newfoundland labrador hydro
a nalcor energy company

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

July 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 enclosed a copy of Newfoundland and Labrador Hydro's ("Hydro") "Quarterly Report on Performance of Generating Units for the Quarter Ended June 30, 2020" ("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 June 30, 2020, the assumptions that were reported in the previous 2019 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***

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

Encl.

ecc: **Board of Commissioners of Public Utilities**
Jacqui Glynn
Maureen P. Green, Q.C.
PUB Official Email

**Newfoundland Power**
Kelly C. Hopkins
Gerard M. Hayes
Regulatory Email

**Consumer Advocate**
Dennis M. Browne, Q.C., Browne Fitzgerald Morgan & Avis
Stephen F. Fitzgerald, Browne Fitzgerald Morgan & Avis
Sarah G. Fitzgerald, Browne Fitzgerald Morgan & Avis
Bernice Bailey, Browne Fitzgerald Morgan & Avis

**Industrial Customer Group**
Paul L. Coxworthy, Stewart McKelvey
Dean A. Porter, Poole Althouse
Denis J. Fleming, Cox & Palmer

**Labrador Interconnected Group**
Senwung Luk, Olthuis Kleer Townshend LLP
Chief Eugene Hart, Sheshatshiu Innu First Nation
Cathy Etsell, Town of Labrador City
Charlie Perry, Town of Wabush
Randy Dillon, Town of Happy Valley-Goose Bay

# Quarterly Report on Performance of Generating Units for the Quarter Ended June 30, 2020

**July 31, 2020**

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

newfoundland labrador hydro
a nalcor energy company

# Contents

1.0 Introduction ..... 1
2.0 Overview for Period Ending June 30, 2020 ..... 3
3.0 Generation Planning Assumptions ..... 4
4.0 Hydraulic Unit DAFOR Performance ..... 5
5.0 Thermal Unit DAFOR Performance ..... 8
6.0 Gas Turbine UFOP Performance ..... 9
7.0 Gas Turbine DAUFOP Performance ..... 11
8.0 Updated Planning Assumptions/Analysis Values ..... 14
9.0 Comparison of Planning Assumptions and Analysis Values ..... 15

# 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 June 30, 2020. The assumptions used throughout are the same as reported in the 2019 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.

This report contains forced outage rates for the current 12-month reporting period of July 1, 2019 to June 30, 2020, for individual generating units at hydraulic facilities, the Holyrood Thermal Generating Station ("Holyrood TGS"), and Hydro's Gas Turbines. The report also provides, for comparison purposes, the individual generating unit data on forced outage rates for the previous period of July 1, 2018 to June 30, 2019. Further, total asset class data is presented based on the calendar year for the years 2006 to 2018.

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.

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

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

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

Note that the data for 2006 to 2018 in Figures 1 through 7 are annual numbers (January 1 to December 31), while the data for 2019 and 2020 are 12-month rolling numbers (July 1 to June 30 for each year).

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

# 2.0 Overview for Period Ending June 30, 2020

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

| Class of Units | Jul 1, 2018 to Jun 30, 2019 | Jul 1, 2019 to Jun 30, 2020 | Historic Base Planning Assumption | Historic Near-Term Planning Assumption[1] |
|---|---|---|---|---|
| Hydraulic (DAFOR) | 0.24 | 1.24 | 0.90 | 2.60 |
| Thermal (DAFOR) | 9.43 | 2.03 | 9.64 | 14.00 |
| Combined Gas Turbine (UFOP) | 4.73 | 6.88 | 10.62 | 20.00 |
| Holyrood Gas Turbine (UFOP) | 0.00 | 3.32 | 5.00 | 5.00 |
| Hardwoods/Stephenville Gas Turbine (DAUFOP) | 18.06 | 12.48 | - | 30.00 |
| Happy Valley Gas Turbine (DAUFOP) | 0.00 | 1.84 | - | 15.00 |
| Holyrood Gas Turbine (DAUFOP) | 0.00 | 3.32 | - | 5.00 |

There was a decline in hydraulic DAFOR and an improvement in thermal DAFOR performance for the current 12-month period ending June 30, 2020, compared to the previous 12-month period ending June 30, 2019 (Table 1). The combined[2] gas turbine UFOP and the Holyrood Gas Turbine UFOP show a decline in performance for the current period compared to the previous period, while DAUFOP shows an improvement in performance for Hardwoods/Stephenville Gas Turbines, and show a decline in performance for the Happy Valley and Holyrood Gas Turbines.

For the hydraulic assets, the forced outage rate of the current period ending June 30, 2020 is 1.24%, which is below the historic near-term planning assumption of 2.60%, but is above the historic 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 No. 1 issues experienced on Bay d'Espoir Units 1 and 2 in September 2019 and a forced derating on Bay d'Espoir Unit 3 from 76.5 MW to 70 MW related to generator thrust and guide bearing issues for the period of October 4, 2019 to November 29, 2019. Additionally, outages on Bay d'Espoir Unit 5, Hinds Lake, Granite Canal and Paradise River also impact the current period DAFOR performance.

For the Holyrood TGS thermal units, the forced outage rate of the current period ending June 30, 2020 is 2.03%, which marks a significant improvement over the previous period and is below the historic base

[1] Refer to "Near-Term Generation Adequacy Report," Newfoundland and Labrador Hydro, November 15, 2017, s 5.0 for further details.
[2] 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.

planning assumption of 9.64%, the historic sensitivity of 11.64% (Section 3.0), and below the near-term planning assumption of 14.00%.

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

# 3.0 Generation Planning Assumptions

The Study introduced new assumptions pertaining to asset availability; however, the assumptions used throughout this report are the same as reported in previous quarterly reports. The potential impacts of these revised assumptions on reporting of generation unit performance are discussed in Section 9.0 of this report. While the new assumptions form the basis of Hydro's current planning processes, this report includes the historic assumptions.

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

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

[3] 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[4] DAFOR and UFOP Historic Planning Assumptions (%)**

| | DAFOR | | UFOP | |
|---|---|---|---|---|
| | Historic Base Planning Assumption | Historic Sensitivity | Historic Base Planning Assumption | Historic 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 |

The DAFOR and DAUFOP assumptions used in developing the May 2018 "Near-Term Generation Adequacy Report" are noted in Table 3. Values currently used in Hydro's assessments of reliability and resource adequacy are provided in Section 9.0.

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

| | DAFOR Historic Near-Term Planning Assumption | DAUFOP Historic Near-Term Planning 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 |

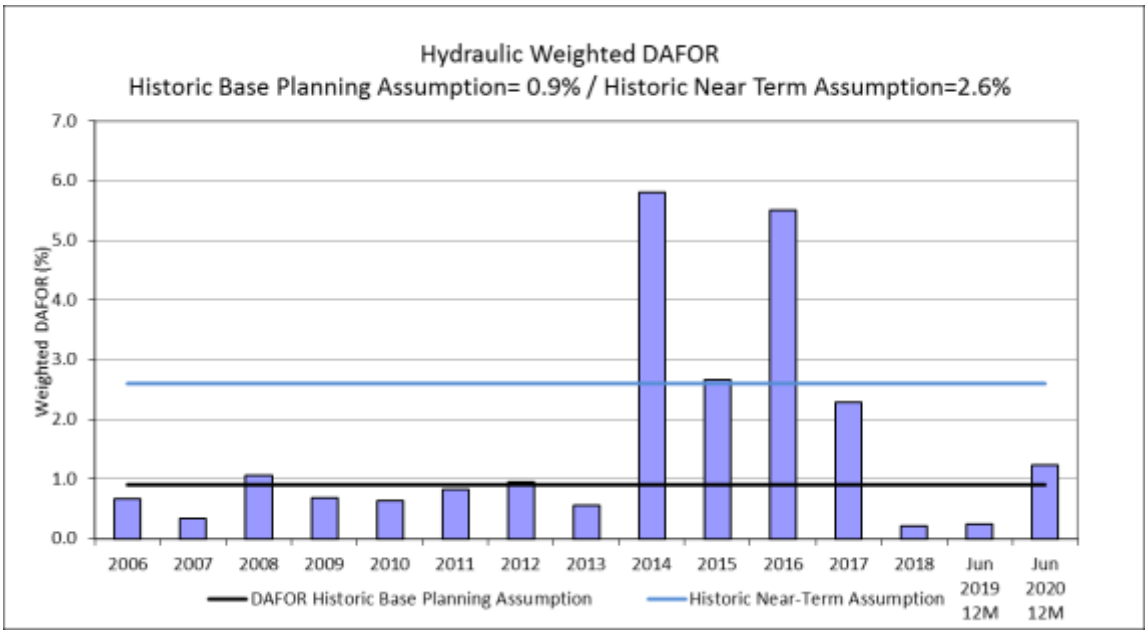
# 4.0 Hydraulic Unit DAFOR Performance

Detailed results for the 12-month period ending June 30, 2020 are presented in Table 4, as well as the data for the 12-month period ending June 30, 2019. These are compared to Hydro's historic near-term planning assumptions, as used in the May 2018 "Near-Term Generation Adequacy Report," and Hydro's historic base planning assumptions for the forced outage rate. Values currently used in Hydro's assessments of reliability and resource adequacy are provided in Section 9.0.

[4] 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 June 2019 (%) | 12 months ending June 2020 (%) | Historic Base Planning Assumption (%) | Historic Near-Term Planning Assumption (%) |
|---|---|---|---|---|---|
| ***All Hydraulic Units - weighted*** | 954.4 | 0.24 | 1.24 | 0.90 | 2.60 |
| **Hydraulic Units** | | | | | |
| Bay D'Espoir 1 | 76.5 | 0.07 | 4.12 | 0.90 | 3.90 |
| Bay D'Espoir 2 | 76.5 | 0.60 | 3.89 | 0.90 | 3.90 |
| Bay D'Espoir 3 | 76.5 | 0.00 | 1.85 | 0.90 | 3.90 |
| Bay D'Espoir 4 | 76.5 | 0.10 | 0.00 | 0.90 | 3.90 |
| Bay D'Espoir 5 | 76.5 | 0.47 | 0.96 | 0.90 | 3.90 |
| Bay D'Espoir 6 | 76.5 | 0.32 | 0.66 | 0.90 | 3.90 |
| Bay D'Espoir 7 | 154.4 | 0.00 | 0.00 | 0.90 | 3.90 |
| Cat Arm 1 | 67 | 0.98 | 0.19 | 0.90 | 0.70 |
| Cat Arm 2 | 67 | 0.16 | 0.00 | 0.90 | 0.70 |
| Hinds Lake | 75 | 0.05 | 1.93 | 0.90 | 0.70 |
| Upper Salmon | 84 | 0.05 | 0.05 | 0.90 | 0.70 |
| Granite Canal | 40 | 0.42 | 1.17 | 0.90 | 0.70 |
| Paradise River | 8 | 1.84 | 6.79 | 0.90 | 0.70 |




## Figure 1: Hydraulic Weighted DAFOR

The combined Hydraulic DAFOR is lower than the near term assumption. Considering individual hydraulic unit performance, the Bay d'Espoir Unit 1 DAFOR of 4.12% did not meet the historic base planning assumption of 0.9% nor the historic near-term planning assumption of 3.9% for an individual Bay d'Espoir unit. The Bay d'Espoir Unit 2 DAFOR of 3.89%, the Bay d'Espoir Unit 3 DAFOR of 1.85%, and the Bay d'Espoir Unit 5 DAFOR of 0.96% did not meet the historic base planning assumption of 0.9% but are below the historic near-term planning assumption of 3.9% for an individual Bay d'Espoir unit. As previously reported, Bay d'Espoir Units 1 and 2 experienced forced outages for the period of September 22, 2019 to October 4, 2019, as a result of a leak in Penstock 1. This leak has since been repaired and the units returned to service. The subsequent internal inspection of Penstock 1, completed in July 2020, revealed no material issues at this time. Bay d'Espoir Unit 3 experienced a forced derating from 76.5 MW to 70 MW for the period of October 4, 2019 to November 29, 2019, as a result of increased vibration at higher output. The generator thrust and guide bearings have since been replaced and the unit returned to full capacity. Since the previous filing of this report, Bay d'Espoir Unit 5 experienced a forced outage for the period of June 2, 2020 to June 4, 2020, as a result of the units Permanent Magnet Generator ("PMG") becoming decoupled during operation. This issue was investigated and remedial actions developed, the PMG was repaired and the unit returned to service.

The Hinds Lake unit DAFOR of 1.93% did not meet the historic base planning assumption of 0.9% nor the historic near-term planning assumption of 0.7% for the unit. This was the result of four forced outages. As previously reported, a forced outage occurred on January 23, 2020 to investigate arcing on the slip ring assembly and the other on March 11, 2020 to address an issue with the brake speed switch. Since the previous filing, two additional outages have occurred which have impacted the DAFOR for the current period. The first, a failure to stop due to excessive wicket gate leakage on April 15, 2020 and the second, a trip due to a faulty scroll case pressure switch on June 4, 2020. Both issues have been addressed and are now considered resolved.

The Granite Canal unit DAFOR of 1.17% did not meet the historic base planning assumption of 0.9% nor the historic near-term planning assumption of 0.7% for the unit. This was primarily the result of two forced outages, as previously reported. The first, a forced outage from July 26, 2019 to July 29, 2019, resulted from a leak in the unit oil head. This leak was addressed and a plan was developed to complete necessary improvement work on the equipment, which was completed during the annual outage in July 2020. The second outage, a starting failure, occurred on October 14, 2019 as a result of miscommunication regarding modifications made to the unit control sequence during the annual

maintenance outage in 2019. Additionally, since the previous filing, forced outages which occurred in the second quarter of 2020 have contributed to the DAFOR result for the current period. These outages were all short duration and determined to be the result of malfunctioning field devices. Each outage has been investigated and the issues are considered resolved.

The Paradise River unit DAFOR of 6.79% did not meet the historic base planning assumption of 0.9% nor the historic near-term assumption of 0.7% for the unit. This was primarily the result of two forced outages. The first, a forced outage from July 29, 2019 to August 9, 2019, as a result of a leak in the penstock expansion joint located in the lower level of the plant, and the second, a forced outage from November 18, 2019 to November 20, 2019, as a result of an issue with the unit breaker. As previously reported, both issues have since been resolved.

# 5.0 Thermal Unit DAFOR Performance

Detailed results for the 12-month period ending June 30, 2020, are presented in Table 5, as well as the data for the 12-month period ending June 30, 2019. These results are compared to Hydro's historic short-term generation adequacy assumptions, as used in the May 2018 "Near-Term Generation Adequacy Report," and Hydro's historic long-term generation planning assumptions for the forced outage rate.

**Table 5: Thermal DAFOR**

| Generating Unit | Maximum Continuous Unit Rating (MW) | 12 months ending June 2019 (%) | 12 months ending June 2020 (%) | Historic Base Planning Assumption (%) | Historic Near-Term Planning Assumption (%) |
|---|---|---|---|---|---|
| ***All Thermal Units - weighted*** | 490 | 9.43 | 2.03 | 9.64 | 14.00 |
| **Thermal Units** | | | | | |
| Holyrood 1 | 170 | 8.54 | 0.38 | 9.64 | 15.00 |
| Holyrood 2 | 170 | 11.44 | 4.27 | 9.64 | 10.00 |
| Holyrood 3 | 150 | 7.16 | 0.37 | 9.64 | 18.00 |

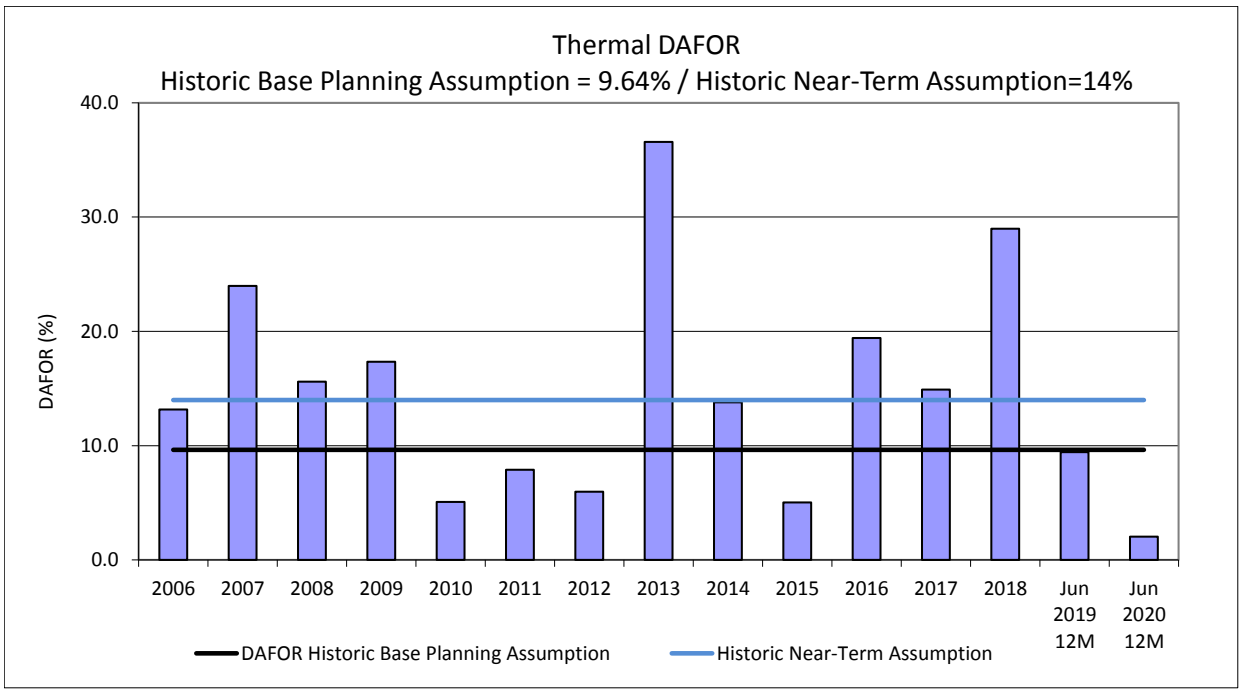



**Figure 2: Thermal DAFOR**

For the 12-month period ending June 30 2020, the weighted DAFOR for all thermal units of 2.03% is below the historic base planning assumption DAFOR value of 9.64%, and below the historic near-term planning assumption of 14.00%. Unit 1 DAFOR was 0.38%, which is below the historic base planning assumption of 9.64% and below the historic near-term planning assumption of 15%. Unit 2 DAFOR was 4.27%, which is below the historic base planning assumption of 9.64%, and the historic near-term assumption of 10.0%. Unit 3 DAFOR was 0.37%, which is below the historic base planning assumption of 9.64% and the historic near-term planning assumption of 18%.

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

# 6.0 Gas Turbine UFOP Performance

The combined UFOP for the Hardwoods, Happy Valley, and Stephenville Gas Turbines was 6.88% for the 12-month period ending June 30, 2020 (Table 6 and Figure 3). This performance is better than the historic base planning assumption of 10.62% and the historic near-term planning assumption of 20.00% although its performance is slightly declined over the previous period.

Considering individual unit performance, the Hardwoods Gas Turbine UFOP for the current period is 4.52%, as compared to the historic base planning assumption of 10.62%. The Stephenville Gas Turbine

UFOP for the current period is 11.63%, which is above the historic base planning assumption of 10.62%, but below the historic near-term planning assumption of 20.00%. The Stephenville unit UFOP in the current period was impacted by two outages experienced in the first two quarters of 2020. These outages included the inadvertent discharge of the fire suppression system resulting in the unit being unavailable from January 22-25, and a trip resulting from loose wiring in the vibration system on April 28. The Happy Valley Gas Turbine UFOP is 1.84% for the current period, as compared to the historic base planning assumption of 10.62%. On an individual unit basis, gas turbine UFOP performance for the Hardwoods Gas Turbine for the current period is improved over the previous period. The UFOP performance for Stephenville and Happy Valley units for the current period is declined over the previous period.

**Table 6: Gas Turbine UFOP**

| Gas Turbine Units | Maximum Continuous Unit Rating (MW) | 12 months ending June 2019 (%) | 12 months ending June 2020 (%) | Historic Base Planning Assumption (%) | Historic Near-Term Planning Assumption (%) |
|---|---|---|---|---|---|
| ***Combined Gas Turbines*** | 125 | 4.73 | 6.88 | 10.62 | 20.00 |
| Stephenville | 50 | 0.61 | 11.63 | 10.62 | 20.00 |
| Hardwoods | 50 | 7.90 | 4.52 | 10.62 | 20.00 |
| Happy Valley | 25 | 0.00 | 1.84 | 10.62 | 20.00 |

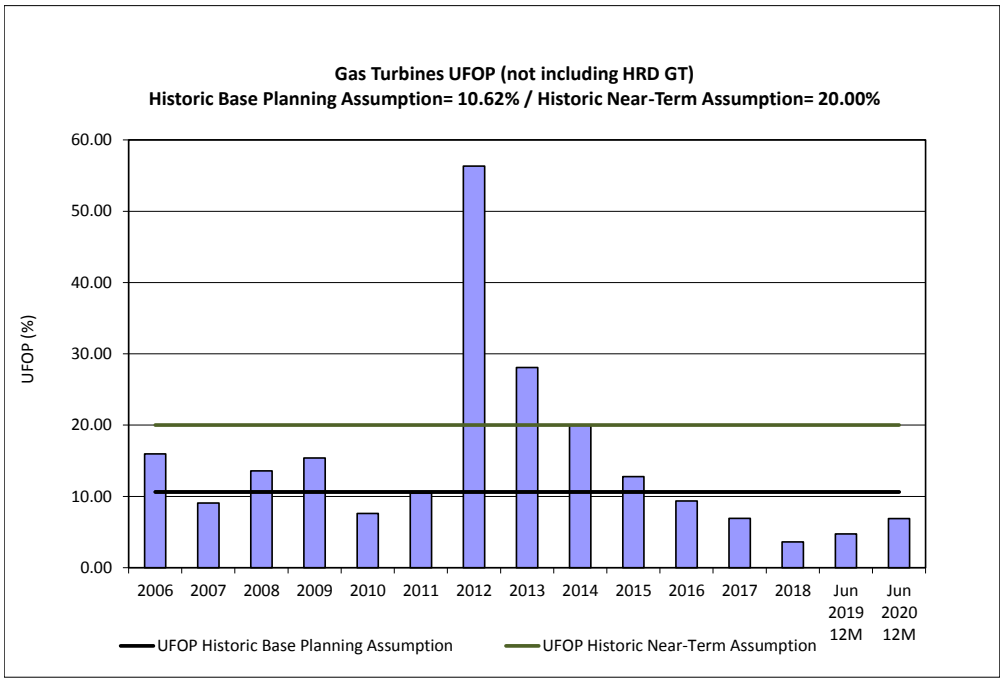



**Figure 3: Gas Turbine UFOP: Hardwoods/Happy Valley/Stephenville Units**

The Holyrood Gas Turbine UFOP of 3.32% for the current period is better than the historic base and historic near-term planning assumptions of 5.00% (Table 7 and Figure 4) but is a decline in performance over the previous period.

**Table 7: Holyrood Gas Turbine UFOP**

| Gas Turbine Units | Maximum Continuous Unit Rating (MW) | 12 months ending June 2019 (%) | 12 months ending June 2020 (%) | Historic Base Planning Assumption (%) | Historic Near-Term Planning Assumption (%) |
|---|---|---|---|---|---|
| Holyrood GT | 123.5 | 0.00 | 3.32 | 5.00 | 5.00 |

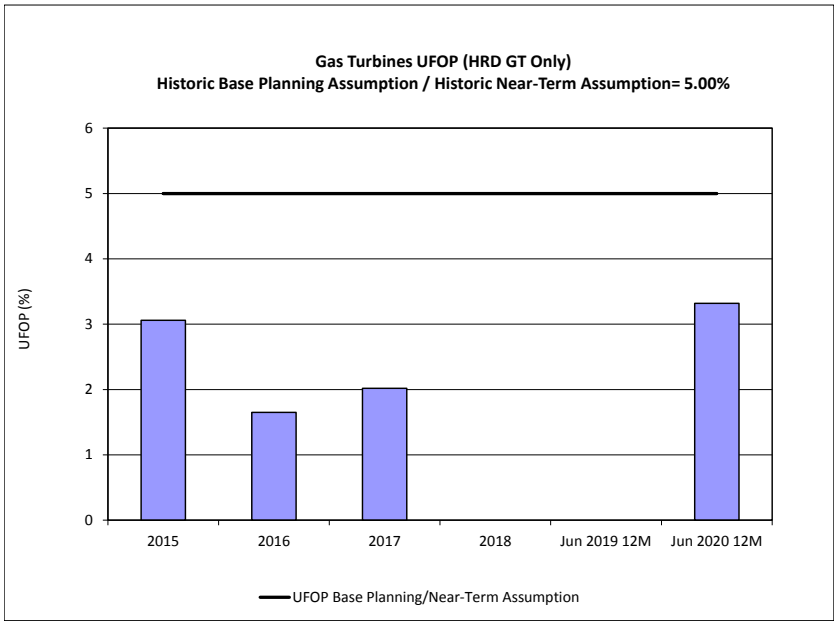


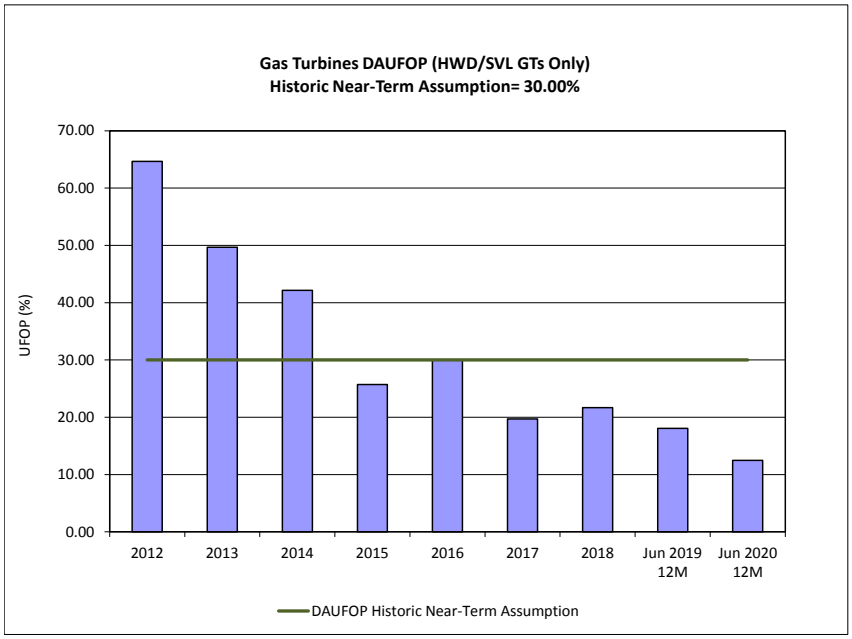

**Figure 4: Gas Turbine UFOP: Holyrood Unit**

# 7.0 Gas Turbine DAUFOP Performance

The combined DAUFOP for the Hardwoods and Stephenville Gas Turbines was 12.48% for the 12-month period ending June 30, 2020 (Table 8 and Figure 5). This is below the historic near-term planning assumption of 30.00%. The Hardwoods Gas Turbine DAUFOP for the current period is 10.17%, which is below the historic near-term planning assumption of 30.00%, and improved over the previous period. The Stephenville Gas Turbine DAUFOP for the current period is 14.15%, which is below the historic 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 June 2019 (%) | 12 months ending June 2020 (%) | Historic Near-Term Planning Assumption (%) |
|---|---|---|---|---|
| ***Gas Turbines (HWD/SVL)*** | 100 | 18.06 | 12.48 | 30.00 |
| Stephenville | 50 | 16.67 | 14.15 | 30.00 |
| Hardwoods | 50 | 18.58 | 10.17 | 30.00 |




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

The DAUFOP for the Happy Valley Gas Turbine was 1.84% for the 12-month period ending June 30, 2020 (Table 9 and Figure 6). This is below the historic near-term planning assumption of 15.00%, but declined over the previous period.

## Table 9: Happy Valley Gas Turbine DAUFOP

| Gas Turbine Units | Maximum Continuous Unit Rating (MW) | 12 months ending June 2019 (%) | 12 months ending June 2020 (%) | Historic Near-Term Planning Assumption (%) |
|---|---|---|---|---|
| Happy Valley | 25 | 0.00 | 1.84 | 15.00 |

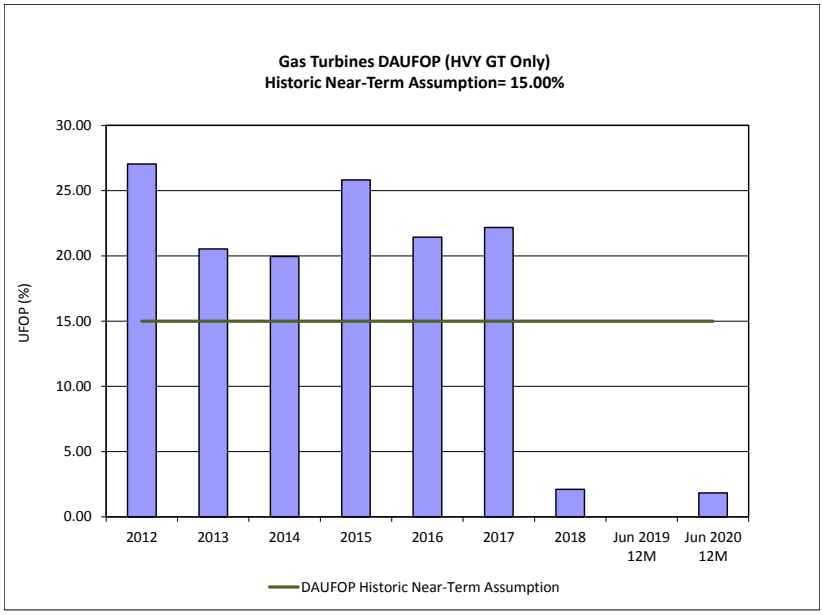



**Figure 6: Gas Turbine DAUFOP: Happy Valley Unit**

The Holyrood Gas Turbine DAUFOP of 3.32% for the current period is better than the historic near-term planning assumption of 5.00% (Table 10 and Figure 7) but is a decline in performance over the previous period.

**Table 10: Holyrood Gas Turbine DAUFOP**

| Gas Turbine Units | Maximum Continuous Unit Rating (MW) | 12 months ending June 2019 (%) | 12 months ending June 2020 (%) | Historic Near-Term Planning Assumption (%) |
|---|---|---|---|---|
| Holyrood GT | 123.5 | 0.00 | 3.32 | 5.00 |

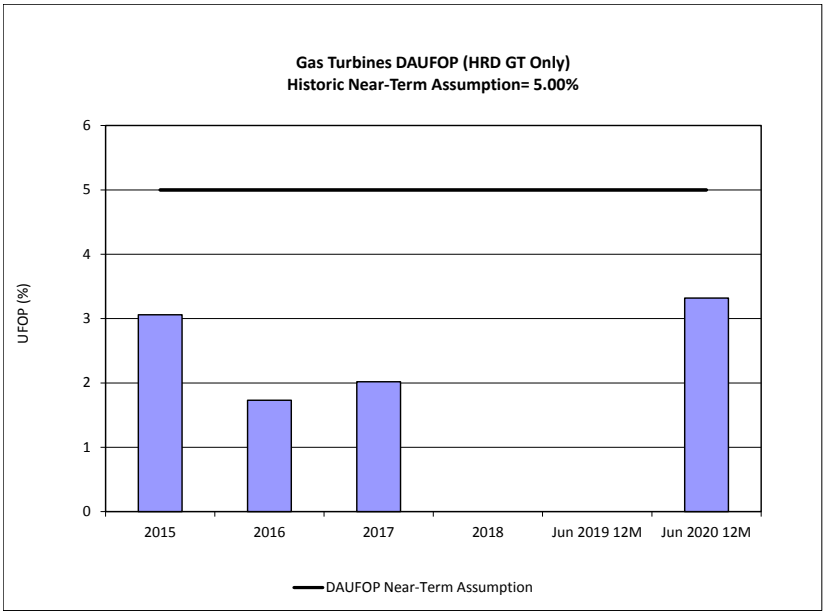



**Figure 7: Gas Turbine DAUFOP: Holyrood Unit**

# 8.0 Updated Planning Assumptions/Analysis Values

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

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

| Unit Type | Measure | Near-Term Analysis Value (%) | Resource Planning Analysis Value (%) |
|---|---|---|---|
| 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 |

[5] Values indicated for Hydro's near-term analysis reflect those used in Hydro's "Near-Term Generation Adequacy Report," filed with the Board on November 15, 2019.

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

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

As the gas turbines in the existing fleet are in varied condition, each was considered on an individual basis, rather than applying a weighted average across all units. For the Happy Valley Gas Turbine, a three-year capacity-weighted average was applied to the unit for the near-term analysis, resulting in a DAUFOP of 9.8%, while a ten-year capacity-weighted average was applied for use in the resource planning model resulting in a DAUFOP of 9.7%. The DAUFOP values were based on historical data founded upon the unit's past reliable performance. For the Holyrood Gas Turbine, a three-year capacity-weighted average was applied to the unit for the near-term analysis, resulting in a DAUFOP of 1.7%. For the Hardwoods and Stephenville Gas Turbines, a DAUFOP of 30% was used for the near-term analysis, consistent with the metrics that were considered in Hydro's May 2018 "Near-Term Generation Adequacy Report." As the Hardwoods and Stephenville Gas Turbines are being considered for retirement, these units were not included in the long- term analysis and, therefore, have no resource planning analysis value included.

# 9.0 Comparison of Planning Assumptions and Analysis Values

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

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

## Table 12: Comparison of Hydro's Planning Assumptions (%)

| | | Historical Planning Assumptions | | Reliability and Resource Adequacy Assumptions | |
|---|---|---|---|---|---|
| **Generating Unit Type** | **Measure** | **Historic Base Planning Assumption** | **Historic 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 |

The generating unit performance presented earlier in this report is again presented in Tables 13 to 17 with comparison to the previous assumptions, as well as the current values. No data is provided for the UFOP performance, as Hydro does not currently use this metric in its reliability assessments. Hydro notes that on an asset class basis, the 12-month rolling performance of its generating units has no violations of Hydro's current planning assumptions pertaining to asset availability, with the exception of the Holyrood Gas Turbine.

## Table 13: Hydraulic Weighted DAFOR Performance Comparison

| | | | | May 2018 | | November 2019 | |
|---|---|---|---|---|---|---|---|
| **Generating Unit** | **Maximum Continuous Unit Rating (MW)** | **12 months ending June 2019 (%)** | **12 months ending June 2020 (%)** | **Historic Base Planning Assumption (%)** | **Historic Near-Term Planning Assumption (%)** | **Near-Term Planning Analysis Value (%)** | **Resource Planning Analysis Value (%)** |
| ***All Hydraulic Units - weighted*** | 954.4 | 0.24 | 1.24 | 0.90 | 2.60 | 2.80 | 2.10 |
| **Hydraulic Units** | | | | | | | |
| Bay D'Espoir 1 | 76.5 | 0.07 | 4.12 | 0.90 | 3.90 | 2.80 | 2.10 |
| Bay D'Espoir 2 | 76.5 | 0.60 | 3.89 | 0.90 | 3.90 | 2.80 | 2.10 |
| Bay D'Espoir 3 | 76.5 | 0.00 | 1.85 | 0.90 | 3.90 | 2.80 | 2.10 |
| Bay D'Espoir 4 | 76.5 | 0.10 | 0.00 | 0.90 | 3.90 | 2.80 | 2.10 |
| Bay D'Espoir 5 | 76.5 | 0.47 | 0.96 | 0.90 | 3.90 | 2.80 | 2.10 |
| Bay D'Espoir 6 | 76.5 | 0.32 | 0.66 | 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 | 0.98 | 0.19 | 0.90 | 0.70 | 2.80 | 2.10 |
| Cat Arm 2 | 67 | 0.16 | 0.00 | 0.90 | 0.70 | 2.80 | 2.10 |
| Hinds Lake | 75 | 0.05 | 1.93 | 0.90 | 0.70 | 2.80 | 2.10 |
| Upper Salmon | 84 | 0.05 | 0.05 | 0.90 | 0.70 | 2.80 | 2.10 |
| Granite Canal | 40 | 0.42 | 1.17 | 0.90 | 0.70 | 2.80 | 2.10 |
| Paradise River | 8 | 1.84 | 6.79 | 0.90 | 0.70 | 2.80 | 2.10 |

## Table 14: Thermal DAFOR Performance Comparison

| | | | | May 2018 | | November 2019 | |
|---|---|---|---|---|---|---|---|
| **Generating Unit** | **Maximum Continuous Unit Rating (MW)** | **12 months ending June 2019 (%)** | **12 months ending June 2020 (%)** | **Historic Base Planning Assumption (%)** | **Historic Near-Term Planning Assumption (%)** | **Near-Term Planning Analysis Value (%)** | **Resource Planning Analysis Value (%)** |
| ***All Thermal Units - weighted*** | 490 | 9.43 | 2.03 | 9.64 | 14.00 | 15.00 | N/A |
| **Thermal Units** | | | | | | | |
| Holyrood 1 | 170 | 8.54 | 0.38 | 9.64 | 15.00 | 15.00 | - |
| Holyrood 2 | 170 | 11.44 | 4.27 | 9.64 | 10.00 | 15.00 | - |
| Holyrood 3 | 150 | 7.16 | 0.37 | 9.64 | 18.00 | 15.00 | - |

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

| | | | | May 2018 | | November 2019 | |
|---|---|---|---|---|---|---|---|
| **Gas Turbine Units** | **Maximum Continuous Unit Rating (MW)** | **12 months ending June 2019 (%)** | **12 months ending June 2020 (%)** | **Historic Base Planning Assumption (%)** | **Historic Near-Term Planning Assumption (%)** | **Near-Term Planning Analysis Value (%)** | **Resource Planning Analysis Value (%)** |
| ***Gas Turbines (HWD/SVL)*** | 100 | 18.06 | 12.48 | N/A | 30.00 | 30.00 | N/A |
| Stephenville | 50 | 16.67 | 14.15 | N/A | 30.00 | 30.00 | N/A |
| Hardwoods | 50 | 18.58 | 10.17 | N/A | 30.00 | 30.00 | N/A |

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

| | | | | May 2018 | | November 2019 | |
|---|---|---|---|---|---|---|---|
| **Gas Turbine Units** | **Maximum Continuous Unit Rating (MW)** | **12 months ending June 2019 (%)** | **12 months ending June 2020 (%)** | **Historic Base Planning Assumption (%)** | **Historic Near-Term Planning Assumption (%)** | **Near-Term Planning Analysis Value (%)** | **Resource Planning Analysis Value (%)** |
| Happy Valley | 25 | 0.00 | 1.84 | N/A | 15.00 | 9.80 | 9.70 |

## Table 17: Holyrood Gas Turbine DAUFOP Performance Comparison

| | | | | May 2018 | | November 2019 | |
|---|---|---|---|---|---|---|---|
| **Gas Turbine Units** | **Maximum Continuous Unit Rating (MW)** | **12 months ending June 2019 (%)** | **12 months ending June 2020 (%)** | **Historic Base Planning Assumption (%)** | **Historic Near-Term Planning Assumption (%)** | **Near-Term Planning Analysis Value (%)** | **Resource Planning Analysis Value (%)** |
| Holyrood GT | 123.5 | 0.00 | 3.32 | N/A | 5.00 | 1.70 | 1.70 |