a) worse than shown due to the classification of the major outage as largely "planned," and (b) Trenton 5 has long been a sub-par performer, comparing its DAFOR against the other NS Power coal units. As we saw with availability, Trenton 5 has also trailed in DAFOR performance for many years. The accompanying DAFOR chart tracks the earlier availability factor chart, showing that Trenton 5 has always had a DAFOR that is higher than the rest of the coal units by several points. That differential has grown in recent years.

iv. Forced Outage Costs

Costs for replacement power at NS Power are primarily a function of: (a) the lost unit's fuel costs, and (b) the time of year. When a low cost unit becomes unavailable during the peak season it produces the greatest cost penalty. A high fuel cost unit down in the off-peak season will produce least. NS Power has provided its estimate of the costs associated with forced outages during the Audit Period. As discussed later under the Trenton 5 section of this chapter, Liberty does agree with NS Power's calculation method. That method produced results showing that forced outages actually produced economic benefits in 22 of the 54 forced outages for which the Company prepared estimates.

v. Planned Outages

The average coal unit normally goes off line for about three weeks per year for planned maintenance and improvements, but large variations form this norm typically occur. Major overhauls, required occasionally, or outages for major capital improvements require much longer outage durations. Inspections of major equipment can also identify serious problems, thus necessitating a longer outage duration than planned.

The effective completion of a planned outage is a function of good planning and management of the execution of the work. We reviewed NS Power's programmatic approach to planning and managing outages in the "Outage Management" section later in this chapter. In the meantime, we will discuss the results achieved by NS Power in 2012-2013. NS Power has initiated many improvements in the planning and management of outages. Those efforts are beginning to show in improved performance.

Our prior analysis of outage performance began by examining planned outages whose completions were delayed by at least one week. This approach recognizes that surprises tend to come up during outages; therefore, completion of work within one week of the target is, in our experience, generally reasonable. This standard has particular relevance for companies similar to NS Power. Specifically, the incremental cost of outage delays is not always sufficient to justify added expenditures to accelerate work to meet a planned end date. Utilities plan outages for off-peak months, during which sufficient low-cost power is generally available to replace the generation lost, thus producing minimal cost effect.

The next paragraphs summarize the major outage delays that occurred in the current Audit Period.

Point Tupper (2013): The worst performing outage in this Audit Period involved the same unit and the same piece of equipment as NS Power experienced in the prior Audit Period. The Company planned that prior (2011) Point Tupper outage to repair the generator, but also found turbine blade cracks. NS Power ended up replacing high and intermediate pressure blades. In addition, the Company replaced low-pressure erosion shields on a planned basis. As a direct result of the 2012 Trenton 5 failure, NS Power examined Point Tupper's last stage erosion blades in 2013. The examination found "significant degradation," with the result that a planned three-week outage stretched to 13 weeks, in order to permit replacement of the shields. Given the issues surrounding the shields, this outcome should not be considered totally unexpected.

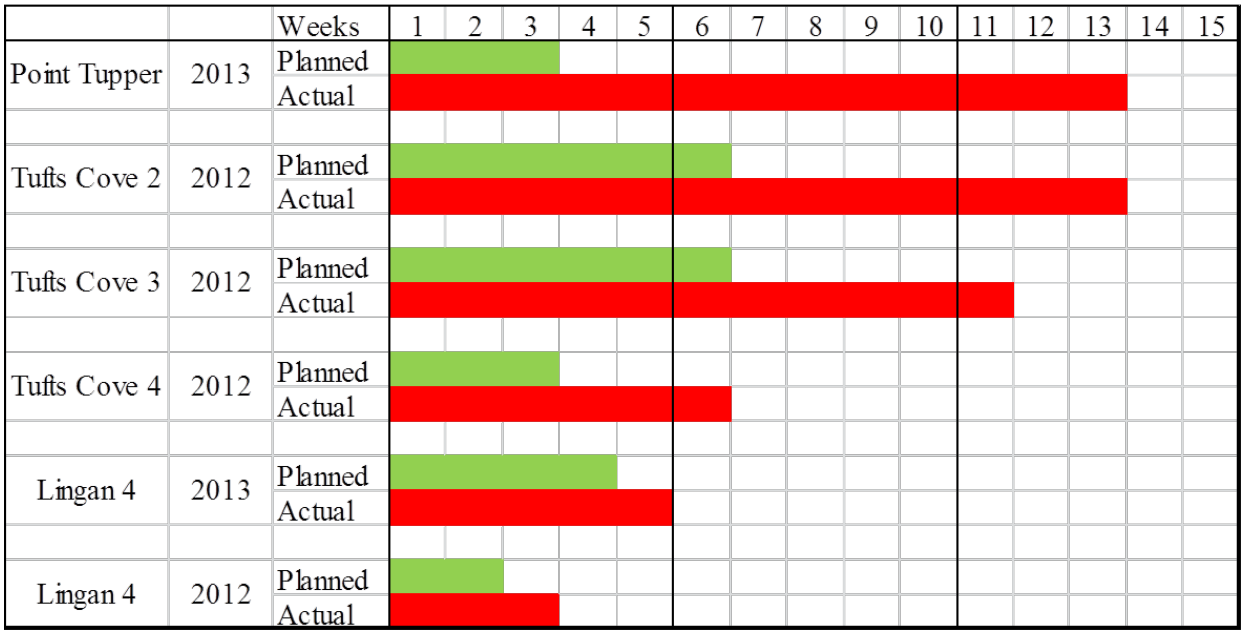
Tufts Cove 3 (2012): This planned six-week outage nearly doubled, reaching 11 weeks. Turbine blade replacements were required in addition to a number of significant capital projects.

Tufts Cove 2 (2012): This outage more than doubled from an initially planned six weeks. The outage included turbine work, with numerous blade replacements. NS Power's delay of the start of this outage until the completion of the Trenton 5 outage pushed completion into the winter months.

Tufts Cove 4 (2012): A scheduled inspection of the LM-6000 showed damage to the extent the unit had to be shipped for repairs, eventually to be replaced by a newly purchased spare.

The chart below illustrates NS Power's performance in 2012-2013.

Planned Outages Extended by 1 Week or More

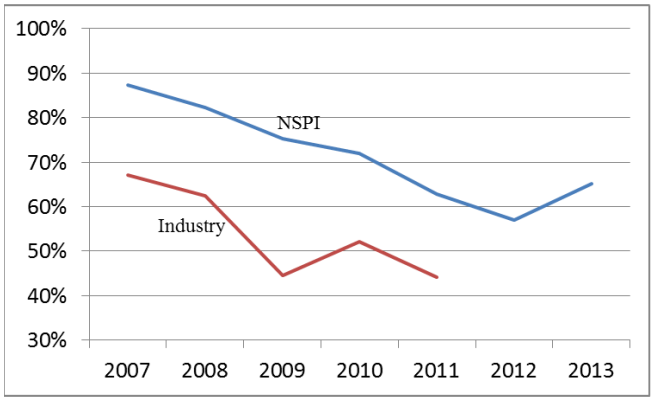


Source: 2012 and 2013 NSPI FAM annual reports

The next table compares prior and current Audit Period performance.

	2010-11	2012-13
Planned outages	19	25
1 week or more late	9	6
% 1 week or more late	47%	24%

Coal Fleet Capacity Factor vs Industry



Data Source: DR 63, Attachment 4 and GADS

The Company conducted more planned outages in the current Audit Period and execution of them went much better from a schedule perspective. The median deviation from the planned duration was zero; *i.e.*, NS Power completed as many outages early as late. Several other planned outages did not occur. Moreover, a planned outage for Trenton 5 became unnecessary in the wake of its prolonged 2012 outage; hence, NS Power classified most of the 2012 Trenton 5 incident-driven outage as planned. We did not include that outage in the assessment of planned outage durations.

c. Unit Output – Capacity Factor

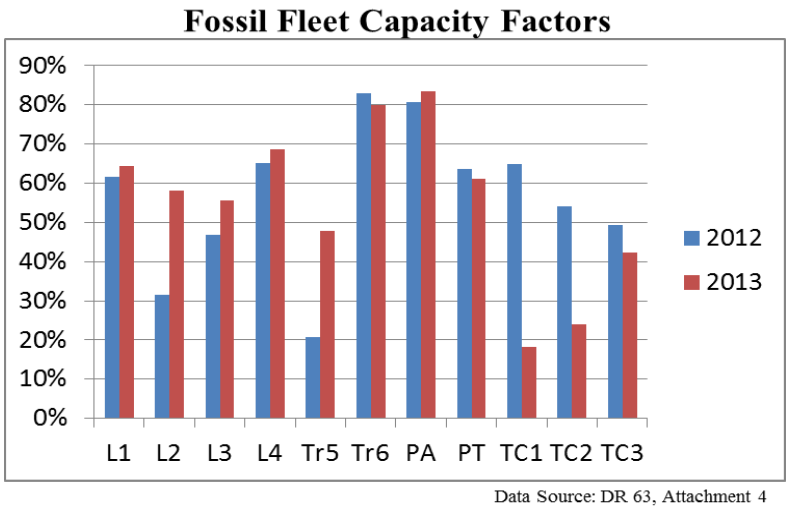
i. Utility Trends

Coal plants throughout North America, and even some nuclear units, have witnessed declining capacity factors for some time now, with some reaching points that have led to their demise. NS Power's plants actually experienced an uptick in 2013. The increase reverses, or perhaps more likely interrupts, the established five-year trend. Our last audit report cited the following factors as then drivers of declining coal usage:

- Increased use of must-run renewables
- Lower gas prices
- Environmental issues
- Low import costs
- Lost load.

An increase in natural gas prices substantially drove the 2013 reversal. This increase affected Nova Scotia relatively severely, going so far as to make oil preferred over gas at Tufts Cove at times. This shift to coal usage is positive in some ways, but did not mean large net cost reductions for customers. Higher coal usage did not result from low coal costs but from high gas prices. The changes in relative prices produced a shift upwards in the dispatch stack and higher costs for customers.

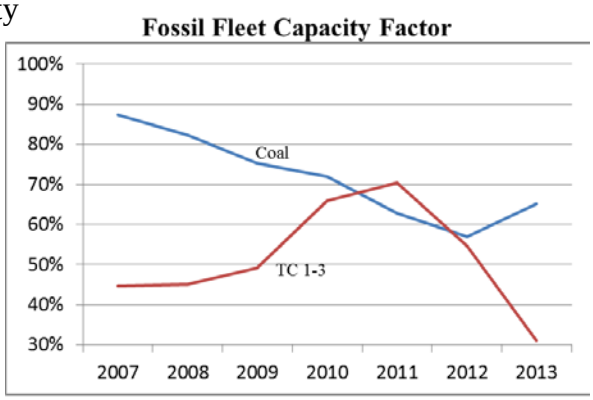
The accompanying chart showing individual unit capacity factors makes clear those units that benefit from the change in the dispatch stack and those that suffer. NS Power placed much greater reliance on the Lingan units in 2013 and less so on Trenton 5. Note, however, that the 2012 Trenton 5 data factor was artificially low. The chart also shows the negative impact on Tufts Cove, but less so for Unit 3, because of its need to provide reactive support.



Data Source: DR 63, Attachment 4

ii. Economic Considerations

The 2013 shift demonstrates the particular sensitivity that NS Power dispatch has to gas prices. Note particularly the overall impact on the dispatchable units. The previously low-cost Tufts Cove units changed dramatically in the dispatch order in 2013. One would ordinarily expect such a shift to produce a major impact on overall running costs and on replacement costs when a unit is unavailable. Consider that Trenton 5 is usually the highest cost base load unit at $40-50/MWh. In 2013, it was elevated in the stack and replaced in the stack by $150 oil at Tufts Cove.

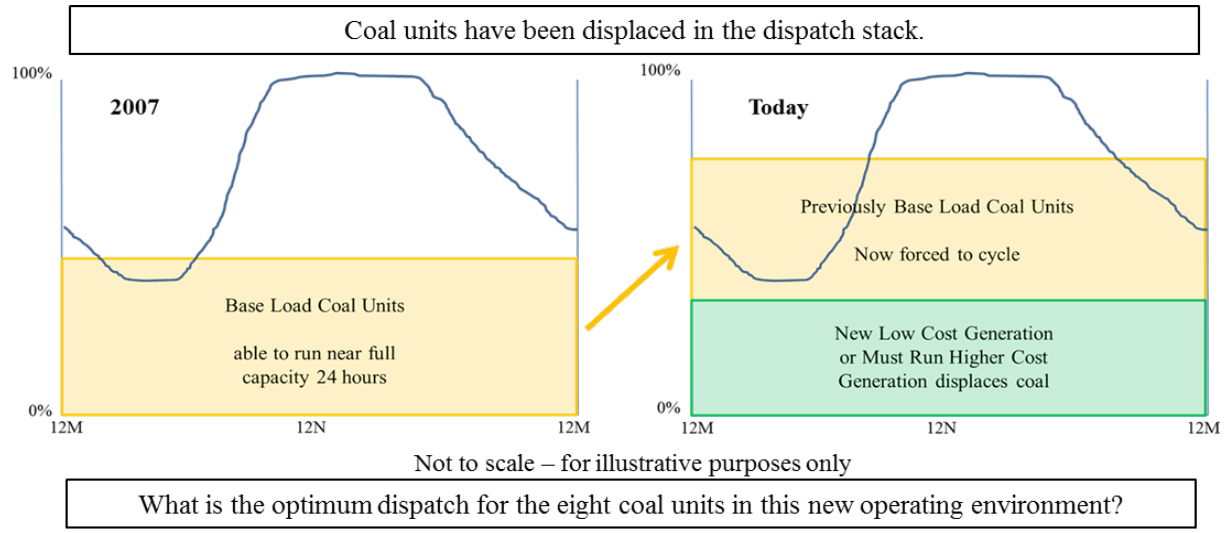


Data Source: DR 63, Attachment 4

iii. Operating Considerations

A continuation of low, and potentially lower, capacity factors will bring consequences. In addition to the obvious economic impact, reduced use of the units triggers other potential problems. NS Power is examining the effects of cycling on the units, in order to develop responsive asset management strategies. In addition, as we will see below, heat rates decline with reduced use. This effect brings additional economic impact. We addressed these factors in the prior report, and now observe a new consideration that is becoming more visible. The challenges of efficiently operating the system are growing as a direct result of lower coal utilization.

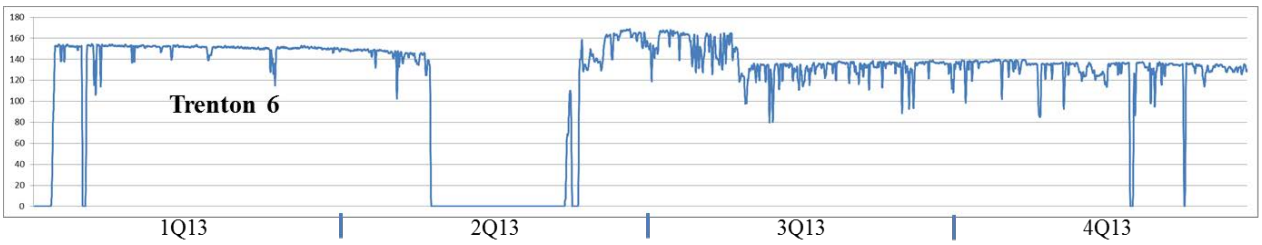
We make this observation on the basis of NS Power's explanations for the constraints it now faces, and from observing the coal fleet's recent operating data. Lower utilization of the coal units has been an observable phenomenon for some time. How one effectively manages that lower utilization is less obvious. NS Power's identification of the necessity to run units out of economic order as a result underscores the importance of the issue. The next diagram's depiction of load (the blue line) across a 24-hour period illustrates the challenge.



In a typical 2007 day, coal units could run at nearly 100 percent around the clock. This explanation is figurative; *i.e.*, not intended to show actual operating levels at any time. The intent is to illustrate the phenomenon that causes coal units to be less used. However, when other units displace coal in the dispatch stack, as illustrated in the "Today" chart, their output must be substantially reduced. The question becomes how to accomplish the reduction optimally. One or more units could be retired, or at least "laid up" for extended periods. A few units could run at near 100 percent, while others either shut down periodically or cycle up and down throughout the day. All the units could be cycled. Rotating shutdowns could be used.

This is an optimization challenge that NS Power's self-described utilization of out-of-merit dispatch to meet minimum load considerations makes important. We refer here to the "minimum load" problem, which describes the need to remove generation at periods of lower load. This need becomes a problem because units can only be reduced to a defined level - their "minimum load." Otherwise, the unit must be taken off line altogether. Consider the annual loading data for Lingan 3, which the chart below depicts. These charts show the eight-hour moving average of hourly unit output for 2013. The unit continuously cycled between 40 and 100 percent load. Plant design did not contemplate this mode of operation, which can thus have unintended, negative consequences. Moreover, this mode of operation likely caused the unit to run out of economic order for many hours (while at minimum load).

The next table shows Trenton 6 data for the same time period.



The unit ran at nearly full output when not shut down, experiencing small and relatively infrequent de-rates (probably for normal operational reasons) or forced (de-rated) outages, as opposed to minimum generation issues. The two charts illustrate the difference between the operationally desired and most economic mode of operation for a base load unit (Trenton 6) versus the opposite (Lingan 3). The questions become how many of the eight coal units can continue to operate as Trenton 6 did, and how many units get reduced to the cyclical operations of Lingan 3. An examination of the corresponding charts for all eight units in 2013 produces the following observations:

- All coal units other than Trenton 6 exhibit the same cyclical patterns as Lingan 3. While the frequency and magnitude of load swings vary slightly, the pattern of operation is clear.
- Of these seven units, the de-rates are smaller (but just as frequent) at Pont Aconi, but only because of the technology of that boiler.

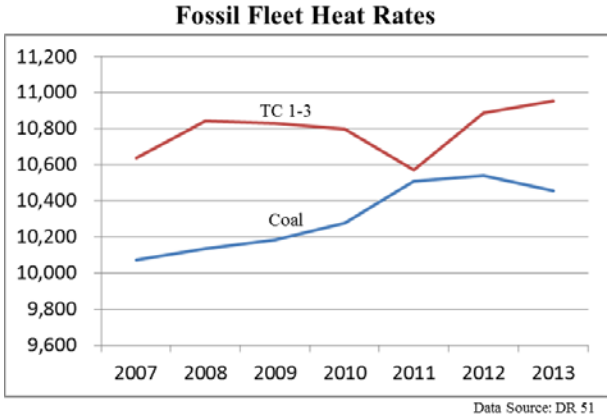
Thus, NS Power appears to be operating seven units running at suboptimal efficiency, with only one functioning as intended. We sought to determine whether any other units were able to run at full load while Trenton 6 was off for much of the second quarter. We observed essentially no change in operating patterns during that period; *i.e.*, every operating coal unit ran in a cycling mode.

This situation is not desirable, but the key question is whether it is avoidable. The available data do not permit an answer at this time. NS Power does not track the hours, magnitude, or reasons for uneconomic dispatch of any of its units. How to optimize coal fleet dispatch requires substantially greater attention by NS Power for operational reasons and for providing important input to the current IRP effort. NS Power has emphasized that it carries out dispatching to support low cost, reliable service. However, the data to conduct the analysis recommended by Liberty does not currently exist at NS Power, as reported by NS Power when Liberty requested such data.

d. Heat Rate

i. Results

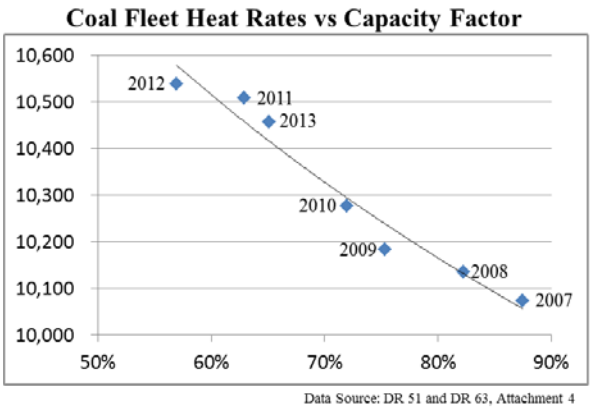
Heat rates at NS Power's coal units appear to have stabilized in the last two years. This stability reverses the previous, adverse trend, and reflects the benefits of changes that the Company has made. We will discuss NS Power's initiatives in this regard below. Higher 2013 capacity factors have also likely contributed to improved heat rates.



The data for the gas units produce a less clear picture, but one surely affected by lower availabilities and big swings in capacity factors. If we consider the 2011 point as artificially low due to very high capacity factors, the curve appears more logical.

ii. Quality of Data and Analysis

Our last FAM audit examined heat rates in detail, particularly considering the reasons for continuing degradation (lessening of efficiency) in the fossil fleet. The accompanying chart shows that decreasing output of the units produced increases in heat rates. We recommended as part of the last audit, however, that it would not be sound to take for granted that capacity factor was the only reason for heat rate degradation. NS Power's broad array of new initiatives has responded to that recommendation.



We recommended then an increased focus on the analysis of heat rates in cycling units, as well as an update to the heat rate standards assumed for each unit. NS Power responded with a significant effort to accomplish both objectives. The Company developed a new set of heat rate curves (heat rate versus unit output) as recommended, and now uses those curves for dispatch purposes. The new curves are superior to those in prior use.

iii. Heat Rate Initiatives

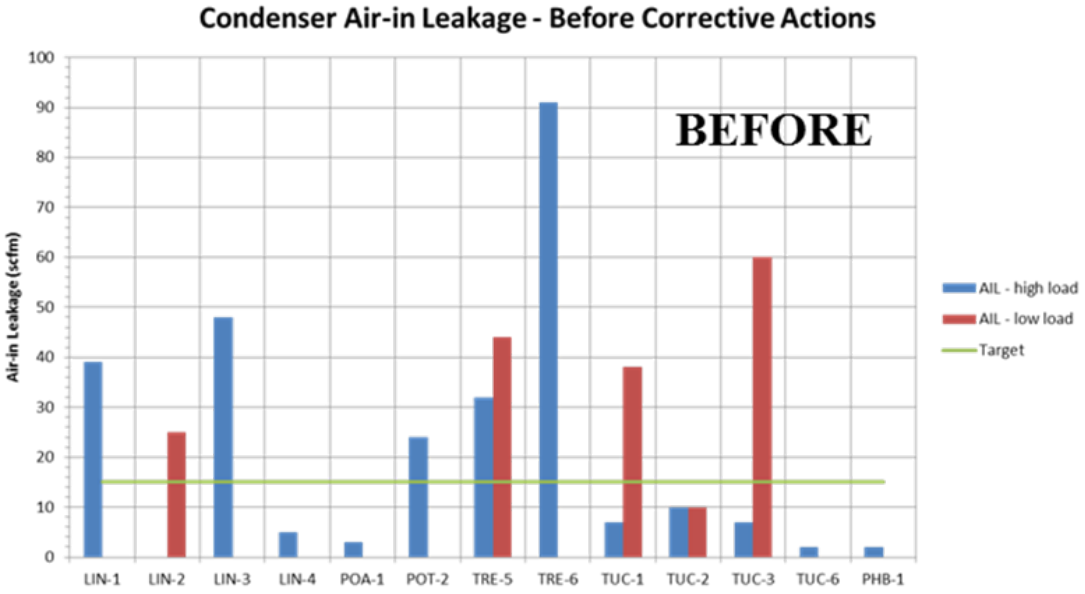
The aging of the units and their declining use likely make a long-term trend of higher heat rates unavoidable. NS Power has nevertheless taken appropriate steps to counter that trend. The Company's recent initiatives include:

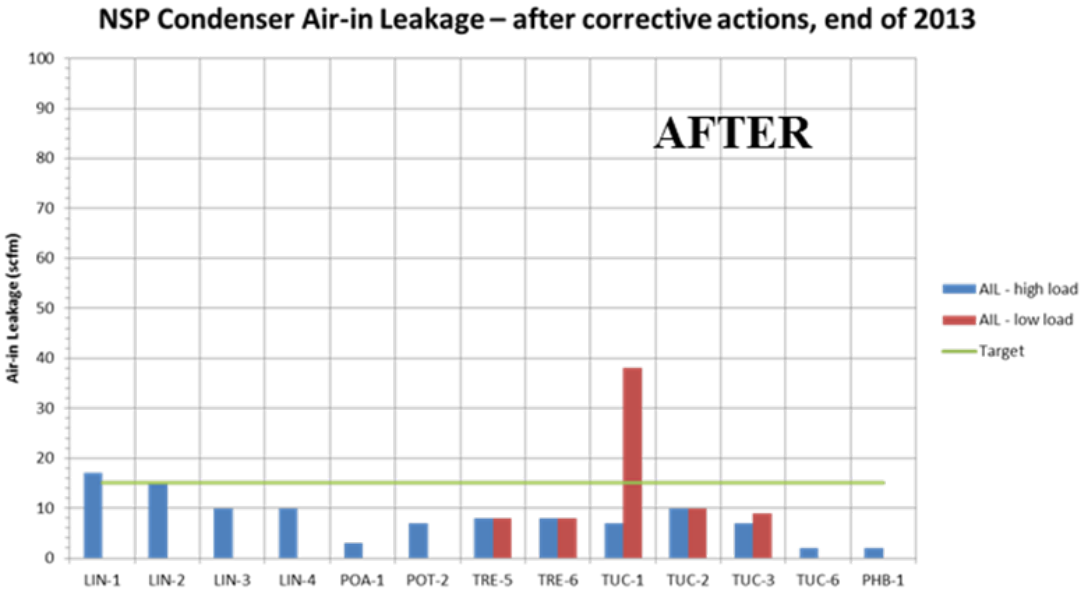
- Monthly heat rate check-ins with the plants
- Heat Rate Action Team
- PMAX (a real-time heat rate monitoring system added at all plants) inspection and optimization with Scientech
- Condenser air-in-leakage monitoring and reduction program
- Condenser flow assessments
- Turbine periodic performance testing
- FW heater periodic performance testing
- Turbine steam path audit (TUC-2 complete; plan for POA in 2014)
- Boiler combustion testing and optimization.

The next charts illustrate the before and after associated with one of the above initiatives (condenser air-in-leakage). The results are significant. Other improvements include:

- Upgraded division plates on LIN-3 htr 5, LIN-4 htr 4 & 6 from bolted construction to welded design to eliminate FW bypassing heater
- RH steam temperature accuracy improved on TRE-6
- Increased main steam pressure at turbine inlet on TRE-6 (more power and improved efficiency).

Each station has a Heat Rate Action Plan laying out the priorities for the coming year and the plan for achieving the defined improvements. Moreover, a fleet summary report lists the successful improvements, the impact on heat rate, and the resulting lowering of fuel costs.





2. Outage Management

Planning and management of outages has a significant impact on unit availability and operating costs. Utilities vary in the sophistication and level of effort applied to outage management. All, however, use a structured program to prepare for and execute outages as efficiently as possible.

Improvements to NS Power's outage planning and management approaches have been in process since before the last audit. Efforts through the current Audit Period have been sound, and have produced signs of effectiveness. These improvements have, however, been slow in coming,

given that the most critical analysis was delivered in 2011 by NS Power's consultant. The Company did not take strong actions in the immediate aftermath of that assessment. Liberty concluded in the last audit that outage execution fell below average, and that planning and the management systems used did not meet industry standards.

The circumstances faced by NS Power do not argue for a comparatively highly-sophisticated outage planning and management program. Such a program would entail more detailed planning, more sophisticated tools, more extensive work management practices, enhanced optimization practices to balance durations with cost, and more effective reporting to assure both analysis and accountability. The opportunities and risks are not clearly high enough to justify significant added costs in these improvement areas. Replacement costs have not been particularly high for planned outages and most of the units run on a limited basis in any event.

We therefore do not propose for NS Power a "state of the art" or "best in class" standard. Rather, a common sense approach that allows outages to be planned and structured efficiently and that provides suitable reporting to permit effective management oversight should be sufficient. We did not believe that NS Power met even this more limited standard in our prior audit. However, effective execution of improvement initiatives underway now should close the gap.

a. Current Program

Comparing the Company's process description from the 2010-2011 audit versus that provided in the current audit illustrates the character of NS Power's current process for outage management. The prior response included 23 "bullets," all of which described various technical investigations (such as inspection reports). That response exhibited the view that "the outage planning and management process" should be characterized by a listing of the detailed technical work associated with the outage. Outage reports reviewed at that time primarily consisted of work lists or inspection reports, which supports this view of the older approach. Our concern then was over the lack of a management and oversight feature.

The response offered in the current audit replaces the 23 bullets with a description of four tools, each of which addresses a management planning or oversight tactic. Management's change in perception represents a solid step forward. The formal approach and process that has taken shape addresses many of our prior concerns.

NS Power's Shutdown Standardization Process (SSP) began in 2011 with the appointment of a committee and subsequent design of a planning requirements document. Key features of the new process included:

- An annual review process centered on a five-year OM&G/capital investment plan
- A required end of 4Q report with an 18 month look-ahead at planned outages
- Completion of a shutdown charter 18-24 months in advance for every planned outage
- Completion and submittal of a high level work plan 15-21 months ahead of all planned outages.

A Shutdown Standardization Committee (a centerpiece of SSP) exists, consisting of planners and maintenance managers from all of the plants, as well as Power Production Staff. The mandate given to the Committee includes:

- A common planning approach for the entire system
- A baseline for the continuous improvement initiative and benchmarks for the plants
- Use of best practices from each plant
- Transparent status reporting from each plant
- A roadmap for current and future planners and managers.

Standardization by itself is not the key feature of the change. Improving the process features and a focus on best practices and transparency are especially critical. The process now requires multi-level planning efforts on a laddered basis, starting at least two years before a planned outage. Such plans tie directly to the five-year financial plan for capital and OMG budgets. As the outage start draws closer, increasing detail is built over the two-year pre-outage period.

Of the many new document requirements, the Shutdown Charter is particularly notable. It captures many of the features typical in a good outage plan and among those recommended in our prior audit. Such a requirement forces early thinking on the factors that go into a successful management approach to outages.

b. Analysis of the Current Program

Given NS Power's needs in the outage management and planning areas, the SSP presents an effective solution. Attention can now shift to success in implementation. We consider the effort still a work in progress from this perspective, although one that is sufficiently well advanced. We found this observation on the limited availability of the documents required by the process. We did secure documents representative of the process, but they did not appear to be of a content and scope that evidences full implementation. Nevertheless, we considered the documentation issue a "growing pain," finding that that progress toward full, effective implementation continues on an appropriate track.

Published outage reports, on the other hand, continue to lack the attributes that management should expect. It seems clear that management does not believe it needs well-structured analytical reports relating to outages, and stresses that plant managers can be trusted to execute effectively. Liberty does not consider this approach sufficient, and continues to see the weak reporting structure as a problem. We emphasized in our last report that:

> *The [outage] reports contain no performance information, no cost data, no resource data (except for one plant), no schedule data (other than start and finish dates), and no indication of the original plan and the degree of compliance with it. We found most striking the lack of any schedule reconciliation and explanation. Outages extended by many weeks produced no indication of cause, or even an indication that delay had occurred."*

As in the past, outage reports seem focused almost entirely on detailed listings and recitations of work done. The reports contain no analysis or consideration of performance from any perspective. It is difficult to see how such reports provide management sufficiently useful information in terms of understanding performance and fulfilling their oversight responsibilities. We defined this issue in terms of insufficient reporting in the past. It appears now that the underlying issue lies more in the insufficiency of management's expectations.

Liberty specifically requested "any reports prepared after a 2012-2013 outage intended to report or analyze performance or lessons learned." The Company experienced 25 planned outages of fossil units during the Audit Period. NS Power provided five documents:

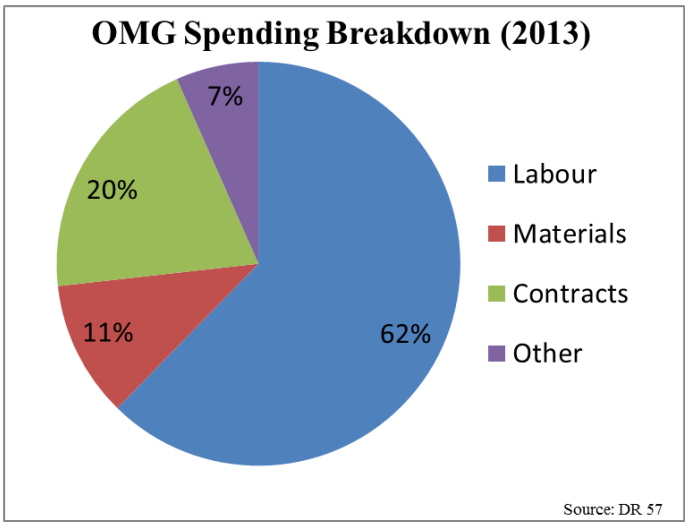
- An extensive list of "lessons learned" with associated actions and recommendations from the 2013 Trenton 6 outage
- A "shutdown debriefing" document from the same outage that discussed the same lessons learned
- A three page "executive summary" of the 2013 Point Aconi outage which recapitulated the work done and, contrary to the description of the document in the DR response, did not contain any "findings and recommendations"
- An eight page "shutdown summary" for the 2012 Lingan 1 outage only recapitulated the work performed
- A 38 page "repair report" by Reliable Turbine Services describing the technical details of their work on the Tufts Cove 2 turbine.

Six of the 25 planned outages in the Audit Period were extended by one week or more, but we observed no discussion regarding outage performance. Of the five documents offered, only one (the first) is responsive to the question asked. The list of Trenton 6 lessons learned demonstrates good thinking on the part of many people at the plant. Nevertheless, the many shortcomings we discussed two years ago (and repeat here), remain. We found no analysis of performance, no cost analysis, no schedule analysis, no explanation for schedule delays, and no analysis of work completed versus work planned.

3. OMG Costs

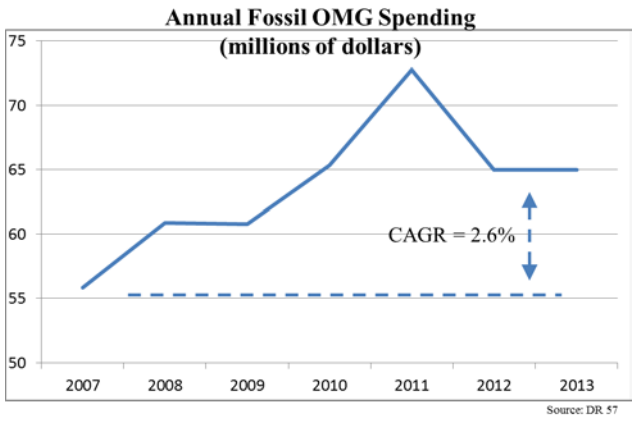
a. Spending Trends

NS Power spent about $65 million in 2013 for operating and maintenance expenses on the 11-unit fossil fleet. This sum equates to $8.12 per MWh of generation. These costs amount only to about one-fifth of fuel costs but they are generally more manageable. NS Power has applied increasing efforts to contain them.

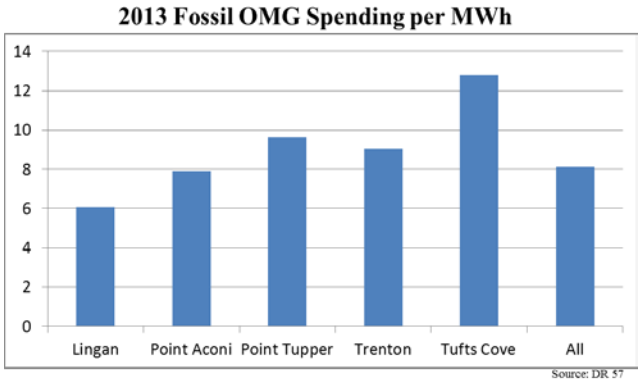


The Company collects and manages costs in many accounts, but three predominate: internal labour, contracts, and materials. The balance of costs amounts to only seven percent of the total. The accompanying pie chart illustrates the importance of these three categories, and particularly the dominance of labour.

Our prior report cautioned that costs seemed to be rising at a rate higher than expectations. This matter now seems under control. In retrospect, 2011 costs appear to have been an anomaly. Costs have decreased substantially in the last two years. Especially noteworthy is the compound annual growth rate (CAGR) of OMG costs. It has only been 2.6 percent since 2007. Given the high labour component and inevitable inflationary growth, sustaining this over a six-year period is notable. It is especially noteworthy when compared to the first four years of that period, when the CAGR of the annual spending was nearly three times higher.



The ability to contain costs on a per unit generation basis is much more difficult, because of the declining denominator (MWh). Nevertheless, NS Power's unit costs remain competitive with those of the industry. We noted in the prior report that comparable units averaged costs in the mid-teens, nearly double those at NS Power. NS Power's 2013 costs are only slightly higher than those reported for 2011 ($8.12 versus $7.83/MWh). The accompanying chart shows that each plant's costs fall in the $6-10 range except for Tufts Cove.

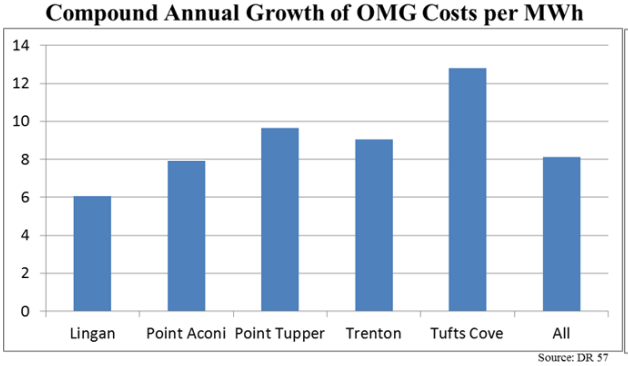


The accompanying table illustrates that NS Power's costs per MWh have increased by more than eight percent per year over the six year 2007-2013 period, despite the minimal growth on an absolute dollar basis. This result indicates considerable improvement over the 2007-2011 data we reported in the last report, but nonetheless remains problematic. Further, dividing stable annual costs by a declining number of MWh means such increases may be largely unavoidable.

Annual Compound Growth Rates		
	2007-2013	2007-11
Annual OMG Dollars	2.6%	6.9%
Annual OMG $/MWh	8.3%	11.7%

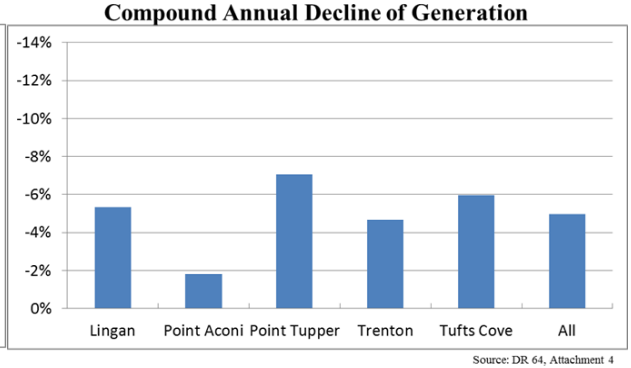
Source: DR 57

Compound Annual Growth of OMG Costs per MWh



Source: DR 57

Compound Annual Decline of Generation

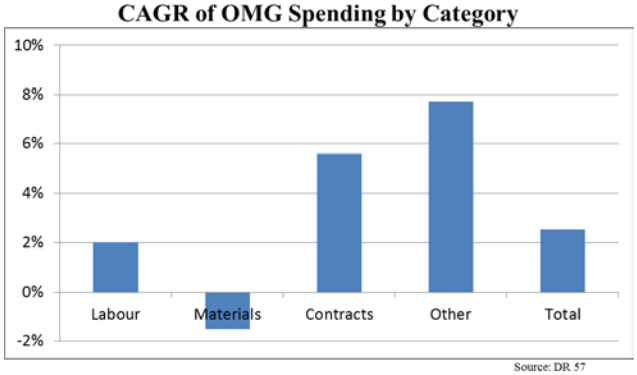


Source: DR 64, Attachment 4

These charts show the CAGR for costs per MWh at each station. Point Tupper and Tufts Cove have exhibited the highest growth rates. It is not coincidental that those two plants have also had the largest decline in generation over the same period. The low generation in 2013 is in part due to the elongated outage at Tupper. In any event, the correlation between the charts illustrates the difficulty in holding cost growth in the face of declining output.

An examination of growth by category is informative, particularly in showing the limited growth of internal labour. No other category has the importance of labour in the defining of spending levels. NS Power's ability to hold growth in labour costs to 2 percent per year is significant.

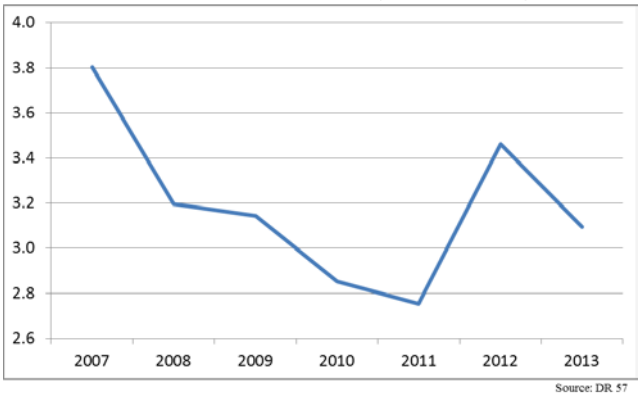
CAGR of OMG Spending by Category



Source: DR 57

Presumably some of this result derives from much higher growth in contracts, but the Company's success in this area remains clear. Specifically, ignoring the unusual high point in 2007, the ratio of internal and external labour has not changed substantially. The adjoining chart therefore shows that improvement has not come merely from shifting costs between resource types.

Ratio of Internal Labour $ to Contract $



Source: DR 57

b. Cost Performance

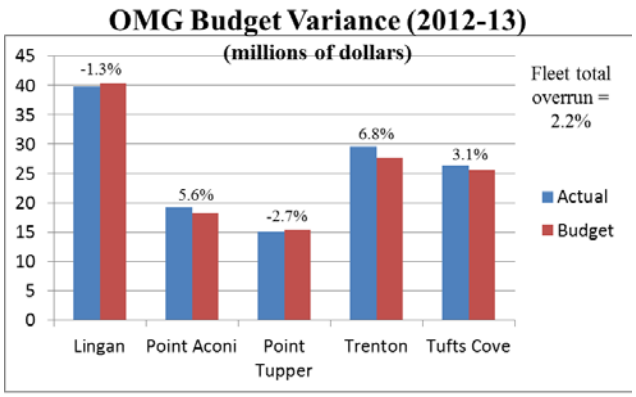
Liberty examined OMG budget performance in the 2012-2013 period, finding significant improvement over the prior Audit Period. Interviews with power production personnel exhibited the existence of a new priority for cost and improved cost performance. The accompanying table shows that budget overruns were 0 and 4 percent respectively in 2012 and 2013, compared to 6 and 13 percent in the prior audit years.

Fossil Fleet Actual vs Budget

2010	2011	2012	2013
6%	13%	0%	4%

+ is over budget Source: DR 58

The accompanying bar chart illustrates performance by plant for the two-year period, with total costs and budgets shown in millions of dollars. The total variant for the fleet is only 2.2 percent. The worst deviation was still less than 7 percent, despite some considerable outage extensions. The overall average and the individual plant levels represent a reasonable level of performance.



Source: DR 58

Control of labor costs earlier has contributed significantly to budget underruns over the current Audit Period. Analysis of the labor category reveals the identical pattern observed in the prior audit. Specifically, internal regular labor costs ran substantially under budget each year, and were largely offset by substantial overruns in overtime and term labor. We did not find this result reflective of best practice then or now. NS Power did not agree with our conclusion.

Budget Deviations by Category		
	% of Total Cost	2012-13
Labour	65%	-2%
Materials	11%	2%
Contracts	18%	9%
Other	7%	23%
Total	100%	2%

Source: DR 61

NS Power states that the labor account in the OMG budget varies for a number of reasons. The Company cites as a primary factor the diversion of internal resources to capital work, followed by a replacement of the diverted O&M resources by term employees and increased overtime. Such an approach can prove appropriate. Our concern here, however, is the failure of that strategy, if it is one, to be observable in the budget and the resource plans in the first place.

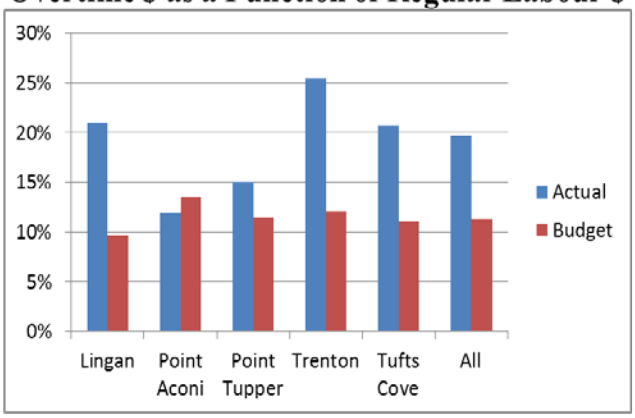
Budget Deviations by Labour Category					
	% of Labor Cost	2010	2011	2012	2013
Regular Labour	77%	-13%	-10%	-13%	-12%
Overtime	15%	43%	39%	41%	53%
Term Labour	8%	69%	52%	61%	81%

Source: DR 61

It is clear that such shifts in resources are not spontaneous or in response to changing priorities. The consistency of the data over at least four years makes that observation clear. The deviations have been consistent and, therefore, predictable. In effect, Power Production has operated under and consistently executed an unofficial resource plan that differs considerably from that approved by management. It is not clear how management can exert effective oversight or measure performance against a plan that does not appear to be the one followed from the start.

The budget and accompanying resource plan should contain the optimum approach, whatever NS Power management believes that to be, and the organization should be managed in accordance with that plan. The failure to do so creates problems, as is amply demonstrated when trying to analyze overtime.

Overtime $ as a Function of Regular Labour $



Source: DR 58

Overtime comprises a critical cost element that has a major impact on productivity. It is also generally considered one of the more "manageable" cost categories. The accompanying chart shows substantial budget overruns in the last two audit periods. Overtime at the five plants increased overall labor costs by about 20 percent.

Actual overtime dollars exceeded the budget by 53 percent. Three plants experienced overruns ranging from 62 to 95 percent. Overtime expressed as hours rather than dollars shows the concern as well. Overtime regularly exceeded 15 percent (the light red blocks) and even 20 percent (the dark red blocks) at some plants.

Overtime Hours as a Percentage of Regular Hours

	Lingan	POA	PT	Trenton	TC	All
2009	15.6%	18.0%	13.7%	24.2%	17.9%	18.3%
2010	15.6%	16.6%	15.4%	21.5%	15.2%	14.7%
2011	15.7%	13.8%	14.5%	16.2%	21.8%	14.0%
2012	12.1%	14.6%	15.1%	16.7%	21.7%	13.5%
2013	20.5%	10.9%	10.4%	24.8%	14.6%	15.1%

Source: DR 61

We consider a 10 percent overtime level to offer a reasonable target. No plant held overtime to 10 percent in the last five years. Kaiser Associates, in its 2008 review for the UARB, recommended 5 to 7 percent. At the time, this level was not much lower than the rates actually being achieved by NS Power. The trend toward what we consider to be excessive rates is therefore relatively recent.

c. New Initiatives

Apart from labour budgeting and planning, we observed notable progress in cost management. The degree to which cost awareness has become a theme throughout the organization is a significant accomplishment.

Reporting represents an area of strength. The nature and quality of reports are sound. We found particularly timely provision of cost data to the organization. This feature is not common in our experience with other utilities. We consider it important, particularly in managing large outages.

Cost analysis has improved as well, although it often is oriented too much on what happened as opposed to why. Given the sophistication of the current program, the quality and awareness of the people, and the wealth of good data available, a more effective approach to performance analysis and the identification of improvement opportunities is possible.

We reported favorably in the prior audit on NS Power's continuous improvement initiative. Two years later, this program is proving successful. Continuous improvement often represents a passing fad in utilities, which frequently have difficulty in effectively embedding it in the culture of the organization. We did not observe this problem at NS Power. Our review indicated that it has been accepted, as it needs to be, as a daily part of the business.

The Continuous Improvement program has produced a number of specific tools that make contributions to cost effective management. Such programs only succeed on a sustainable basis when backed by strong management commitment, which we observed to be the case within Power Production.

4. Capital Investment

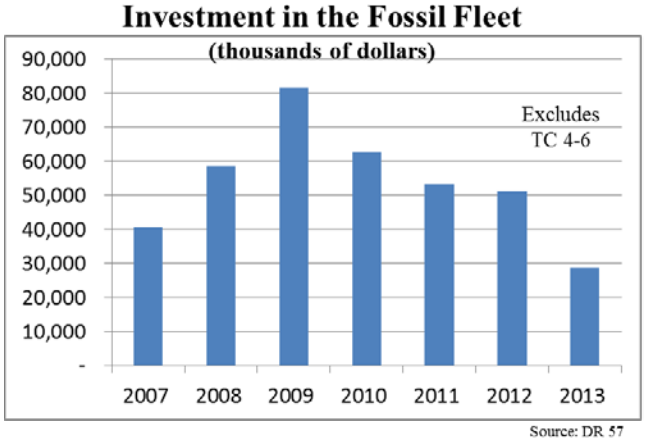
a. Resource Planning

Developing a strong investment strategy for power plants requires a clear understanding of the future use of those assets for a reasonable time going forward. The need has particular importance for the NS Power fleet, which faces questions raised by: (a) the longevity of some of the units, and (b) the mode of operation for all of the units. We observed in the prior audit that, while important, a new Integrated Resource Plan (IRP) at that time would have faced fluid factors making the effort impractical at that time. We cited the $45 million spent on a major overhaul in 2009 at Trenton 5. Developments since that time underscore the need for critical review of the future of the unit, as one critical uncertainty facing the Company's supply planning.

b. Investment Trends

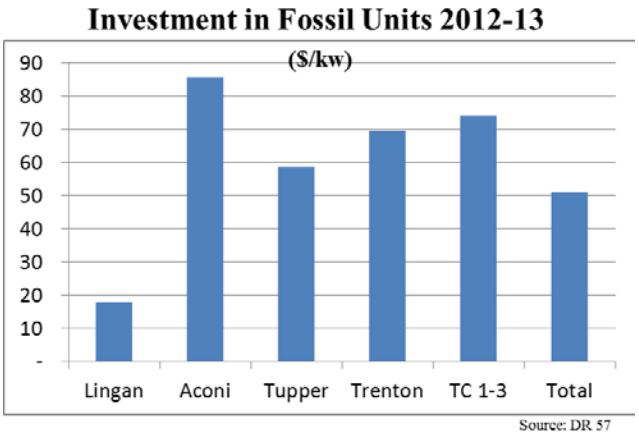
Large operating assets require continuing investment to sustain a long and efficient life. As a unit ages, demand for new investment can grow, but the merits of continuing to make large investments late in life becomes more questionable. From an economic standpoint, fewer years remain to recover new investments.

As a result, we would expect at some point to see declining capital requirements, all else equal. The accompanying chart shows that capital investment has indeed dropped in each of the last four years, after peaking with the large 2009 Trenton 5 improvement effort. Last year's expenditures were particularly low, although the balance is subject to question arising from insurance credits associated with the 2012 Trenton 5 incident. The Company similarly believes 2013 was an anomaly, and that future expenditures will fall closer to 2012 levels.



During the Audit Period, NS Power invested about $50 per kW in the fossil units. Minimal investment at Lingan significantly affected this value. Lingan was the only plant under the $50

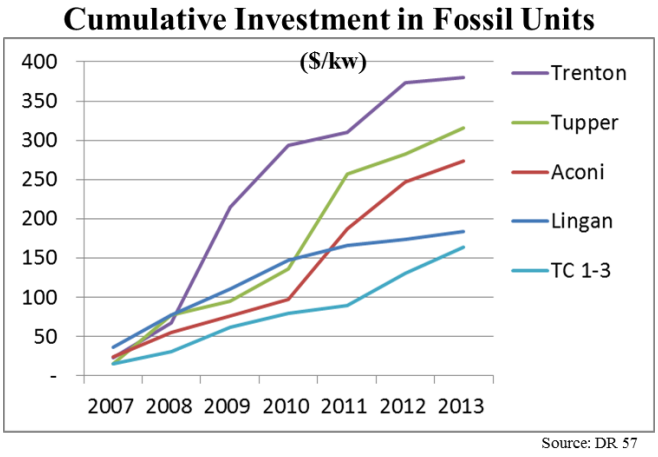
average. Lingan experienced many years of $20 million or more in spending, before declining to recent levels in the last three years.



Point Aconi's high spending resulted from major boiler-related work in 2012. Trenton's major spending arose from cleanup and repairs in the wake of the 2012 incident. Point Tupper underwent significant boiler and turbine work in 2013. Tufts Cove had substantial turbine and generator work in both 2012 and 2013 on Units 2 and 3.

Our interest in capital spending focuses on its impact on operations. Our primary question of interest is the degree to which spending has remained sufficient to maintain efficient plant operation. Issues of prudence and recovery of investment are a part of the ACE process, and not of this audit.

The accompanying chart illustrates that the largest investments came at Trenton. Considering the longstanding and continuing trend of poor performance at Unit 5, the value of this large investment should be questioned. One cannot observe a correlation between spending at Trenton and improvements in performance. On the opposite end of the spectrum is Tufts Cove, which has seen the smallest investments over the last seven years. Even so, while Tufts Cove has not been an exceptional performer, nothing suggests that comparatively low investment has affected unit performance.



The Company points out that significant life extension investments have been made at Trenton 5 and as subject to the UARB capital approval process.

5. Trenton Unit 5

a. The Incident

At 9:00 PM on March 1, 2012, NS Power took Trenton Unit 5 off line for what was thought to be a brief repair. The turbine was to be held at rated speed with no load, and immediately re-synchronized after repair work completion. Running a turbine unloaded and at rated speed comprises an abnormal and potentially high risk condition. The back end of the turbine will overheat and, if given sufficient time, damage to the turbine is likely to occur. Trenton 5

management believed that the time running at no load would be less than an hour, and therefore saw no apparent danger to the equipment.

As the work progressed, it became apparent that additional time was necessary. NS Power indicates that management understood the potential consequences of continuing in the unloaded but rated speed condition, but elected to do so nevertheless. Management further indicates that operations personnel received instructions to monitor conditions closely while in this state. Over the next few hours, alarms and other indicators of trouble arose, but operations personnel did not regard them as serious. At 12:15 AM on March 2, 2012, the unit was synchronized; shortly thereafter it became clear that a major failure had occurred. The unit was manually tripped at that time.

Investigation determined that a number of erosion shields (devices attached to the edge of the Trenton 5 last stage turbine blades) separated from the blades, and entered the condenser at high speed. Damage resulted to condenser tubes, thus allowing seawater to infiltrate into the feedwater system and then the boiler. The unit remained out of service for more than seven months, while cleanup and repair occurred.

NS Power concluded that operator errors contributed significantly to the incident. NS Power also concluded that the erosion shields were not sufficiently attached to the blades and that the brazing process for their attachment was flawed. In 2013, NS Power inspections at the Point Tupper turbine, which is identical to the Trenton 5 machine, indicated that the same defect was found.

b. Accountability

Liberty has concluded that management failures contributed materially to the causes of the incident. NS Power's internal root cause analysis (RCA) concluded that operating personnel should have acted differently to prevent the incident, or at least to mitigate its consequences. We found the evident scope of that RCA to be too narrow. An effective RCA should seek to determine the primary and contributing causes underlying an incident. It should proceed under a holistic approach that examines all potential influences of substance. The NS Power RCA did not meet this test for a number of reasons.

First, it narrowly focused on the immediate mechanics of the incident. A RCA should consider all of the factors that potentially placed the operators in a position to fail. The matters requiring review include training, procedures, out-of-service alarms and controls, and the decision to run the unit in a high risk mode (which the RCA did characterize as "ill advised"). NS Power has stated that the RCA did cover these matters, and indicated that training was not a key factor in the event. We discuss below that training initiatives launched in the wake of the incident were, in Liberty's opinion, some of the most effective and well-designed responses. It is therefore not clear why NS Power now suggests training was not a problem. Similarly, the RCA material presented to Liberty offered no analysis of training or the other factors noted here.

Second, the RCA failed to address any role or influence of management. The role of management in setting the stage is critical. We found the absence of management during the incident to be of concern, given that the unit was known to be operating in a high risk manner.

The Company notes that the Operations Superintendent was in touch by telephone, and NS Power apparently believes that mode of oversight was sufficient.

Third, the RCA did not solicit input from key managers. Our interviews explicitly disclosed that the RCA team did not interview the plant manager. NS Power notes that the people reporting to the Plant Manager were interviewed, suggesting that confining interviews to that level was sufficient.

Fourth, the RCA dismissed what we view as relevant concerns raised by operations personnel. The operator indicated that he disregarded some warnings from the instrumentation because there was a history of spurious or otherwise incorrect alarms. The RCA investigated this contention, and concluded it had no basis. When Liberty visited Trenton in March 2014, we observed at least half of the target lights on the annunciator board to be lit while the unit was running at steady-state full power. One must question why, with so many indicators lit under steady state operation, what must have been the case during the transient, startup, abnormal conditions existing at the time the 2012 incident occurred.

NS Power has responded that this observation by Liberty is not correct. Specifically, NS Power has stated:

> *"There are approximately 80 alarms at Trenton that are displayed on an annunciator panel in the control room. The plant estimated that approximately 5-7 alarms were lit in total during the visit in March 2014 and that all were understood by the panel operator."*

Liberty's representative was accompanied by key NS Power power production management and this situation was discussed at the time. NS Power knew that Liberty was not questioning all annunciators in the Trenton control room, but specifically discussed a single turbine-related panel on Unit 5. It comprised perhaps 20-25 windows. Further, about a dozen of those windows were lit. NS Power's reference to 80 windows is not pertinent to the observation at issue. Liberty discussed its observations in the control room with the panel operator and plant management and later in a Trenton meeting room. The responses at that time were that: (a) "a team is working on that" and (b) "this does not excuse the operator in the 2012 incident."

Fifth, we found insufficient attention by the RCA to what we view as one of the most significant root causes. An alarm that would have instructed the operator to trip the unit was not connected. The signaling of that alarm and the indicated response by the operator could have prevented the incident altogether. A differential expansion alarm did occur, but a subsequent differential expansion alarm, which would recommend trip, was not connected. That second alarm is included in unit operating procedures, giving an operator an expectation of backup and protection. NS Power believes that the operator should not have needed this assist. Management has also opined that the operator would not likely have acted correctly, even with such a warning.

NS Power concluded by assigning all accountability to the lowest organizational levels, while making no findings of management responsibility. In contrast, NS Power has taken a number of

measures that to us clearly demonstrate recognition that management factors beyond mere operator failure contributed to the incident. The Company has taken positive measures to benefit from those lessons learned. The constructive efforts include a much enhanced training process, a better definition of supervisory responsibilities, new training in those responsibilities, and enhanced procedures that will make the kind of operator errors experienced at Trenton 5 less likely. Liberty reviewed the latter three initiatives and believes they are appropriate and should be effective. The need for such measures, however, also reflects efforts to close gaps that fall clearly within management responsibility.

c. Additional Costs

The March 2012 incident caused Trenton 5 unavailability for more than seven months. Customers lost the value of the unit's contribution despite the fact that rates included costs based on a determination that the unit did have value. That value loss resulted from circumstances that management could have but failed to address until after the incident. That there may also have been operator errors is not inconsistent with this observation.

One way to measure lost value is to examine the costs of power to replace generation lost by reason of Trenton 5's unavailability. NS Power and Liberty have discussed a number of approaches for determining value in that manner. We have reached consensus on the difficulty of calculating that value in a manner that is analytically sound, given the myriad of inputs (*e.g.*, operational constraints at generation sources and on the transmission system, loads, fuel costs, dispatch costs, purchases and sales) that can vary widely across the 200 or so days for which a separate calculation would be required to make a precise determination. Given that complexity, Liberty and NS Power have agreed that an estimate of $300,000 is appropriate, although the Company does not agree that such costs arose from imprudent management action or inaction. There are valid arguments for higher or lower estimates, but the complexity of calculating value makes the estimated amount reasonable.

One of the complicating factors in estimating the cost impact of lost generation at Trenton 5 arises from its need, according to NS Power, to operate out of economic order for material periods of time. NS Power considers it necessary to do so to provide security against certain contingencies on its transmission system. In particular, NS Power considers the use of Trenton 5, given its location with respect to the grid, preferable to the use of lower cost Lingan generation, when certain contingencies exist. Many utilities find uneconomic operation to be appropriate under such circumstances. The implication is the seemingly illogical notion that a unit that would operate uneconomically is actually better off being out of service and that an outage represents a sort of forced cost savings.

Such an analysis is not possible at this time since NS Power does not collect what we consider to be important information relating to such circumstances. The Company could not provide the hours during which the unit operated uneconomically, the uneconomic energy generated in those hours, and the specific reasons for running the unit in those hours. When such data was requested, NS Power responded that it does not have a system for tracking hours and megawatts of generation dispatched out of economic merit by the system operator to address reliability and system complaints.

The analysis of the 2012 forced outage brought attention to issues involving the long term future of Trenton 5:

- Trenton 5 is the oldest unit in the coal fleet (at 45 years). This factor is not conclusive, but makes the unit a prime candidate for consideration when looking at a clearly changing resource mix, recently and into the foreseeable future.
- The Trenton units have been a comparatively very large consumer of capital. The wisdom of such investment on the lowest cost coal unit in the fleet (Unit 6) raises fewer questions than doing so on the highest cost unit (Unit 5).[5]
- Trenton 5 has had the lowest availability of all of the coal units, and has consistently been the lowest for a long time.
- Trenton 5 has the highest DAFOR of all of the coal units, and has consistently been the highest for a long time.
- The recent run of boiler tube failures should raise concerns about whether the 2012 incident produced long term chemical damage in the boiler and perhaps the feedwater and condensate systems. If it has, there exists a risk of materially higher costs and more outages in the future, perhaps for an extended period of years.
- NS Power's indication that Trenton 5 runs out of economic order on an undefined number of occasions means added customer costs, whose necessity bears attention.

6. Tufts Cove 4, 5, and 6

a. Background

Tufts Cove (TC) 4 and 5 are each 50 MW LM-6000 gas turbines. The TC 6 "add-on facility" creates a combined cycle operation for the three units. The capture and use of the exhaust heat from Units 4 and 5 allows Unit 6 to generate an additional 25 MW. Another 25 MW results from duct firing in Unit 6. Duct firing involves further heating the exhaust stream with gas-fired burners. A more efficient and cost effective plant results from the additions, including the feature that the first 25 MW has a zero fuel cost.

Since the inception of the TC 6 project in 2008, a history of trouble at Tufts Cove has continued to the present. Problems with failing engines on Units 4 and 5 and continuing design issues on Unit 6 combined for higher costs, longer schedules, and frequent unavailability of the units. Major events included:

- TC 4 – The engine failed in 2009 due to manufacturing defects.
- TC 6 – Modelling errors on the part of the design firm, discovered in 2010, led to a chain of construction delays that ultimately moved the in-service date by 20 months (an extraordinary result for a comparatively small, simple project).
- TC 5 – During normal operation in 2011, a blade failed rendering the unit unserviceable.
- TC 6 – Design inadequacies, discovered in 2012, relating to the oxygen removal system and the circulating water system restricted operation and required plant modifications.
- TC 6 – Another design deficiency discovered in 2012 disclosed that adequate gland steam supply could not be maintained as the unit was run down from single LM-6000

[5] The Company notes that Trenton 5 underwent a significant mid-life investment and environmental performance upgrades approved in accordance with established practices.

operation. An auxiliary boiler to supply gland steam (omitted from the original design) was required.

- TC 4 – During its maintenance outage in 2012, the unit was determined to be unserviceable, due to defects tracing back to manufacturing. NS Power procured a spare, with the intention that it would be permanently available to replace either TC 4 or TC 5 whenever needed.
- TC 4 – In early 2013, the spare engine that had been installed as TC 4 failed. A replacement spare was secured.

b. Accountability

These events trace back to one of two causes: (a) errors by the TC 6 engineering contractor, and (b) turbine defects by the LM-6000 manufacturer. Our prior Audit Report addressed the contracts and performance associated with these to service and equipment providers. We found that NS Power exercised proper care, and that it did what it could to address the problems as they arose. NS Power has continued to do so through the end of the current Audit Period. Any future opportunities to work with the two outside entities involved should be carefully evaluated. With that said, however, both are respected entities in the industry, and NS Power cannot expect to approach them (or alternative providers having similar reputations) with leverage (measured by volume of business) likely to secure especially favorable contract terms or commitments to the very highest tier of personnel and management attention that such providers can make available to their many (and frequently much larger) customers.

In any event, NS Power believes the Tufts Cove problems are now behind it. Unit 6 fixes will be complete with the addition of an auxiliary boiler and the purchase of the spare engine will largely mitigate any subsequent engine problems, as well as keeping two units in service when one engine is being maintained.

The costs associated with outages of the three units are likely substantial. In 2012, gas prices were low and Units 4 and 5 were the lowest cost thermal units on the system. In addition, Trenton 5 was off for most of the year. Replacement costs for the TC units when they were unavailable would therefore have been very high.

7. Power Plant Visits

We conducted on-site examinations and interviews at three plant sites, choosing them on the basis of unique circumstances associated with them. We visited Tufts Cove and Trenton, where continuing developments at both plants that merited follow up. We also visited the Port Hawkesbury Biomass plant -- a new facility not in service at the time of the last audit.

As in inspections conducted as part of the last audit, we found the plant personnel very supportive of our efforts and willing to share information on unit performance. NS Power's plant people are professional and skilled. In addition, we found the facilities to be clean, well maintained, and characterized by safe operations.

C. Conclusions

1. The declining role of the coal fleet continues to create challenges for management in maintaining the plants efficiently in the face of reduced load operation.

This North American trend towards lesser use of coal was interrupted in Nova Scotia in 2013 due to high gas prices. It is likely, however, that the decline will be re-established and capacity factors of the coal units will resume their decline.

2. Coal plant availabilities have declined by about five percent since the era of high capacity factors ended in 2007, but there have been significant improvements in the last two winter seasons.

There is a basis for assuming that the drop in availability is another consequence of declining usage and cycling of the coal units. The fact that availability has been generally stable at the 5 percent lower value for six years argues that this may have been a one-time dislocation. In any event, availability in the peak season, when it is most important, has moved back above 90 percent, a positive development.

3. Trenton 5, the oldest and most expensive coal unit, is also the worst performer by most measures, and has been the bottom performer for an extended period of time.

The recent problems at Trenton 5 have been well known, but the longevity and consistency of this unit's poor performance are less known. It has had the lowest availability and highest DAFOR among the coal fleet by several percentage points. Perhaps most notable is the fact that, were the 2012 incident and ensuing outage to be excluded, performance at Trenton 5 in 2012 would still be the worst of the coal fleet.

4. Reduction of boiler tube failures has been a notable achievement, but the extreme number of recent Trenton 5 failures argues that permanent damage may have been done by the chemistry problems associated with the 2012 incident.

Boiler tube failures have been reduced by a factor of three in the last dozen years. The steps taken by Power Production to produce these improvements have been a notable success. Nevertheless, Trenton 5 suffered five failures in about one year after the incident – a rate that is five times higher than the current rate for the fleet. NS Power now states that two of the five were caused by the 2012 incident.

5. Execution of planned outages has notably improved in the last two years, an apparent result of an improved outage planning and management program.

The program is not fully in place, but its design is strong and it is producing positive results. We note later some shortcomings in the program, but the results achieved in controlling outage durations so far are good.

6. The recent spike in gas prices demonstrated that the power production portfolio is especially sensitive to such pressures, the result being that the gas units move from the top of the dispatch order to the bottom, a massive economic upheaval in the portfolio.

This is simply an observation of the degree of leverage naturally present in the NS Power portfolio when it is exposed to major swings in gas prices. This does not imply any errors in the creation of that portfolio. The reality is that changes in gas prices can move a gas unit's location in the dispatch stack, not by place or two, but from top to bottom, with the result being a change in dispatch costs of not a few dollars, but perhaps $100.

7. **The lower utilization of the coal fleet has created a problem in optimally deploying the fleet on a day-to-day basis; it does not appear that NS Power has effectively addressed that problem.** *(Recommendation #1)*

Of eight coal units that previously could function at near full load most of the time, seven now are forced to cycle on a continuing basis. This condition likely produces inefficient operation, higher fuel costs, heavier wear-and-tear on the machines, and an out-of-economic-order dispatch process. That NS Power does not track out-of-order dispatch impairs its ability to identify an optimum running strategy over time.

8. **NS Power has implemented an effective heat rate improvement program that, while not likely to reverse the trend to higher heat rates, nonetheless seems to be containing the negative impacts of necessary changes in operation of the units.**

Power Production's heat rate initiative is a broad program ranging over many areas and with many different tactics. We found program design and execution sound, and supporting improvements in results.

9. **The outage planning and maintenance program is well designed and promises to be a winning initiative, it remains a work-in-progress and the processes it promises do not yet seem to be in place.** *(Recommendation #2.)*

We sought the documents required by the program and found them not to exist in many cases. Samples and the few actual documents available were impressive, but the pace of implementation seems to be slow.

10. **Outage reports continue to lack the basic content that should be available for management to meet its oversight responsibilities.** *(Recommendation #3)*

Management has not developed a process that results in formal analysis of performance and that documents the actual outcomes of outages. It is difficult to see how management can effectively provide oversight and guidance with the limited and informal information at its disposal.

11. **Power Production has managed to hold growth of labour costs to about two percent per year, which constitutes a strong achievement over a sustained period.**

Labour costs are by far the most important cost category, yet are also the most challenging to control. NS Power has shown the ability to maintain a level of growth that is near or below inflation, and to demonstrate that over a number of years.

12. **Power Production's continued use of artificial baselines for staffing, overtime and term employees precludes effective analysis and control of performance by management in these important areas.**

Staffing plans are inflated while overtime and term labour are understated. As a result, staffing is well under budget but is offset by higher overtime and term employees. When these deviation inevitably occur, management has no effective way of analyzing them, because since the levels did not represent true targets from the start. This conclusion, with a suitable recommendation was considered and rejected by NS Power in the last audit, although NS Power did analyze and prepare a report on this matter as part of the audit action plan in 2013.

13. Overtime, both on an absolute basis and versus budget, is at levels typically thought to be excessive, and the trend is moving higher. *(Recommendation #4)*

Overtime is averaging about 15 percent on an hourly basis, which is higher than has been employed by NS Power in the past. While there is no universally accepted standard, many utility managers believe 10 percent represents a reasonable level that should not be consistently exceeded. A UARB consultant several years ago recommended levels less than that, and NS Power had earlier regularly achieved levels less than that.

It therefore appears that the average of 15 percent, as well as the 20 percent and higher figures seen at some plants, is excessive. Management has not defined a workable standard or target for overtime. Rather it is assumed that budgeted overtime will be overrun (see Conclusion 12).

14. Power Production's cost management initiative (1) has been successful in enhancing the cost culture, (2) offers many best-in-class features, including high quality and timely reports, and (3) appears to be producing real results.

While certain practices, as discussed earlier, merit improvement standard, the cost management program, on balance, is a sound effort that is producing positive results.

15. The Continuous Improvement initiative has proven to be a successful program that has a broad level of support in the organization, and is producing efficiencies in the way work gets done.

We were positive about this program's prospects during the last audit and it seems to have progressed well since that time.

16. Management failings contributed significantly to the March 2012 Trenton 5 incident. *(Recommendation #5)*

NS Power's root cause analysis failed to address management contributions to the outage and the need for changes. The Company nonetheless took steps to prevent future occurrences. While positive and appropriate, they demonstrate management's contribution to the incident.

17. Trenton 5 has displayed a history of problems and weak performance for an extended period of time, making a focused improvement plan and an assessment of its long term future important timely. *(Recommendation #6)*

Of the eight NS Power coal-fired units, Trenton 5 has consistently been the fleet's worst performer. While the performance over the past five years has been especially poor comparatively, the history of sub-par results goes back much further. Our analysis covered results back to 1996, and Trenton 5 seems to have occupied the bottom position for that entire period.

It should be clear that this unit has been a problem performer and a drain on the Company and its customers for a long time. NS Power needs to deal with such issues aggressively and correct the continuing problems associated with Trenton 5.

The current IRP process appears to present an opportunity for making and sharing this assessment.

18. The excessive problems at Tufts Cove Units 4, 5 and 6, which have spanned the last five years, are attributable to third-party failures.

We do not believe that the added costs from the many problems at Tufts Cove have resulted from management failings. Extending the string of adverse circumstances and conditions, however, would understandably test patience with the notion that customers should continue to bear the full risks of increased costs from what should have been a reasonably straightforward addition to NS Power's supply resources.

D. Recommendations

1. Complete an optimization study addressing the optimal way of running (or not running) the coal units on a day-to-day basis. *(Conclusion #7)*

We have observed that 7 of the 8 coal units are relegated to cycling on a regular basis and that such operation is not likely to be economic, helpful to the machines, or optimum. A study, perhaps as a supporting initiative of the IRP effort, should help identify ways to have more units run more often or be off altogether, rather than so many units cycling and running at minimum load uneconomically.

2. Accelerate the defined implementation of the key features and documentation requirements of the Shutdown Standardization Process. *(Conclusion #9)*

It is our understanding that full implementation was slated for 2013, but requests for typical outputs suggested that the tools and plans required were not yet in place. A more concerted effort to get each plant on board with the required planning documents should be initiated.

3. Define management's needs for outage performance analysis and require such analyses to be prepared as part of the outage management program. *(Conclusion #10)*

The scope of required information was suggested in the last audit report. Necessary areas include analysis of performance, cost analysis, schedule analysis including explanation for schedule changes, and analysis of work completed versus work planned.

4. Define and implement an optimum level of overtime, considerably less than currently being experienced. *(Conclusion #13)*

The first step here is recommended as the establishment of principles relating to overtime. These would define Power Production policies on where overtime is desirable and how it should be managed. Optimum levels should then be established as part of the annual planning process and maximum (budgeted) levels established. Finally, management expectations regarding overtime performance have to be defined and communicated.

5. A downward adjustment of $300,000 should be made to the FAM to account for the 2012 Trenton 5 outage. *(Conclusion #16)*

The removal of a unit for seven months undoubtedly has negative effects. Any used and useful unit makes some contribution of value to the electric system, whether it be by operating economically, standing in reserve, or providing some other attribute to operation of the system. Loss of that unit for a sustained period eliminates that value, and customers receive no benefits for an asset that is included in rates. Determining the precise "loss of value" to the customer can be a difficult computation in any case, but it is especially so in the case of Trenton 5. After much discussion between NS Power and Liberty, Liberty suggested that an estimate of $300,000 would be fair and reasonable, recognizing that the complexity of the problem precluded a precise answer at this time. The Company agreed.

Regarding NS Power's role in the loss of value, the Company concluded that its employees were primarily at fault, and their employees' failures rose to a level justifying the most extreme reaction, termination. We have described several management failures in this report that support disallowance. While the relative degree of management's share of the blame may be debatable, complete exoneration of management, as suggested by the root cause analysis, is not justified. Consider the problem of annunciator targets, which apparently was long-standing and which was "being worked on" two years later. Consider the unconnected "trip recommended" alarm, which had it been connected would have, in our opinion, forced action by the operator and prevented the incident altogether. Consider the changes in training that the incident precipitated, which we believe were strong and positive, but which nonetheless suggest that training had been an issue. Consider the lack of management presence as the unit's condition slowly deteriorated and its state of risk escalated over a period of hours. Also, consider that the root cause analysis avoided any management criticism even to the extent that the plant manager was not even interviewed, his opinions were not solicited, and his role in the incident, if any, was not discussed with him.

6. Develop and implement an aggressive program to improve Trenton 5's performance. *(Conclusion #17)*

The unit's performance has continually lagged that of the remainder of the coal fleet. NS Power should conduct a structured, comprehensive analysis of ways to bring performance more into line with its other units. Moreover, given industry trends and risks in the industry involving coal plants, a close and parallel examination of unit retirement is also both in order, and apparently timely, given the pendency of an IRP effort.

NS Power's planning data supporting the use of Trenton 5 over a Lingan unit to protect against certain transmission system contingencies does not appear conclusive. This fact makes Trenton 5 economics more important to consider, given that running it to protect against the consequences of those contingencies, according to NS Power, imposes higher costs on customers.

We understand that the analysis of the future of the coal fleet generally (and Trenton 5 most particularly, given its high costs) must consider the uncertainty imposed by extreme volatility in New England and therefore Nova Scotia seasonal gas costs. The analysis must also consider increasing pressure throughout these regions and beyond to reduce, if not end, reliance on coal as a source of electric energy. While the uncertainties surely complicate the required analysis, they also heighten the importance of performing it and keeping it current.

IX. Economic Dispatch

A. Background

1. Dispatch

Dispatching power generation units comprises a 24-hour continuous process that requires a balance between the needs of system security and economics. The dispatch team must find the least-cost approach to meeting the system demand within the constraints of the supply stack at any given time period. The process must take into consideration both the demand-side issues of customer load and the supply-side issues of short or long-term outages of generating units, power purchase and sale agreements, daily fluctuations of weather, wind resource output, and daily fuel prices.

The basic premise of economic dispatch is that individual generating units should be brought on line to meet customer load (dispatched) in order of increasing cost. The less expensive units (from a variable dispatch cost standpoint, which is primarily driven by fuel cost, heat rate and variable O&M costs) should be dispatched before the more expensive units. At all times, a supply stack defines the dispatch order, which ranks units by dispatch cost.

Dispatch algorithms use fuel unit prices in $/MMBtu, which dispatchers apply to generating unit heat rates (Btu/kWh) to produce either a single, step-function, or curve of the $/MWh dispatch cost. Fuel unit costs in $/MMBtu comprise by far the most important driver of dispatch cost. Variable O&M cost (VO&M) also has importance, but makes up only a small percentage (typically less than 10 percent) of total dispatch cost. Heat rates also play a key role, but generally do not present a factor within dispatcher and operator control. Heat rates do not fluctuate to the degree that fuel prices do, and represent a longer-term parameter that defines unit cost effectiveness and competitiveness.

Dispatch personnel must consider other operational and financial implications in defining the least expensive unit over a given time period. For example, to meet a short-term increase in load, the unit with the next lowest dispatch cost on a per MWh basis may be considered for dispatch. Should that unit, however, have very high start-up costs, a higher-cost ($/MWh) unit with lower start-up costs may serve better, given the short timeframe required for this specific operation.

Units also have other operational constraints, such as ramp rates (in MW per minute), that define the rate at which the unit can increase its output to serve load. Start-up times can prove key to defining whether a unit is fit for a particular situation. Many units have minimum up time and minimum down time parameters as well. Units have minimum load levels that limit their ability to cycle to a low load level. Finally, many units produce emissions such as mercury, carbon dioxide (CO_2), sulfur oxides (SO_x), and Nitrogen Oxides (NO_x) that must be capped or accounted for economically. Sophisticated models take all of these parameters into consideration before setting a dispatch plan.

From a system reliability standpoint, power plant dispatch is not based solely on least-cost operation. A number of operational and security constraints may come into play within any power grid that must be considered in the dispatch. Examples include transmission issues such as

thermal limits on lines, voltage support needs, system stability issues (such as reliability requirements and load following requirements).

2. Fuel

The key driver in economic dispatch is the price of fuel. The dispatch process must consider: (a) the magnitude of the fuel impact on dispatch costs, (b) the uncertainty associated with fuel markets, and (c) the liquidity and transparency, or lack thereof, in fuel markets. Coal consumption and coal pricing for dispatch requires careful consideration, especially for smaller utilities like NS Power, because coal purchases occur less frequently. Accordingly, there can arise a major disconnect in fuel prices between the assumed price for dispatch and the ultimate price actually paid.

Power generators generally use a coal dispatch cost that reflects the current market price (all-in, delivered; and also termed the "burner tip" price) for the coal consumed. This replacement cost approach forms the standard in the power generation industry. Liberty examined the approach NS Power uses for determining coal dispatch costs. The Company continued during the Audit Period to use replacement costs tied to future expected purchase dates, not current market price. NS Power is in the process of conforming to the current replacement cost approach, which our last FAM audit recommended.

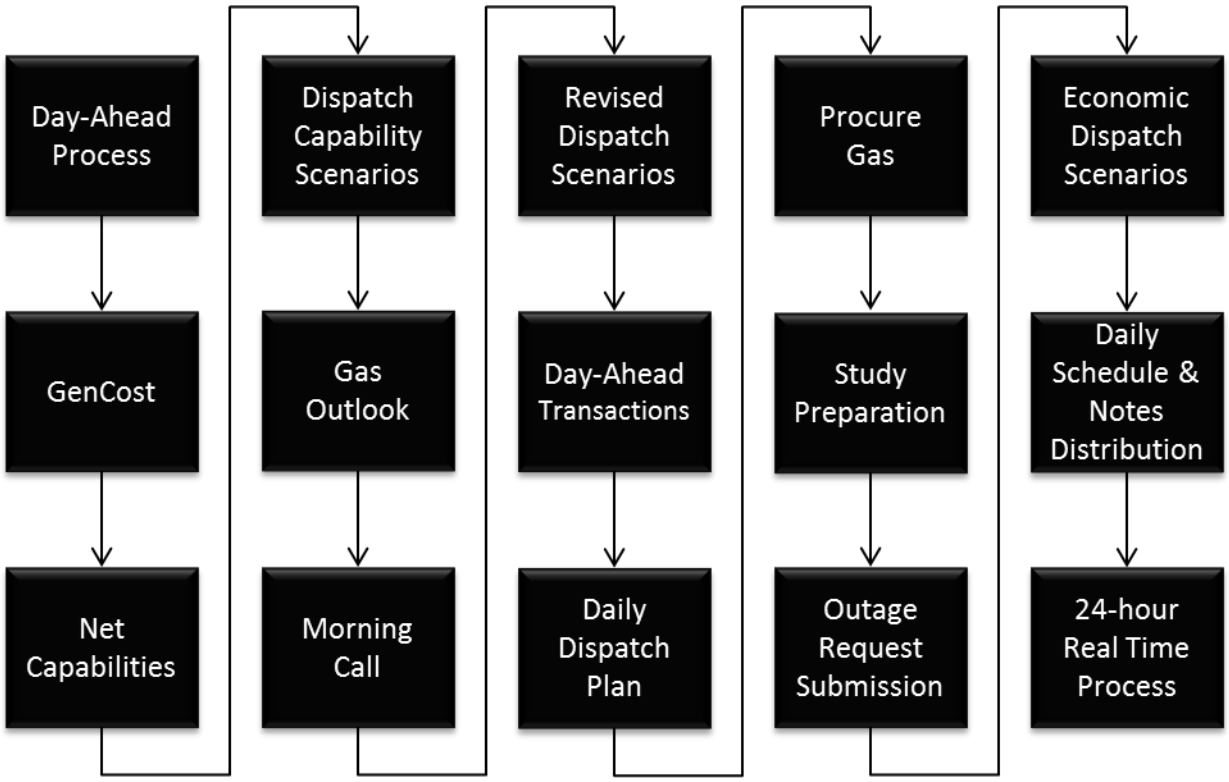
NS Power uses a standardized and established process for dispatching units. The process consists of a repeated series of daily steps that covers the two primary time periods served by NS Power: the Day-Ahead Process and the Real-Time Process. The Company's processes are standard for serving load in North American markets. NS Power's approach uses the following flow of processes and information:

- The Day-Ahead Process begins with GenOps model, which NS Power populates with the operational and cost parameters of all the dispatchable units, updated by plant staff. The parameters include net capacity, AGC capability, ramp rates and all key elements of plant production.
- Planners run scenarios, starting with the base case, on system economics and system security, to get an initial dispatch schedule.
- The Day-Ahead marketer and gas marketer discuss the next-day gas requirements, based on the scenario runs.
- A "morning call" takes place between the day-ahead marketer, the operations superintendents from each plant, and the system operator at the Energy Control Centre (ECC). The call addresses:
    - Outages
    - Output and availability
    - Fuel use and fuel mix
    - Maintenance and repairs needed
    - Risk assessment
    - Equipment issues
- Scenarios get revised based on the information from the morning call and the model is re-run.
- Day-Ahead transactions are made considering imports and exports.

- The daily dispatch plan is created and sent to all users of this information by email.
- Gas is procured (transactions finalized) for next-day gas.
- The Day-Ahead marketer prepares the daily dispatch study.
- Outage requests are considered and accepted.
- Economic dispatch scenarios are developed and run.
- The final Daily Schedule (with notes) is distributed.
- The Real-Time Process is in effect to balance load and generation.

This next chart displays this process.

Economic Dispatch Process



To summarize, NS Power prepares a schedule of its upcoming resource commitments on a daily basis, seeking most economically to meet system requirements, particularly over the following 24-hour period. The daily scheduling meeting takes place each morning to discuss the Day-Ahead commitment schedule and the factors that will influence that schedule. The next-day schedule is the focus of discussion; that is, for the 24-hour period commencing at midnight, or about 15 hours after the scheduling meeting.

The daily call offers the primary opportunity to share information among personnel at all generating units and at dispatch operations. It takes place by phone conference call, with notes taken by the day-ahead marketer. Information gathered by this voice call is summarized, and included in the daily operating plans.

The short-term load forecast, weather forecast, and forecasts of activity from the large-volume customers serve as primary drivers for NS Power estimates of load. A forecast of the availability of its power plants and other resources for the same period provides another key input to scheduling. Units are "available" taking into account maintenance outages, operational restrictions and must-run statuses for reliability reasons.

The results of the Day-Ahead commitment schedule go to NS Power's Real-Time desk for management of the economic dispatch on an hourly basis. A Real-Time marketer remains on duty at all times to enter into hourly transactions for imports and exports, if they are economic compared with NS Power's own generation. For each hour, the energy marketer assesses the dispatch order, and compares the costs of resources available for import or export with NS Power's incremental generating costs, making hourly purchases from the market when economically advantageous. The hourly resource schedules select resources from the NS Power stack until all system requirements are met.

NS Power first dispatches resources that are not economically driven, but are required for effective electric system operations. For example, this would include any generating units in "reliability must-run" status, in order to provide voltage support where needed on the NS Power system. The IPPs and wind generators also get dispatched first, regardless of their cost, because NS Power must take their output per contract requirements. Load-following resources required to make up for large load changes or the intermittent production of the wind resources may also require dispatch out of economic order. These examples illustrate the need for must-run resources and the effects of operational requirements that require first NS Power dispatch, and around which NS Power must conduct its secondary dispatch decisions and its purchase and sale activities. The NS Power hydroelectric resources have almost zero operating costs. Hydro resources therefore get dispatched prior to any of the fossil fuel resources.

The first resources dispatched after the must-run and hydroelectric resources are NS Power's lower-cost coal and gas generating units. At higher natural gas prices (relative to coal prices), all or most NS Power coal units may be dispatched before the natural gas-fired units. With low gas prices, as have been seen in recent years, coal and gas can compete closely.

3. Port Hawkesbury Paper

The Company has designed its dispatch process to meet the needs of the entire system demand. The load at Port Hawkesbury Paper (PHP) comprises a key component of system demand. PHP operates under a special tariff (the Load Retention Tariff, or LRT). PHP's peak demand of 185 MW has particular importance to NS Power given its large contribution to total system load.

The NSUARB commissioned a separate "Audit of the Port Hawkesbury Paper Load Retention Tariff." That audit has relevance to our work, given the implications that PHP has on the overall dispatch of NS Power units. Liberty worked with the other audit team, and participated in a number of joint interviews. That audit of the PHP tariff found several issues with the process by which NS Power implements the LRT, including the following conclusions:

- NS Power underestimated the complexity of the LRT.
- NS Power's method for calculating incremental energy cost with Cost Quantity (CQ) pairs does not produce a sufficiently accurate estimate of those costs.

- Variations between CQ pairs and actual costs limit the value of pricing signals to PHP.
- In October 2013, NS Power implemented a "differential method" for calculating incremental energy costs to bill PHP.
- The differential method is the most accurate method for calculating incremental costs of serving PHP load.

The report also made the following recommendations:

- NS Power should re-calculate its billed incremental costs with the differential method and compare the results to the actual amounts it billed.
- The use of CQ pairs for billing purposes should be discontinued.
- Further analysis of NS Power's differential calculations should be performed.

Liberty conferred with Synapse throughout the audit process. Liberty discussed the critical issues with Synapse, and agrees with all of the conclusions and recommendations.

B. Findings

1. Overall Dispatch Approach

NS Power's dispatch process is well documented, and established. It is staffed by experienced managers and personnel. Liberty found the systems in place appropriate for planning and conducting economic dispatch. Liberty finds that the overall dispatch process, from a planning and theory standpoint, is satisfactory.

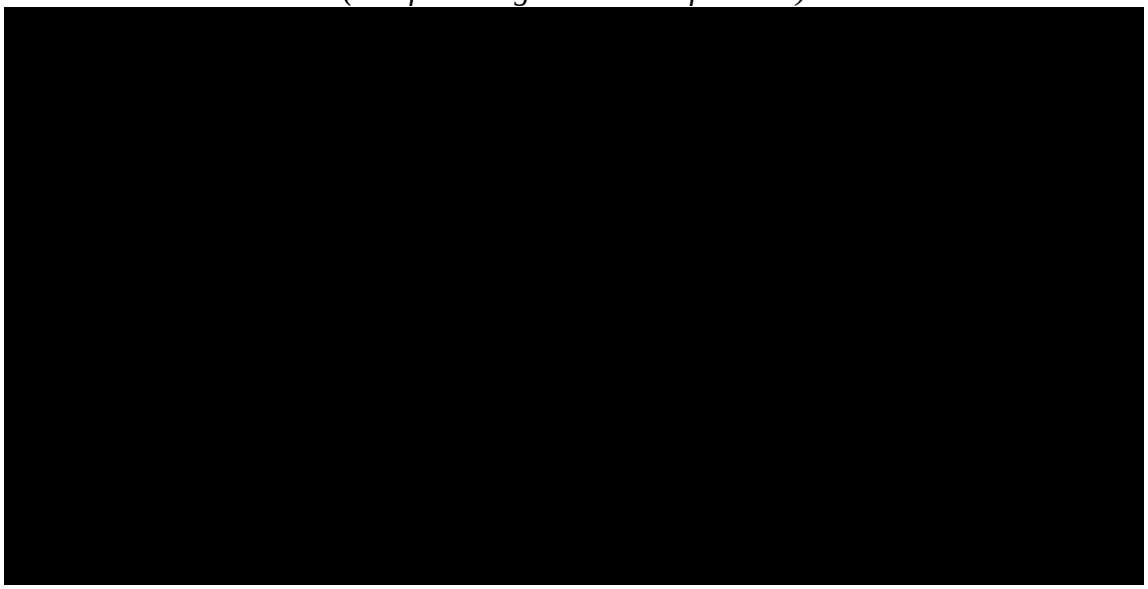
Specifically, Liberty found NS Power's dispatch approach to be consistent with standard industry practices, in terms of the intention to minimize costs within the constraints of system reliability. Actions underway to address outstanding issues from the 2010-2011 audit, when fully implemented, will further bolster the dispatch approach, particularly with respect to coal dispatch costs. Liberty finds the process documentation easy to follow and personnel to be credible.

However, Liberty also found some shortcomings and examples of apparent failure in implementation of the dispatch process. They concern economic dispatch associated with outages, coal dispatch cost, and VO&M costs.

2. Dispatch Implementation

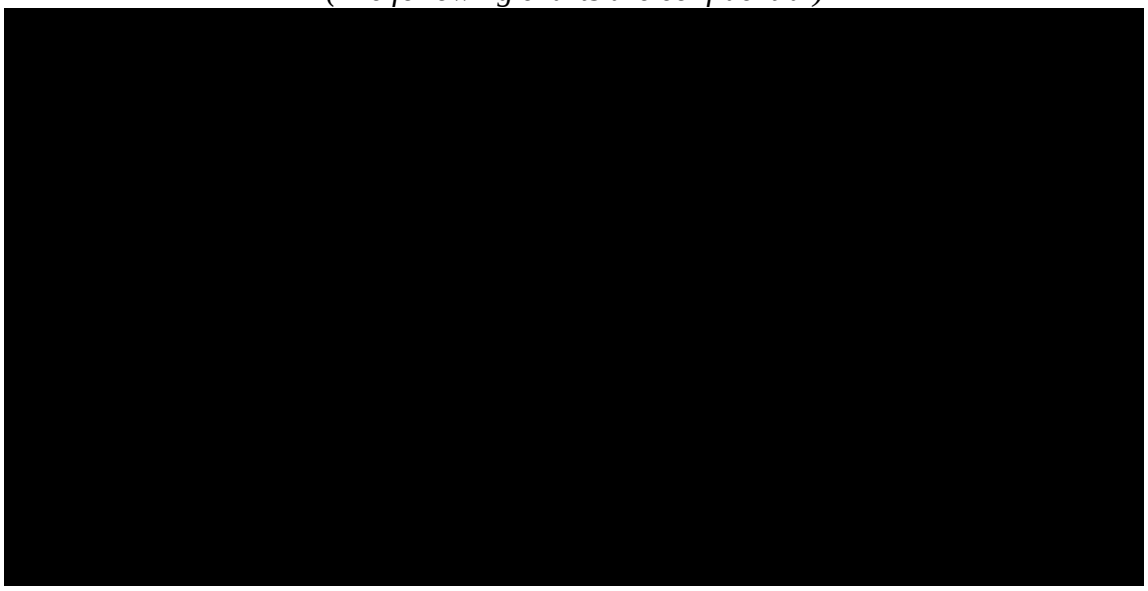
Liberty sought to assess the overall consistency of unit dispatch with relative costs. We chose the coal units to make this assessment, because these units have generally similar operating constraints and thus can be compared on an apples-to-apples basis by dispatch cost and corresponding capacity factor. For each, Liberty viewed the fuel dispatch cost. Over the period from January 2012 through October 2013, Trenton 6 was the lowest-cost coal unit, followed closely by Point Aconi. Next in order of merit for this period is Point Tupper, followed closely by Lingan. Trenton 5 is the highest-cost unit. The next table displays relative costs, excluding outlying events caused by extended outages.

(The following chart is confidential)



Despite having the highest fuel dispatch costs, Trenton 5's heat rate falls in the middle of the group, as the next chart shows. This observation points to the actual delivered cost of fuel ($/MMBtu) as the dominant cause of Trenton 5's high dispatch cost. The second table shows the unit's comparatively high fuel costs.

(The following charts are confidential)



The next chart displays the monthly capacity factors for 2012-2013, which is as expected in that the higher-cost units dispatch less than the lower-cost units. This correlation between dispatch and cost indicates that NS Power's dispatch process results in economic results, at very least not indicative of any glaring issues. It also shows no evidence that any coal units are used for non-economic dispatch of any great volume.

The results are summarized in the table below, which shows the average fuel dispatch cost for each facility, and the corresponding capacity factor. Each facility was ranked from best (1) to worst (5) for both cost and capacity factor. The cost rankings corresponded perfectly with the capacity factor rankings.

(The following chart is cofidential)

Average Cost and Capacity Factors

3. Dispatch Implementation: Port Hawkesbury Paper

The LRT is designed to maintain a competitive electric service rate for the 185 MW load at the PHP mill. Originally, NS Power utilized a pricing and billing mechanism based on Cost Quantity pairs (CQ pairs) that represent day-ahead blocks of MWs offered to PHP at specific prices. These were updated every three hours in real time. Further, NS Power used the same CQ pairs after the fact to bill PHP.

Liberty agrees with findings of the other audit addressing the LRT. However, we found those concerns to relate to accounting issues. We did not find them material to our scope, which includes how NS Power dispatches units. We did consider whether the use of CQ pairs for providing price signals to PHP could have some implications for dispatch. CQ pairs comprise blocks of power at specific load levels and prices provided to PHP. The LRT audit found that the resulting price signal is not sound, in that expected prices do not reconcile well with realized prices. We found, however, no direct connection with the actual dispatch process.

4. Coal Dispatch Cost

The market price assigned to replacement coal is a critical dispatch parameter. NS Power has used an approach that assigned a dispatch cost to its coal units based on coal prices forecasted for the date of the next assumed "open-position;" *i.e.;* one requiring a procurement. The basis for defining open-positions comes from NS Power's schedule for future purchases and deliveries of specific coal commodities. NS Power used future, projected prices determined on the basis of that schedule for dispatch of coal-fired units. The exception to NS Power's use of projected (futures, forwards or forecasted) is for the petcoke requirements at Point Aconi because NS Power has no valid source for projections of this commodity.

NS Power used the expected coal blend at each unit to weigh the commodity costs. The Company updated these blends through runs of the Company's Coal Model, which has now been replaced by the Coal Optimizer. These runs ascertain expected fuel mix at each unit. These numbers fed both the Company's dispatch and forecasting processes and models.

Our last FAM audit recommended the use of spot coal prices for dispatching coal units. Liberty does not consider sound the use of the next-open-position method because that approach leads to dispatch decisions driven by inventory levels. Our recommended approach leads to inventory decisions that are based on economic dispatch.

Since the last audit, NS Power has questioned the importance of our recommendation, on the basis that it would not materially change the dispatch order. NS Power continued to dispatch based on the cost of the next open-position throughout 2013. NS Power now, however, has

begun efforts to implement the last audit's recommendation to use a near-term coal market price for its coal unit dispatch. The approach is being implemented as this report is being developed. We therefore cannot review implementation.

NS Power plans to use a monthly coal price index, in order to base the dispatch on near term market prices and to align the timeframe with that of gas dispatch. This change would put the two fuel commodities on a level playing field. NS Power has agreed to implement daily (spot) pricing by the end of February 2014.

5. Variable O&M Costs

Our last audit observed that VO&M plays a small role in dispatch. It has some impact on dispatch costs, but much less than fuel does. Historically, coal and gas price differentials have been high enough to make close competition between the two fuels for dispatch rare. However, fuel market price convergence has caused such competition. This situation is likely to continue. Tight competition between coal and gas units can make VO&M the determinative factor in setting the order of economic dispatch.

In 2013, based on Liberty's recommendation from the last audit, NS Power commissioned Lummus Consultants International to perform a study of unit VO&M costs, including the approach to their calculation. The Lummus study is due in early 2014. NS Power has stated that so far, it would appear that the numbers the Company uses for its units lie within the range of averages for units in North America. NS Power is uncertain about how to address VO&M for Combustion Turbines (CT), but that such costs will not likely affect their dispatch order. While this *may* be true, it *will* affect the overall cost of dispatch accounting.

C. Conclusions

1. The overall dispatch process is sound from a structural standpoint, but exhibits some data implementation issues.

Liberty concludes that the concepts and models behind the dispatch process are sound. Note, however that Chapter VIII addresses concerns about consideration of longer term impacts in approaching dispatch. The documentation and interviews indicate knowledgeable personnel and a well thought out process. This comment speaks to the theory and intent of NS Power's process, and is inclusive of the models and systems. Our concerns, expressed in the following conclusions, address implementation of the process and the data used.

NS Power's dispatch shows generally a sound conformity between unit costs and dispatch, under a high-level review of variable cost versus output. This result, however, does not validate the finer details of dispatch, such as the inclusion of start-up and ramp rates, but is suggestive of overall effectiveness.

2. Problems exist with the PHP LRT's use of CQ pairs have not adversely affected dispatch on behalf of other customers.

Synapse Consulting determined that CQ pairs do only a fair job at providing price signals to PHP, and a poor job as a proxy for actual incremental cost to be billed. The latter, it turns out, is

not a consideration for the dispatch of actual units, but is instead a matter for appropriate revenue from PHP.

3. NS Power has not completed the implementation of Liberty's recommended approach for establishing the replacement cost to use in determining coal unit dispatch. *(Recommendation #1)*

Historically, NS Power has dispatched its coal-fired units based on a dispatch cost that uses the expected delivered cost of coal from the next "open-position" for the particular commodities comprising the blend to be dispatched. Liberty believes that this approach causes NS Power to make dispatch decisions based on reasonably uncertain future buying behavior, instead of making buying and inventory decisions based on economic dispatch.

Since the 2010-2011 audit, NS Power has questioned the importance of our recommendation given NS Power is now moving to determine a near-term coal market price approach for dispatching its coal units. The approach is being implemented as this report is being developed.

4. NS Power's dispatch model uses questionable Variable O&M data. *(Recommendation #2)*

At the time of this audit report, NS Power continues to base its dispatch on data that can result in incorrect dispatch results. Variable O&M costs play an important role in the forecasting and dispatch processes at NS Power due to cycling and the proximity in the dispatch curve of coal and gas units. The VO&M parameters used by NS Power were found to be very low relative to similar power plants in North America. NS Power's provides an unrealistic advantage to coal-fired power plants in its portfolio. This approach results in sub-optimal dispatch, by not adequately reflecting the true all-in variable dispatch cost of units, relative to one another.

NS Power commissioned a study of variable O&M (VO&M) costs, including the approach to their calculation. The concept arose from Liberty recommendations from the 2010-2011 audit. The Lummus study is due in early 2014. NS Power is still reviewing the results of the study relative to VO&M for CTs, but believes that considering them would not affect dispatch.

D. Recommendations

1. Complete the implementation of spot pricing of coal for economic dispatch and provide a summary of the integration process. *(Conclusion #3)*

Liberty recommends that upon completion of the switch to spot pricing of coal for dispatch purposes, that NS Power provide a description of how the implementation was performed, and an assessment of the success of the integration.

2. Integrate Lummus Report results into GenCost. *(Conclusion #4)*

NS Power should integrate the results of the Lummus Report into dispatch and forecasting tools as soon as possible. Liberty's recommendations from the 2010-2011 have been agreed to and accepted by NS Power, and have been partially implemented (data for all but the LM units has been implemented). Implementation represents a key step in improving the dispatch process. Until full implementation, dispatch results may be skewed by improper VO&M levels.

X. Power Purchases and Sales

A. Background

NS Power has traditionally relied predominantly on its own generation, rather than power purchases, to supply its load. Its purchases have fallen into three principal categories:

- Long-term contracts from solicitations for independent or renewable power, undertaken in response to Provincial requirements
- Term imports of market power acquired to replace NS Power generation during maintenance outages or at peak-load times
- Short-term (including Day-Ahead and Real-Time) purchases from the power markets to the west and from New England, when NS Power can buy on a real-time (hourly) or Day-Ahead basis at a delivered price lower than the marginal cost to generate with its own units.

NS Power conducted five competitions for independent or renewable power over the 20 years prior to 2010. A 2007 solicitation focused on the acquisition of substantial amounts of renewable energy required to meet Nova Scotia's renewable energy standard ("RES") of five percent of energy production in 2010 and 10 percent in 2013. Deliveries from these projects began in 2010 and continued through 2013, with 244.5 MW of contracted wind production operating at the end of 2013. NS Power is a joint venture minority owner in some of the projects to stabilize ones that had experienced financing difficulties. The Company also owns two projects totaling 80 MW that brings the wind generation on the system to about 325 MW.

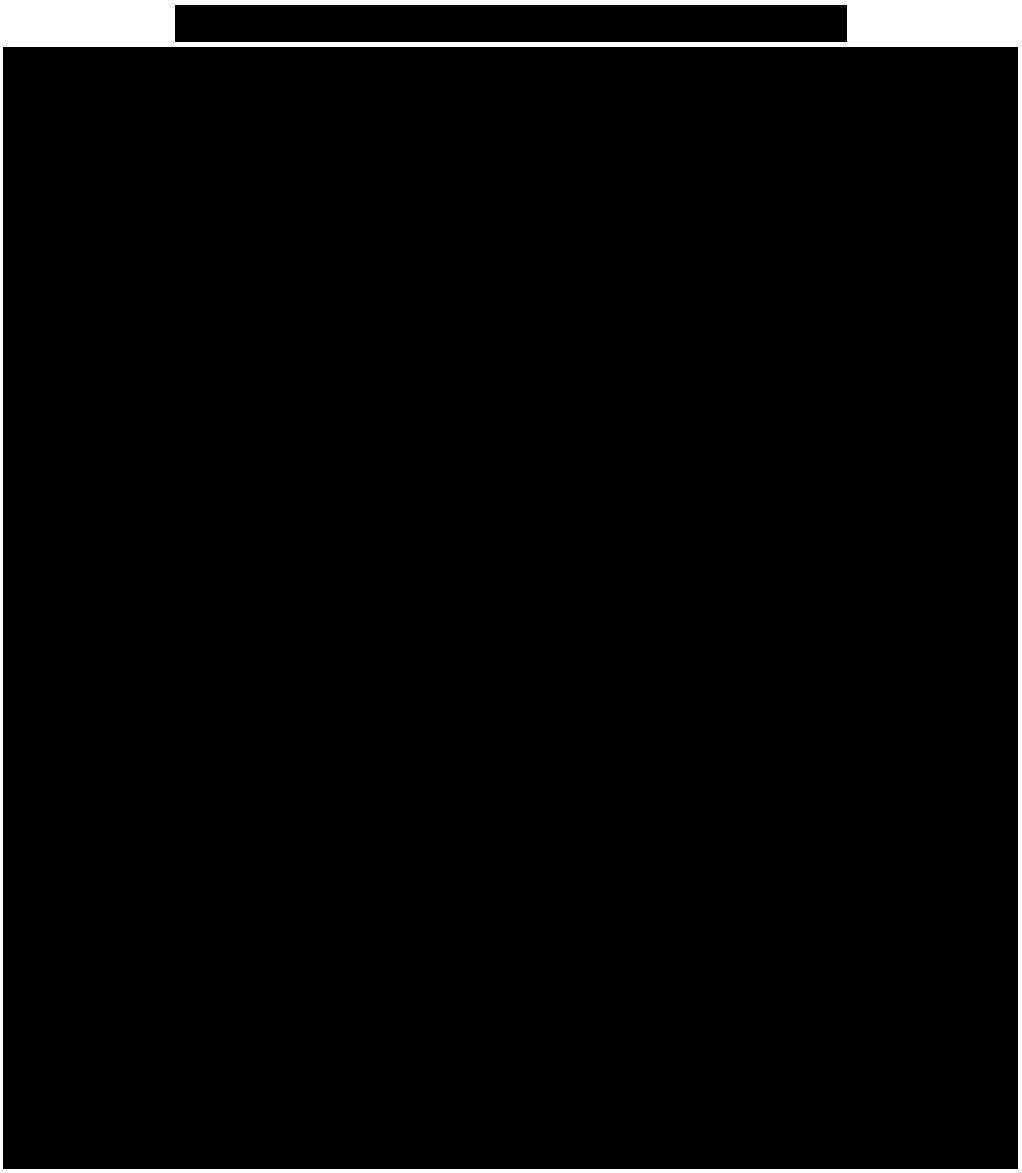
Energy Dispatch and Marketing also maintains a Real-Time trading desk. A Real-Time marketer remains on duty at all times to enter into hourly transactions for imports and exports that prove economic compared with NS Power's own generation. The Real-Time desk and operators run a *Generation Operation ("GenOps")* model hourly, updating the system loads and generating unit information. The energy marketer on duty assesses the dispatch order for each hour of the day, and compares the costs of resources available for import or export with NS Power's incremental generating costs. The marketer makes hourly purchases from or sales into the market when economically advantageous.

In previous FAM audits, Liberty concluded that NS Power should improve the identification, solicitation, and evaluation of opportunities for term power purchases. Liberty also recommended that the Company better establish itself in the market for term power purchases, and more regularly identify, solicit, and evaluate market opportunities. Liberty also recommended that the Company develop specific written procedures for making export power sales.

NS Power began regular solicitations for monthly power purchases in the spring of 2011. The Company has continued issuing regular RFPs for term power in 2012 and 2013, undergoing substantial evolution in types of term purchase products requested with the incorporation of term market experience and information into the processes. The Company established term import procedures in 2011 and updated them in September 2013.

B. Findings

The following table presents the power quantities and costs associated with categories of wholesale power purchases and power exports for each of the two years of the Audit Period. Information for 2011 is also presented for comparative purposes.



The NS Power total system requirements decreased markedly in 2012 (by 11.8 percent) before increasing in 2013. The closure of two paper mills in 2012 caused a reduction in industrial load of 1,349 GWh, or 38.4 percent. The Company also noted that residential and commercial sales in 2012 were reduced by warm weather (5 percent warmer than in 2011). In 2013, one of the major paper mills returned to operation and weather was 12 percent warmer than in 2012. These changes increased total system requirements. However, the total system requirements in 2013 still did not reach the levels experienced in 2011.

The table above also shows a substantial increase in production from IPP Wind projects from 2011 levels to 2012. This trend continued in 2013 as additional contracted wind projects came online. Wind production in 2013 increased by 26 percent over 2011 levels, and has grown to represent 6.4 percent of total system requirements.

In 2012, NS Power experienced a 63 percent drop in power import volumes from 2011 amounts, before a strong rebound in 2013 to near the previous levels. The substantial paper mill and weather impacts on total system requirements were also reflected in the high volatility of the volumes of power imports from 2011 through 2013. Net outside resources stood at 11.8 percent of total system requirements for the 2013 period.

1. Independent and Renewable Power

a. Wind Projects

NS Power conducted a 2007 solicitation focused on the acquisition of substantial amounts of renewable energy required to meet Nova Scotia's renewable energy standard ("RES") of five percent of energy production in 2010 and 10 percent in 2013. Wind-project developers experienced significant delays and restructuring of projects, primarily due to project financing difficulties. The projects began coming online in 2010. They gradually reached a total of 244.5 megawatts of operating wind capacity by the end of 2013, as shown in the table below. Several smaller projects have been cancelled or have experienced start-up and mechanical problems to date.

i. 2012 and 2013 Wind Budget Performance

The table below presents budgeted and actual production performance in MWh for each of the contracted wind projects for 2012 and 2013.

(The following graph is confidential)
NSPI IPP Wind Contracts and 2012/2013 Production

The contracted wind projects produced 11.9 percent more than NS Power's budgeted megawatt hour amounts for 2012. Approximately [redacted] percent of this production variance resulted when the Amherst Wind project came online about nine months earlier than expected by the Company in making its budget estimates. The Amherst project produced almost [redacted] MWh in 2012 (versus a budgeted volume of zero).

In 2013, actual production from the wind projects was only 2.2 percent greater than the Company's budgeted amounts. Three of the major projects produced at higher levels than budgeted. The Company has tended to budget many projects at the contracted minimum volumes. The under-budgeting on these projects was mostly offset when some of the smaller wind projects failed to come online as expected and when facilities underperformed in comparison to budgeted volumes.

NS Power provided the following explanations of the larger budget variances experienced in 2012 and 2013:

- *Shear Wind/Glen Dhu North* – This 62 MW wind project produced [redacted], resulting in NS Power's budgeting at the contract minimum levels for both 2012 and 2013. The project produced [redacted]

- *RMS/Dalhousie Mountain* – This project [redacted] in each 2012 and 2013, which exceeded the Company's more conservative estimates.
- *Amherst Wind* – As noted above, the Amherst project had eight or nine months of unexpected production in 2012. The project subsequently [redacted].
- *Renewable Energy Services/Point Tupper 3* – NS Power budgeted volumes at the contract minimum levels for this project in 2013. The project has [redacted].
- *Wind Prospect* – The project was contracted to be online in mid-2012, but was [redacted].
- *Confederation Power projects* – The smaller Tiverton and Springhill projects each [redacted] in 2012 and in 2013.
- *Glace Bay/Lingan II* – This project was expected to come online in mid-2012, [redacted].
- *Black River projects* – The three smaller Black River projects were expected to come online in 2012. [redacted] production in 2012 [redacted] production in 2013.
- *Scotian Windfields projects* – Each of the three projects, which were contracted to be online prior to 2012, were terminated. The owner has subsequently contracted the projects in the COMFIT program described below.

NS Power purchased the Nuttby Mountain (50 MW) and Digby Mountain (30 MW) wind projects from developers to enable the completion of the troubled projects, contributing significantly to meeting RES requirements. These two projects are owned by the Company and therefore are not part of the IPP wind category of power purchases, but do increase the NS Power operating wind capacity to 324.5 MW at year-end 2013 and provide renewable production to meet the RES requirements.

NS Power also is a 49 percent joint venture partner in two wind projects currently under development that are expected to be in service in 2015. The South Canoe wind project will be the largest on the system (at 102 MW). The Sable wind project adds an additional 13.8 MW of wind capacity. The 324.5 MW of operating wind production plus the 116 MW of new projects and 90 MW of COMFIT power contracts signed to date total an estimated 530 megawatts of total wind production currently anticipated by the end of 2015. An additional 110 MW of COMFIT is projected by the Company, with 60 MW expected in 2016.

ii. Wind Forecasting Improvements

NS Power does not "dispatch" wind-powered generators, but must take the production of each IPP as it comes. The wind power-purchase agreements ("PPAs") set annual delivery quantities, [redacted].

NS Power formed a working group in 2009 to study operational changes necessary to maximize the value of production from its owned and contracted wind resources. That group identified

improved wind forecasting as a high-value activity in identifying appropriate adjustments to operating processes. NS Power subsequently developed wind forecasting models and processes that use extensive data collected about weather and the operations of wind-powered generation. The Company tested and began using its wind forecasting models during the past three years, with reasonably effective results as reported by Company managers. More recently, NS Power explored using outside vendors that may be able to further improve wind forecasting. Company managers note that a challenge to effectively performing wind forecasts at IPP sites is acquiring confidential wind data from project owners to utilize in forecasting.

AWS Truepower ("AWS") was identified as a well-regarded commercial provider in developing wind forecasting. In 2013, NS Power worked with AWS to compare the vendor's services to the Company's existing wind forecasting model. A three-month trial was arranged, under which AWS provided wind forecasting data for the NS Power Nuttby and Digby wind sites. NS Power compared the data to its existing modeling. The trial resulted in conclusions that, while the Company's existing model performed reasonably well, the service provided by AWS outperformed the existing model by 3 to 5 percent in accuracy. NS Power is in the process of contracting with AWS to provide its services for these two sites, to be implemented by mid-year 2014[redacted].

iii. Wind Integration and Balancing

NS Power engaged GE International in 2012 to perform a renewable energy integration study (REIS) to quantify the impact of increasing renewable energy penetration on the operation and reliability of the Nova Scotia power system, to evaluate performance and operating costs, and to consider methods and approaches to mitigate the adverse impacts of renewable energy integration. The intent of the REIS was to provide guidance and quantitative metrics to aid NS Power in future development decisions. The Company requested consideration of nine study cases covering the years 2012, 2013, 2015 and 2020. The nine cases include wind penetrations that are low (335 MW), medium (488 to 551 MW) and high (796 to 916 MW). The 2020 cases considered the impact of meeting the 40 percent renewable energy target for that year with and without the Maritime Link. The final REIS study was presented on June 28, 2013.

NS Power has reported that it is now able to handle the balancing requirements of the wind-powered generating facilities on its system with current resources, primarily through the Wreck Cove hydroelectric facility. Hydroelectric generating capacity is the most useful resource for balancing wind. Existing hydroelectric resources, however, are not sufficient for balancing all of the wind generation expected on the system (over 600 MW) in the coming several years.

Connections to neighboring electric systems provide important sources of additional balancing capability. Simulations performed for the REIS suggest that ties to neighboring systems [redacted] for balancing. These studies suggest, however, that most of the balancing transactions will involve flows of [redacted]. Flows of this magnitude fall within the capability of the reduced transfer capability of the existing Nova Scotia-New Brunswick tie (see the "Transmission Limitations" section below). NS Power personnel suggest that, when combined with NS Power's own-system balancing resources, the current tie can handle the incremental balancing requirements for up to 600 MW of wind capacity.

The Maritime Link is scheduled to be operational in October 2017, but recently the related work in Newfoundland and Labrador has been subject to public discussion of possible schedule extension. The Maritime Link offers an important additional resource for balancing future wind generation for NS Power. The Company should be able to handle the 600+ MW of wind with existing hydro resources, balancing transactions with New Brunswick and the Maritime Link. To the extent that wind generation reaches or exceeds 600 MW before the Maritime Link is operational, however, balancing wind could be problematic. NS Power has been working with [redacted] to effectively facilitate balancing in the medium term (next three years).

The costs and required investments for integrating the variable generation are a concern that was studied in the Company's "Variable Generation Integration Costs" dated May 1, 2014. This recent effort identifies and estimates incremental costs associated with integrating variable generation resources on the NS Power system. The additional costs identified were associated with unit dispatch and commitment, system reserves and capital investments.

NS Power's modeling of its 2020 system (including the Maritime Link) in the study indicates that operational dispatch costs associated with integration of variable energy would increase sharply after about 550 MW of wind generation. In addition, the Company's wind forecasting suggests that the currently committed 550-600 MW of wind, and any further increases, will increase operational reserve requirements to ensure reliable operation. Thirdly, substantial new capital investments will be necessary to integrate more variable generation on the system past 600 MW while maintaining reliability. The capital investments would address requirements for fast acting firm capacity, system inertia, reactive power support, primary and secondary frequency response and other system reliability requirements. The results of the study indicate that integration of more than 550 MW of wind generation on NS Power's system would be operationally difficult and extremely expensive.

The REIS study reached the following conclusions with regard to "high wind penetration cases" (778 MW and 916 MW), which lie well above the Company's projections:

> *While this study concludes that it is technically feasible to integrate large amounts of wind power in Nova Scotia, it would not be without significant impact to Nova Scotia Power's customers. In high wind penetration cases, wind power would be curtailed much more often than it is today. NSPI generating facilities would maneuver more, with less warning and more urgency. Operating practices would need to change; rescheduling would also need to occur more frequently. Operating and maintenance costs on thermal and hydro plants would increase. New operating practices would be needed; new information gathered, archived and digested. Investment in existing NSPI plant and equipment, and people, would also be needed.*

b. COMFIT

The Province of Nova Scotia's Renewable Electricity Plan provides for a Community-Based Feed-In Tariff (COMFIT) program to encourage the development of local renewable energy projects by municipalities, First Nations, co-operatives, and non-profit groups. Projects will connect to the power grid at the distribution level. The program began accepting applications in September 2011. NS Power developed a distribution-class power purchase agreement (PPA) for use with these projects, and began contracting for approved projects in 2012. Five small projects totaling 1.2 MW began operating in 2013, as shown in the table below. Substantially more

contracted projects and capacity will come online in 2014. Company managers report that COMFIT contracts that have been signed to date total 93 megawatts of capacity in total, and that approximately 150 MW is expected in the long-term.

(The following table is confidential)

[redacted]

c. Non-Wind IPPs

NS Power's non-wind IPPs originally resulted from a solicitation following the construction of Point Aconi Unit 1. NS Power has contracts with six IPPs, but only one of the operating projects is large enough to produce substantial amounts of energy relative to NS Power's total load. The contracts for these IPPs do not fix production volumes; NS Power buys whatever they produce. The Company prepares internal forecasts of production from each project, using the most recent three years of production data.

Production from the non-wind IPP's was [redacted] percent below Company budgeted volumes in 2012, primarily due to the failure of the Minas Pulp cogeneration plant to come online during that year. In 2013, the non-wind IPP category fell [redacted] percent under budgeted volumes, primarily due to lower than budgeted generation from Brooklyn Power in some months.

i. <u>Brooklyn Power</u>

The Brooklyn Power project at 23.4 MW stands as NS Power's largest non-wind IPP. Brooklyn Power was developed in association with the Bowater Mersey paper mill in Liverpool, Nova Scotia. The Bowater Mersey paper mill closed in 2012, but the Brooklyn plant has continued to operate under its existing contract. The circumstances of that operation and how it came to be owned by an affiliate of NS Power will be addressed in some fashion at a future date.

ii. <u>Minas Basin Pulp & Power Project</u>

NS Power conducted an RFP process for power from distribution-connected biomass projects in December 2008[redacted], which proposed a biomass-fueled cogeneration project. The parties entered a purchased power agreement for 10 MW in September 2010, with production forecast to begin in 2012. Numerous delays have caused the project online date to be pushed back several times; NS Power currently expects a January 2017 operations date. NS Power budgeted for 27,500 MWh in production in

2012, causing a large variance in the non-wind IPP category. The Company cut the budget to zero for 2013.

iii. NS Power Port Hawkesbury Project

In April, 2010, the Company issued an RFP for firm renewable energy from transmission-connected projects, and also filed a Capital Work Order with the NSUARB for the Port Hawkesbury Biomass Project. Port Hawkesbury was a 60 MW cogeneration project to be located at NewPage's Port Hawkesbury paper manufacturing plant. In September 2010, NS Power filed Supplemental Evidence with the NSUARB in the Capital Work Order proceeding that concluded that NS Power's proposed Port Hawkesbury project gave the Company the best opportunity to achieve timely compliance with the 2013 RES requirement. The NSUARB approved the Company's project later in 2010. Economic changes affecting loading and net sales in the Company's service territory eventually eliminated the need for additional, contracted renewable resources from the RFP process to supplement the Port Hawkesbury project in meeting 2013 RES requirements.

The Port Hawkesbury Biomass Plant is a Company-owned project that does not comprise part of the non-wind IPP category presented above, though its production is a component in meeting RES requirements. It came online July 15, 2013.

2. Term Imports

NS Power has historically made most of its import power purchases on an hourly basis, occasionally making 24-hour block purchases as well. Maintenance outages have also led the Company occasionally to seek one- or two-week purchase opportunities. A recommendation in the 2010 FAM audit encouraged the Company to further explore the markets for economic term purchases, defined as being from two weeks to two years or more. It was also recommended that the Company establish regular solicitations through RFP processes for term import purchases.

NS Power began in March 2011 to issue written RFPs for month-long power supplies. The Company has continued to conduct regular RFP processes in 2012 and 2013, with gradually increased variety in the energy products requested and in the terms for import purchases. The RFPs in 2012 and 2013 went to [redacted] This entity has served since 2004 as NS Power's agent in the ISO New England Power market, buying power in ISO New England and delivering it to NS Power at [redacted] replaced [redacted] providing this service for NS Power in [redacted].

a. 2012 RFP Processes

NS Power conducted seven RFP processes for term purchase power imports during 2012. Four of the RFPs were solicitations for energy for the two-month blocks of January/February, April/May, September/October and November/December. RFPs for single months of purchased power were conducted for the March and June periods. NS Power also conducted a solicitation for supply during the two-week period from December 8-22. RFPs were not issued for July or

August, because the Company expected to have ample coal-fired generation for the lower loads expected, and the import markets were [redacted] to offer [redacted].

The RFPs requested a standard purchase volume of up to 100 MW for each solicitation, except for the December 8-22 solicitation which requested 79 MW. The delivery location was specified as the Nova Scotia/New Brunswick intertie. The specified product requested in the RFPs was for peak weekday energy (5X16) for the solicitations of the months from January through June; the RFPs for the remainder of the year specified peak energy for all days of the week (7X16). The RFPs also noted that a fixed-price product was preferred. However, the RFPs each noted that the Company would consider other volumes, delivery location, hours and days of delivery, and pricing method.

An important consideration for the solicitation of term purchase power imports during 2012 and 2013 was whether the energy product delivered would be firm or non-firm. NS Power's January/February 2012 RFP requested firm energy delivered to the Nova Scotia/New Brunswick intertie. However, the Company [redacted] proposals for firm energy in response to this RFP. Representatives of the energy suppliers informed the Company that firm transmission through New Brunswick was not available, meaning that firm energy could not be delivered to NS Power. All of the subsequent RFPs in 2012 and for 2013 (except for seasonal RFPs) requested non-firm energy in response to these market realities. The inability to deliver firm energy to Nova Scotia on a term basis due to transmission constraints in New Brunswick has been an issue that has grown substantially worse through late 2013.

NS Power's 2012 RFP processes resulted in two economic term import purchases. A purchase of 50 to 67 MW from [redacted] the month of March was estimated by the Company to provide a financial advantage of [redacted] when compared to the Company's [redacted] A second economic purchase of 79 MW for December 8-22 was made [redacted] with an estimated financial advantage of [redacted] as compared to NS Power's [redacted] that would be on the margin in December.

The 2012 RFP processes included two other situations where the Company chose not to make import purchases. Its evaluations showed [redacted] comparing the purchase pricing to NS Power generation costs. For the June and September/October solicitations, the estimated financial advantage of the import purchases [redacted] The Company believes that [redacted] to accommodate the power purchased.

The other three RFP processes in 2012 were also negatively affected by the lack of transmission availability. As noted previously, no firm transmission was available for the January/February RFP requesting firm energy. For the April/May RFP process, an import purchase was not made despite a significant economic advantage shown in the Company's evaluations. The Company noted that "the non-firm nature of the purchase requires backup and will not allow a generating unit to be taken off and replaced by the purchase." The RFP processes for the November and December time periods produced no viable proposals, because potential suppliers deemed that transmission constraints would not allow delivery to the Nova Scotia/New Brunswick interface.

b. 2013 RFP Processes

NS Power conducted 10 RFP processes for term purchase power imports, expanding their scope to include a greater variety of term energy products during 2013. The RFP solicitation documents varied with regard to volumes requested, firm or non-firm energy, peak energy, and delivery hours and days of the week. These RFPs solicited purchase contract terms of one month, two months, three months, and a seasonal (five-month) supply. The varied and complex requests encouraged the proposals submitted by market suppliers to provide substantial additional market information that is valuable to NS Power in identifying economic import opportunities.

NS Power did not issue an RFP for January 2013. For each of the months February, March, April and May, NS Power's RFP solicitations included three volume "products" that varied from month to month according to the Company's needs. For instance, the March RFP suggested three purchased power products: Product 1 for 35 MW, Product 2 for 100 MW, and Product 3 for 135 MW. Each of the product suggestions were for non-firm energy, for peak hours and for all days of the week (7X16), and stated a preference for fixed pricing. The RFPs noted that NS Power would transact for only one of the three products, and that the actual quality and quantity mix would be at the Company's option. NS Power made one economic import purchase during the first five months of 2013. It secured 75 MW [redacted] For March, April and May, no economic purchases were made in response to the supplier proposals. The proposals received were not economic; the landed prices of the purchase imports were well above NS Power's [redacted] costs in each of these months.

In April 2013, NS Power issued an RFP for a seasonal product to be delivered from November 1, 2013 to March 31, 2014. The RFP was for 50 MW of firm energy for peak hours in each day of the five-month term (7X16). Company managers confirmed that the request for five months of firm energy during the winter months was a test for the availability of both seasonal energy and firm energy deliveries to NS Power. The Company had not requested a firm energy product since the January/February 2012 RFP. That earlier RFP failed to generate firm energy proposals, due to a lack of firm transmission capacity through New Brunswick. No offers were received in response to this new seasonal RFP either, again due to lack of firm transmission.

NS Power did not issue an RFP for June 2013. RFPs were issued for July/August and later for September. Both of these solicitations were for up to 100 MW of non-firm energy for peak periods on all days (7X16). For October and November, the RFPs were for up to 75 MW and for 100 MW, respectively. The October and November RFPs each requested non-firm energy for peak hours only (5X16). For the four solicitations covering from July 1 to November 30, NS Power made only one purchase, of 75 MW from [redacted] October. The price was [redacted] except for [redacted] generation. The economic advantage to the purchase was calculated at [redacted] On the other hand, for both September and November, the landed prices of the import options were [redacted] generation in those months. NS Power declined them, due to the lack of demonstrable financial advantage. For the July/August RFP, the import option pricing was [redacted] of the Company's generation resources.

NS Power's final RFP for term purchases in 2013 requested a three-month product for December 1, 2013 through February 28, 2014. The RFP requested up to 100 MW of firm energy in either a

7X16 or 7X24 format. The "firm energy" was to be delivered on non-firm transmission, recognizing that no firm transmission would be available for delivery. The RFP also included scheduling requirements: "transmission must be purchased for the full term if supplying a delivered product. The deal must also be scheduled and attended monthly." The RFP generated [redacted] for the two products. It came from [redacted] offering was considered [redacted] was rejected for both transmission and economic considerations:

> *Due to transmission and delivery concerns through New Brunswick any volumes purchased that are sourced from [redacted] are at risk of curtailment throughout the winter. [redacted] solid fuel generation and with the 2014 forecast showing [redacted] to offset.*

c. NS Power Term Power Import Procedures

NS Power drafted its "Term Power Import Procedures" in September 2011, in response to recommendations from its own wholesale power consultants and the 2010 FAM audit report. The procedures document was updated in September 2013, and included the following components:

- Determination of Economic Import Requirements
  - A monthly or seasonal system study will be produced to assess import requirements using hourly economic dispatch software
- Solicitation of Term Supply
  - Based on the results of initial counterparty contact and systems study, targets for the following will be developed: size, hours and days of energy delivery, product firmness, delivery location, contract duration, pricing structure and solicitation flexibility
- Evaluation of Bids
- Contract Award
- Contract Implementation
- Deal Entry (into the Risk Management System)
- Solicitation Documentation
- Hedge Strategy (not required with fixed pricing)
- Supplier Response Evaluation
- Counterparty Management.

In September 2013, FERM managers performed a review of certain of the items under the "Solicitation of Term Supply" category shown above, considering market observations from the RFP processes during the previous two years. One conclusion reached in the review was that the current target size for monthly power imports of [redacted] had worked well during the previous two years. Market responses to the target size level were considered favorable. Company managers also emphasize that they would like to leave flexibility for short-term purchases that have offered more economic purchase opportunities to date. The suggestion was made that in cases where the intertie is limited to [redacted] the target volume should be reduced to about [redacted]

The review of energy product firmness concluded that, as a result of the [redacted] reducing firm transmission availability [redacted] FERM changed the target product firmness from firm to non-firm to match market conditions. However, non-firm imports impose additional operating reserve requirements on NS Power. They require the maintenance of one MW of reserve for every MW of non-firm energy purchased. This requirement does not present problems at times when the [redacted] but presents challenges during periods [redacted]

The targets for contract duration and product structure (regarding hours and days of energy delivery) were recommended to be continually evaluated on a month-by-month basis to incorporate market developments.

After reviewing the scope of system studies to estimate potential economic import requirements included in the procedures, Company managers emphasized that the monthly RFP processes and market testing, rather than system studies, provided the most important information in determining energy product details.

3. Short-Term Purchases and Sales

NS Power's day-ahead and real-time traders continually compare the cost of on-system generation to market counterparty pricing to determine economic purchased power imports. Short-term purchases run from one hour to several hours to as much as one week, depending on the season, market pricing and the incremental cost of the Company's system generation. Short-term purchases come from [redacted] when it is the best short-term option.

The table below shows the number of short-term purchase and sale transactions and related volumes by counterparty for 2012 and 2013.

(The following table is confidential)

[redacted]

The 2012 sharp decrease in short-term import volumes and subsequent strong rebound in 2013 were caused in large part by the paper mill shutdowns and reopening, along with volatile weather. [redacted] by far the largest volume counterparty for NS Power, representing about [redacted] percent of imports and over [redacted] percent of exports in 2013 [redacted] and the [redacted] In 2013, [redacted] replaced [redacted] as NS Power's trader for hourly transactions at the Massachusetts hub, [redacted] purchased from this counterparty.

Company managers note that the [redacted] makes [redacted] available to the market on a day-ahead basis. Transmission availability in New Brunswick is [redacted] is greater than for [redacted] About [redacted] percent of the import volumes are classified as [redacted] versus only [redacted] percent for [redacted] through the Company's RFP processes for term purchases.

On-peak purchases constitute [redacted] as shown in the table above. The Company managers note that greater opportunities for economic power imports occur [redacted] as [redacted] during these periods and are more likely to be [redacted]

4. Transmission Limitations

The Nova Scotia/New Brunswick intertie currently provides the only path for power flows in and out of Nova Scotia. The intertie consists of one 345 kV line and two 138 kV lines that have a physical transfer capability of 550 MW. NS Power sets its import limit at 300 MW, and the

export limit is 350 MW. The NS Power import limit is the lesser of 300 MW or [redacted] percent of the Company's load, which limits the exposure of customers to under-frequency load shedding. NS Power self-imposes this limit to protect system reliability, but transmission limits to imports are now caused primarily in New Brunswick, due to a load pocket in the Moncton area and the inability to transmit power regularly across New Brunswick from Québec and ISO-NE. The transmission constraints in New Brunswick have caused difficulty for NS Power in arranging economic purchased power imports that would lower overall fuel costs in the FAM. Specific instances of the lack of transmission availability through New Brunswick discouraging potential economic term import purchases are noted in the "Term Imports" section above.

a. Limits to Power Imports

The New Brunswick system operator had previously posted a value of 405 MW for the total transfer capacity (TTC) on the intertie between New Brunswick and Nova Scotia. New Brunswick must maintain firm transmission capacity of 105 MW in both summer and winter to facilitate a reserve-sharing agreement with NS Power, leaving 300 MW of available transmission and transfer capability into Nova Scotia.

In July 2011, the New Brunswick system operator released a report on the total transfer capacity between New Brunswick and the combination of Nova Scotia and Prince Edward Island (PEI), based on updated studies and assumptions for its system. Based on the study results, the New Brunswick system operator established a firm available transfer capacity of 100 MW in summer and 0 MW in winter. The 100 MW of summer transmission capacity have been reserved for service to PEI (including 80 MW long-term firm), leaving zero firm capacity year-round for transfers to Nova Scotia (from 300 MW previously). The lack of firm transmission into Nova Scotia has caused power suppliers to be unable to deliver a firm energy product to NS Power.

In September 2013, the NB Power System Operator informed its neighboring transmission system operators that non-firm transfer capability from New Brunswick to Nova Scotia would be reduced to a maximum of 100 MW (from 405 MW previously). The New Brunswick Power System Operator has determined that the combination of high load in the Moncton area combined with heavy flow to PEI and Nova Scotia would result in the loss of more than [redacted] of net Maritimes area load following a single contingency. As a result, the New Brunswick Power System Operator implemented the restriction on non-firm flow to Nova Scotia. After discussions with NS Power and further examining of the conditions causing the transmission restriction, the non-firm transfer capacity limit was raised in January 2014 to between 140 to 200 MW, depending on system load in New Brunswick and transmission availability.

The firm and non-firm transfer capabilities from New Brunswick into Nova Scotia have been drastically reduced during the past five years. The following chart demonstrates how transfer capacity has been revised, reducing the firm transfer capability from 300 MW to zero, and non-firm transfer capability from 550 MW to 100 MW (or possibly 140 to 200 MW).

New Brunswick to Nova Scotia Transfer Capability Changes, 2009-2013

Date	Firm Transfer Capability	Non-firm Transfer Capability	Total Transfer Capability
October 1, 2009	300 MW	550 MW	550 MW
October 1, 2010	250 MW	480 MW	480 MW
October 1, 2011	0	405 MW	405 MW
October 1, 2012	0	405 MW	405 MW
October 1, 2013	0	100 MW	405 MW

Power in the future from the Maritime Link can have the effect of "unloading" NB Power's transmission system around Moncton. The Maritime Link's capacity is projected at 500 MW. The Nova Scotia Block is 153 MW on-peak on a year-round basis. There is also a Supplemental Block of energy for a period of five years from the date in which the project is complete that will allow for approximately 200 MW during off-peak hours (defined as 23:00 to 07:00 seven days per week) during the winter months (November through March). The third discretionary block (Surplus Energy) allows for importing market-priced energy, over and above the NS Black and the Supplemental Block, up to a total domestic import (retained for use in NS) of 300MW. There could be as much as 330 MW potentially flowing through Nova Scotia to markets in New Brunswick and beyond. Power flowing from Nova Scotia to New Brunswick could "off-load" NB Power's transmission system by supplying Moncton and Prince Edward Island partially from the east, instead of completely from the west. Such east-to-west flows envision Nalcor's power exports to markets beyond Nova Scotia, after the Maritime Link enters service. These flows can be accomplished with relatively modest upgrades to NS Power's transmission system, which are currently planned as part of transmission improvements associated with the Maritime Link. The "unloading effect" of Nalcor/Maritimes Link power can positively impact transmission constraints, but it does not constitute the return of firm transfer capability from New Brunswick into Nova Scotia. This arrangement requires that power be flowing through Nova Scotia for sale to a customer in New Brunswick or beyond. When no "export" power is flowing, current limits will apply until New Brunswick's southeastern power transmission system is upgraded.

C. Conclusions

1. NS Power continues to make sufficient progress in integrating growing wind resources into its power supply mix.

NS Power currently has about 325 MW of operating wind resources on its system. With some large wind projects underway and up to 200 MW of COMFIT expected, the Company is estimating that 600-650 MW of wind resources will eventually reside on the system, including Company-owned wind projects. Integrating the variable wind resource over which the Company has little operational control presents a challenging issue that the Company has been appropriately addressing.

NS Power has been able to balance the variable wind resources using the Wreck Cove hydroelectric resource to date. The Company is properly preparing for future growth in the wind resources, first by completing the wind integration study (REIS) with General Electric. Using the information provided by the REIS, the Company is appropriately studying and testing the operational impacts of additional wind resources and possible solutions and mitigation measures.

For instance, the Company is evaluating two-shifting and low-load operations of coal units, making preparations for greater industrial load interruptions, and of course the Maritime Link. The Maritime Link will provide a key asset in balancing the wind resources after its completion. The Company's upcoming integrated resource plan will also address the strategic resource aspects of a large wind component on the NS Power system.

2. NS Power performs budgets and forecasts for wind resources that have been generally effective in predicting volumes and schedules from this power resource.

NS Power's performance in forecasting and budgeting for its wind resources was strong in 2012 and 2013, especially considering the uncertainty of IPP projects, their online dates and operational issues.

The IPP wind resource variance from budget in 2012 was caused by a larger wind project coming online unexpectedly early, rather than the planned 2013 online date. Other than this apparent communication issue with the developer, the 2012 variances from budget were less than one percent, a superior performance. In 2013, actual wind production was 2.2 percent greater than the budgeted amount, which is good performance in budgeting for variable wind resources.

NS Power has also been diligent in continually developing and upgrading its forecasting methods for wind resources. By testing and eventually [redacted], the Company is seeking ongoing improvement in its wind forecasting, which is important to system operations and dispatch.

3. NS Power's economic import power purchases are primarily short-term and on-peak in nature and constitute four to five percent of total system requirements.

NS Power made about [redacted] percent of its economic import power purchases in 2012 and 2013 on a [redacted] basis, despite the Company's monthly RFP solicitations for [redacted] purchases. Term purchases are hampered by a lack of firm transmission availability, while the [redacted] In addition, on-peak hours are most likely to [redacted] Transmission constraints limit NS Power's ability to increase the volumes of economic purchases above the [redacted] percent of total system requirements achieved in 2013.

4. The Company's regular market solicitations for term power purchases in 2012 and 2013 have effectively tested power markets for monthly and seasonal purchases.

NS Power began conducting monthly RFP solicitations for term import purchased power for delivery in March 2011. NS Power subsequently conducted seven RFP processes for term imports during 2012. Three of the RFPs were solicitations for two months of energy, three were for single months of purchased power, and a two-week solicitation for a December peak period was also conducted. NS Power conducted 10 RFP processes for term imports during 2013. The RFP solicitation documents were varied with regard to volumes requested, firm or non-firm energy, peak energy or for all hours and days of the week, and solicited purchase contract terms of monthly, two months, three months and a seasonal five-month product. The more varied and

complex requests generated proposals that provided substantial additional market information for NS Power.

NS Power has generated power supplier interest through its regular RFP processes that have made the wholesale market aware of the types of purchased power products that are of interest to the Company. The RFP processes have also tested the market for the availability of energy on firm and non-firm bases, for the volumes that are available, for peak versus all-hours products, and for contract duration.

Importantly, the RFP processes have tested and provided significant market information on the availability of firm and non-firm transmission, and how transmission constraints have affected the ability of the Company to make economic term imports that lower FAM costs.

The results of the 17 RFP processes in 2012 and 2013 were as follows:

[redacted]

- Four instances in which transmission availability clearly discouraged proposals or their potential viability.

In seven of the RFP recommendations, transmission availability was identified as one of the primary reasons for an import purchase not being made.

5. NS Power has developed effective procedures, including RFP product targets, evaluation techniques and recommendation formats for soliciting term purchase power imports.

NS Power developed the "Term Power Import Procedures" in September 2011 and has sufficiently followed the procedures in their RFP processes for term imports. The determination of economic import requirements and the details of RFP solicitation documents (*i.e.* size, product firmness, contract duration, etc.) are continually reviewed by FERM managers and adjustments made based on market feedback and learning from the solicitations. The procedures are clear and comprehensive, and are an effective roadmap to document these important processes.

We agree with the Company's position that reviews and adjustments made to the procedures are based primarily on market experience and feedback, which tends to be more valuable than the analytical systems studies that were prescribed. The reviews of the procedures have resulted in RFP processes that have become increasingly effective in testing the power markets with regard to several product variables and in utilizing that information in subsequent solicitation processes.

The evaluation of proposals generated by the RFPs has also been developed and utilized that entail comparing the "landed price" of proposed term imports against either the marginal costs of solid fuel generation or natural gas generation, depending on the season and Company generation used during the period being analyzed.

NS Power has also established sufficient solicitation documentation of the RFP processes that include the RFP documents, bidder lists, counterparty conversation logs, proposals received, financial evaluations of alternatives, recommendation memos, and deal documentation.

Liberty finds that the term import procedures are well organized, detailed and are generally effective, with a few exceptions as described in Conclusion #8 below.

6. **The elimination of firm transmission availability imposed by the New Brunswick system operator has limited the frequency and volume of term economic power imports.** *(Recommendation #1)*

The lack of firm transmission availability has severely restricted the Company's access to economic term imports solicited in the RFPs. The negative impact of this issue is clear from our review of the 2012 and 2013 RFP processes, where reductions in transmission availability have diminished economic import opportunities.

The New Brunswick system operator's 2011 reduction of firm transfer capability into Nova Scotia to zero from 300 MW in 2009 and 250 MW in 2010 has greatly diminished the opportunities for economic term imports. NS Power has recognized that firm transmission is required for the delivery of import purchases with a duration of more than one month, and is far more advantageous for purchases from a few days to one month. The lack of firm transmission and transfer capability also makes suppliers unable to respond to a two-month RFP for firm energy, as shown in early 2012. Firm transmission is also a requirement for the delivery of multi-month energy purchases such as that requested by the Company for three months and five month seasonal purchases for the winter of 2013/2014; the unavailability of firm transmission resulted in no supplier proposals.
The absence of firm transfer capability into Nova Scotia effectively eliminates large portions of the market for term imports. The limitations on firm transmission into Nova Scotia are due solely to transmission constraints in New Brunswick, and are established and controlled by the New Brunswick system operator.

7. **The 2013 reduction in non-firm transfer capability into Nova Scotia has further diminished NS Power's ability to purchase economic power imports.** *(Recommendation #1)*

The reduction in non-firm transfer capability into Nova Scotia from 405 MW to 100 MW (later increased to 140 to 200 MW depending on system load in New Brunswick and transmission availability) has further restricted economic import opportunities for NS Power. The Company had previously been forced to request non-firm energy in its RFPs due to the complete absence of firm transmission capability into Nova Scotia.

NS Power has encountered curtailments on its non-firm term purchases that have discouraged subsequent potential imports that may be financially advantageous. The Company reports that [redacted] percent of the volumes purchased in the 2012 and 2013 RFP processes were not delivered due to transmission curtailments. The transmission curtailments occurred on non-firm term purchases during a majority of the days contracted, with the exception of September 2013. Curtailments in the transmission of economic imports caused increased generation costs and eliminates the economic benefit gained during the curtailment. Transmission curtailments that occur during

peak periods are especially damaging, as the financial advantage of economic imports is generated primarily during peak periods when more expensive Company resources are displaced.

Another issue with non-firm transmission is that power suppliers have not provided proposals in response to the RFPs in some instances, recognizing that the delivery of non-firm imports may be curtailed, especially during the winter months and other high load periods for the transmission paths. Suppliers realize that the value and attractiveness of their energy proposals are substantially diminished if frequent curtailments are expected to occur.

The reduction of non-firm transfer capability to 100 MW in September 2013 caused lost opportunities for economic imports that were recognized by NS Power. The Company performed a retrospective analysis of the NB/NS tie transfer capability restriction of 100 MW for non-firm energy for the previous 2013 winter period. The analysis used actual system data and fuel pricing and applied the 100 MW limitation to determine the simple replacement cost of imported energy had the import restriction not been in place. The replacement energy cost was conservatively estimated to be [redacted] million over the winter of 2013. The Company managers noted that the lost economic imports were estimated to be [redacted]MWh over the same winter period.

We believe that this analysis may underestimate the impact of the non-firm transfer capability reduction, as its negative impact on potential term imports that were discouraged was not included. Since power suppliers did not make proposals in some RFP processes due to the lack of transmission availability, the cost of lost term import opportunities due to reduced non-firm transfer capability are unknown, but are certainly substantial.

8. NS Power did not effectively evaluate the economic impact of transmission curtailments and their effect on Company generation operations in certain RFP evaluations and decisions. *(Recommendation #2)*

NS Power changed its RFPs to begin requesting non-firm energy as of the solicitation for March 2012. The Company had discovered in previous RFPs that firm energy could not be delivered because no firm transmission was available.

The RFP for March 2012 non-firm monthly energy resulted in an attractive proposal [redacted] The Company's evaluation and recommendation estimated the financial advantage of the economic purchase to be [redacted] and [redacted] MW were purchased from [redacted]. The evaluation also concluded that [redacted] However, the financial impact [redacted] was not estimated and included in this or other RFP evaluations.

Company managers were asked about the consideration of potential transmission curtailments in making their decision to make the purchase. They noted that, at the time of the decision, they did not believe that occasional curtailments would eliminate the economic advantage expected. However, they noted that curtailments were a problem with this economic import in that they were more frequent than the Company had anticipated. They also noted that ramping down the coal units due to the import caused minimum generation issues and operational problems.

The RFP process for the following month (April 2012) presented a similar situation to be evaluated. The best proposal had a "landed price" of [redacted] However, in this case the Company did not make the purchase for the following reasons from its recommendation memo:

> *Due to transmission and delivery issues through New Brunswick any volumes purchased that are [redacted] are at high risk of curtailment. This coupled with the non-firm nature of the purchase will not allow a unit to be taken off and replaced with a purchase. In a period of low loads and high winds this could put the system in a difficult scheduling position.*

The Company's managers explained that the poor experience with the previous month's purchase caused operational issues due to the curtailments. The Company believed that the potential issues of curtailment and scheduling overrode [redacted] advantage in the evaluation. However, the cost of the curtailments and any related operational problems that the Company may experience were not estimated and included in the evaluation. A third economic import evaluation and decision for December 8-22, 2012 was inconsistent with the previous decisions. The evaluation showed a landed price of the purchase proposed [redacted] was [redacted] than the average estimated cost of the [redacted] that would be displaced. The recommendation and decision was to make the purchase, even though the economic benefit of [redacted] was [redacted] than the [redacted] of the April economic purchase proposal that was rejected. The concerns with non-firm transmission were not mentioned in the recommendation memo, nor were any estimated costs of transmission curtailments included in the evaluation.

In light of the evaluations, recommendations and decisions described above, Liberty concludes that in these instances, the Company was not consistent in its decision-making. We also conclude that the Company should analyze and estimate the financial impacts of transmission curtailments and related operational issues and include them in the RFP evaluations. Such information would provide a more complete picture of the financial implications of economic purchases, and provide a more sound basis for making decisions.

Liberty also concludes that the "inefficiencies caused by backing down coal units" has not been quantified and included in any of the RFP evaluations. Estimating the costs of such inefficiencies should also provide a more complete picture of financial implications that should be used for economic import decision-making.

D. Recommendations

1. Provide to the NSUARB periodic reports on developments in New Brunswick regarding transmission and power-coordination issues. *(Conclusions #6 and #7)*

The NSUARB should be kept apprised of developments in New Brunswick that affect NS Power's access to competitively-priced power imports, and to markets for power exports. The Board should also be informed about progress in power coordination as it affects the economic and efficient operation of NS Power's system. Liberty recommends that NS Power provide quarterly reports to the Board on these issues.

2. **Develop effective methods to accurately quantify and analyze the economic impact of transmission curtailments on its generation operations for use in evaluating economic purchase power import opportunities.** *(Conclusion #8)*

Quantifying the costs of non-firm transmission curtailments is difficult but important in providing the complete financial impacts of making economic import purchases in RFP evaluations. Providing a complete financial evaluation of non-firm economic imports requires the quantification of all financial impacts, including transmission curtailments.

The Company should also provide specific and accurate estimates of the costs of backing down the Company's coal and natural gas units. Accurate information is needed to quantify all of the financial impacts of economic imports, especially in cases where the economic advantage to the imports is slight.

XI. FAM Accounting

A. Background

A 2009 NSUARB order approved the implementation of NS Power's Fuel Adjustment Mechanism ("FAM"). The FAM provides for annual adjustment to recover fuel and purchased power costs on a more current basis, in order to address the effects of volatile fuel and energy costs. The FAM reconciles the differences between actual fuel and energy costs and base fuel and energy costs. Two deferral accounts drive annual changes in the costs recovered from customers through the FAM:

- AA (the Actual Adjustment): Tracks the difference in current fuel and energy costs from those reflected in the base cost of fuel or actual adjustment
- BA (the Balancing Adjustment): Compares costs actually recovered through AA to those intended to be recovered.

The difference between current costs and recoveries accrues carrying charges, which form part of the reconciliation of actual and base costs.

The scope of Liberty's FAM accounting review for 2012 and 2013 (Audit Period) included:

- FAM accounting policy and procedures
- Actual fuel and purchased power costs recorded in general ledger accounts, as provided for under the approved Plan of Administration (POA)
- Difference between actual fuel and purchased power costs and those recovered under base rates
- Carrying charges on differences
- The AA's deferred balance associated with 2012 and 2013 costs to be refunded or collected
- The BA deferred balance associated with tracking the AA balance
- Other relevant accounting issues that may affect the FAM, such as the addition of Biomass Fuel generation in 2013, which is now included in the FAM.

1. FAM Accounting - Fuel and Purchased Power Cost

Liberty reviewed NS Power's financial accounting process, and examined detailed financial accounting records that support the actual cost of fuel and purchased power claimed. Liberty conducted an on-site review to examine documents and supporting work papers, and to discuss processes, procedures, systems, documentation, and FAM reporting with NS Power personnel. Liberty sampled accounting entries from January 2012 through December 2013 reporting, and performed test procedures on selected entries that included related supporting accounting documents. We also reviewed organization charts, charts of accounts, cost-center and project activity codes, general policies, and procedures. We examined accounting process narratives related to fuel and purchased power procurement, fuel inventory records, energy marketing documents, and supporting accounting information pertaining to the FAM's cost components.

We sought to determine whether NS Power maintains its FAM accounting and reporting information in a manner sufficient to facilitate a level of verification and auditing customary in

the administration of clauses such as NS Power uses, and that regulators oversee. Liberty's review addressed FAM accounting issues identified in prior reviews; *e.g.*, Mark-To-Market (MTM) accounting for solid and liquid fuel transactions, increased cost of solid fuel handling, and implementation of prior audit recommendations. Liberty reviewed changes in fuel use during the Audit Period (*e.g.*, the introduction of biomass as a generation fuel), and sought to identify any other operational changes that might affect accounting for the costs of fuel and purchased power.

B. Findings

1. Accounting Resources for FAM Administration

Liberty interviewed NS Power's Senior Manager Fuels Planning and Performance and other individuals responsible for creation and maintenance of accounting records and for preparation of monthly, quarterly, and annual FAM reports, statements, and supporting documents. Liberty's review process included presentations, discussions, and input from the Director of Fuels Energy & Risk Management, the Senior Manager of Fuels Strategy and Performance, and the Biomass Supply Manager, conducted to gain additional insight into coal and biomass handling and inventory strategy that might affect FAM-related costs. Liberty also examined the procedures that guide these activities. The Plan of Administration (POA) serves as the principal governing document. This plan sets forth the policies and procedures guiding FAM calculation and determining allowed costs. NS Power also employs other accounting policies and procedures that have relevance to fuel and purchased power costs. They provide the administrative and accounting procedures that ensure that costs have been reasonably and accurately reported. As we observed in the last FAM audit, Liberty found NS Power's accounting personnel to be knowledgeable, helpful, and open about FAM accounting and reporting processes, and familiar with the detailed, supporting work papers.

NS Power continues to maintain a formal accounting flow chart, and operates under a clear chain of reporting in those organizations responsible for FAM-related accounting activities. These organizations include the Controller, Fuels Planning & Performance, and Fuel Accounting & Reporting. NS Power made a number of incremental organizational changes during the Audit Period. Fuel-related accounting staff fell by one, leaving a total complement of six employees. A lower level staff position remained vacant at the time we began field work in December 2013, but the Company later filled the position. The senior manager and three lower level staff employees remained unchanged from the last Audit Period. NS Power brought in a new manager of fuels accounting in early 2013. As a previous employee of NS Power's outside auditors, he came to the position with considerable experience and knowledge about fuel accounting operations.

A formal POA continues to contain the necessary supporting procedures and accounting and reporting checklists. NS Power also maintains appropriate accounting policies and procedures. They adequately address accounting for fuel and purchased power expense, including inventory records. Moderate changes to the POA have received NSUARB approval, except for 2013 proposed changes which have not yet been approved. One of the more notable proposed changes was the addition of provisions for biomass fuel, whose costs the FAM now recovers.

The systems and tools that NS Power uses for fuel and energy accounting and reporting include an appropriate overall accounting system and an appropriate chart of accounts, which have numbers and definitions sufficient to define adequately the accounts, activities, cost centers, and project codes necessary for FAM operation and calculations. NS Power uses an effective *Oracle* Accounting System to maintain its general ledger. *Aligne* operates as a sub ledger for fuel inventories and its interfaces with *Oracle* are effective. *Aligne* became operational in January 2012, replacing the previous system, known as *Fuelworx*. The new system provides some additional upgrades and enhancements in fuel accounting and reporting. NS Power used *MS Excel* worksheets to perform variance reporting in key areas of sales information, foreign exchange, and other related fuel and purchased power activity.

Liberty observed that NS Power has generally maintained the same detailed monthly analytical data in support of FAM costs. However, more streamlined reports now reduce redundant analyses, and *Aligne* provides enhanced reporting capabilities. Test work validated the existence of documented FAM accrual and adjusting entries, and continued reliance upon these entries, along with supporting analysis.

Liberty found NS Power's accounting and reporting organizational structure and staff suitable for FAM accounting and administration purposes. Further, Liberty found that the accounting department exercised reasonable oversight and direction of its staff. We did, however, find some areas (discussed later in this chapter) where accounting policies and procedures warrant improvement.

2. FAM Reports to the NSUARB

The general context of the accounting resources, including the FAM tools and administration described above, provide the backbone information used to compile the monthly/quarterly/annual FAM reports submitted to the Board. NS Power prepares these reports under process checklists that it keeps current, and to which its personnel adhere. The supporting procedural accounting and reporting checklists, along with supporting documents, were well maintained and followed, with a few minor exceptions. NS Power continues to maintain a formal FAM in-house review and approval process. The process provides for a stepped level of review by key personnel, who review and comment on the draft monthly/quarterly/annual FAM filings to be submitted to the Board. Our review of January 2012 to December 2013, monthly, quarterly, and annual FAM control review sheets found them properly maintained. However, NS Power no longer maintains copies of the comments provided by respective reviewers during the review and approval process. Liberty believes such comments should be preserved for future review and audit purposes.

3. FAM Accounting Policies and Procedures Verification

Liberty tested and verified NS Power's FAM accounting policies and procedures that underlie fuel and purchased power costs reported for the Audit Period. This portion of Liberty's audit work included testing of some activities in various months of the Audit Period. Liberty pursued more detailed review and analysis for some specific FAM cost elements, such as the addition of biomass activity in mid-2013.

Liberty requested and received copies of NS Power's general accounting policies and procedures and process narratives for fuel and purchased power procurement and inventory, as well as energy marketing.

NS Power's updated documents did not reflect effective dates, making it difficult to determine when they applied. Further, when the Company began to require biomass procurement, only a simple reference was made to reflect its inclusion as a fuel component. NS Power relied upon coal policies and procedures as a proxy for biomass processes. Biomass fuel, operations, and inventory tracking and adjustments differ from those applicable to coal. For example, NS Power performs coal inventory adjustments quarterly, but decided upon an annual (year-end) cycle for biomass inventory adjustments. Also, the current process narratives explain quality and quantitative analysis with reference to coal. Liberty's review of the current process narrative found no similar discussion or direction related to biomass. NS Power's biomass presentation to Liberty explained in some detail the complexities associated with biomass procurement and consumption. Process and procedure documentation should reflect those complexities and their unique elements. Despite this gap, however, our testing of biomass did not disclose any findings that would affect FAM costs materially.

4. Fuel and Purchased Power Accounting Verification

a. Prior Audit Period FAM Cost Element Issues

Liberty addressed with NS Power a number of issues related to the preceding FAM Audit and the process for setting the FAM adjustor amounts from 2009 through 2011. MTM accounting for hedges comprised a significant issue in the 2009 FAM cost and 2010 FAM adjustor calculations. At that time, NS Power agreed to make necessary changes to its accounting policy, and to reflect MTM transactions in the FAM calculation when the underlying instruments settle. The change also required the recalculation of interest charges in 2010 for the reversal of such prior transactions. Liberty's current discussion with NS Power for review of FAM accounting and reporting data for the 2012-2013 Audit Period confirmed that NS Power has continued to operate in accord with the appropriate changes.

Liberty also discussed a prior audit recommendation to designate a project code for the underlying fuel handling costs related to dead coal storage activity at Lingan. Liberty's current review confirmed that NS Power has used appropriate coding during the Audit Period.

b. Current Audit FAM Cost Element Issues

As it has done before, NS Power continued to maintain vendor master files, and adhere to organization and authority approval levels for fuel and purchased power procurement. Data from purchase requisitions, purchase orders, and contracts effectively flowed through *Aligne* and *Oracle* as required. The data included contract change authorizations. Station-by-station receipts of goods and tracking of deliveries existed and NS Power prepared analytical reports on a station-by-station basis to support review and reconciliation. NS Power bills BTU penalty adjustments to suppliers, or deducts a corresponding amount from supplier invoices. Monitoring includes cross checks, and provides for reconciliations and any necessary adjustments.

Liberty's review and testing of fuel procurement, invoicing, and verification process demonstrated conformity between costs contracted and costs paid. Liberty did, however, observe

weaknesses in use of *Aligne* and *Oracle* in connection with contract and purchase order controls and overall price verifications. We discuss this matter below.

The plants employ various feeders, meters, and measurement systems to determine the quantity of fuel consumed. Policies and procedures exist to track inventory consumption and to make inventory adjustments. Measurements taken by feeders/meters as coal and oil are consumed are automatically fed into the Process Information ("PI") system. PI system data feeds into Aligne daily. Each plant enters the fuel blend ratio into *Aligne* and the system calculates consumption quantities.

Liberty's review of the Chart of Accounts and definitions identified account designation, activity, cost center, and project codes related to FAM fuel and purchased power costs. Liberty obtained detailed general ledger activity within *Oracle* for each FAM account listed in the POA, and for other accounts affecting the FAM. Liberty tested some January 2012 through December 2013 activity by tracing activity to the sub ledger, original adjusting, and accrual entries, and to supporting work papers. Liberty reviewed and tested Lingan dead storage fuel handing costs under the newly assigned project code activity. Liberty found no issues with the costs reported. We also found that NS Power updated the chart of accounts to provide for the addition of biomass fuel activity.

Liberty reviewed the interfaces between *Aligne* (the sub ledger for fuel inventories) and *Oracle*. We traced, cross checked, and reconciled information on a sample basis. Liberty's work included a review of variance reporting that supported costs entries. This work disclosed no concerns.

Liberty reviewed in some detail the *MS Excel* worksheets used for variance reporting in the categories of sales information, foreign exchange, and other related fuel and purchased power activity. Our audit procedures included requests for supporting data, followed by discussion with NS Power to gain a better understanding of approach and reporting practices. Liberty tracked, for example, gas sales recorded from supporting *MS Excel* schedules. We verified the accuracy of the charges we tested, as well as the accompanying adjusting and accrual entries.

5. Fuel Contract and Purchase Order Controls Verification

Liberty's review and testing of fuel procurement, invoicing, and verification processes did not disclose any instances where costs paid for fuels procured exceed contractually agreed upon prices. Liberty tracked and compared contract pricing agreements maintained within the Fuel Energy & Risk Management department with data from Fuel Accounting. Difficulties arose in getting clear and concise information on contracts. Such information needs to be coordinated between the groups. We believe that the difficulties stemmed from NS Power's effort to move to electronic based file maintenance, given that we did not experience this difficulty in the prior audit, which occurred before the transition at issue. We experienced similar problems in other areas of this audit, as discussed in more detail in Chapter IV, Solid Fuel Procurement and Contracts. NS Power's fuel procurement department experienced difficulties in efficiently producing a list of contract terms and pricing to compare to the invoice pricing activity within the fuel accounting department. During the transaction testing process, Liberty obtained an informal internal control sheet prepared by fuel accounting. This sheet provided detailed information for coal contracts, including purchase order numbers, contract terms and pricing, and

other relevant information, such as verification that appropriate management personnel authorized such terms. Liberty found this informal control sheet to be helpful. Formalization of this control sheet to include shared oversight and approval by both the fuel procurement and fuel accounting departments would enhance related controls.

The purchase order numbers assigned to agreements change annually. However, some agreements remain in effect for periods greater than a year. Moreover, some vendors have multiple agreements with NS Power. Invoices accurately reflect the annually assigned purchase orders. The lack, however, of a specifically assigned contract number corresponding to a purchase order and invoice made it difficult and time consuming to connect purchase orders to the correct contract. The addition of a contract code would enhance the overall process.

One of the *Oracle* controls within the accounts payable function sets a total, not-to-exceed value, for a purchase order. That value generally represents the annual value under the agreement's terms, plus a variable for volume contract options and shipping tolerance. For example, an agreement with an annual base quantity and price value of $17,990,000 displayed an *Oracle* accounts payable system value of $21,767,900. The additional $3,777,900 reflected the addition of a contingency of 20 percent for volume and shipping tolerances. Liberty posed a hypothetical scenario in which a vendor and a Company employee could enter a false contract price into *Aligne*, in order to query whether such activity could escape attention until such time within the year that costs exceeded the maximum set amount. Note that our review and testing did not disclose such activity; we sought only to examine its potential for occurring. The risk of this possibility could be mitigated by: (a) eliminating the inclusion of amounts higher than the contract amount in the annual purchase order value, or excluding the variable, and (b) requiring spot reviews and verifications of the contract terms entered into *Aligne*. This control could be executed by persons, such as the Senior Manager of Fuel Accounting, who is not authorized to enter contract prices or price adjustments into the fuel accounting system.

6. FAM Process Accounting Controls Verification

NS Power's accounting department generally has continued since the last Audit Period to rely on the same activities and reporting checklists when preparing monthly FAM accounting support for FAM filings, except for the addition of biomass activities. Liberty reviewed and tested the overall accounting controls to verify that they support thorough and accurate FAM cost reporting. We discuss later in this chapter the review and testing of monthly analytical, accrual and adjusting entry data. Liberty found the senior and manager level accounting staff to be appropriately engaged in the review and oversight process. Their activities include documented sign offs of necessary accounting documents.

7. FAM Monthly Reporting Analytical Data Verification

NS Power maintains a binder entitled "Fuel & Purchased Power Month-End" for use in preparing each monthly FAM filing. These binders contain the checklist of tasks to be performed for each generating station. The process provides for comparison of consumed with recorded costs, and for adjustments, where appropriate and approved. The binder also describes formal review processes to be performed.

In the later part of 2013, NS Power undertook a number of steps to reduce redundant or unnecessary activities to streamline the monthly FAM accounting process. Additional electronic

file record keeping steps came as part of a paper minimization effort. Liberty received access to a number of such electronic files. We found no concerns with regard to the methods, process, or results associated with the material provided. Our testing found the analytical data and the processes producing them to be reasonably applied. There was adequate control of adjustments.

8. FAM Monthly Accrual and Adjusting Entries Verification

NS Power maintains another binder referred to as "Fuel & Purchased Power Accounting." The binder contains a checklist for each FAM adjusting and accrual entry, and includes supporting work papers. For example, adjusting and accrual entries provide support for such major FAM cost components as booked natural gas consumption, hedges, storage gas losses, heavy fuel oil burn and overhead, fuel handling reallocation, MTM adjustments, Foreign Exchange adjustments, quarterly fuel financial instruments, and power purchases and sales. Liberty performed spot testing and tracing of a number of entries to the general ledger accounts. This testing included review of the supporting work papers. Liberty found no material gaps or errors.

Liberty undertook additional testing to confirm transaction details, examine supporting information, and in some instances review the rationale for incurring certain costs. For example, we performed some testing to confirm FAM accounting treatment of MTM and Lingan dead storage transactions within the general ledger, in order to confirm transaction consistency with recommendations made in prior FAM audit reports. We found no issues in this regard.

Liberty reviewed, tested, and requested additional information to support the rationales behind a number of items included in FAM cost within this binder. We observed two items of note, which we address later in this chapter: (a) costs for Sydney Harbor dredging, and (b) expenses for underutilized rail cars accounted for as FAM expenses in the Audit Period. With the exception of these two items, Liberty's review of entries and supporting documents demonstrated conformity with NS Power's monthly, quarterly, and annual Audit Period reports.

9. Accounting System Flexfiled Codes

Liberty reviewed NS Power's Chart of Accounts, including information that describes its fourteen-digit "Accounting Flexfiled" code system. This five-segment system allows for unique identification by company, account, activity, cost centers, and project. Liberty reviewed the consistency of cost classification through review of detailed general ledger account activity information, transaction testing on a number of the major cost elements, testing of related adjusting entries and supporting data, and review of additional supporting details.

Our examination disclosed no reason for concern about the consistency of the classification of costs within the appropriate accounts, nor did it disclose any material differences between underlying FAM cost recorded and those reported. NS Power's accounting system, including supporting work papers, provided sufficient and reasonable transparency for analyzing costs associated with the various FAM cost elements, with the exception of certain specifically addressed items. The Company's work papers and supporting documents supported the ability to query and extract information from systems.

10. Sydney Harbor - $1 million 2012 FAM Expense Claim

In August 2012 NS Power accrued $1 million of expense related to an agreement in which the Company joined with others to dredge the Sydney Harbor. Liberty reviewed the detail and

rationale for these costs. NS Power explained that deepening the harbor would allow vessels to carry more coal on a single shipment, thus lessening delivery cost. Liberty does not believe that such costs are allowed for in the FAM; and, NS Power did not seek a waiver from the Board to include it in the FAM. We do not believe that NS Power should have capitalized (per se) the project's costs. The work, however, was undertaken to produce long term benefits. Liberty therefore believes that if NS Power had sought and received a waiver to include it in the FAM the reasonable approach would have been to amortize its $1 million share of costs over a five-year period. Moreover, amortization should begin only when NS Power made the payment (December 2012). With a monthly amortization amount of $16,666, FAM-recoverable expenses under this approach for 2012 would be $16,666 and for 2013 would be $200,000.

11. Biomass FAM Accounting and Expense Verification

Accounting transaction controls for biomass fuels follow the same approach as applicable to other fuels. Appropriate account codes have been established, and the same accounts payable process exists. The Company creates purchase orders based upon commercial agreements, and subject to pre-defined management approval levels. Payments are approved against purchase orders that undergo verification against activity tracked through *Aligne*, which NS Power uses for all inventoried fuels. The Company tracks purchases and consumption of biomass fuels in *Aligne*, and produces monthly reports to support consumption information and adjustments, if any. The Company also performs appropriate monthly accrual and adjusting entries, which include supporting work papers related to FAM approved fuel handling expenses. Liberty reviewed the monthly data related to these transactions for 2013, and tested a number of transactions from 2013.

Liberty's review found the data and the underlying processes reasonable, consistent, and adequately reviewed by appropriate management. Liberty also undertook detailed transaction testing and verification. This review and examination showed no reason for concern as to consistency of the classification of costs, nor did it disclose any material differences between cost recorded and those reported. However, Liberty's review of December 2013 data revealed two items of cost which require downward adjustments. NS Power failed to apply a normal ongoing allocation factor to various operating and maintenance expense so as to remove approximately $30,000 of cost from FAM consideration; and, $12,500 was included for costs associated with the lease of land to provide for additional storage facilities for solid fuel inventory. Liberty believes that this type of expense is not provided for in the FAM.

C. Conclusions

1. NS Power applies suitable accounting resources, systems, tools, and methods to FAM administration.

NS Power provides reasonable oversight and direction of accounting for fuel and energy transactions affecting FAM operations. Personnel in the fuel procurement and accounting departments exercised reasonable oversight and direction of staff in performing activities related to the FAM administration.

2. **Formal review and approval processes exist for FAM reports submitted to NSUARB which processes NS Power has followed; however, NS Power should maintain copies of comments by the respective reviewers during the review process.** *(Recommendation #1)*

NS Power continues to maintain a formal FAM in-house review and approval process for reports submitted to the Board. The process provides for a stepped level of review by key personnel. However, in a departure from past practice, NS Power no longer maintains copies of the comments provided by respective reviewers during the review and approval process. Liberty believes such comments should be preserved for future review and audit purposes.

3. **NS Power's accounting policies, procedures, and process narratives are generally effective, but not all policies and procedures bear current effective dates, and changes to reflect the addition of biomass do not address that fuel's unique requirements with sufficient specificity.** *(Recommendations #2 and #3)*

In mid-2013 biomass fuel was added to NS Power's generating capabilities. Updated documents did not reflect effective dates. The inclusion of such dates is important in identifying when such policies apply. The Company relied upon policies, procedures, and processes designed for coal to address biomass. Such policies should be revised and updated to reflect that there are differences in addressing the requirements for each.

Liberty's testing found no exceptions or concerns with respect to adherence to existing policies, procedures, and processes.

4. **Fuel and purchased power accounting (inventory and expense) is generally sufficient.**

NS Power's accounting system for solid and liquid fuels and for natural gas effectively employs *Aligne* and *Oracle*, along with stand-alone *MS Excel* spreadsheet analysis. Supply contracts are set up and maintained in the inventory master file in *Aligne* and data from the Process Information (PI) system feeds *Aligne*. This system automatically calculates the weighted-average unit cost of inventory used to record consumption. The spreadsheets process gas and power revenue, purchases, receivables, and payables. *Nucleus* tracks market transactions. Deals are executed over a recorded phone line or logged over instant messaging (IM), which is then confirmed by issuing and faxing the confirmation from *Nucleus*.

Accounting transactions are generated from *Nucleus* and processed through *Oracle*, the general accounting system. Other entries that have an impact on the cost of fuel included in the FAM, such as MTM and FX rates, are processed through spreadsheets. All related fuel and purchased power costs (solid and liquid fuels, gas and purchased power, MTM, and FX, for example) included in the FAM are supported by detailed documents and a review process that includes controlled accrual and adjusting entries. Liberty's review and testing found them to be consistently and appropriately applied.

Fuel and purchased power inventory accounting policies and procedures provide the necessary guidance for maintaining the inventory master file, conducting physical inventory, comparing and adjusting counts, if necessary, and reporting results to the Director, FERM. Liberty notes that biomass inventory adjustments occur on an annual basis, in contrast to other fuels, which

undergo quarterly adjustment. Liberty's review and testing found no exceptions or concerns, except as noted above related uniquely to treating biomass processes.

Liberty's prior audit recommended that a project code be added to the accounting system to fuel handling cost related to Lingan dead storage inventory. Liberty's review and testing confirmed implementation of this recommendation.

5. There are some specific opportunities to improve document retrieval and controls, which are generally effective. *(Recommendations #4, #5, #6, and #7)*

The gaps that Liberty observed include:

- Difficulties in the ability to provide promptly information on contract terms and conditions
- Lack of assigned control numbers to follow activity on approved contracts
- Use of the highest potential contract value to control accounts payable controls within *Oracle*.

The objective of internal controls is to assure effectiveness and efficiency, reliable reporting, and compliance with laws, regulations and policies. The importance of such internal controls is not limited to one single department but at times will require shared responsibilities to achieve the desired results. Liberty experienced difficulties in obtaining timely information to verify and test for compliance with various coal contract terms approved by fuels management to that of actual transactions recorded by fuel accounting. In short, there was a lack of cohesiveness between the two departments due in part to a move to a more electronic reporting system; *i.e.*, paper reduction efforts.

Liberty's review and testing of the procurement, invoicing, and verification processes did not disclose any situation where costs actually paid for fuels procured exceeded agreed upon prices. However, Liberty experienced some difficulties in making comparisons between data within Fuel Energy & Risk Management and records maintained in Fuel Accounting. Fuel Energy & Risk Management personnel could not quickly produce a list of contract terms and pricing to compare to the invoice pricing activity within the fuel accounting department. Liberty obtained an informal internal fuel contract control sheet that detailed contract terms. Formalizing content and use of this fuel contract control sheet, and instituting shared oversight and approval of this control sheet related to procurement, invoicing and verification by both the fuel procurement and fuel accounting departments would enhance controls.

Assigned purchase order numbers change annually, despite the fact that some contract agreements remain in effect for longer durations. Some vendors also have multiple contract agreements with NS Power. Lack of a specifically assigned contract number to a corresponding purchase order and invoice make it difficult and time consuming to relate contract numbers to their agreements.

6. NS Power maintains and adheres to appropriate process accounting controls when preparing monthly FAM-related supporting reports.

NS Power's senior and manager level accountants adhere to a formal accounting review and approval check off process as they oversee FAM reports (*e.g.*, comparing the various fuel and purchased power reports for each station to information from *Aligne*, *Nucleus*, and *Oracle* as well as gas and purchased power purchased/sold). NS Power maintains two supporting binders that guide the preparation of monthly FAM reports. The Accounting Department instituted a number of steps, to include improved electronic record keeping as part of its overall paper reduction efforts. Except for those areas more fully discussed in this report, Liberty found the senior and manager level accountants review and approval process to be reasonable.

7. Detailed monthly analytical data supports recorded FAM costs.

NS Power maintains a binder entitled "Fuel & Purchased Power Month-End" for each monthly FAM filing. This binder contains the checklist of analytical tasks to be performed for each of the generating stations in which fuels are consumed, and their related cost values are analyzed within the various reporting programs. Consumed costs are compared to recorded costs, and adjustments where appropriate, if any, are determined and approved. The binder also contains the formal in-house review process described earlier. The analytical data and related process was reviewed and tested and found to be reasonably applied.

8. FAM accrual and adjusting entries are appropriately documented.

The accrual and adjusting entries related to fuel and purchased power costs reside in the "Fuel & Purchased Power Accounting" monthly binder. The binder contains a check list of required monthly accrual and adjusting entries, for which entries and all supporting data are attached. Liberty reviewed and tested some of the major entries (including copies of various general ledger accounts). Costs reflected in these accounts represent the fuel costs allowed to be recovered through the FAM, as listed in the POA. Liberty's review of entries and supporting documents supported NS Power's monthly, quarterly, and annual FAM report for the scope of the Audit Period. Two items of interest were further reviewed and are addressed below.

9. The accounting system provides suitable transparency and utility for analyzing costs.

Our testing included review of the related adjusting entries and supporting data; and where warranted, we requested additional information to support the rationale for underlying costs. Except for the items specifically noted in our report, this review and examination showed no reason for concern as to consistency of the classification of costs within the appropriate accounts, nor did it disclose any material differences between FAM cost recorded and those reported.

10. The $1 million paid for dredging of Sydney Harbor is not provided for in the FAM, and NS Power did not seek a waiver and approval for its inclusions. *(Recommendation #8)*

NS Power contributed to dredging costs that will permit vessels to carry more coal, thus, lessening delivery cost. Liberty believes that this type of expense is not provided for in the FAM, unless NS Power first seeks appropriate waiver and approval for the inclusion of such cost. While not per se an NS Power capital project, the work nevertheless was designed to produce long-term benefits. Assuming appropriate waiver request and approval the costs should therefore be amortized.

11. Liberty found NS Power's FAM accounting for related biomass fuel accounting to be well documented and reasonably reflected in the FAM.

Liberty undertook a detailed review, testing, and verification of NS Power's FAM accounting related to biomass expenses reflected in the FAM. In general, the organizational structure and staff oversight was reasonable and adequate. The accounting staff worked closely with the biomass plant staff to develop necessary reports and methods in support of expenses reflected in the monthly FAM cost. This review and examination showed no reason for concern as to consistency of the classification of costs within the appropriate accounts, nor did it disclose any material differences between FAM cost recorded and those reported.

12. Two items of biomass cost warrant downward adjustment. *(Recommendation #9)*

NS Power's December 2013 data revealed two items of cost that warrant downward cost adjustment. NS Power failed to apply a normal ongoing allocation factor to various operating and maintenance expenses that would remove approximately $30,000 of cost from FAM consideration; and, $12,500 was included for costs associated with the lease of land to provide for additional storage facilities for solid fuel inventory. Liberty believes that these expense types are not provided for in the FAM.

D. Recommendations

1. Retain all comments provided by reviewers during the review of draft monthly/quarterly/annual FAM reports. *(Conclusion #2)*

Preserving the comments provided by reviewers during the review process provides insight into what, if any, changes were made to initial FAM reports and the rationale for such changes. This step has value for auditors in helping to identify steps taken by the Company to address errors or weakness related to the preparation of the FAM report and that such errors are not of a recurring nature.

2. Update accounting policies and procedures to incorporate process narratives and effective dates. *(Conclusion #3)*

In general, policies direct workers to take action consistent with prescribed accounting organizational requirements; and procedures provide the necessary related instructions. Policies and procedures change from time to time; therefore, it is important that those individuals who rely upon them have a clear understanding of their effective dates so that changes are properly and timely implemented. Such narratives and effective dates will also ensure that outside auditors have a similar understanding.

3. Update accounting policies and procedures to include process narratives and provide sufficient direction related to biomass fuels. *(Conclusion #3)*

In general, policies provide broad, high-level management directives regarding prescribed accounting organizational requirements and procedures provide the broad operational instructions; however, they must be both concise and substantive. NS Power's accounting policies and procedures did not adequately address the biomass process. They should be revised and updated to clearly reflect appropriate accounting treatment and direction, on both a quality and quantitative basis, and to reflect that inventory adjustments are done only on an annual basis.

4. **Implement a formal control report schedule that will provide detailed summary information for contracts and approval process.** *(Conclusion #5)*

Liberty recommends that the informal internal control sheet prepared by Fuel Accounting, detailing coal contract terms such as, purchase order numbers, contract terms and pricing, as well as verification of appropriate representatives' authorization of such terms be formalized, and include shared oversight and periodic approval of the report by both the fuel procurement and fuel accounting departments. This change will provide assurance that contract terms are readily available, in order to permit monitoring for compliance with contract terms.

5. **Assign permanent control code numbers to assist in the oversight control and review process.** *(Conclusion #5)*

Invoices appropriately reflect purchase order numbers, but the lack of a specifically assigned contract number hinders the review and control process, especially when contracts are in effect for periods greater than a year. Effective internal controls should promote effectiveness and efficiency, and provide for adequate monitoring. A permanent contract code number, which would remain unchanged, enhances the overall control and review process.

6. **Revise contract value designations to reflect base minimum total contract value, in lieu of a contract value that includes an additional, variable component.** *(Conclusion #5)*

Oracle controls covering purchase orders do not require a review of a payment until such time as the amount to be paid results in the cumulative year payments that would exceed the entered contract amount for the year, including a 20 percent variation. Liberty recommends that NS Power's accounting management department develop an internal review and reporting procedure to monitor purchase order transactions that exceed the base contract value, without adding allowances, in order to mitigate financial risk.

7. **Revise controls to require the Senior Manager or the Manager of Fuel Accounting to conduct at least an annual review of contract term values entered in the *Aligne* fuel accounting system.** *(Conclusion #5)*

Current coal contract terms entered into the *Aligne* fuel accounting system by lower level staff with authority to enter and edit contract terms are not reviewed by a responsible supervisor. In order to prevent and detect fraud and reduce financial risk, the Senior Manager or Manager of Accounting should conduct at least an annual review of contract term values entered into *Aligne* by subordinates.

8. **Reduce 2012 FAM one-time expense claim of $1 million for dredging Sydney Harbor.** *(Conclusion #10)*

Liberty does not question the value of the project; however, we believe that the FAM does not provide for recovery of such costs. The one-time cost of $1 million should be amortized at a rate of $16,666.67 per month; *i.e.,* 60 months, beginning on the date actually paid (December 2012). Thus, for FAM-expense purposes the 2012 and 2013 annual cost would be $16,667 and $200,000, respectively.

9. Reduce 2013 FAM Biomass expenses by: (a) $30,000 in Biomass O&M expense, and (b) $12,500 in land lease costs. *(Conclusion #12)*

In December 2013 NS Power failed to apply a normal ongoing allocation factor to various operating and maintenance expense so as to remove approximately $30,000 of cost from FAM consideration; thus, FAM claimed cost should be reduced accordingly.

Liberty believes that the $12,500 cost associated with the lease of land to provide for additional storage facilities for solid fuel inventory is not the type of expense properly includable in the FAM.

XII. NS POWER/EEI Gas and Power Transactions

A. Background

NS Power and its affiliate Emera Energy Inc. (EEI) buy and sell natural gas and electric power at wholesale in the Maritime Provinces. Thus both affiliates compete in the same markets; they serve as suppliers to and customers of each other. This chapter provides the results of some broad comparisons between the gas and power transactions of NS Power and EEI. Because they buy from and sell to third parties, as well as from and to each other, it is possible to compare their transactions with each other to those with other, unaffiliated parties. This comparison will indicate how prices for similar transactions compare as between the two. This chapter also presents the results of some "matching transaction" tests.

Performing a matching transaction analysis requires care to assure comparability. A number of factors can affect the value of power or gas at a particular location. In an effort to control for the variables that can distort results, Liberty's definition of "matching" transactions requires:

- A common "trade date[1]" for agreeing to the transaction (sale or purchase)
- Common flow dates (beginning and end)
- Common flow hours (in the case of power purchases and sales)
- Common delivery or receipt points.

Liberty divided its work in both power and gas matching transaction analysis into two parts:

- From NS Power data, compare the price it is paying to or receiving from EEI with those it is paying to or receiving from its other counterparties in matching transactions
- From EEI data, compare the price NS Power is paying to or receiving from EEI with what EEI's other counterparties are paying or receiving in matching transactions.

This chapter also summarizes broadly changes in purchase and sales patterns in NS Power's natural gas and power transactions with all counterparties. Liberty reviewed the transaction records of NS Power and EEI to verify that each entity records and invoices transactions with one another on identical terms. Liberty also examined the physical separation and controls that exist for NS Power and EEI's gas and power marketers, and their access to transaction records and activities of one another.

Chapter V: Gas & Oil Procurement and Contracts describes natural gas supply changes from previous Audit Periods, and how these changes affected NS Power's natural gas purchases and sales during 2012 and 2013. Chapter X: Power Purchases and Sales contains similar details regarding power transactions.

[1] Trade date was not considered for balancing transactions.

B. Findings

1. Gas Transactions

a. NS Power

NS Power bought gas from the same number of counterparties in each of the past three years, while as with the previous Audit Period, EEI continues to transact with a larger number of counterparties. EEI masks the identity of their counterparties in information provided to Liberty. We therefore do not know the names of their additional suppliers and sales parties.

Purchase Counterparties

	2008	2009	2010	2011	2012	2013
NS Power						
EEI						

Sales Counterparties

	2008	2009	2010	2011	2012	2013
NS Power						
EEI						

The following table shows the quantities of NS Power gas purchases from all counterparties in 2012 and 2013. All of these transactions took place at delivery points on M&NP-CA.

NS Power Counterparty	2010 Purchases	2011 Purchases	2012 Purchases	2013 Purchases
EEI				
Irving Oil Commercial GP				
J.D. Irving, Limited				
NewPage Port Hawkesbury Limited				
Pengrowth Energy Corporation				
Repsol Energy Canada Ltd.				
Shell Energy North America (Canada) Inc.				
Cavendish Farms Corporation				
Total				
Percent from EEI				
EEI Rank Amongst NS Power CPs				

NS Power purchased significantly less natural gas than it did in the previous Audit Period. [redacted] NS Power's largest supplier of natural gas in 2012 and 2013; however, its percent of total NS Power purchases dropped from [redacted] percent in 2010 [redacted] to [redacted] percent in 2013. NS Power purchased nearly five times as much natural gas from EEI in the current versus the prior Audit Period. EEI provided over [redacted] percent of NS Power's total natural gas purchases in both years of the current Audit Period.

The following table shows the quantities of NS Power's gas sales in 2012 and 2013. All of these transactions took place at delivery points on M&NP-CA.

NS Power Counterparty	2010 Sales	2011 Sales	2012 Sales	2013 Sales
[redacted]				

NS Power's total gas sales have declined steadily since the [redacted] end of [redacted] contract. The percentage of NS Power's natural gas sales to EEI has increased, but the volumes in these transactions were quite low in the Audit Period.

b. EEI

We identified EEI's gas purchases and sales at delivery points on M&NP-CA in 2012 and 2013. We do not report that information here, because EEI considers it extremely confidential.

c. Matching Transactions

Liberty obtained and compared records of gas purchase and sale transactions from both NS Power and EEI. In 2012 and 2013 NS Power and EEI made natural gas purchases from and sales to one another under intra-day/balancing transactions and next-day/day-ahead transactions. There were no monthly, seasonal, or other transactions between NS Power and EEI during the current Audit Period.

i. <u>NS Power Natural Gas Purchases</u>

NS Power's transaction records show [redacted] purchases of gas from EEI in 2012 and [redacted] in 2013. These numbers are approximately four times the 2010 – 2011 Audit Period total [redacted]. Liberty reviewed both parties' transaction records to compare the prices in transactions between one another with prices between other, non-affiliated counterparties in similar transactions. For example, if NS Power purchased gas from EEI, Liberty compared the purchase price in that transaction to purchases from other counterparties that had the following matching transaction characteristics:

- Transaction Type: Balancing/Daily or Same-Day/Next-Day
- Flow Dates.

We did not consider location, due to the "postage-stamp" transportation rates on M&NP Canada. As a further note on why location was not considered, NS Power and EEI's records do not

always show identical Atlantic Canada transaction locations [redacted] for transactions with one another.

The following table summarizes transaction matches and shows the percentage of times the price NS Power paid EEI was higher than what NS Power paid other counterparties in "matching transactions," the percentage of times it was lower, and the percentage of times it was equal.

NS Power Natural Gas Purchases Price Comparison

Purchase Type	From EEI Price Higher	From Others Price Higher	Equal Price
Balancing	68%	19%	13%
Daily	60%	27%	12%

ii. NS Power Natural Gas Sales

NS Power's transaction records show that it sold gas to EEI [redacted] in 2012 and [redacted] in 2013. In the 2010 – 2011 Audit Period the Audit Period total was 32. Due to this [redacted], the number of comparable balancing transactions with other [redacted]. A review of NS Power's daily natural gas sales showed no comparable transactions to those made with EEI.

iii. EEI Natural Gas Purchases

EEI's purchase records show [redacted] purchases of gas from NS Power in 2012 and [redacted] in 2013. This number [redacted] in the previous Audit Period. Due to [redacted], the number of comparable transactions with other counterparties [redacted].

iv. EEI Natural Gas Sales

EEI's transaction records show [redacted] sales to NS Power in 2012 and [redacted] in 2013; this number [redacted] in the previous Audit Period. The following table summarizes transaction matches and compares the price EEI received from NS Power and other counterparties in natural gas purchases.

EEI Natural Gas Sales Price Comparison

Sale Type	To NS Power Price Higher	To Others Price Higher	Equal Price
[redacted]			

2. Power Transactions

a. NS Power

NS Power's power transactions considered in this analysis comprise power imports and exports. NS Power's contract purchases within Nova Scotia from independent power producers and from wind-power producers are not included in the analysis. NS Power also has some small local-distribution customers in Nova Scotia which are not included in this analysis.

Liberty's analysis did include power imports from the U.S., which come via the MEPCO/New Brunswick Power interface, power bought at the HydroQuebec/New Brunswick Power interface, and power bought at the New Brunswick Power/Nova Scotia Power interface. Power exports take place at the MEPCO/New Brunswick Power interface and at the New Brunswick Power/Nova Scotia Power interface. Both NS Power and EEI transact with a limited number of counterparties at these interfaces.

The following table shows NS Power's power imports by counterparty in 2012 and 2013.

Counterparty	2010 Imports	2011 Imports	2012 Imports	2013 Imports
[redacted]				

NS Power's purchase patterns with EEI have changed over the past four years. There were [redacted]

The following table shows NS Power's power imports by counterparty in 2012 and 2013.

Counterparty	2010 Exports	2011 Exports	2012 Exports	2013 Exports
[redacted]				

[redacted]

b. EEI

We identified EEI's gas purchases and sales at delivery points on M&NP-CA in 2012 and 2013. We do not report that information here, because EEI considers it extremely confidential.

c. Matching Transactions

i. NS Power Purchases

NS Power [redacted] in 2012 [redacted]

[redacted]

ii. NS Power Sales

[redacted]

3. Transaction Records – Volume and Price Information

Liberty compared the transaction records for gas and power purchases and sales between NS Power and EEI to verify that each entity was reporting similar information. The data provided to us was from the Nucleus transaction recording system. Liberty found three instances of transaction record inconsistencies, but verified that each issue was resolved through NS Power's normal invoice verification procedures, and was ultimately invoiced properly.

4. Physical Separation of Trading Personnel and Controls

NS Power and EEI Gas and Power Marketers are physically separated, located in different parts of the NS Power headquarters building, with access controlled by electronic key card. NS Power has internal options for backing up its Gas and Power Marketers, and personnel do not, and are not able to, trade for another entity. Both NS Power and EEI utilize the Nucleus system for recording gas and power transactions, but control over system access is designed to establish proper access levels. EEI and NS Power employ separate accounting groups for gas and power transactions. The Risk Management group is a provider to both.

NS Power Gas and Power marketers generate a "Transaction Benefit" report which compares, for each transaction with EEI, the price of the EEI offer with the price of competing offers by all other counterparties. The price differential is calculated and applied to the transaction volume, and transaction by transaction dollar benefit is calculated.

C. Conclusions

1. EEI continues to conduct natural gas transactions with more counterparties than NS Power in Atlantic Canada.

The following table shows both NS Power and EEI's natural gas counterparties by year, since 2008, and by transaction type.

Purchase Counterparties

	2008	2009	2010	2011	2012	2013
NS Power	[redacted]					
EEI						

Sales Counterparties

	2008	2009	2010	2011	2012	2013
NS Power	[redacted]					
EEI						

2. NS Power purchased significantly more natural gas from EEI during this Audit Period.

NS Power's purchases from EEI increased to over [redacted] percent of total gas purchases during the Audit Period. This includes [redacted] percent of all [redacted] transaction volumes; EEI was the largest provider of [redacted] in the Audit Period, and the second largest provider of [redacted].

NS Power Counterparty	2010 Purchases	2011 Purchases	2012 Purchases	2013 Purchases
[redacted]				

3. NS Power and EEI natural gas and power purchasing and sales activities operate independently from one another, with appropriate physical separation and controls.

Each group's front office marketers and traders buy and sell only for their respective entity, and personnel operate in separate locations with access controlled by electronic key card. These personnel do not have the ability to view the other's transaction information. NS Power and EEI each maintain a separate fuels accounting group.

4. Liberty's review of all transaction and price data together found no patterns suggesting that Audit Period fuel and energy transactions between NS Power and EEI disadvantaged NS Power.

Liberty reviewed NS Power's transaction records to compare the prices in fuel and energy deals between NS Power and EEI with the prices paid in deals with other counterparties in similar transactions. Power transactions between the two entities [redacted] the current Audit Period. There are [redacted] comparable transactions to consider. The same held true for NS Power natural gas sales to EEI. However, NS Power's natural gas purchases from EEI did yield a larger number of matching comparable transactions. For these comparisons, we used identical transaction dates, types, and flow dates. We did not consider transaction location, because transactions on M&NP Canada are subject to a postage-stamp rate.

For balancing purchases, the price NS Power paid to EEI was [redacted] percent of the time, while the price paid to the non-affiliated counterparty [redacted] the price NS Power paid to EEI was [redacted] of the time, while the price paid to the non-affiliated counterparty [redacted] of the time.

Similarly, we reviewed EEI's transaction records to review natural gas sales to NS Power, to determine how the price paid by NS Power in these transactions compared to the price paid by EEI's other counterparties. In [redacted], NS Power [redacted] of the time, while EEI's other trading partners did so [redacted] of the time. In [redacted], these figures [redacted] for both NS Power and EEI's other, non-affiliated trading partners.

Liberty also reviewed NS Power's trading benefit reports to further examine the pricing in transactions with EEI versus other, non-affiliated counterparties. NS Power's gas and power marketers create these reports to record offers made by all counterparties, in order to provide a comparison of transaction prices in purchases and sales with EEI to parallel offers received from non-affiliated counterparties. In some instances there are [redacted] The reports show that in instances where both EEI and non-affiliated counterparties did make offers, the purchase from (or sale to) EEI [redacted]

5. NS Power and EEI fuel and energy transactions were invoiced on like terms.

Chapter XI: FAM Accounting details the invoice procedures the Fuels Accounting Group undertakes to ensure that fuel and energy transactions are accurately invoiced. Liberty's review in this area found that those procedures were followed with respect to fuel and energy transactions with EEI.

D. Recommendations

Liberty has no recommendations in this area.