

October 15, 2018

The Board of Commissioners of Public Utilities  
Prince Charles Building  
120 Torbay Road, P.O. Box 21040  
St. John's, NL A1A 5B2

**Attention: Ms. Cheryl Blundon**  
**Director Corporate Services & Board Secretary**

Dear Ms. Blundon:

**Re: The Liberty Consulting Group Report – Analysis of Newfoundland Island  
Interconnected System Power Supply Adequacy for the Winter of 2018-2019 –  
Biweekly Update Report**

In its correspondence of September 19, 2018, the Board of Commissioners of Public Utilities (Board) requested that Newfoundland and Labrador Hydro (“Hydro”) provide a biweekly report on Hydro’s supply adequacy for Winter 2018-2019, commencing October 1, 2018.

This biweekly report provides an update on the in-service of the Labrador-Island Link (“LIL”) and how it relates to Winter 2018-2019 supply adequacy, as well as details on Hydro’s production facilities asset management.

### **The LIL In-Service Update**

This report contains:

- an overview of the critical path tasks required for reliable operation of the LIL for Winter 2018-2019;
- an overview of the highest risks being monitored and mitigated for the LIL in-service in Winter 2018-2019;
- Hydro’s updated modelled assumptions for Winter 2018-2019 supply adequacy planning; and,
- Hydro’s proposed contingency plan to mitigate the consequences of unavailability or unreliability of the LIL for all or part of the upcoming winter.

This report also contains meeting minutes from biweekly meetings held between Hydro, Transition to Operations (“TTO”), and Power Supply in which expectations of supply and energy

from the LIL in advance of Winter 2018-2019 are discussed. Minutes from these meetings will be provided with each biweekly update report to the Board.

### **Hydro's Asset Management Strategy Update**

As requested by the Board, Hydro has developed a more robust response to Liberty's Recommendation 4 in its August 30, 2018 report.<sup>1</sup> This report contains a summary of Hydro's Asset Management Plan, outlining key tasks/activities accomplished during the 2016-2018 period and areas of focus identified for the 2019-2021 period. The information found within the report applies to Hydro's entire generation fleet (i.e., hydraulic, gas turbine, and the Holyrood thermal generating assets).

Should you have any questions, please contact the undersigned.

Yours truly,

### **NEWFOUNDLAND AND LABRADOR HYDRO**



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Senior Legal Counsel  
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cc: Gerard Hayes – Newfoundland Power  
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<sup>1</sup> *The Analysis of Newfoundland Island Interconnected System Power Supply Adequacy for the Winter 2018-19*

# **Asset Management Strategy Update**

October 15, 2018

*A Report to the Board of Commissioners of Public Utilities*



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Appendix A: Asset Management Plan Summary

1 **1. Introduction**

2 On September 19, 2018, the Board requested that Hydro provide a more full response to  
3 Liberty’s Recommendation 4 as outlined in the August 30, 2018 report and provide “a specific  
4 plan on organizational actions that need to be taken to provide both an improved program and  
5 improved skills and capabilities in asset management.”

6  
7 Attached to this report (Appendix A) is a summary of Hydro’s Asset Management Plan, outlining  
8 key tasks/activities accomplished during the 2016-2018 period and areas of focus identified for  
9 the 2019-2021 period. The information found within this report applies to Hydro’s entire  
10 generation fleet (i.e., hydraulic, gas turbine, and the Holyrood thermal generating assets).  
11 Certain aspects of Hydro’s generating fleet asset management activities are further advanced  
12 than others, a reflection of the evolving nature of an Asset Management Plan which  
13 encompasses assets at varying ages and conditions.

14  
15 Hydro’s Asset Management Plan is built on the pillars of people, process, and equipment.

16 1) People: the asset management focus which includes, but is not limited to, identifying  
17 required skills and capabilities, obtaining necessary training, the development of a  
18 supportive organizational structure, recruitment and retention for keys roles in a  
19 supporting structure, and development of key responsibility areas and objectives for  
20 roles in each functional area, as identified in the Asset Management Plan.

21 2) Process: the portion of asset management that focuses on establishing, improving,  
22 reviewing, and auditing formal processes for use throughout all functional areas of the  
23 company, where appropriate.

24 3) Equipment: the management of the physical assets, including, but is not limited to,  
25 preventive maintenance programs and corrective maintenance, the use of operational  
26 technology to gain a better understanding of the asset health and condition, the  
27 execution of required capital upgrades, and the identification and procurement of  
28 critical spares.

1 Since 2016, Hydro’s initiatives for its Asset Management Plan have been largely identified,  
2 documented, and monitored inside of annual Reliability Improvement Plans. These annual  
3 initiatives are prepared by each generating asset class during the latter portion of the fourth  
4 quarter of each year and finalized in the first quarter of the following year. The initiatives  
5 highlight key deliverables in the areas of people, process, and equipment and are developed  
6 considering asset performance. As would be expected with varying levels of asset performance,  
7 the deliverables differ across the asset classes. While they do differ, they follow the corporate  
8 reliability improvement focus and asset management framework. The annual deliverables of  
9 the Reliability Improvement Plan are a combination of items selected from the departmental  
10 plans, the Enterprise Risk Management Risk Register, the Integrated Annual Work Plan – which  
11 includes the Winter Readiness Plan and the Capital Plan – as well as items identified in each  
12 functional area as having potential impact on asset reliability. In addition to items identified  
13 through the Reliability Improvement Plans, other initiatives may be completed based on  
14 criticality of need or appropriate opportunity for completion (e.g., known issues with a  
15 particular asset component which is applicable across the fleet).

16  
17 Hydro is currently in the process of completing its planning for 2019 through which initiatives  
18 will be identified for 2019 and beyond. As such, the Asset Management Plan activities for 2019-  
19 2021 found in Appendix A do not provide timeframes for various activities as the planning  
20 process will not be complete until the first quarter of 2019.

21  
22 **2. Asset Management Overview**

23 Hydro defines asset management as the comprehensive management of assets: requirements,  
24 planning, procurement, operations, maintenance, and evaluation in terms of life extension or  
25 rehabilitation, replacement, or retirement to achieve maximum value for the stakeholders  
26 based on the required standard of service. It is a holistic lifecycle view on the management of  
27 assets.

1 Hydro has established an asset management system which is modelled after industry best  
2 practices. The framework for the asset management system is laid out and has undergone  
3 revisions to ensure best practices are being utilized in a manner that is practical and within  
4 Hydro's ability. Using this framework contributes to Hydro's progress on asset maintenance,  
5 reliability and lifecycle management. A hallmark of a strong asset management system is  
6 continual improvement. Hydro is committed to annually assessing its asset management  
7 capabilities and establishing plans to improve people, process and equipment with the  
8 objective to improve reliability and asset management capabilities.

9

### 10 **3. Past Initiatives**

11 In recent years, Hydro has implemented a number of improvements in the area of asset  
12 management as it relates to the generating asset classes. There have been a number of  
13 initiatives in the areas of people, process and equipment that have been successfully  
14 implemented across all three generating asset classes – Hydraulic, Gas Turbine, and Holyrood  
15 Thermal. Additionally, there have been improvements implemented in individual asset classes,  
16 with particular distinction in the area of equipment. Not all improvement initiatives will be  
17 common to each generating asset class; this is due to the difference in current life cycle  
18 maturity of the physical assets and the supporting organizational structure.

19

### 20 **3.1 People**

#### 21 **3.1.1 Hydraulic Group**

22 The focus to date for the Hydraulic group in the area of people has been on the effective  
23 utilization of the available resources to sustain and monitor the Asset Management Program.  
24 Training completed has focused on required training for operations personnel, as well as  
25 training in physical asset management and asset health related training such as Partial  
26 Discharge Analysis, Vibration Monitoring techniques, and generator basics and condition  
27 monitoring.

1 Other key accomplishments include:

- 2 1) Employee Complement Changes: Two Asset Specialist positions were established in the  
3 Hydraulic Production group; one with accountability of focusing on asset performance  
4 and reliability; one with accountability for electrical/protection and control operational  
5 oversight, data trending, and response to operational issues. Both positions did not  
6 previously exist inside the Hydraulic Production organizational structure and the job  
7 duties were spread across various other individuals, or were not previously captured.  
8 With these new resources dedicated to monitoring reliability performance as well as  
9 equipment performance, there is a single-point accountability for Long-Term Asset  
10 Planning (“LTAP”) to ensure that issues are investigated in a timely and thorough  
11 manner and that the appropriate remedial actions are identified and completed.  
12 Additionally, there is now a single person responsible for ensuring that appropriate data  
13 is being collected and that key equipment indicators are being trended. As these  
14 positions are new, the development of required skills and capabilities is ongoing.
- 15 2) Owner’s Engineer: To ensure that the appropriate expertise is present when completing  
16 complex, critical pieces of work (major unit overhauls to improve the technical  
17 knowledge basis of employees) the Hydraulic Production team has started engaging  
18 external consultants. These external consultants act as Hydro’s “Owner’s Engineer” in  
19 the execution of pieces of work. This has helped staff gain exposure while working with  
20 subject matter experts in the preparation of necessary procedures, drawings, and  
21 commissioning plans and is growing the knowledge base of Hydro.

22

### 23 **3.1.2 Gas Turbine Group**

24 Over the last few years, the Gas Turbine group has been focused on building a team to operate  
25 and manage the gas turbine assets. The training completed by the group has focused on control  
26 system training for Gas Turbine Operators as well as the maintenance staff responsible for relief  
27 operation and troubleshooting of the unit in Happy Valley-Goose Bay. Training has also been  
28 completed on Programmable Logic Controllers (“PLCs”) for the Holyrood Gas Turbine  
29 operations and maintenance crews to facilitate the ability to troubleshoot more effectively.



1 Additional training on the Hardwoods Automatic Voltage Regulator (“AVR”) was completed to  
2 aid in the troubleshooting and diagnostic efforts for this unit.

3

4 Key accomplishments include:

5 1) Organizational Structure: Recruited staff for approved positions – general manager,  
6 asset specialist, equipment engineer, and production supervisor – to establish a  
7 supporting organizational structure dedicated to the operations and management of the  
8 gas turbine assets. This dedicated structure with the mentioned employee complement  
9 did not previously exist several years ago.

10 2) Engagement of Outside Expertise: Established relationships with Gas Turbine Original  
11 Equipment Manufacturers (“OEMs”) to assist in troubleshooting operational issues,  
12 repeat failure issues, and the development and revision of maintenance strategies. The  
13 initial engagement of this outside expertise in the items listed has allowed for timely  
14 resolution of issues and facilitated knowledge transfer between the OEM experts and  
15 Gas Turbine staff. This has better prepared Hydro staff to troubleshoot and resolve  
16 operational issues and better manage the asset availability and reliability.

17 3) Training: with the development of necessary foundation training and ongoing hands-on  
18 development, there has been improved response to unit start-up issues, forced outages,  
19 and other operational concerns. The improved knowledge and ability to interrogate and  
20 resolve issues has resulted in improved asset availability and reliability.

21

### 22 **3.1.3 Holyrood Thermal Generating Station**

23 For the Holyrood Thermal Generating Station (“Holyrood”), the focus has been on maintaining  
24 the trained staff and stabilizing the workforce through securing key personnel to operate and  
25 maintain the plant asset through March 2021. Effective asset management requires competent  
26 people to execute and enhance the process, and manage the equipment. As a result of the  
27 coming operational changes at Holyrood, Hydro is focused on ensuring that the people required  
28 to maintain the asset, execute the preventive maintenance program and other asset  
29 management processes, and reliably operate the equipment, are secured through the

1 remaining life of the plant. To support the people aspect of the Asset Management Plan for  
2 Holyrood, a dedicated Human Resources position was implemented to focus on recruiting,  
3 engaging, and retaining key people that impact the asset management work at Holyrood. From  
4 a training perspective, training completed has focused on mandatory training and in-house  
5 group training on key reliability topics including turbine governor training for plant  
6 instrumentation staff, and boiler training for plant operations staff which has contributed to an  
7 improved ability to monitor the asset base and respond to operational concerns in advance of  
8 issues.

9  
10 The Holyrood group has also focused on ensuring strong contracts are in place to supplement  
11 internal resources, aiming to provide for appropriate asset management and ability to respond  
12 in the event of issues.

13  
14 Select examples include:

- 15 1) Extended service agreements with OEM Contractors for major assets including turbines,  
16 generators, boilers, major pumps. These companies provide regular maintenance of  
17 major assets, utilizing industry experts. As the OEM, they provide engineering and field  
18 service expertise to ensure safe and reliable operations of the equipment.
- 19 2) Awarded service agreement to local motor service provider. This company is well  
20 experienced in motor servicing and provides local, rapid service.
- 21 3) Awarded Maintenance Contract to a local labour contractor to protect from any future  
22 inability to adequately staff the Holyrood shops. This ensures that Holyrood will always  
23 have skilled resources to perform maintenance activities and execute the PM Program  
24 and Capital Program.

25  
26 **3.2 Process**

27 In the last number of years, there have been many corporate process improvements which  
28 have been successfully implemented across all generating asset classes. These include the  
29 implementation of corporate work management processes, the development of the Integrated

1 Annual Work Plan (including the Winter Readiness Plan and the Capital Plan), the development  
2 and regular update of the Enterprise Risk Management Risk Register, the development and  
3 proper use of management of change processes, as well as the use of formal outage tracking  
4 and investigation reporting templates.

5

6 Select previous process-related initiatives include:

7 1) Established a Reliability Improvement Plan, which is implemented annually and tracked  
8 monthly which focuses on reliability centered items from the various corporate plans.

9 2) Recently upgraded JD Edwards EnterpriseOne software and, in conjunction with the  
10 upgrade, Hydro has implemented five asset management system business processes.  
11 This upgrade allows Hydro to avail of improved aspects of the new software and these  
12 updated processes, such as the improved ability to record, analyze and report on  
13 equipment data software and asset management applications.

14 3) Improved operational readiness focus by prioritizing the annual work plan to include  
15 Winter Readiness activities, conducting monthly reviews of completion, and regular  
16 tracking to ensure winter readiness activities.

17

### 18 **3.2.1 Hydraulic Group**

19 In addition to the common process improvement initiatives, there have been new processes  
20 and process improvements implemented in the last number of years by the Hydraulic group  
21 that focus on improving reliability and generating asset performance.

22

23 Select examples include:

24 1) Established Enterprise Risk Management (“ERM”) system. In the past, equipment issues  
25 were captured in work orders but transparency regarding risk to reliability from a  
26 system perspective was lacking. Hydro determined that it was appropriate to capture  
27 these risks and mitigating actions in a formal register as a methodical means of review.  
28 The update and evaluation of risk is reviewed and updated on a quarterly basis to  
29 continually manage and mitigate risks.

- 1        2) The Hydraulic Production Team began daily priority review meetings for newly entered  
2            work orders. The attendance was expanded to include a representative of the Asset  
3            Management group
- 4        3) Monthly Generation Performance Meetings are conducted by the Asset Specialist -  
5            Performance and Reliability to review and discuss production statistics, outage data,  
6            complete and outstanding action plans, ongoing and new reliability concerns and work  
7            order reports. These meetings are working to improve the equipment and system  
8            reliability as they bring focus to ongoing and repeat issues, as well as provide an  
9            opportunity for all key stakeholders to come together and discuss the asset base
- 10       4) Forced Outage Investigation standard was revised.
- 11       5) Forced outages and deratings which have been tracked in an excel document since 2008  
12           are now also captured inside a Forced Outage Remedial Action Database. There has  
13           been increased emphasis on using this tool. This database provides documentation and  
14           tracking tool, not only for outages, but also for the follow up remedial actions generated  
15           as a result of the investigations. These remedial actions are one of the most important  
16           tools Hydro uses to ensure root causes have been addressed and to prevent future  
17           occurrence of similar issues across the hydraulic generating fleet. Unlike the original  
18           excel document, this database has functionality to send automatic reminders and  
19           complete simple reporting on the status of investigations and remedial actions. This  
20           allows an automatic process to assure that after actions are assigned, individuals are  
21           notified and reminded of the actions assigned to them and the due dates associated.
- 22       6) Work Order Management Reports were created and implemented as part of Hydro's  
23           ongoing effort to increase visibility of reliability drivers. Hydro recognized gaps in the  
24           work order management of work orders that were cancelled or not completed in the  
25           planned timeframe. This lack of visibility on incomplete or cancelled items had the  
26           potential to result in pieces of work being missed and then creating reliability risks.
- 27       7) Established an on-going In-Service Failure capital project to facilitate refurbishment of  
28           failed equipment. This project allows work to be completed when necessary, in an

1 efficient, timely manner without an extended approval process, thus minimizing  
2 potential availability interruptions.

### 4 **3.2.2 Gas Turbine Group**

5 New processes and process improvements that focus on improving reliability and availability  
6 have been implemented within the Gas Turbine group in the past couple of years.

7  
8 Select examples include:

- 9 1) Gas Turbine reliability was previously tracked using the Utilization Forced Outage  
10 Probability (“UFOP”). However, the gas turbines group has now also established asset  
11 availability tracking through the Derated Adjusted Utilization Forced Outage Probability  
12 (“DAUFOP”). This metric provides a better indication of asset availability and focuses  
13 attention to equipment issues that impact the ability to operate a plant a full capacity.
- 14 2) Established monthly review of asset performance against annual target and time to next  
15 maintenance interval (Holyrood Gas Turbine). A monthly performance report is now  
16 prepared by the Gas Turbine Asset Specialist which discusses asset performance and  
17 UFOP and DAUFOP data. This report is shared with the Gas Turbine team and  
18 contributes to the development of capital plans, departmental plans and items for the  
19 Operational Reliability Improvement Plan.
- 20 3) Implemented a system to track forced outages and forced de-ratings and associated  
21 investigations and remedial and follow-up actions. Investigations into equipment issues  
22 are completed and root causes identified. Remedial actions are implemented and  
23 lessons learned are applied to other gas turbine generating assets, where appropriate.

### 25 **3.2.3 Holyrood Thermal Generating Station**

26 At the Holyrood Thermal Generating Station, new processes and process improvements that  
27 focus on improving reliability and availability have been implemented in recent years.

1 Examples include:

- 2 1) Assigned Asset Specialist with strong operations background to daily production  
3 meetings.
- 4 2) Consolidated the Business Continuity Plan and the plant Risk Registry into an Enterprise  
5 Risk Management system that is tracked and updated quarterly.
- 6 3) Expanded the roles and responsibilities of on-call personnel to better understand the  
7 whole system perspective and how Holyrood's operation is impacted by or affects other  
8 parts of the system.
- 9 4) Implemented a system to track forced outages and forced de-ratings and associated  
10 investigations and remedial and follow-up actions. This process ensures that issues what  
11 impact plant Derated Adjusted Forced Outage Rate ("DAFOR") are documented and  
12 investigated. Remedial actions are assigned to ensure root causes are eliminated.
- 13 5) Completed asset management self-assessments and winter readiness self-assessments.  
14 This is an annual self-reflection, which identifies strengths, areas of improvements, and  
15 areas of relative weakness that can be improved.
- 16 6) Established an on-going In-Service Failure capital project to facilitate refurbishment of  
17 failed equipment. This project allows work to be completed when necessary, in an  
18 efficient, timely manner without an extended approval process, thus minimizing  
19 potential availability interruptions.

20

### 21 **3.3 Equipment**

22 For all generating asset classes, personnel have focused on identifying gaps in critical spares  
23 and have begun to close the gaps identified to ensure continued reliability of the generating  
24 fleet. This is working to ensure that various equipment components which, if damaged, would  
25 result in asset unavailability, is readily available to mitigate downtime and to ensure the  
26 equipment can be returned to reliable operation. Through identifying critical equipment and  
27 critical components, a list of critical spares has been developed in each asset class and work  
28 continues to close the gaps. As new equipment is installed and equipment is replaced, critical  
29 spares are identified and acquired.

1 **3.3.1 Hydraulic Group**

2 The Hydraulic group has focused on monitoring and improving equipment condition and  
3 performance. Improvement work on equipment to date has been driven by current condition  
4 assessments, ongoing performance trending – including key equipment indicators and  
5 preventative maintenance work and obsolescence. The focus has been on understanding  
6 current condition and planning necessary interventions to ensure continued reliable operation  
7 while providing the right time, right actions.

8

9 Select examples include:

- 10 1) Implemented a capital program to increase the presence of asset health and condition  
11 monitoring systems on its generating assets.
- 12 2) Ongoing review and updates of Preventative Maintenance checks to ensure that the  
13 current checks are thorough at discovering pre-indicators of equipment deterioration  
14 and are assisting in the development of the capital plan for overhauls, upgrades and  
15 replacement. This review also ensures that Preventative Maintenance (“PM”) programs  
16 are modelled after current industry best practice for maintenance of specific equipment  
17 to ensure continued reliability of the asset base.
- 18 3) Began implementing improved collection, tracking, technical review and follow-up  
19 action of key equipment indicators. An example of an item that is now tracked more  
20 deliberately is the rotational seal clearances on generating units. The improved tracking  
21 of this measurement, as well as others, has improved the visibility on current asset  
22 health and as better equipped staff with adequate time to prepare for necessary  
23 intervention.

24

25 **3.3.2 Gas Turbine Group**

26 For the Gas Turbines group, the initial and ongoing focus has been on equipment condition and  
27 performance. Work on the equipment has been guided by condition, performance and  
28 obsolescence issues. Increased operation of standby assets has presented challenges from  
29 maintenance strategy and planning perspective. Capital work has primarily focused on

1 condition assessment and refurbishment work that is required to establish the condition of key  
2 components/assets, and replacing or refurbishing such assets as required ensuring reliable  
3 operation as well as acceptable levels of availability.

4

5 Select examples include:

- 6 1) Completed thorough site walk downs of Hardwoods and Stephenville Gas Turbines with  
7 stakeholders from the asset management, operations and maintenance personnel to  
8 identify and document operational issues, component obsolescence, history of repeat  
9 failure issues, etc. This exercise provided input to the development of capital plans,  
10 departmental plans as well as identified items for inclusion on the Reliability  
11 Improvement Plans.
- 12 2) Completed a review of maintenance practices with a renewed focus on the current  
13 operating requirements of the gas turbines. Through consultation with OEMs, industry  
14 best practice maintenance strategies were implemented, as appropriate at each site.  
15 This ensured that an adequate PM program was in place to ensure continued reliability  
16 of generating assets.
- 17 3) Retained loaner engines to allow for timely return to full capacity of the plant in the  
18 event of an engine failure. With the loaner engines secured, the downtime associated  
19 with an engine failure has been reduced, as now the only downtime experienced due to  
20 engine failure is that which is required to remove the failed engine and install the  
21 loaner. Prior to acquiring the loaner engines, the gas turbine plant would be operating  
22 at reduced capacity for the duration of the repair of the failed engine.
- 23 4) Established a Service contract with the OEM (Siemens) for Holyrood Gas Turbine. This  
24 service contract includes major maintenance activities as well as online remote  
25 monitoring and review of the unit performance by individuals at the Siemens office.  
26 Through online monitoring of the unit in operation, the Siemens staff are able to  
27 identify issues based on pre-warning indicators and can communicate these to  
28 operations and maintenance staff to ensure timely intervention. For the major



1 maintenance activities, leveraging the OEM facilitates knowledge transfer and access to  
2 subject matter experts to provide technical guidance and oversight.

3 5) The completion of capital projects related to replacement of obsolete equipment and  
4 equipment that has reached end of life. Replacing obsolete equipment allows for the  
5 asset management team to adequately stock spare parts as well as securing support  
6 from OEMs. Identifying end of life equipment and planning for its replacement was  
7 necessary to ensure continued reliable operation of the gas turbine plant.

8 6) Given the life stage of some of the gas turbine assets, it was necessary to perform major  
9 equipment maintenance activities to overhaul and replace components and ensure the  
10 units are prepared for continued operation.

### 11 12 **3.3.3 Holyrood Thermal Generating Station**

13 At the Holyrood Thermal Generating Station, work on the equipment has been guided by  
14 ongoing condition assessments which feed into the Capital Plan and the PM programs. Changes  
15 in the in-service dates for the Labrador-Island Link and the Labrador Transmission Assets has  
16 caused some challenges in ensuring that the right work is completed at the right time. Capital  
17 work has primarily focused on condition assessment work, which is required to establish the  
18 condition of key assets, and replacing or refurbishing such assets, as required, to ensure safe  
19 and reliable operation.

20  
21 Select related initiatives include:

22 1) Completed Condition Assessment projects in accordance with the capital plan. Included  
23 Level 1 Condition Assessment Refresh which updated the previous extensive Level 1  
24 assessment completed by AMEC by focusing on updated end of steam service dates and  
25 long-term assets required to operate beyond that time; Level 2 Condition Assessment of  
26 boiler and pressure parts, which is an ongoing project to ensure that critical safety  
27 equipment work is planned and executed; Stacks, Tank Farm life extension to ensure  
28 that fuel oil storage requirements are met for the life of the plant.

- 1        2) Completed significant reliability upgrades and replacements including, installation of a  
2            redundant Water Supply Line from Quarry Brook Dam, rewinding of the Unit 3  
3            generator rotor, replacement of aging battery banks.
- 4        3) As a result of deratings associated with boiler air flow issues, an Engineering Assessment  
5            was completed. This identified work required to restore the boilers to full load  
6            capability. Work was completed on Unit 1 and Unit 2 and is in progress on Unit 3. Unit 2  
7            has since returned to full load capability and similar results are expected for Unit 1 and  
8            Unit 3.
- 9        4) Refreshed the Asset Retirement Obligation Report, which includes a decommissioning  
10           plan for Holyrood assets. This plan feeds the Capital and PM programs and is a useful  
11           tool in making asset management decisions.
- 12       5) In addition to completing improvement work on critical spares. Holyrood has enhanced  
13           the critical spares database to facilitate quick and accurate tracking of spare parts  
14           status. This database directly queries the inventory in JD Edwards EnterpriseOne and  
15           provides updates on spares status.
- 16       6) Implemented Asset Specialist review of completed preventive maintenance check-  
17           sheets. This review ensures that all required checks are completed and that necessary  
18           data and detail is documented as expected. This provides an opportunity for any  
19           equipment abnormalities or variances to be identified and investigated appropriately.

#### 21    **4. 2019-2021**

22    Looking forward, to align with the three-year planning period used in Hydro's departmental  
23    plans, the Production division of Hydro is undertaking the expansion of its Reliability  
24    Improvement Plans to multi-year plans. These multi-year plans will focus on the asset  
25    management areas of people, process and equipment. There will be improvement initiatives  
26    and organizational actions that will be common across all generating asset classes. However, as  
27    a result of the life cycle stage of each asset class, as well as the stage of maturity of the  
28    supporting organizational structure, there will be specific improvement initiatives in each asset  
29    class that may or may not be appropriate for the others.

1 **4.1 People**

2 In the area of people, a common focus across all generating asset classes is to confirm training  
3 and skill requirements and establish reasonable training plans for key resources. This will  
4 include:

5  
6 **4.1.1 Hydraulic Group**

7 Improvement work for the Hydraulic group in the area of people will focus on the evolution of  
8 the organizational structure that will better support the areas of asset management thereby  
9 improving reliability and will determine training plans to further develop the knowledge base of  
10 the current team and the formalization of foundational training on processes for new hires and  
11 employee transfers.

12  
13 Current select expected Initiatives include, but specific initiatives will be confirmed in annual  
14 planning:

- 15 1) Modify the organizational structure to better focus the LTAP group on long-term  
16 planning, and asset technical knowledge and analysis.
- 17 2) Determine training requirements to further improve asset management of equipment  
18 (i.e., condition monitoring such as vibration analysis, air gap monitoring, etc.).
- 19 3) Formalize foundation training plan on asset management process for new hires and  
20 transfers.
- 21 4) Establish cross-functional team to monitor effectiveness of reliability improvement  
22 efforts – individual areas are presently tracking efforts on their own.
- 23 5) Continue to leverage outside expertise in the form of “Owner’s Engineers” for major  
24 projects to facilitate knowledge transfer with Hydro staff as well as ensuring appropriate  
25 work is completed on assets.

1 **4.1.2 Gas Turbines Group**

2 The Gas Turbines group will focus on the evolution of the organizational structure for the gas  
3 turbines and diesel group and improving the knowledge base of the current team. Training  
4 requirements for operational and maintenance staff will be determined and executed.

5  
6 Current select expected Initiatives include, but specific initiatives will be confirmed in annual  
7 planning:

- 8 1) Develop succession plan for Gas Turbine resources.
- 9 2) Develop future staffing plan for Gas Turbines and Diesel groups.
- 10 3) Determine training requirements to further the knowledge base of the asset  
11 management, operations and maintenance team.

12

13 **4.1.3 Holyrood Thermal Generating Station**

14 At the Holyrood Thermal Generating Station, the focus will be on retention and development of  
15 the key personnel including the continued technical training of staff on critical equipment.

16

17 Current select expected Initiatives include, but specific initiatives will be confirmed in annual  
18 planning:

- 19 1) Continue to emphasize the single-point accountability of asset ownership for LTAP  
20 personnel. This will involve asset management/reliability training, and more integration  
21 of the Long-Term Asset Planners in the PM program.
- 22 2) Leverage agreements with engineering consultants to assess and improve reliability  
23 initiatives within the plant. Hydro will reach out to consultants to look for opportunities  
24 to improve plant equipment reliability as well as facilitate knowledge and skills transfer  
25 to current staff.
- 26 3) Continue with retention plans for key personnel to ensure that the critical people  
27 required for continued successful asset management are retained.

1 **4.2 Process**

2 Beginning in 2019, the expansion of the Reliability Improvement Plan into a multi-year plan will  
3 be an initiative across all generating asset classes. In addition, improved consistency of forced  
4 outage and de-rating tracking and analysis will occur throughout the Production Division. This  
5 multi-year plan will also include ongoing assessment of performance in relation to the asset  
6 management system business processes and, if appropriate, actions to implement  
7 improvements.

8  
9 **4.2.1 Hydraulic Group**

10 In the area of process, the Hydraulic group will focus on operating and maintenance data  
11 review, as well as the improvement of equipment performance.

12  
13 Current select expected Initiatives include, but specific initiatives will be confirmed in annual  
14 planning:

- 15 1) Establish a temporary changes/jumper management standard for Hydraulic Production  
16 to formally capture modifications to equipment, both temporary and permanent. As  
17 well as establish a formal review process for evaluating the temporary changes.
- 18 2) Establish structured PM completion process to include Asset Specialist review of  
19 completed PM check sheets and trending of key indicators to improve early intervention  
20 on potential reliability issues.
- 21 3) Implement a formalized PM review process to ensure field mark-ups and suggested  
22 updates are completed prior to the next maintenance cycle.
- 23 4) Improve operations input into final decision on 5-year and 20-year capital plans with  
24 input from operations/maintenance staff.

25  
26 **4.2.2 Gas Turbine Group**

27 The Gas Turbines group will focus on the review of operating and maintenance procedures and  
28 the improving asset performance review. In addition, improvements to forced outage tracking  
29 and analysis will be made consistent with the rest of the Production Division.

1 Current select expected Initiatives include, but specific initiatives will be confirmed in annual  
2 planning:

- 3 1) Review plant operating procedures and determine if there are requirements for  
4 additional/revised procedures.
- 5 2) Continue to review maintenance strategies and programs to ensure continual  
6 improvement.
- 7 3) Continue to review the results of preventative maintenance activities to ensure  
8 continual improvement.
- 9 4) Continue to work to improve planning, scheduling and execution of the Integrated  
10 Annual Work Plan (“IAWP”) for the gas turbines.

#### 11 **4.2.3 Holyrood Thermal Generating Station**

12 As Holyrood is nearing end of life, long-term initiatives are not planned. Therefore, recently  
13 implemented processes will continue to be refined.

14

15 Current select expected Initiatives include, but specific initiatives will be confirmed in annual  
16 planning:

- 17 1) Complete self-assessments of condition monitoring programs including lube oil,  
18 hydraulic fluid, and vibration monitoring. This will identify opportunities for  
19 improvements within these programs and will lead to improved reliability.
- 20 2) Investigate improving on-line condition and trend monitoring by leveraging service  
21 agreements with GE (turbine generator) and B&W (boilers and related equipment).  
22 Hydro will work with these companies to identify opportunities to detect problems  
23 before the happen.
- 24 3) Implement a formal process to improve review and evaluation of preventive  
25 maintenance program activities by LTAP personnel. This will create a more full review  
26 process for the current PM program by ensuring the LTAP reviews the work done and  
27 results achieved by reviewing check sheets and other documents.

- 1        4) Improve daily production meetings to ensure that key boiler process indicators are  
2            discussed and any issues identified and resolved. Agenda to be driven by safety,  
3            production threats, fouling prevention initiatives, forced outage database items, and  
4            results from Reliability Improvement Plan activities.

5  
6        **4.3 Equipment**

7        The focus for equipment for the period 2019 to 2021 regarding equipment will be on the timely  
8        execution of preventive maintenance programs and required corrective maintenance for all  
9        assets, with continued diligence in the area of monitoring and analyzing key equipment  
10       indicators such as operations daily checks and condition monitoring. Ensuring that data is  
11       routinely collected, recorded and analyzed against operating parameters will contribute to a  
12       more robust long-term plan and the timely identification of future work.

13  
14       **4.3.1 Hydraulic Group**

15       Improvement work for the Hydraulic group in the area of equipment will focus on execution of  
16       projects identified in the capital plan, planning for new equipment, upgrades, and modifications  
17       as required to ensure continued reliable operation of generating assets. Further, a focus will be  
18       on data collection, analysis and review to monitor asset health.

19  
20       Current select expected Initiatives include, but specific initiatives will be confirmed in annual  
21       planning:

- 22       1) Continuing executing capital program to increase asset health and condition monitoring  
23            information including replacement of existing obsolete systems and installation of new  
24            dynamic monitoring systems for vibration, partial discharge, etc. The installation and  
25            upgrades to these systems will provide real time monitoring of asset condition which  
26            will aid in the analysis of system performance and will provide indication if deteriorating  
27            equipment condition prior to an issue occurring. This will allow for the asset  
28            management group to address these upcoming issues in a timely fashion and implement

1 mitigating measures in the interim to ensure continued reliable operation of the asset  
2 base.

3 2) Expand use of mobile data capture for operations inspections.

4 3) Review critical spares list and confirm the required testing/monitoring for each spare.

5 Where identified, make required changes to PM program.

6

#### 7 **4.3.2 Gas Turbines Group**

8 The Gas Turbines group will focus on ensuring continuing improvements in reliability and  
9 availability of the gas turbine assets through appropriate monitoring and tracking of  
10 performance, critical spares, and preventive maintenance.

11

12 Current select expected Initiatives include, but specific initiatives will be confirmed in annual  
13 planning:

14 1) Continue to monitor and track performance of all assets and complete monthly review  
15 of operational, reliability and availability data including recommendations for  
16 improvements. Having up to date information as well as regular discussion on the top of  
17 equipment performance enhances the asset management program by keeping focus on  
18 what is requiring attention.

19 2) Review critical spares and confirm the requirement for maintenance activities on those  
20 items. For any which are identified that require modifications, add to PM program as  
21 required.

22

#### 23 **4.3.3 Holyrood Thermal Generating Station**

24 At Holyrood, work will focus on the execution of the capital plan, planning for new equipment,  
25 upgrades, and modifications for the transition to post-steam operation, and controlling boiler  
26 fouling through process control and optimization.



1 Current select expected Initiatives include, but specific initiatives will be confirmed in annual  
2 planning:

3 1) Focus on key boiler process indicators such as fuel additive dosage rates, Average Cold  
4 End Temperature with the intention to control boiler fouling. This will be executed  
5 through the daily production meetings and on-call person duties.

6 2) Focus on on-line maintenance of critical boiler components such as burners and  
7 sootblowers to ensure optimal performance. This will be executed through daily  
8 production meetings and on-call person duties.

9 3) Review and execute capital plan activities required to ensure smooth transition to post  
10 steam operation including plant heating, electrical equipment upgrades and  
11 modifications.

12

## 13 **5. Conclusion**

14 Hydro's continued commitment to improving its asset management approach and capabilities  
15 as it relates to the generation fleet is evident in the successful implementation of the  
16 improvement initiatives completed over the last number of years (identified in the asset  
17 management plan summary included in Appendix A). This commitment continues into 2019 and  
18 beyond with a focus on people, process and equipment.

19

20 The focus to-date in each asset class has varied as a result of the life cycle stage of each asset  
21 class, as well as the stage of maturity of the supporting organizational structure. Successful  
22 improvements identified in one asset class will be implemented across other generating asset  
23 classes, where appropriate, further lending to a cohesive approach to asset management in the  
24 generating fleet.

25

26 Looking forward, Hydro will continue to identify and document gaps and opportunities for  
27 improvements to asset management. Initiatives to address the gaps and opportunities will be  
28 prioritized for inclusion inside the Reliability Improvement Plans with high level action plans for  
29 implementation and deliverables. This plan will be revised on an annual basis. The plan for

- 1 2019-2021 is presently being developed and is expected to be finalized, along with the other
- 2 corporate planning initiatives, in the first quarter of 2019.

**Appendix A**  
Asset Management Plan

Asset Management Area	Asset Class	Category	Initiative	2016				2017				2018				2019-2021
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
People	Hydraulic (Past)	Recruitment	Conduct local school presentations providing info around career opportunities within Hydro							X						
		Organizational Structure	Two Asset Specialist positions; one with accountability of focusing on asset performance and reliability and one with accountability for electrical/protection and control operational oversight, data trending and response to operational issues.									X				X
		Consultants	Engagement of Owner's Engineer for knowledge transfer during major work packages	Ongoing initiative as resources are required.												
		Training	Complete three year plan with specific training required to maintain and improve the technical competency of the maintenance group. Plan considers risks with loss of specific skills due to retirement.								X					
	Gas Turbines (Past)	Training	Training/support for Holyrood Gas Turbine operators, Hardwoods operator and relief, for staff of the gas turbine in Happy Valley-Goose Bay, and Holyrood Gas Turbine maintenance staff				X									
		Recruitment	Continue to hire operator positions for Holyrood Gas Turbine as well as technical head office support roles	Work has been ongoing to develop organizational structure since 2014.												
		Training	Execute Control System training for Happy Valley								X					
		Training	Execute AVR Training for Hardwoods									X				
	Holyrood Thermal Generating Station (Past)	Training	Execute Control System training for Hardwoods and Stephenville													X
		Service and Labour Contracts	Secure service agreements with OEM contractors for major assets.				X									
		Training	Execute Operator Training Program			X										
		Recruitment	Stabilize core Holyrood management as well as key operations and maintenance staff through end of steam, with contingency plans	Ongoing initiative.												
		Organizational Structure	Establish a dedicated HR lead in Holyrood to help manage organizational transition and recruit, engage, retain key people that impact the asset management.					X								
People	All Asset Classes (Future)	Training	Improve relationships with other organizations at the Society of Maintenance and Reliability Professionals Annual Conference													X
		Training	Determine formal asset management training requirements for positions in Asset Management (e.g., Long-Term Asset Planning Managers, Equipment Engineers, Asset Specialists)	Target dates to be determined through corporate planning process through Q4 2018. Targets for 2019 milestones will be finalized in Q1.												
	Hydraulic (Future)	Organizational Structure	Adjust organizational structure to allow for improved focus on long term asset planning as well as improved focus on supporting real time technical support for operational issues.													
		Training	Determine training plan for physical asset management - such as conditional monitoring techniques													
		Training	Formalize foundational training on work management processes for new hires and employee transfers													
	Gas Turbines (Future)	Consultants	Continue to leverage outside expertise in the form of "Owner's Engineers" to facilitate knowledge transfer to Hydro staff													
		Organizational Structure	Develop succession plan for Gas Turbine resources.													
		Organizational Structure	Develop future staffing plan for Gas Turbines and Diesels group													
	Holyrood Thermal Generating Station (Future)	Training	Determine future training requirements for Gas Turbines staff.													
		Organizational Structure	Strengthen the asset ownership within the Long Term Asset Planning group.													
		Consultants	Continue leveraging engineering consultants to assess and improve reliability initiatives within the plant.													
		Organizational Structure	Continue with retention plans for key resources.													

Asset Management Area	Asset Class	Category	Initiative	2016				2107				2018				2019-2021
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Process	Hydraulic (Past)	Work Management	Complete 90% of IAWP Activities													
		Work Management	Conduct Monthly AWP Reviews													
		Work Management	Conduct Daily Coordination/Update Meetings													
		Winter Readiness	Complete 100% of Winter Readiness Activities													
		Preventative Maintenance Program	Implement a PM Completion Procedure						X							
		Preventative Maintenance Program	Support Implementation of PM Cancellation & Overdue Work Report							X						
		Work Management	Support Implementation of WO Backlog Report						X							
		Reporting	Implement the standard for generation outage investigations								X					
		Work Management	Implement Backlog Review of critical assets and ensure any priority work is included in the 2019 AWP												X	
		Work Management	Continue the daily Gatekeepers meeting focusing on prioritization and completion dates.													X
		Work Management	Continue use of Work Order Priority and Backlog Reports to report on the progress of backlog review													X
		Engineering Directives	Revise the remaining engineering directives that were identified as requiring revisions in 2017													X
		Reporting	Conduct year-end review of Forced Outage Investigations/Reporting for compliance to Outage Investigation Standard													X
	Engineering Directives	Develop a jumper management program (FM/Operations)													X	
	Gas Turbines (Past)	Reporting	Monthly review of asset performance					X								
		Work Management	Utilizing system of tracking forced outages and deratings					X								
		Reporting	Formalize reporting on DAUFOP												X	
	Holyrood Thermal Generating Station (Past)	Winter Readiness	Execute winter readiness self-assessment for Holyrood						X							
Work Management		Develop & Implement monthly cancelled work order review, Holyrood							X							
Work Management		In-service failure project										X				
Work Management		Develop & Implement monthly work order priority & risk oversight tool, Holyrood								X						
Forced Outages		Develop & implement standard equipment trip reporting, Holyrood												X		
Process	All Asset Classes (Future)	Reliability Improvement Plan	Expand Reliability Improvement Plan to a multi year plan.	Target dates to be determined through corporate planning process through Q4 2018. Targets for 2019 milestones will be finalized in Q1.												
		Forced Outages	Support improvements to the Forced Outage Database, and once completed, use the improved Database to track outages.													
		Communication	Increase interactions across the production division.													
	Hydraulic (Future)	Forced Outages	Continue to work towards alignment with CEA outage tracking mechanisms,													
		Preventative Maintenance Program	Formalize the review by Asset Specialists to be included in the PM completion process.													
		Capital Program	Improve Operations input to final decisions on the 5 year and 20 year plans.													
	Gas Turbines (Future)	Operating Procedures	Continue the review of plant operating procedures and implement any required modifications													
		Preventative Maintenance Program	Continue to review the preventative maintenance strategies for gas turbine assets.													
		Preventative Maintenance Program	Continue to review and monitor the results of the preventative maintenance program.													
		Work Management	Continue to work to improve the planning, scheduling, execution of the IAWP for gas turbines.													
	Holyrood Thermal Generating Station (Future)	Preventative Maintenance Program	Complete self-assessment of condition monitoring programs such as lube oil, hydraulic fluids and vibration monitoring.													
		Preventative Maintenance Program	Investigate improvements to on line condition and trend monitoring by leveraging service contracts.													
Preventative Maintenance Program		Implement formal process to improve LTAP review and evaluation of PM activities														
Communication		Improve daily production meetings to ensure that key boiler process indicators are discussed.														

Asset Management Area	Asset Class	Category	Initiative	2016				2017				2018				2019-2021		
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4			
Equipment	Hydraulic (Past)	Spares	Purchase spare excitation transformer for Unit 7			X												
		Capital Program	Identify Capital Replacement plan for all remaining Excitation Transformers	X														
		Spares	Complete the Critical Spares Analysis for remaining critical parts				X											
		Spares	Purchase the capital spares as outlined in the 2017 capital spares proposal											X				
		Spares	Update the multiyear plan to close the gaps in critical spares											X				
		PM Checks	Review and refresh PM program for transformers					X										
		Capital Program	Execution of reliability centered capital projects											X				
		Capital Program	Execution of reliability centered capital projects - Cat Arm spherical valve controls, Hinds Lake coolers, Upper Salmon rotor repairs,															X
		Spares	Identify critical spares that require a maintenance program and develop a gap closure plan															X
		Spares	Execute the 2018 portion of the critical spares maintenance program gap closure plan															X
		PM Checks	Implement PM changes for the Penstocks/Surge Tanks based on any new recommendations from the 2017 Hatch report.															X
		Gas Turbines (Past)	Spares	Continue to execute spares program				X										
	Capital Program		Continue to execute capital refurbishment program execution				X											
	Equipment Improvements		Develop short term fueling resupply capability for increased operation in November/Dec 2015			X												
	Equipment Improvements		Complete CI and overhaul, bearing modifications Holyrood Gas Turbine				X											
	Spares		Risk of unexpected failure of an engine in Hardwoods or Stephenville, retain loaner engine											X				
	Spares		Continue to execute critical spares program											X				
	Capital Program		Continue to execute capital refurbishment and upgrade program											X				
	Equipment Assessments		Execute PI condition assessment on Hardwoods & Stephenville Gas Turbines						X									
	Equipment Improvements		Investigate relocation of vibration probes on Hardwoods & Stephenville to improve signal accuracy and engine protection											X				
	Equipment Improvements		Establish vibration condition monitoring program for Hardwoods, Stephenville, Holyrood & Happy Valley							X								
	Service Agreements		Establish Long-Term Service Agreements with Siemens for Holyrood Gas Turbine							X								
	Tooling		Procure critical capital tools (boroscope, pressure calibrator)							X								
	Tooling		Procure critical capital tools (lube oil filter carts)						X									
	Tooling		Procure critical capital tools (thermal imaging camera, meggar)							X								
	PM Checks		Initiate fuel quality sampling program, Hardwoods & Stephenville, consider need at Holyrood							X								
	Service Agreements	Complete remote monitoring system install for Holyrood Gas Turbine											X					
	Spares	Execute critical spares program Holyrood Gas Turbine															X	
	Equipment Improvements	Implement PI recommendations at Hardwoods & Stephenville Gas Turbines											X					
	Holyrood Thermal Generating Station (Past)	Spares	Pursue purchase of required spares				X											
		Equipment Improvements	Overhaul one set of feedwater valves per year				X											
		Equipment Assessments	U1 & U2 Stator Assessment by IRIS Power											X				
		Equipment Assessments	Amec Level 2 pressure parts condition assessment											X				
Equipment Assessments		Fuel tank #2 In-service inspection and life extension study											X					
Equipment Improvements		Upgrade controls section of stage 1 exciters to UNITROL 6000 standard											X					
Equipment Improvements		Reliability improvement project: (1.) Boiler airflow & heat xfer equipment, expansion joints, air htr o/h, baskets & seals. (2.) Piping, valves, steam tracing and screens, incl. feed water, steam & cooling water systems. (3.) Turbine & generator lubrication, electrical and control equipment incl. starters, Mark V turbine controls system, probes & cables.												X				
Equipment Improvements		Execute planned 2017 turbine valve and major pump overhauls												X				
Equipment Improvements		Perform boiler cleaning on U1 & U2												X				
Equipment Improvements		Complete 2017 priorities from Level 2 condition assessments (piping)												X				
Equipment Improvements		Replace/repair valves identified in defective valve surveys												X				
Equipment Assessments		Mark V turbine control system reliability improvements; Interrogate inventory and determine OEM recommended critical spares & investigate options for service agreement												X				
Equipment Improvements		Implement plan for Action items from AMEC Level 1 Condition Assessment refresh completed in 2017.												X				
PM Checks		Ensure Emergency and Black Start Diesel PM's are completed prior to 2018/2019 operating season.													X			

Asset Management Area	Asset Class	Category	Initiative	2016				2017				2018				2019-2021
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Equipment	All Asset Classes (Future)	Equipment Assessments	Continue completing required monitoring and analysis of key equipment indicators such as operational daily checks, condition monitoring, etc.	Target dates to be determined through corporate planning process through Q4 2018. Targets for 2019 milestones will be finalized in Q1.												
		Equipment Improvements	Execute reliability and availability related projects within the Capital Plan.													
	Hydraulic (Future)	Equipment Improvements	Continuing expanding the use of asset health and condition monitoring systems by replacing existing obsolete systems and installing new systems.													
		Operational Oversight	Expand the use of mobile data capture for operations inspections.													
		Spares	Review critical spares list and confirm the required testing/monitoring required for each spare.													
	Gas Turbines (Future)	Equipment Assessments	Continue to monitor and track performance of all assets and complete monthly reviews of operational, reliability and availability data.													
		Spares	Review critical spares and confirm the requirement for maintenance activities on these spares.													
	Holyrood Thermal Generating Station (Future)	Equipment Assessments	Focus on key boiler process indicators such as fuel additive dosage rates, average cold end temperature with the intent to control boiler fouling.													
		Equipment Assessments	Focus on on-line maintenance of critical boiler components such as burners and sootblower to ensure optimal performance.													
		Equipment Improvements	Review and execute capital plan activities required to ensure smooth transitions to post steam operation - including plant heating, electrical equipment upgrades and modifications.													