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March 9, 2020

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 of Corporate Services & Board Secretary

Dear Ms. Blundon:

Re: Charlottetown Diesel Generating Station Fire – Preparation for Winter Operation Allowance for Unforeseen Items Final Report

Please find enclosed one original and eight copies of Newfoundland and Labrador Hydro's ("Hydro") final report regarding the above-mentioned.

Should you have any questions, please contact the undersigned.

Yours truly,

NEWFOUNDLAND AND LABRADOR HYDRO

Shirley A. Walsh
Senior Legal Counsel, Regulatory
SAW/las

Encl.

ecc: **Board of Commissioners of Public Utilities**
Jacqui Glynn
PUB Official Email

Charlottetown Diesel Generating Station
Preparation for Winter Operation – Final Report

March 9, 2020

A report to the Board of Commissioners of Public Utilities

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1.0 Introduction

Newfoundland and Labrador Hydro ("Hydro") has 24 diesel generating stations, 19 of which are prime power stations,[1] serving approximately 4,400 customers. Prime power is provided to the electrically isolated communities of Charlottetown and Pinsent's Arm in Southeast Labrador (see Figure 1) from a diesel generating station in the community of Charlottetown. On October 7, 2019, at approximately 5 a.m., an outage was reported in the communities of Charlottetown and Pinsent's Arm. Investigation determined that there was an active fire at the diesel generating station. Firefighting crews in Charlottetown and the nearby community of Port Hope Simpson were able to extinguish the fire and prevent damage to the existing substation, mobile gensets,[2] and fuel tanks; however, the building enclosing the permanent gensets, including all housed auxiliary equipment, was damaged beyond repair. Hydro restored power to Charlottetown and Pinsent's Arm at approximately 11:10 p.m. on October 7, 2019 using the two existing mobile gensets on site. The investigation into the fire did not identify a definitive cause.

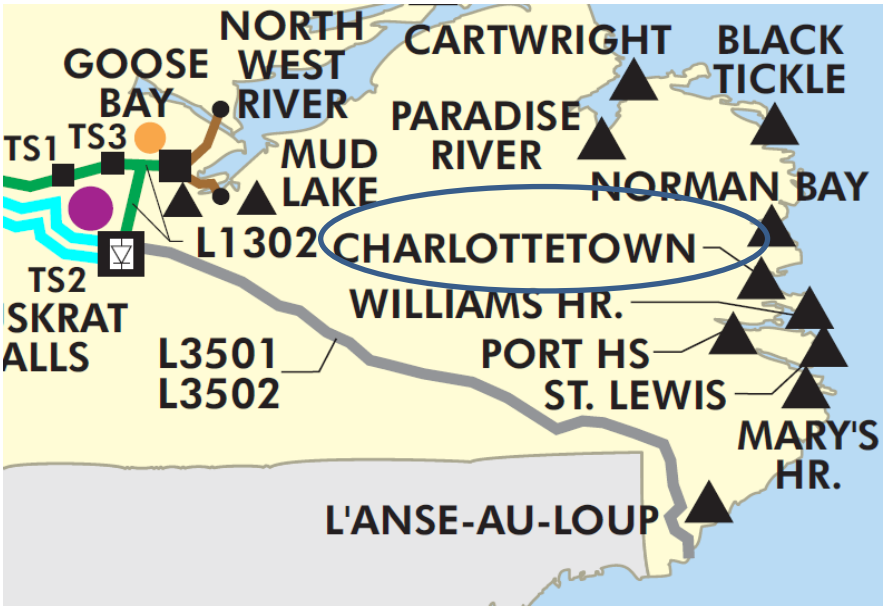

Figure 1: Location of the Charlottetown Diesel Generating Station

[1] Prime power stations are not interconnected to the grid and rely on the power supplied by the diesel generation units for capacity and energy.
[2] A genset is a diesel engine and generator combination serving to produce power as a single unit.

The existing Charlottetown Diesel Generating Station ("Charlottetown DGS") was built in 1989 and the engine hall contained three permanent gensets that were lost in the fire, listed in Table 1.

Table 1: Gensets Destroyed in the Charlottetown Diesel Generating Station Fire

Unit	Rating (kW)	Model	Year	Engine Hours
2087	500	CAT 3412	2011	37,710
2092	725	CAT C27	2016	19,835
2098	545	CAT C18	2018	2,855

Two mobile gensets were also onsite prior to the fire for use in summer and fall to support the increased load from the shrimp plant. With the destruction of the diesel generating station these two gensets along with a third genset (Unit 2102)[3] are now required for service year round to supply the towns until a new generating station or alternative can be built. The details on the mobile gensets currently on site are listed in Table 2.

Table 2: Mobile Gensets Providing Power to Charlottetown and Pinsent's Arm Post-Fire

Unit	Rating (kW)	Model	Year	Engine Hours 2019 End
2088	910	CAT C32	2011	15,600
2089	725	CAT C27	2012	18,794
2102	910	CAT C32	2014	500

2.0 Justification

2.1 Existing System

2.1.1 Before Fire

The engine hall contained three gensets (outlined in Section 1.0). These were supplemented by two mobile gensets that were used in summer and fall to support the seasonal load from the shrimp plant. The mobile gensets are not designed for use during winter weather in their original configuration since large volumes of air drawn through the containers during operation would lead to unacceptably cold temperatures and would also draw in snow, potentially damaging electrical components and lead to outages and costly repairs to the units.

[3] This mobile genset was relocated from Muskrat Falls as a backup to the two existing mobile gensets and will be proposed for purchase under a separate supplemental capital budget application.

Figure 2: Charlottetown Diesel Generating Station Engine Hall (Before Fire) – Units 2092 and 2098

2.1.2 Immediately After Fire

Immediately following the fire, the existing mobile gensets (Units 2088 and 2089) were brought back online using the existing substation that was not impacted by the fire. These mobile gensets were originally supplied fuel through equipment and piping inside of the diesel generating station building prior to the fire; however, each genset has its own fuel tank which can be used should the permanent bulk supply be unavailable. As a result of the fire, the permanent bulk fuel supply was disrupted resulting in the need for continual delivery by a tanker truck to the gensets' on-board fuel tanks. Regular deliveries were necessary in order to avoid outages.

Hydro's focus in the initial days after the fire was on power restoration and assessment for winter operation;[4] although the mobile gensets were suitable for their use at the time, Hydro was assessing the options for their winterization. It was determined that the mobile gensets in their original configuration

[4] On Hydro October 11, 2019, Hydro withdrew a capital proposal in the "2020 Capital Budget Application" to install diesel generating station fire protection.

were suitable for operation in October weather but required modification in order to reliably service the communities throughout the winter. Therefore, Hydro was unable to delay the capital work as there would have been serious negative consequences if the mobile gensets were not reconfigured for winter operation. On November 13, 2019, Hydro provided official notification to the Board of Commissioners of Public Utilities ("Board") of its intention to prepare the two mobile gensets for winter operation at the Charlottetown DGS under the approved Allowance for Unforeseen Items project, in compliance with the Capital Budget Application Guidelines.[5]

Figure 3: Mobile Gensets Immediately Following the Fire (No Winter Modifications)

Hydro sourced and relocated a third mobile genset to Charlottetown from Muskrat Falls as an initial backup during operation of the shrimp plant. With the shrimp plant in production two gensets are required. Should one of those fail, the third genset would be required to carry the load to serve both the residents and the shrimp plant. During the winter months the shrimp plant is not in production and only one genset is required in full-time operation to serve the town load. Therefore, it was necessary for Hydro to winterize only the two existing mobile gensets under this project. As the third genset will be

[5] Board Order No. P.U. 46(2018)

required for summer operation, Hydro intends to file a supplemental capital Budget application to purchase the Muskrat Falls genset for annual summer use (refer to Section 4).

2.1.3 Current Installation

Hydro has reliability criteria requiring each diesel generating station to have N-1 capacity where if the largest genset is unavailable the load can still be serviced by the remaining gensets; the criteria also states there must be a minimum of three gensets in an isolated diesel system. Hydro has three mobile gensets currently on site that are able to serve the community load, as well as the shrimp plant load during its seasonal operation. The two existing mobile gensets (Units 2088 and 2089) were modified to be suitable for winter operation and will be supplemented by a third mobile genset (Unit 2102) during the peak loads experienced when the shrimp plant is in operation in summer and fall months.

The modifications made for winter operation were based on Hydro's prior experience with winter failure of mobile gensets. Modifications included the following activities:

- Onboard radiators have been removed from the containers and radiators that were originally installed outside of the diesel generating station were salvaged from the fire and have been remotely mounted and connected to the mobile gensets to reduce the likelihood of snow being drawn into the container and engine;
- Onboard fuel tanks have been bypassed and the mobile gensets were tied into the bulk fuel storage tank onsite to ensure there is adequate fuel supply for the gensets without the need for constant and costly on demand fuel deliveries by tanker truck; and
- Ventilation systems on the containers have been modified to prevent snow from being drawn into the units during winter operation.

Additionally, Unit 2102 has been tied into the bulk fuel storage system and a higher exhaust stack has been added to comply with environmental regulations. Other modifications have not been made as this genset is planned for use only in summer or fall months during shrimp plant operation.

Figure 4: Winterized Units 2088 and 2089 and Newly Installed Unit 2102

2.2 Operational Impact

The current configuration involving the use of mobile gensets to supply prime power to a community is not standard for Hydro due to the unreliability of using mobile gensets during winter months. Regular maintenance and overhauls on mobile gensets are also more difficult and time consuming due to limited access to components. However, with the modifications completed as a part of this project there are no major issues anticipated in the immediate future. With two winterized mobile gensets and a third genset available for redundancy during operation of the shrimp plant, there are no anticipated concerns with reliably meeting customer demand.

Consideration of the long term viability of the existing setup is required as it has not been attempted by Hydro in the past.

3.0 Project Description

3.1 Project Scope

The detailed scope of this project includes:

- Construction of an enclosure for required electrical equipment, starters, and fuel pumps;

- Installation of required electrical equipment, motor starters, fuel pumps, and other operational equipment in the enclosure for winterized operation of the existing mobile gensets;
- Installation of remote radiators and aftercoolers outside of the existing mobile gensets;
- Connection of existing mobile gensets to radiators and aftercoolers installed outside of the mobile genset enclosures;
- Ventilation modifications to existing mobile genset enclosures including installation of vestibules, restriction of existing intake dampers and installation of new exhaust fans; and
- Modifications to the existing bulk fuel supply system to tie in a new intermediate tank and feed mobile gensets on site.

3.2 Project Timeline

The project milestones and their completion dates are listed in Table 3.

Table 3: Project Timeline

Milestone	Completion Date
Diesel Generating Station Fire	October 7, 2019
Power Restored to Communities and Shrimp Plant Station Service	October 7, 2019
Personnel On Site to Investigate	October 8, 2019
Full Power Restored to Shrimp Plant	October 12, 2019
Equipment Enclosure Installed	October 18, 2019
Vestibule Construction Complete	November 24, 2019
Fuel System Modifications Complete	December 16, 2019
Unit 2088 Ready for Winter Operation	December 16, 2019
Unit 2089 Ready for Winter Operation	January 24, 2020
Units 2088 and 2089 Ventilation System Complete	January 25, 2020
Substantial Completion of Commissioning	February 7, 2020

Figure 2: Substation and Winterized Gensets (Units 2088 and 2089)

4.0 Future Work

As noted in correspondence to the Board on July 31, 2019, Hydro is reviewing alternatives for long-term supply to some southern Labrador coastal communities. With the permanent Charlottetown DGS destroyed, the alternatives for long-term supply include constructing a new Charlottetown DGS (either on the existing site or an alternative site) or expansion of the Port Hope Simpson Diesel Generating Station and construction of a distribution feeder to Charlottetown for permanent supply to Charlottetown and Pinsent's Arm. Both of these options, and others, are under assessment; however, any option such as these will take up to three years to execute. As a result, the current modifications to the existing site will be in service until commissioning of the permanent supply option. Hydro will provide further communication to the Board once the review of the alternatives is complete and there is a determination of the least cost option for provision of permanent power to the communities.

At this time there are no plans for further modification to the winterized mobile gensets; they will be monitored closely throughout the winter.

6.0 Project Cost

The current expenditures for this project are shown in Table 1. The original proposed estimate in the Notification Letter – Allowance for Unforeseen dated November 13, 2019 was $500,000. On January 15, 2020, Hydro notified the Board of a budget estimate change to $825,000.[6]

Table 1: Estimated Project Expenditures

Description	Forecast Final Cost ($)
Project Management	20,987
Consultant	71,257
Labour	367,277
Material	271,710
Travel/Expenses	69,285
Equipment	16,900
Contract Work	9,577
Total	**826,993**

The estimated project expenditures presented in Table 2 reflect forecasted costs-to-completion. This value may change as final invoicing is received from all vendors, with final costs to be reported in the Allowance for Unforeseen Capital Expenditures Monthly Report.

5.0 Conclusion

On October 7, 2019, the Charlottetown DGS was destroyed in a fire. Hydro responded promptly and power was restored the same day using two mobile gensets which were already onsite. The power supply was later supplemented with a third mobile genset (Unit 2102) secured from the Muskrat Falls Project. This unforeseen project was undertaken to provide winterized mobile genset power to the communities of Charlottetown and Pinsent's Arm and ensure the site was functional for operators and staff to reliably provide power to the customers until a long-term replacement power supply is approved and commissioned.

[6] "Allowance for Unforeseen Report for December 2019," Newfoundland and Labrador Hydro.

Appendix A

Project Execution Photos

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Photo 1: Charlottetown Diesel Generating Station Post Fire – Building Secured

Photo 2: Charlottetown Diesel Generating Station Post Fire – Building Secured

Photo 3: Site at Project Completion

Photo 4: Substation and Fuel Supply System

Photo 5: Equipment Enclosure for Fuel Pumps and Motor Starters

Photo 6: Fuel Transfer Pumps in Equipment Enclosure

Photo 7: Motor Starters in Equipment Enclosure

Photo 8: Unit 2088 Vestibule and Remote Cooling Equipment

Photo 9: Unit 2088 and Substation

Photo 10: Unit 2089 Vestibule Complete

Photo 11: Unit 2088 Remote Cooling Equipment and Fuel Lines

Photo 12: Unit 2089 Remote Cooling Equipment and Fuel Lines

Photo 13: Unit 2088 Ventilation Fan

Photo 14: Intermediate Fuel Tank – Supply from Bulk Tanks to Mobile Units

Photo 15: Overall Site – Units 2088, 2089 and 2102