



Hydro Place, 500 Columbus Drive,  
P.O. Box 12400, St. John's, NL  
Canada A1B 4K7  
t. 709.737.1400 f. 709.737.1800  
www.nlh.nl.ca

March 25, 2019

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: Rigolet Diesel Engine Failure**  
**Allowance for Unforeseen Items Final Report**

Please find enclosed the original and eight copies of the final report in relation to the above noted matter.

Should you have any questions, please contact the undersigned.

Yours truly,

**NEWFOUNDLAND AND LABRADOR HYDRO**

---

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

Encl.





# Rigolet Diesel Engine Failure Final Report

March 25, 2019

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





## Table of Contents

1.0 Introduction.....	1
2.0 Project Description .....	2
2.1 Project Scope.....	2
2.2 Project Timeline .....	3
3.0 Justification.....	4
3.1 Existing System.....	4
3.2 Operational Issues.....	4
3.3 Operational Impact .....	5
4.0 Future Work.....	5
5.0 Conclusion .....	6
6.0 Project Costs .....	6

## Appendices

Appendix A: Project Execution Photos



1 **1.0 Introduction**

2 Newfoundland and Labrador Hydro (“Hydro”) has 25 diesel generating stations, 21 of which are  
3 prime power stations,<sup>1</sup> serving approximately 4,400 customers. The Rigolet Diesel Generating  
4 Station has three generating units: 1) Unit 2051 (545 kW), 2) Unit 2065 (320 kW), and 3) Unit  
5 2081 (455 kW). Diesel generating stations are designed such that firm power<sup>2</sup> can be delivered  
6 in the event of failure of the largest generating unit. The forecasted peak load can be met  
7 during the failure of one diesel generating unit (“Genset”); however, all remaining units are  
8 required to be in service to meet that load.

9

10 Unit 2051 was taken out of service on December 12, 2018 due to noise in the engine observed  
11 by the operator. During the inspection of the engine from December 17, 2018 to December 19,  
12 2018, it was determined the engine had suffered a catastrophic failure. A project was then  
13 initiated for the immediate replacement of the unit, utilizing the Allowance for Unforeseen  
14 Items Account. Hydro notified the Board of Commissioners of Public Utilities (the “Board”), in a  
15 letter dated December 20, 2018, of its intention to utilize the Allowance for Unforeseen Items  
16 Account for the completion of this project. Hydro proceeded to execute the project using  
17 Allowance for Unforeseen Items funding because, with one unit out of service, reliable  
18 electrical service to the Town of Rigolet (“Rigolet”) was at risk. Due to the catastrophic nature  
19 of the failure and the risk of permanent outage to part of Rigolet should another failure occur,  
20 the project could not follow the normal schedule for capital project approval. To follow the  
21 capital budget application process would result in replacement during the winter of 2020 and  
22 expose Rigolet to ongoing risk to its reliable electrical service. The process of submission and  
23 approval of a supplemental capital budget application would also extend the risk through the  
24 home heating season. Shipping a self-contained mobile diesel unit, which cannot be easily  
25 disassembled, as a temporary solution for the winter of 2018–2019 was not possible until the  
26 shipping season opens in the spring. This timeframe was also considered too long and high risk.

---

<sup>1</sup> Prime power stations are not interconnected to the grid and rely on the power supplied by the diesel generation units for capacity and energy.

<sup>2</sup> Firm power is the summation of the capacity of all units minus the capacity of the largest unit.

1 The unit replacement was completed and the new unit was released for service on February 21,  
2 2019. This report details the activities completed to ensure the continued reliable operation of  
3 the Rigolet Diesel Generating Station through the winter of 2018–2019 and the associated cost.

4

## 5 **2.0 Project Description**

### 6 **2.1 Project Scope**

7 Following an internal inspection of Unit 2051, Hydro’s maintenance staff, in consultation with  
8 the Long-Term Asset Planning group, determined that a complete unit replacement was  
9 required. Work to procure a new unit commenced immediately upon discovery of the failure.  
10 Toromont Cat had a new, suitable replacement unit in stock in Brampton, Ontario. This C18  
11 Genset was shipped to the Goose Bay Airport and disassembled by Hydro maintenance staff  
12 into four pieces such that each piece could be flown on a Twin Otter aircraft into Rigolet and  
13 transported to the Rigolet Diesel Generating Station by snowmobile.

14

15 The steps to complete the installation were as follows:

16

- 17 1) Removal of the failed Unit 2051 from the plant to make room for the new unit (“Unit  
18 2101”);
- 19
- 20 2) Disassembly of Unit 2101 into four pieces (engine, generator, aftercooler, and skid) to  
21 allow transport on a Twin Otter aircraft;
- 22
- 23 3) Transportation of the components of Unit 2101 to Rigolet (four separate flights from the  
24 Goose Bay Airport to the Rigolet Airport);
- 25
- 26 4) Unloading of the components of Unit 2101 from the aircraft at the Rigolet Airport and  
27 towing to the plant by snowmobile;



- 1        5) Movement of Unit 2101 components into the plant and reassembly of Unit 2101 to
- 2            prepare for installation;
- 3
- 4        6) Installation of Unit 2101 in the previous location of Unit 2051;
- 5
- 6        7) Connection of exhaust, coolant lines, fuel lines, electrical cabling, and controls;
- 7
- 8        8) Installation of aftercooler outside the plant for Unit 2101; and
- 9
- 10       9) Commissioning of Unit 2101 with assistance from Toromont Cat technicians.

11

12 Project work was undertaken with a focus on making the Unit 2101 available for service as soon

13 as possible, with work performed seven days a week. Hydro engaged its mechanical installation

14 crew to carry out this work in conjunction with regional maintenance staff in Labrador. All

15 identified work was completed and Unit 2101 was released for service on February 21, 2019.

16

## 17 **2.2 Project Timeline**

18 The project milestones and their completion dates are listed in Table 1. Delays were

19 encountered during project execution as a result of the failure occurring near the Christmas

20 holiday period and weather-related travel delays to site for installation and maintenance

21 personnel.

**Table 1: Project Timeline**

<b>Milestone</b>	<b>Completion Date</b>
Genset Failure	12-Dec-2018
Inspection Complete	19-Dec-2018
New Unit Ordered	21-Dec-2018
Unit Delivered to Goose Bay Airport	5-Jan-2019
Unit Delivered to Rigolet	12 to 18-Jan-2019
Mechanical Installation of Unit Complete	7-Feb-2019
Unit Ready for Commissioning	18-Feb-2019
Unit Released for Service	21-Feb-2019



**Figure 1: Unit 2101 Installed in place of Unit 2051**

1    **3.0    Justification**

2    **3.1    Existing System**

3    Of the three units installed at the Rigolet Diesel Generating Station, Unit 2051 was a Cat D3412  
4    that was installed in 1998 and had 88,409 operating hours. It had five overhauls in its lifetime  
5    with the most recent taking place in 2017 due to a premature engine block failure. Unit 2051  
6    was forecasted for replacement in 2021 once it reached 100,000 operating hours. The failure of  
7    Unit 2051 in December 2018 required a complete Genset replacement in order to maintain  
8    reliable generation in Rigolet for the winter of 2018–2019. Unit 2101, replacing Unit 2051, is a  
9    Cat C18 unit rated for 545 kW.

10

11    **3.2    Operational Issues**

12    Unit 2051 had a long history of dark exhaust smoke and sooting from the exhaust stacks. Hydro  
13    received multiple letters from the neighboring home owner and the Nunatsiavut Government  
14    complaining about this unit emitting black smoke and soot falling onto the ground. Emissions  
15    tests were completed and there were no violations; however, even after repeated investigation  
16    and several regularly scheduled overhauls this dark exhaust and sooting persisted. This is no

1 longer an issue as Unit 2051 has been replaced by Unit 2101, which has had no visible exhaust  
2 emissions since commissioning.

3

### 4 **3.3 Operational Impact**

5 Unit 2051 was the largest unit in the Rigolet Diesel Generating Station. The unit operated for  
6 approximately 4,400 hours annually on average making it the most utilized engine in the plant,  
7 which is normal for the largest unit in any plant. When Unit 2051 failed on December 12, 2018  
8 the community was supplied by the remaining two units in the plant, Unit 2081 and Unit 2065.  
9 While these two units could meet peak load demands when operated together, if either unit  
10 needed to be taken down to perform required maintenance (e.g., an oil change) a customer  
11 outage was required affecting approximately half the customers in the town. Routine oil  
12 changes are performed approximately every 500 operating hours and this would result in two  
13 power outages per month at a minimum. Due to the short duration of the project's execution,  
14 only two customer outages were required to allow for unit oil changes and operational  
15 adjustments to be completed. The first outage was taken on December 21, 2018 and lasted 2  
16 hours and 15 minutes. The second, a 50-minute outage, occurred on February 2, 2019.

17

### 18 **4.0 Future Work**

19 Future work will be required to complete the installation of Unit 2101 in accordance with  
20 Hydro's standards for unit installation. The unit's exhaust system requires an upgrade to meet  
21 Hydro's noise emission standards for its diesel plants, and the unit's main conductor cabling  
22 requires replacement. Unit 2101 is currently operating in "manual" mode as it has not been  
23 connected to the plant's automation system due to a required instrumentation upgrade. Once  
24 installed, the operation of the plant automation will need to be verified with the new unit  
25 added. In addition, all materials and equipment removed from service will require disposal  
26 when normal shipping returns to service in the spring.

1 **5.0 Conclusion**

2 Unit 2051 suffered catastrophic engine failure on December 12, 2018. Inspection of the engine  
3 by Hydro personnel determined that the unit was unrepairable and required immediate  
4 replacement. A new Cat C18 Genset was purchased from Toromont Cat and shipped to site in  
5 January 2019. The new Genset, Unit 2101, was installed by Hydro personnel and commissioned  
6 with assistance from Cat Technicians. Unit 2101 was released for service on February 21, 2019.

7  
8 Hydro does not believe there were any viable alternatives to the replacement of Unit 2051  
9 other than the Genset replacement. The existing unit was determined to be beyond repair and  
10 a temporary mobile diesel generator could not be shipped to Rigolet until the shipping season  
11 opened in spring.

12  
13 **6.0 Project Costs**

14 The current expenditures for this project are shown in Table 2. The original proposed estimate  
15 was \$643,000.

**Table 2: Project Expenditures**

<b>Description</b>	<b>Forecast Final Cost (\$)</b>
Labour	206,181
Material	225,613
Project Management	12,000
Travel	37,118
Contract Work	46,621
<b>Total</b>	<b>527,533</b>

16 The project expenditures presented reflect expected costs-to-date. This value may change  
17 marginally as final invoicing is received from all vendors, with final costs to be reported in the  
18 Allowance for Unforeseen Capital Expenditures Monthly Report.

Appendix A  
Project Execution Photos





**Photo 1: New Engine on Sled Leaving Rigolet Airport Being Towed by Skidoo to the Plant**



**Photo 2: The New Generator (Left) and the New Engine (Right) Inside the Rigolet Plant**





**Photo 3: New Aftercooler Installed Outside the Rigolet Plant**



**Photo 4: Unit 2101 Installed (Nearest Unit)**