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January 31, 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: Rolling 12 Month Performance of Newfoundland and Labrador Hydro's Generating Units**

In accordance with item 2.8 of the Liberty Report Recommendations dated December 17, 2014, please find attached the original plus twelve copies of Newfoundland and Labrador Hydro's ("Hydro") "Quarterly Report on Performance of Generating Units for the Quarter Ended December 31, 2019" ("Report").

On November 16, 2018, Hydro filed the "Reliability and Resource Adequacy Study" ("Study") with the Board of Commissioners of Public Utilities ("Board"). The Study included Hydro's proposed planning assumptions for consultation and discussion with the Board and other stakeholders. For the Report, which covers the performance of Hydro's generating units for the quarter ended December 31, 2019, the assumptions that were reported in the previous 2018 quarterly reports have been maintained for clarity prior to the transition to reporting against the new assumptions.

We trust the foregoing is satisfactory. If you have any questions or comments, please contact the undersigned.

Yours truly,

**NEWFOUNDLAND AND LABRADOR HYDRO**



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

Encl.

cc: **Newfoundland Power**  
Mr. Gerard M. Hayes

**Consumer Advocate**  
Mr. Dennis M. Browne, Q.C, Browne Fitzgerald Morgan & Avis

**Industrial Customer Group**  
Mr. Paul L. Coxworthy, Stewart McKelvey  
Mr. Denis J. Fleming, Cox & Palmer

**Praxair Canada Inc.**  
Ms. Sheryl E. Nisenbaum

ecc: **Board of Commissioners of Public Utilities**  
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Mr. Dean A. Porter, Poole Althouse

**Teck Resources Limited**  
Mr. Shawn Kinsella



# Quarterly Report on Performance of Generating Units for the Quarter Ended December 31, 2019

**January 31, 2020**

A Report to the Board of Commissioners of Public Utilities





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## 1.0 Introduction

In this report, Newfoundland and Labrador Hydro (“Hydro”) provides data on forced outage rates of its generating facilities. The data provided pertains to historical forced outage rates and assumptions Hydro uses in its assessments of resource adequacy. On November 16, 2018, Hydro filed its “Reliability and Resource Adequacy Study” (“Study”) with the Board of Commissioners of Public Utilities (“Board”). The Study included Hydro’s proposed planning assumptions for further discussion with the Board and the parties. An updated version of the Study was filed with the Board on November 15, 2019. This report covers the performance of Hydro’s generating units for the quarter ending December 31, 2019. The assumptions used throughout are the same as reported in the 2018 quarterly reports except for the new assumptions included and identified in Table 12. While the new assumptions form the basis of Hydro’s current planning processes, this report includes the historic assumptions and style to maintain similarity to previous reports and provide clarity while the Board assesses the Study.

This report contains forced outage rates for the current 12-month reporting period of January 1, 2019 to December 31, 2019, for individual generating units at hydraulic facilities, the Holyrood Thermal Generating Station (“Holyrood TGS”), and Hydro’s Gas Turbines. This report also provides, for comparison purposes, the individual generating unit data on forced outage rates for the previous period of January 1, 2018 to December 31, 2018. Further, total asset class data is presented based on the calendar year for the years 2006 to 2017.

The forced outage rates of Hydro’s generating units are calculated using three measures: 1) Derated Adjusted Forced Outage Rate (“DAFOR”) for the hydraulic and thermal units, 2) Utilization Forced Outage Probability (“UFOP”), and 3) Derated Adjusted Utilization Forced Outage Probability (“DAUFOP”) for the gas turbines.

DAFOR is a metric that measures the percentage of the time that a unit or group of units is unable to generate at its maximum continuous rating due to forced outages or unit deratings. The DAFOR for each unit is weighted to reflect differences in generating unit sizes in order to provide a company total and reflect the relative impact a unit’s performance has on overall generating performance. This measure is applied to hydraulic and thermal units; however, it is not applicable to gas turbines because of their operation as standby units and their relatively low operating hours.

1 UFOP and DAUFOP are measures used for gas turbines. UFOP measures the percentage of time that a  
2 unit or group of units will encounter a forced outage and not be available when required. DAUFOP is a  
3 metric that measures the percentage of time that a unit or group of units will encounter a forced outage  
4 and not be available when required and includes the impact of unit deratings.

5 The forced outage rates include outages that remove a unit from service completely, as well as instances  
6 when units are derated. If a unit's output is reduced by more than 2%, the unit is considered derated  
7 under Canadian Electricity Association ("CEA") guidelines. CEA guidelines require that derated levels of a  
8 generating unit are calculated by converting the operating time at the derated level into an equivalent  
9 outage time.

10 In addition to forced outage rates, this report provides details for those outages that contributed  
11 materially to forced outage rates exceeding those used in Hydro's generation planning analysis for both  
12 the near- and long-term.

13 Note that the data for 2006 to 2017 in Figures 1 through 7 are annual numbers (January 1 to December  
14 31), while the data for 2018 and 2019 are 12-month rolling numbers (January 1 to December 31 for each  
15 year).

16 As part of the Study, Hydro detailed the process undertaken to determine the forced outage rates most  
17 appropriate for use in its near-term reliability assessments and long-term resource adequacy analysis.  
18 The values have been updated to reflect the most current outage data and the revised forced outage  
19 rates that resulted from this process are included in sections 8.0 and 9.0 of this report. The potential  
20 impacts of these revised forced outage rates on future performance reporting are also discussed.

## 2.0 Overview for Period Ending December 31, 2019

Table 1: DAFOR, UFOP, and DAUFOP Overview (%)

Class of Units	January 1, 2018 to December 31, 2018	January 1, 2019 to December 31, 2019	Base Planning Assumption	Near-Term Planning Assumption <sup>1</sup>
Hydraulic (DAFOR)	0.21	1.04	0.90	2.60
Thermal (DAFOR)	28.97	4.48	9.64	14.00
Combined Gas Turbine (UFOP)	3.62	3.98	10.62	20.00
Holyrood Gas Turbine (UFOP)	0.00	0.00	5.00	5.00
Hardwoods/Stephenville Gas Turbine (DAUFOP)	21.67	13.61	-	30.00
Happy Valley Gas Turbine (DAUFOP)	2.11	0.00	-	15.00
Holyrood Gas Turbine (DAUFOP)	0.00	0.00	-	5.00

There was a decline in hydraulic DAFOR and an improvement in thermal DAFOR performance for the current 12-month period ending December 31, 2019, compared to the previous 12-month period ending December 31, 2018 (Table 1). The combined<sup>2</sup> gas turbine UFOP shows a slight decline in performance for the current period compared to the previous period, while DAUFOP shows an improvement in performance.

For the hydraulic assets, the forced outage rate of the current period ending December 31, 2019, is 1.04%, which is below the near-term planning assuming of 2.60%, but is above the base planning assumption of 0.90%. The hydraulic DAFOR for the current period is greater than the previous period; this is primarily the result of penstock issues experienced with Bay d’Espoir Units 1 and 2 in September 2019.

For the Holyrood TGS thermal units, the forced outage rate of the current period ending December 31, 2019, is 4.48%, which is below the base planning assumption of 9.64%, the sensitivity of 11.64% (section 3.0), and below the near-term planning assumption of 14.00%.

The Holyrood TGS DAFOR for the current period reflects a material improvement during the 2018–2019 winter season due to the work that was completed during the 2018 annual outages to improve the performance of all units with respect to air flow limitations. Additional chemical cleaning was performed

<sup>1</sup> Refer to “Near-Term Generation Adequacy Report,” Newfoundland and Labrador Hydro, November 15, 2017, s 5.0, for further details.

<sup>2</sup> Combined gas turbines include the Hardwoods, Happy Valley, and Stephenville units. The performance of the Holyrood unit was not included in the combined base planning or sensitivity numbers as these numbers were set prior to its in service date.

1 during 2019 annual outages. All three units were successfully tested to full load and have remained at  
2 that capability, with minor exceptions.

3 Hydro began reporting DAUFOP performance in January 2018 for its gas turbines.

### 4 **3.0 Generation Planning Assumptions**

5 The Study introduced new generation planning assumptions; however, the assumptions used  
6 throughout this report are the same as reported in previous quarterly reports. The potential impacts of  
7 these revised assumptions on reporting of generation unit performance are discussed in section 9.0 of  
8 this report. While the new assumptions form the basis of Hydro's current planning processes, this report  
9 includes the historic assumptions and style to maintain similarity to previous reports and provide clarity  
10 while the Board assesses the Study.

11 Hydro produces reports based on comprehensive reviews of energy supply for the Island Interconnected  
12 System. This is part of Hydro's analysis of energy supply up to the Muskrat Falls interconnection. The  
13 "Near-Term Generation Adequacy Report," filed on May 22, 2018, contains analysis based on the near-  
14 term DAFOR and DAUFOP and the resulting implication for meeting reliability criteria until the  
15 interconnection with the North American grid. The near-term analysis has been updated since that time  
16 to reflect changes in assumptions with respect to the in-service of the Labrador-Island Link ("LIL"). The  
17 results of this analysis were presented to the Board as part of the "Labrador-Island Link In-Service  
18 Update," submitted October 1, 2018.

19 Hydro's DAFOR and UFOP planning assumptions are provided in Table 2. The Holyrood Gas Turbine has a  
20 lower expected rate of unavailability than the older gas turbines (5% compared to 10.62%) due to the  
21 fact that the unit is new and can be expected to have better availability than the older units.<sup>3</sup>

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<sup>3</sup> Hydro selected a 5% UFOP for the new Holyrood Gas Turbine following commentary on forced outage rates contained in the "Independent Supply Decision Review," Navigant Consulting Ltd., September 14, 2011.

**Table 2: 2017<sup>4</sup> DAFOR and UFOP Long-Term Planning Assumptions (%)**

	DAFOR		UFOP	
	Base Planning Assumption	Sensitivity	Base Planning Assumption	Sensitivity
Hydraulic Units	0.90	0.90		
Thermal Units	9.64	11.64		
Gas Turbines: Existing			10.62	20.00
Gas Turbines: New			5.0	10.0

- 1 The DAFOR and DAUFOP assumptions used in developing the May 2018 “Near-Term Generation  
2 Adequacy Report,” are noted in Table 3.

**Table 3: DAFOR and DAUFOP Near-Term Generation Adequacy Analysis Assumptions (%)**

	DAFOR	DAUFOP
	Near-Term Generation Adequacy Assumption	Near-Term Generation Adequacy Assumption
All Hydraulic Units	2.6	
Bay d’Espoir Hydraulic Units	3.9	
Other Hydraulic Units	0.7	
Holyrood TGS	14.0	
Hardwoods and Stephenville Gas Turbines		30.0
Happy Valley Gas Turbine		15.0
Holyrood Gas Turbine		5.0

## 4.0 Hydraulic Unit Derated Adjusted Forced Outage Rate Performance

Detailed results for the 12-month period ending December 31, 2019, are presented in Table 4, as well as the data for the 12-month period ending December 31, 2018. These are compared to Hydro’s short-term generation adequacy assumptions, as used in the May 2018 “Near-Term Generation Adequacy Report,” and Hydro’s long-term generation planning assumptions for the forced outage rate.

<sup>4</sup> Refer to “Near-Term Generation Adequacy Report,” Newfoundland and Labrador Hydro, November 15, 2017, s 5.0, for further details.

Table 4: Hydraulic Weighted DAFOR

Generating Unit	Maximum Continuous Unit Rating (MW)	12 months ending December 2018 (%)	12 months ending December 2019 (%)	Hydro Generation Base Planning Assumption (%)	Near-Term Planning Assumption (%)
<b>All Hydraulic Units - weighted</b>	954.4	0.21	1.04	0.90	2.60
<b>Hydraulic Units</b>					
Bay D'Espoir 1	76.5	0.07	3.74	0.90	3.90
Bay D'Espoir 2	76.5	0.64	3.76	0.90	3.90
Bay D'Espoir 3	76.5	0.00	2.00	0.90	3.90
Bay D'Espoir 4	76.5	0.15	0.08	0.90	3.90
Bay D'Espoir 5	76.5	0.00	0.40	0.90	3.90
Bay D'Espoir 6	76.5	0.54	0.00	0.90	3.90
Bay D'Espoir 7	154.4	0.00	0.00	0.90	3.90
Cat Arm 1	67	0.94	0.19	0.90	0.70
Cat Arm 2	67	0.00	0.15	0.90	0.70
Hinds Lake	75	0.07	0.00	0.90	0.70
Upper Salmon	84	0.15	0.10	0.90	0.70
Granite Canal	40	0.45	0.74	0.90	0.70
Paradise River	8	0.00	9.15	0.90	0.70

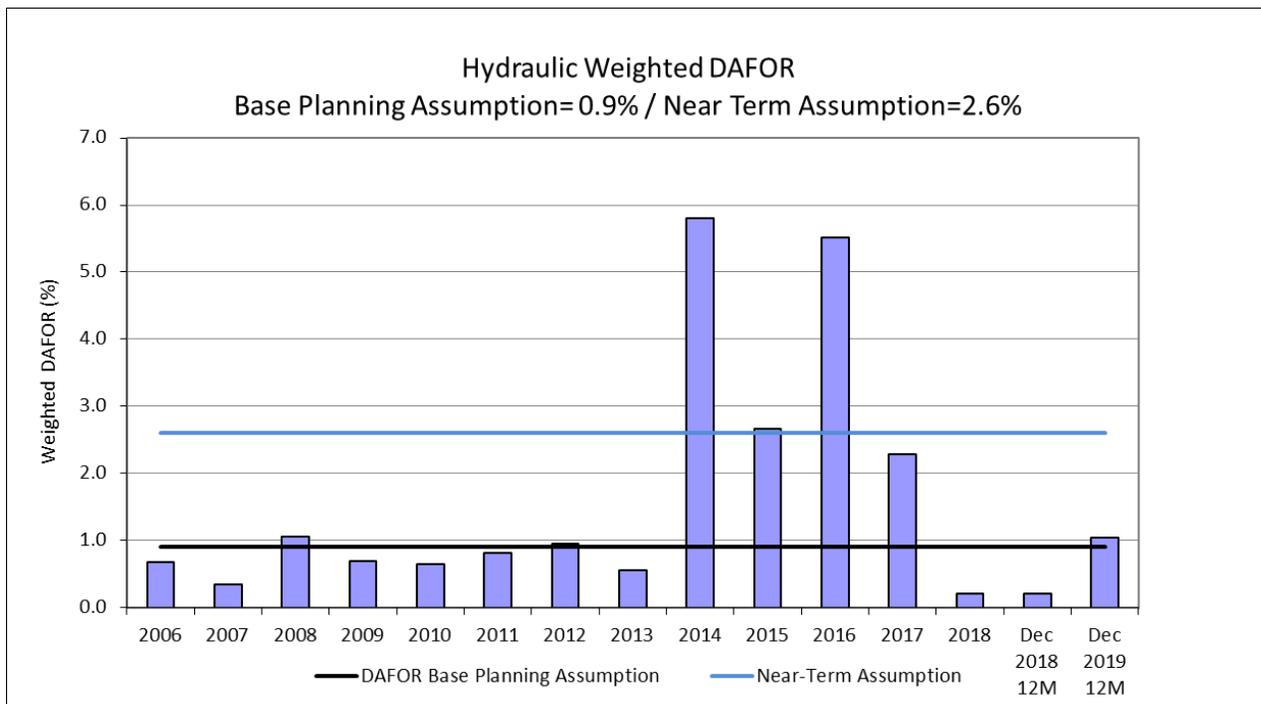


Figure 1: Hydraulic Weighted DAFOR

- 1 Considering individual hydraulic unit performance, the performance of Bay d'Espoir Unit 1, Bay d'Espoir
- 2 Unit 2, Bay d'Espoir Unit 3, and the Paradise River unit did not meet Hydro generation base planning
- 3 DAFOR for the current period.

1 The Bay d’Espoir Unit 1 DAFOR of 3.74%, the Bay d’Espoir Unit 2 DAFOR of 3.76%, and the Bay d’Espoir  
2 Unit 3 DAFOR of 2.00% did not meet the base planning assumption of 0.9% but are below the near-term  
3 assumption of 3.9% for an individual Bay d’Espoir unit. Bay d’Espoir Units 1 and 2 experienced forced  
4 outages for the period of September 22, 2019 to October 4, 2019, as a result of a leak in Penstock 1. This  
5 leak has since been repaired and the units returned to service. In addition, to mitigate potential impacts  
6 should another penstock leak occur, Hydro has taken proactive measures to ensure reduced downtime.  
7 Bay d’Espoir Unit 3 experienced a forced derating from 76.5 MW to 70 MW for the period of October 4,  
8 2019 to November 29, 2019, as a result of increased vibration at higher output. The generator thrust  
9 and guide bearings have since been replaced and the unit returned to full capacity.

10 The Paradise River unit DAFOR of 9.15% did not meet the base planning assumption of 0.9% nor the  
11 near-term assumption of 0.7% for the unit. This was primarily the result of three forced outages. The  
12 first outage was due to a starting failure that occurred on January 13, 2019. The second forced outage  
13 occurred from July 29, 2019 to August 9, 2019, as a result of a leak in the penstock expansion joint  
14 located in the lower level of the plant. The third forced outage occurred from November 18, 2019 to  
15 November 20, 2019, as a result of an issue with the unit breaker. All issues have since been resolved and  
16 the procurement of a spare breaker is ongoing.

## 17 **5.0 Thermal Unit Derated Adjusted Forced Outage Rate** 18 **Performance**

19 Detailed results for the 12-month period ending December 31, 2019, are presented in Table 5, as well as  
20 the data for the 12-month period ending December 31, 2018. These results are compared to Hydro’s  
21 short-term generation adequacy assumptions, as used in the May 2018 “Near-Term Generation  
22 Adequacy Report,” and Hydro’s long-term generation planning assumptions for the forced outage rate.

**Table 5: Thermal DAFOR**

Generating Unit	Maximum Continuous Unit Rating (MW)	12 months ending December 2018 (%)	12 months ending December 2019 (%)	Hydro Generation Base Planning Assumption (%)	Near-Term Planning Assumption (%)
<b><i>All Thermal Units - weighted</i></b>	490	28.97	4.48	9.64	14.00
<b>Thermal Units</b>					
Holyrood 1	170	36.66	0.93	9.64	15.00
Holyrood 2	170	24.03	10.24	9.64	10.00
Holyrood 3	150	22.80	0.67	9.64	18.00

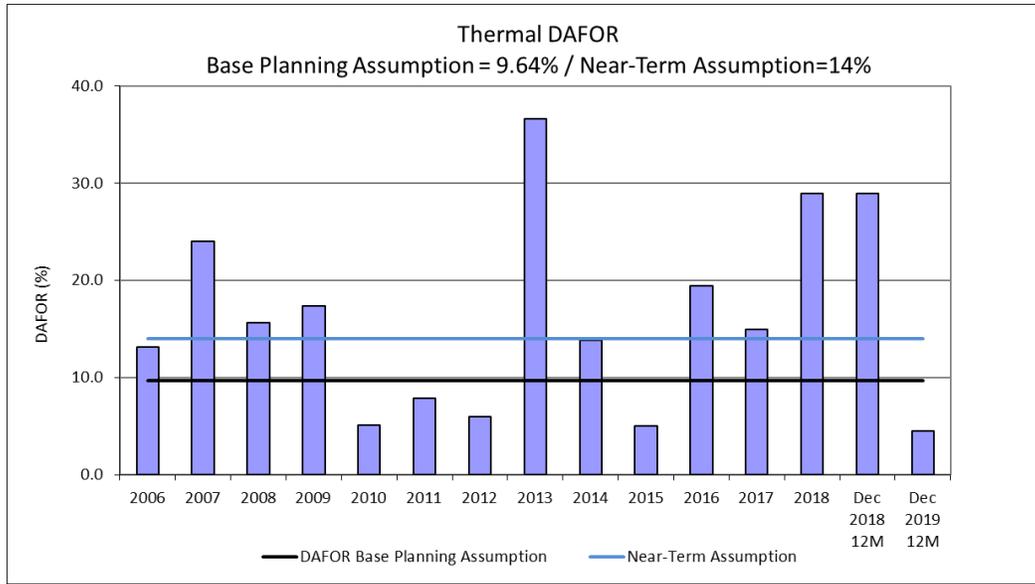


Figure 2: Thermal DAFOR

1 For the 12-month period ending December 31, 2019, the weighted DAFOR for all thermal units of 4.48%  
 2 is below the assumed base planning DAFOR value of 9.64%, and below the near-term assumption of  
 3 14.00%. Unit 1 DAFOR was 0.93%, which is below the base planning assumption of 9.64% and below the  
 4 near-term assumption of 15%. Unit 3 DAFOR was 0.67%, which is below the base planning assumption  
 5 of 9.64% and the near-term assumption of 18%. However, Unit 2 DAFOR was 10.24%, which is above the  
 6 base planning assumption of 9.64% and the near-term assumption of 10.0%.

7 Unit 2 did not meet the base planning assumption and near term assumption primarily because of a  
 8 forced outage in April 2019. From April 12 to May 4, 2019, the unit was off line due to a failure of the  
 9 turbine control valve camshafts. Investigation determined that both the upper and lower camshaft  
 10 assemblies were bent which prevented proper control of the control valves and led to the unit trip. The  
 11 camshafts were removed, straightened at local machine shop, re-installed with all new bearings, and  
 12 function tested to confirm proper operation before returning the unit to service. Spare upper and lower  
 13 camshafts were ordered and have been added to inventory for use on either Unit 1 or 2 in the event of  
 14 an additional failure.

15 There were three shorter forced outages with Unit 2 that also contributed to the DAFOR being above  
 16 the base planning and near term assumptions. On September 5, 2019, when returning the unit to  
 17 service after completion of the 2019 annual outage, the packing in a small drain valve on the main  
 18 steam line to the turbine failed causing a steam leak. The unit had to be shut down for approximately

one and a half days to replace the drain valve. On October 23, 2019, the unit tripped while preparing to start up Unit 1. Unit 2 was off for approximately 30 hours while this trip was being investigated. The solenoid that controls the Unit 1 main fuel oil trip valve shorted to ground, creating a ground fault in the Stage 1 125VDC system. This caused a trip of the Unit 2 exciter and, consequently, the generator. The solenoid and two relays associated with the exciter were replaced with spares, which restored the operating capability of the units. On October 30, 2019, the east forced draft fan tripped, which lead to a unit trip on low airflow because of the loss of the fan. The unit was returned to service approximately six hours later. The fan trip was due to low voltage. The cause has not been determined or repeated. Investigation continues to understand why the unit tripped as a result of the fan trip.

The current period DAFOR for all units is improved over the previous period.

## 6.0 Gas Turbine Utilization Forced Outage Probability Performance

The combined UFOP for the Hardwoods, Happy Valley, and Stephenville Gas Turbines was 3.98% for the 12-month period ending December 31, 2019 (Table 6 and Figure 3). This performance is better than the base planning assumption of 10.62% and the near-term assumption of 20.00% but has declined from the previous period. The Hardwoods Gas Turbine UFOP for the current period is 4.13%, as compared to the base planning assumption of 10.62%. The Stephenville Gas Turbine UFOP for the current period is 4.80%, as compared to the base planning assumption of 10.62%. The Happy Valley Gas Turbine UFOP is 0.00% for the current period, as compared to the base planning assumption of 10.62%. On an individual unit basis, gas turbine performance for the Hardwoods and Happy Valley units for the current period are improved over the previous period. The UFOP for Stephenville Gas Turbine for the current period is increased over the previous period.

**Table 6: Gas Turbine UFOP**

Gas Turbine Units	Maximum Continuous Unit Rating (MW)	12 months ending December 2018 (%)	12 months ending December 2019 (%)	Hydro Generation	
				Base Planning Assumption (%)	Near-Term Planning Assumption (%)
<b>Combined Gas Turbines</b>	125	3.62	3.98	10.62	20.00
Stephenville	50	1.45	4.80	10.62	20.00
Hardwoods	50	4.80	4.13	10.62	20.00
Happy Valley	25	2.11	0.00	10.62	20.00

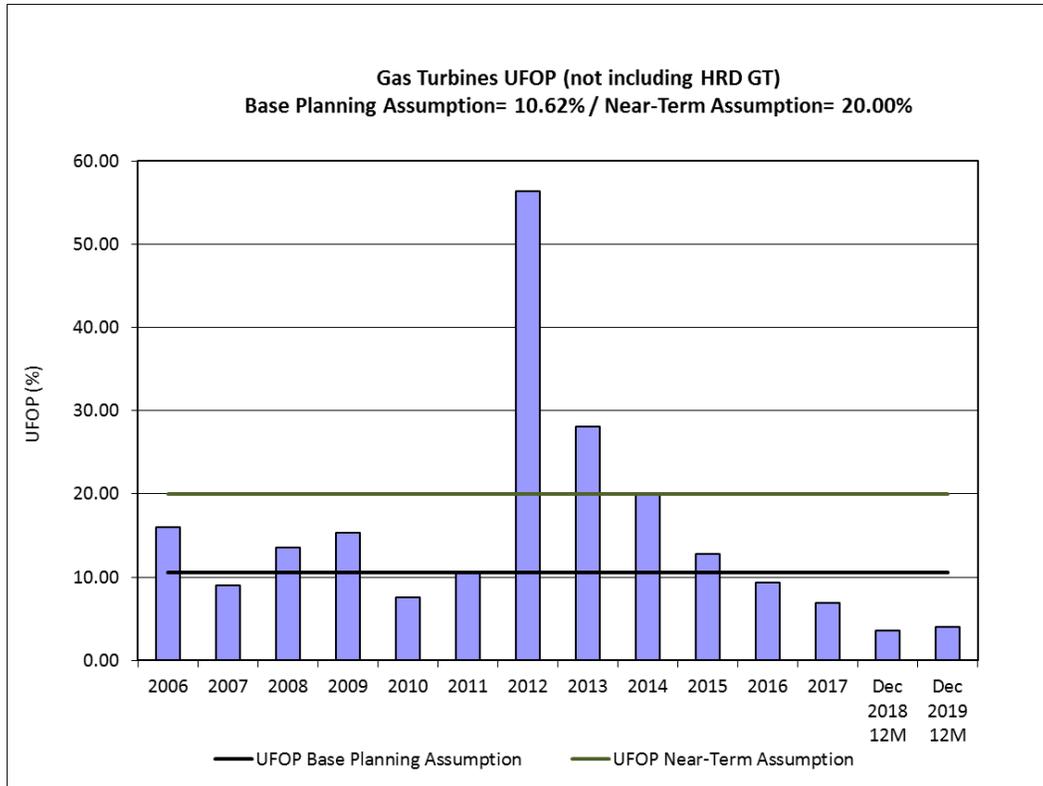


Figure 3: Gas Turbine UFOP: Hardwoods/Happy Valley/Stephenville Units

- 1 The Holyrood Gas Turbine UFOP of 0.00% for the current period is better than the base and near-term
- 2 planning assumptions of 5.00% (Table 7 and Figure 4) and is equivalent to the UFOP for the previous
- 3 period.

Table 7: Holyrood Gas Turbine UFOP

Gas Turbine Units	Maximum Continuous Unit Rating (MW)	12 months ending December 2018 (%)	12 months ending December 2019 (%)	Hydro Generation	
				Base Planning Assumption (%)	Near-Term Planning Assumption (%)
Holyrood GT	123.5	0.00	0.00	5.00	5.00

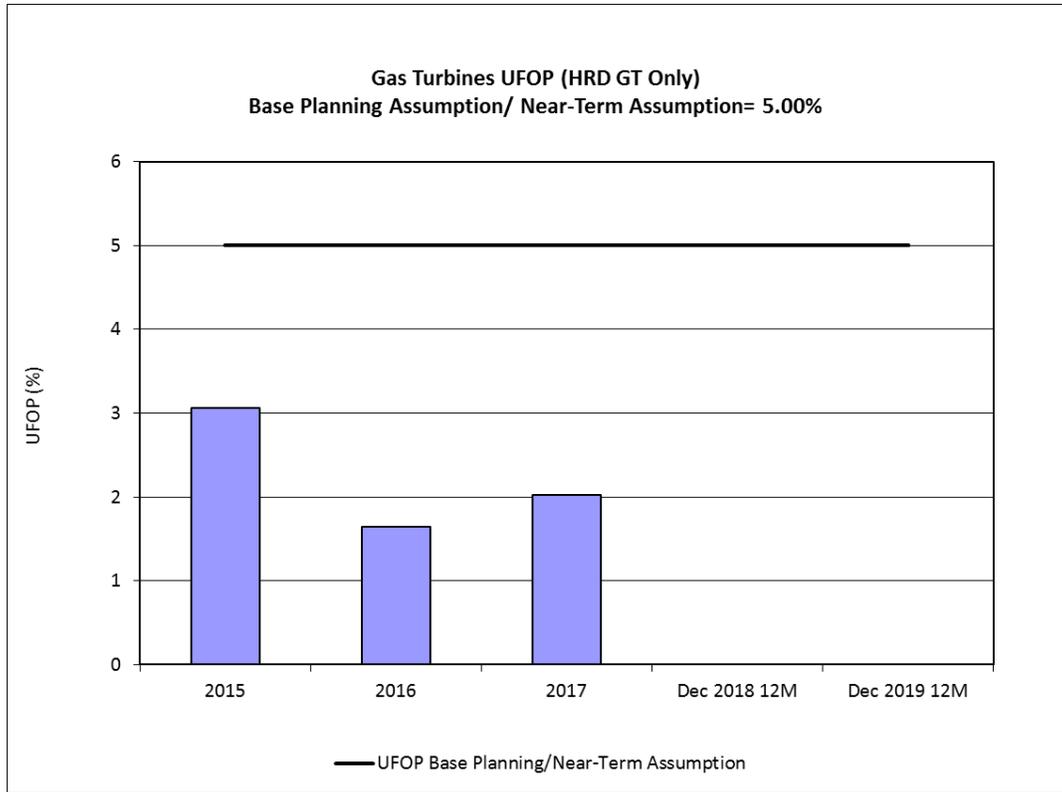


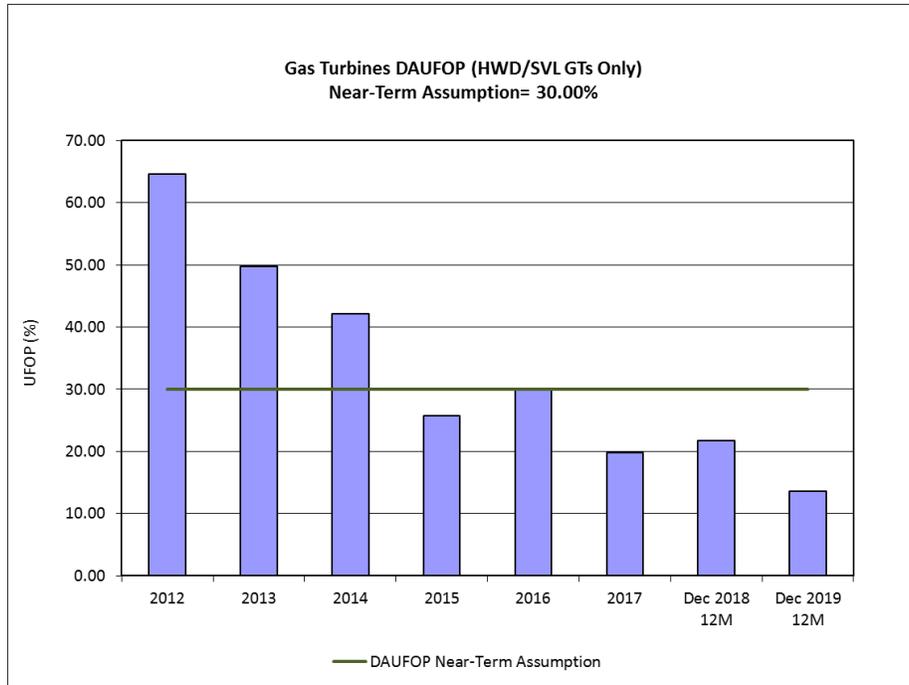
Figure 4: Gas Turbine UFOP: Holyrood Unit

## 7.0 Gas Turbine Derated Adjusted Utilization Forced Outage Probability Performance

The combined DAUFOP for the Hardwoods and Stephenville Gas Turbines was 13.61% for the 12-month period ending December 31, 2019 (Table 8 and Figure 5). This is below the near-term planning assumption of 30.00%. The Hardwoods Gas Turbine DAUFOP for the current period is 20.52%, which is below the near-term planning assumption of 30.00% but above the DAUFOP for the previous period. The Stephenville Gas Turbine DAUFOP for the current period is 5.66%, which is below the near-term planning assumption of 30.00%, and improved over the previous period.

Table 8: Hardwoods/Stephenville Gas Turbine DAUFOP

Gas Turbine Units	Maximum Continuous Unit Rating (MW)	12 months ending December 2018 (%)	12 months ending December 2019 (%)	Near-Term Planning Assumption (%)
<b>Gas Turbines (HWD/SVL)</b>	100	21.67	13.61	30.00
Stephenville	50	47.48	5.66	30.00
Hardwoods	50	8.28	20.52	30.00



**Figure 5: Gas Turbine DAUFOP: Hardwoods/Stephenville Units**

- 1 The DAUFOP for the Happy Valley Gas Turbine was 0.00% for the 12-month period ending December 31,
- 2 2019 (Table 9 and Figure 6). This is below the near-term planning assumption of 15.00%, and improved
- 3 over the previous period.

**Table 9: Happy Valley Gas Turbine DAUFOP**

Gas Turbine Units	Maximum Continuous Unit Rating (MW)	12 months ending December 2018 (%)	12 months ending December 2019 (%)	Near-Term Planning Assumption (%)
Happy Valley	25	2.11	0.00	15.00

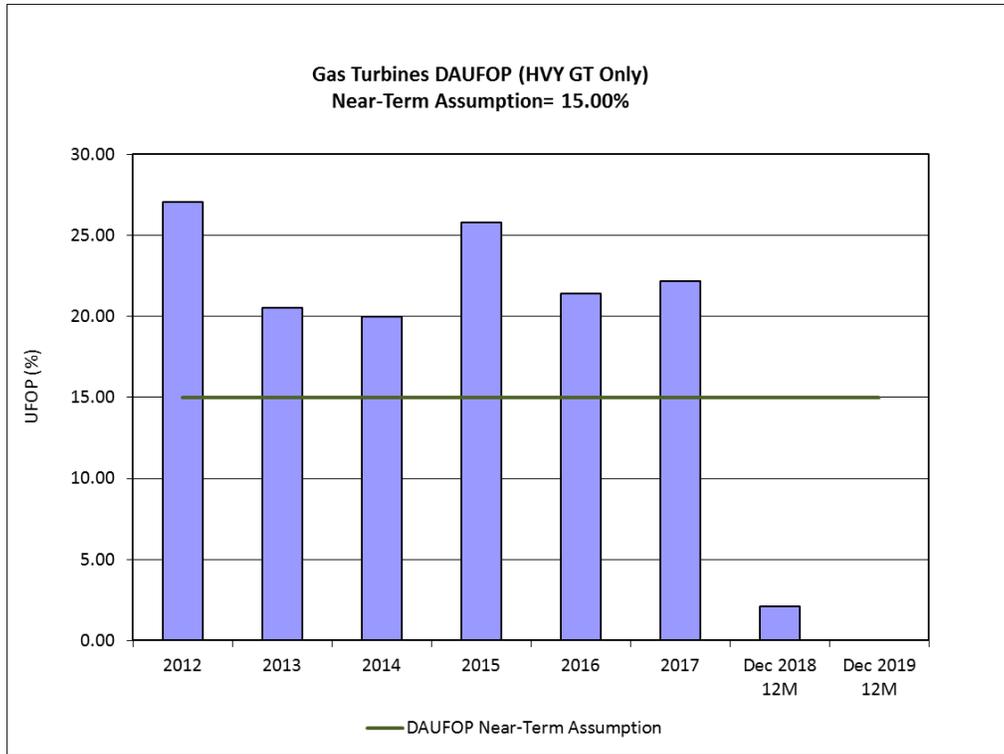


Figure 6: Gas Turbine DAUFOP: Happy Valley Unit

- 1 The Holyrood Gas Turbine DAUFOP of 0.00% for the current period is better than the near-term
- 2 planning assumption of 5.00% (Table 10 and Figure 7) and equivalent over the previous period.

Table 10: Holyrood Gas Turbine DAUFOP

Gas Turbine Units	Maximum Continuous Unit Rating (MW)	12 months ending December 2018 (%)	12 months ending December 2019 (%)	Near-Term Planning Assumption (%)
Holyrood GT	123.5	0.00	0.00	5.00

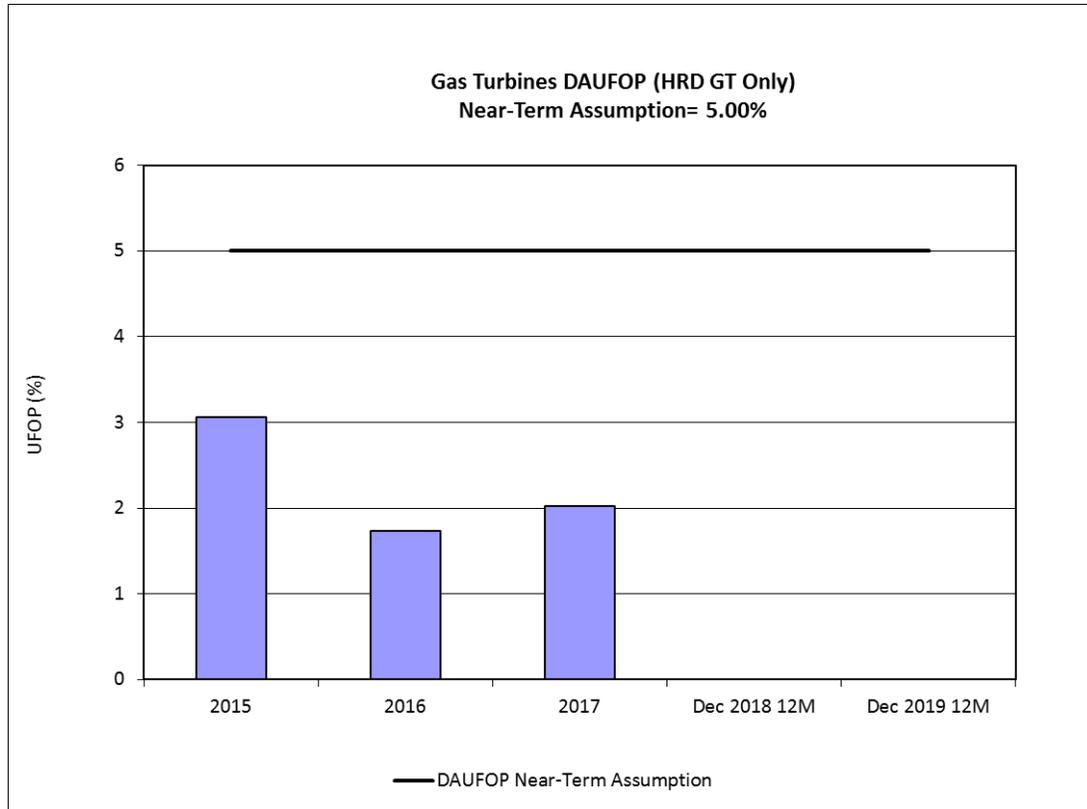


Figure 7: Gas Turbine DAUFOP: Holyrood Unit

## 1 8.0 Updated Planning Assumptions/Analysis Values

2 As part of the Study, Hydro detailed the process undertaken for determining the forced outage rates  
3 most appropriate for use in its near-term reliability assessments and long-term resource adequacy  
4 analysis. Table 11 summarizes the most recent forced outage rate assumptions as calculated using the  
5 forced outage rate methodology.<sup>5</sup>

<sup>5</sup> Values are consistent with those used in the “Near-Term Generation Adequacy Report,” filed with the Board on November 15, 2019.

**Table 11: Hydro’s Reliability and Resource Adequacy Study Analysis Values**

Unit Type	Measure	Near-Term Analysis Value <sup>6</sup> (%)	Resource Planning Analysis Value <sup>7</sup> (%)
Hydraulic	DAFOR	2.8	2.1
Thermal	DAFOR	15.0	N/A
Gas Turbines			
Happy Valley	DAUFOP	9.8	9.7
Hardwoods and Stephenville	DAUFOP	30.0	N/A
Holyrood	DAUFOP	1.7	1.7

1 For the hydroelectric units (Bay d’Espoir, Cat Arm, Hinds Lake, Granite Canal, Upper Salmon, and  
2 Paradise River) a 3-year capacity-weighted average was applied to these units for the near-term  
3 analysis, resulting in a DAFOR of 2.8%, while a 10-year capacity-weighted average was applied for use in  
4 the resource planning model, resulting in a DAFOR of 2.1%. The DAFOR value was based on historical  
5 data reflective of Hydro’s maintenance program over the long-term.

6 DAFORs of 15%, 18%, and 20% were applied to each of the units at the Holyrood TGS to determine the  
7 sensitivity of the system to Holyrood TGS availability in the near-term. This is consistent with the May  
8 2018 “Near-Term Generation Adequacy Report.” As the Holyrood TGS units are planned to be retired  
9 once the Muskrat Falls Project assets have been reliably placed in service, the units were not included in  
10 the long-term analysis and thus there is no resource planning analysis value listed for these units. For  
11 the total plant, an all units weighted value of 15% is used for the near-term.

12 As the gas turbines in the existing fleet are in varied condition, each was considered on an individual  
13 basis, rather than applying a weighted average across all units. For the Happy Valley Gas Turbine, a 3-  
14 year capacity-weighted average was applied to the unit for the near-term analysis, resulting in a  
15 DAUFOP of 9.8%, while a 10-year capacity-weighted average was applied for use in the resource  
16 planning model resulting in a DAUFOP of 9.7%. The DAUFOP values were based on historical data  
17 founded upon the unit’s past reliable performance. For the Holyrood Gas Turbine, a 3-year capacity-  
18 weighted average was applied to the unit for the near-term analysis, resulting in a DAUFOP of 1.7%. For

<sup>6</sup> Near Term Analysis values are used in Hydro’s Near-term Reliability Assessments, which focus on system reliability in years one through five.

<sup>7</sup> Resource Planning Analysis values are used in Hydro’s Near-term Reliability Assessments, which focus on system reliability in years beyond year five.

1 the Hardwoods and Stephenville Gas Turbines, a DAUFOP of 30% was used for the near-term analysis,  
 2 consistent with the metrics that were considered in Hydro’s May 2018 “Near-Term Generation  
 3 Adequacy Report.” As the Hardwoods and Stephenville Gas Turbines are being considered for  
 4 retirement, these units were not included in the long- term analysis; therefore, no resource planning  
 5 analysis value is listed for those units.

## 6 **9.0 Comparison of Planning Assumptions and Analysis Values**

7 As Hydro’s reliability and adequacy planning assumptions have been historically used in reporting on the  
 8 performance of Hydro’s generating units, a comparison of the values used historically to the most recent  
 9 analysis is provided in Table 12 for clarity.

10 Hydro notes that the Study did not utilize UFOP in its analysis. The analysis instead utilized the DAUFOP  
 11 measure with changes as shown in Table 12.

**Table 12: Comparison of Hydro’s Planning Assumptions (%)**

Generating Unit Type	Measure	Historical Planning Assumptions		Reliability and Resource Planning Assumptions	
		Base Planning Assumption	Near-Term Planning Assumption	Near-Term Analysis Value	Resource Planning Analysis Value
Hydraulic	DAFOR	0.9	2.6	2.8	2.1
Thermal	DAFOR	9.64	14.0	15.0	N/A
Gas Turbines					
Happy Valley	DAUFOP	-	15.0	9.8	9.7
Hardwoods and Stephenville	DAUFOP	-	30.0	30.0	N/A
Holyrood	DAUFOP	-	5.0	1.7	1.7

12 The generating unit performance presented earlier in this report is again presented in Tables 13 to 17  
 13 with comparison to the previous assumptions, as well as the recently revised values. No data is provided  
 14 for the UFOP performance, as Hydro does not plan to use this metric in future for reliability  
 15 assessments.

Table 13: Hydraulic Weighted DAFOR Performance Comparison

Generating Unit	Maximum Continuous Unit Rating	12 months ending December 2018 (%)	12 months ending December 2019 (%)	May 2018		November 2019	
				Base Planning Assumption (%)	Near-Term Planning Assumption	Near-Term Planning Analysis Value	Resource Planning Analysis Value
<i>All Hydraulic Units - weighted</i>	954.4	0.21	1.04	0.90	2.60	2.80	2.10
<b>Hydraulic Units</b>							
Bay D'Espoir 1	76.5	0.07	3.74	0.90	3.90	2.80	2.10
Bay D'Espoir 2	76.5	0.64	3.76	0.90	3.90	2.80	2.10
Bay D'Espoir 3	76.5	0.00	2.00	0.90	3.90	2.80	2.10
Bay D'Espoir 4	76.5	0.15	0.08	0.90	3.90	2.80	2.10
Bay D'Espoir 5	76.5	0.00	0.40	0.90	3.90	2.80	2.10
Bay D'Espoir 6	76.5	0.54	0.00	0.90	3.90	2.80	2.10
Bay D'Espoir 7	154.4	0.00	0.00	0.90	3.90	2.80	2.10
Cat Arm 1	67	0.94	0.19	0.90	0.70	2.80	2.10
Cat Arm 2	67	0.00	0.15	0.90	0.70	2.80	2.10
Hinds Lake	75	0.07	0.00	0.90	0.70	2.80	2.10
Upper Salmon	84	0.15	0.10	0.90	0.70	2.80	2.10
Granite Canal	40	0.45	0.74	0.90	0.70	2.80	2.10
Paradise River	8	0.00	9.15	0.90	0.70	2.80	2.10

Table 14: Thermal DAFOR Performance Comparison

Generating Unit	Maximum Continuous Unit Rating (MW)	12 months ending December 2018 (%)	12 months ending December 2019 (%)	May 2018		November 2019	
				Base Planning Assumption (%)	Near-Term Planning Assumption (%)	Near-Term Planning Analysis Value (%)	Resource Planning Analysis Value (%)
<i>All Thermal Units - weighted</i>	490	28.97	4.48	9.64	14.00	15.00	N/A
<b>Thermal Units</b>							
Holyrood 1	170	36.66	0.93	9.64	15.00	15.00	-
Holyrood 2	170	24.03	10.24	9.64	10.00	15.00	-
Holyrood 3	150	22.80	0.67	9.64	18.00	15.00	-

**Table 15: Hardwoods/Stephenville Gas Turbine DAUFOP Performance**

Gas Turbine Units	Maximum Continuous Unit Rating (MW)	12 months ending December 2018 (%)	12 months ending December 2019 (%)	May 2018		November 2019	
				Base Planning Assumption (%)	Near-Term Planning Assumption (%)	Near-Term Planning Analysis Value (%)	Resource Planning Analysis Value (%)
<b>Gas Turbines (HWD/SVL)</b>	100	21.67	13.61	N/A	30.00	30.00	N/A
Stephenville	50	47.48	5.66	N/A	30.00	30.00	N/A
Hardwoods	50	8.28	20.52	N/A	30.00	30.00	N/A

**Table 16: Happy Valley Gas Turbine DAUFOP Performance Comparison**

Gas Turbine Units	Maximum Continuous Unit Rating (MW)	12 months ending December 2018 (%)	12 months ending December 2019 (%)	May 2018		November 2019	
				Base Planning Assumption (%)	Near-Term Planning Assumption (%)	Near-Term Planning Analysis Value (%)	Resource Planning Analysis Value (%)
Happy Valley	25	2.11	0.00	N/A	15.00	9.80	9.70

**Table 17: Holyrood Gas Turbine DAUFOP Performance Comparison**

Gas Turbine Units	Maximum Continuous Unit Rating (MW)	12 months ending December 2018 (%)	12 months ending December 2019 (%)	May 2018		November 2019	
				Base Planning Assumption (%)	Near-Term Planning Assumption (%)	Near-Term Planning Analysis Value (%)	Resource Planning Analysis Value (%)
Holyrood GT	123.5	0.00	0.00	N/A	5.00	1.70	1.70