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July 17, 2015

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

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

Dear Ms. Blundon:

Re: Newfoundland and Labrador Hydro - The Board's Investigation and Hearing into Supply Issues and Power Outages on the Island Interconnected System – Rolling 12 month performance of 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 12 copies of the quarterly report *Rolling 12 Month Performance of Hydro's Generating Units*.

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

Yours truly,

NEWFOUNDLAND AND LABRADOR HYDRO

Tracey L. Pennell
Legal Counsel

TLP/bs

cc: Gerard Hayes – Newfoundland Power
Paul Coxworthy – Stewart McKelvey Stirling Scales
Sheryl Nisenbaum – Praxair Canada Inc.
ecc: Roberta Frampton Benefiel – Grand Riverkeeper Labrador
Thomas Johnson – Consumer Advocate
Thomas O' Reilly – Cox & Palmer
Danny Dumaresque

A REPORT TO
THE BOARD OF COMMISSIONERS OF PUBLIC UTILITIES

QUARTERLY REPORT
ON
PERFORMANCE OF GENERATING UNITS
FOR THE QUARTER ENDED JUNE 30, 2015

NEWFOUNDLAND AND LABRADOR HYDRO

JULY 17, 2015

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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. This data is provided in relation to past historical forced outage rates and as well as in relation to assumptions used in Loss of Load Hours (LOLH) calculations for system planning purposes.

The forced outage rates are provided for individual generating units at hydraulic facilities; the three units at the Holyrood Thermal Generating Station (HTGS) and Hydro's gas turbines for the current 12-month reporting period of July 1, 2014 to June 30, 2015. The report also provides, for comparison purposes, the individual generating unit data on forced outage rates for the previous period July 1, 2013 to June 30, 2014. Further, total asset class data is presented on an annual basis for years the 2004-2013. This report provides data on outage rates for forced outages, not planned outages. The forced outage rates of Hydro's generating units will be presented using two measures: Derated Adjusted Forced Outage Rate (DAFOR) for the hydraulic units and the HTGS, and Utilization Forced Outage Probability (UFOP) for the gas turbines.

Derated Adjusted Forced Outage Rate (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 (MCR) due to forced outages. 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, this measure is not applicable to gas turbines because of their nature as a standby unit and therefore low operating hours.

Utilization Forced Outage Probability (UFOP) is 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. This metric is used for the gas turbines.

Included in the forced outage rates are outages that remove the unit from service completely, as well as instances when units were de-rated. If a unit's output is reduced by more than 2%, the unit is considered de-rated by Canadian Electricity Association (CEA) guidelines. Per CEA guidelines, to take

into account the de-rated levels of a generating unit, the operating time at the de-rated level is transformed into an equivalent outage time.

In addition to forced outage rates, this report provides outage details for those outages that contributed materially to forced outage rates exceeding those used in Hydro's generation planning analysis.

2.0 Period Ending June 30, 2015 Overview

Class of Units	July 1, 2013 to June 30, 2014 (%)	July 1, 2014 to June 30, 2015 (%)	Base Planning Assumption (%)
Hydraulic	4.98	2.85	0.90
Thermal	22.99	10.06	9.64
Gas Turbine	13.32	19.14	10.62

The hydraulic and thermal DAFOR performance (in table above) improved for the current period, the 12-month period ending June 2015 compared to the previous period, the 12-month period ending June 2014. The gas turbine UFOP performance (in table above) declined in the current period compared to the previous period.

In the 10 year period prior to 2014, the hydraulic units show a somewhat consistent DAFOR. The DAFOR of the current 12-month period compared to the previous 10 years is higher primarily due to the rectifying transformer failure on Unit 6 at Bay d'Espoir.

The units at HTGS, in the 10 year period prior to 2014, exhibit more variability than the hydraulic units, but many years were close to a consistent rate of approximately 10%. Considering the forced outage rate of the current period ending June 2015 compared to the previous 10 years, the 10.06% DAFOR is near the rate of many years, and notably improved compared to the previous 12-month period when the rate was approximately 23%.

Hydro's gas turbines UFOP in the 10 year period prior to 2014 was generally consistent at approximately 10% until 2012 when the rate exceeded 50%. Since 2012, the UFOP has been improving each year. The current 12-month period ending June 30, 2015 performance declined due to Hardwoods being derated to 25 MW since March 1, 2015 and a forced outage on the Stephenville

unit from May 1 to 27. The newest unit in this asset class is the 123.5 MW unit and the data for this unit started to be measured in March 2015.

Note that the data in the charts for 2004 to 2013 are annual numbers (January 1 to December 31), while June 2014 and June 2015 are 12-month rolling data (July 1 to June 30 for each period).

3.0 Generation Planning Assumptions

The DAFOR and UFOP indicators used in the planning model are representative of a historic average of the actual performance of these units over the five years 2008 – 2012. These numbers are noted in the table below under the column "Base Planning Assumption".

Hydro also provides a "Sensitivity" number for DAFOR and UFOP as part of its generation planning analysis. This number takes into account a higher level of unavailability, should it occur, to assess the impact of higher unavailability of these units on overall generation requirements. The analysis demonstrated that with the implementation of the new gas turbine generating unit and the capacity assistance arrangements, the LOLH reliability criterion will be met beyond 2018 for the full range of sensitivity in the table below.[1]

The new gas turbine (Holyrood CT) has a lower expected rate of unavailability than the original gas turbines, 5% compared to 10.62% respectively, due to the fact that the unit is new and can be expected to have better availability than the older units.[2]

[1] During the 12-month period ending June 30, 2015, the thermal and gas turbine units performed within the sensitivity range for DAFOR and UFOP.

[2] Hydro selected a 5% UFOP for the new Holyrood CT following commentary on forced outage rates contained in the *Independent Supply Decision Review – Navigant (September 14, 2011)*

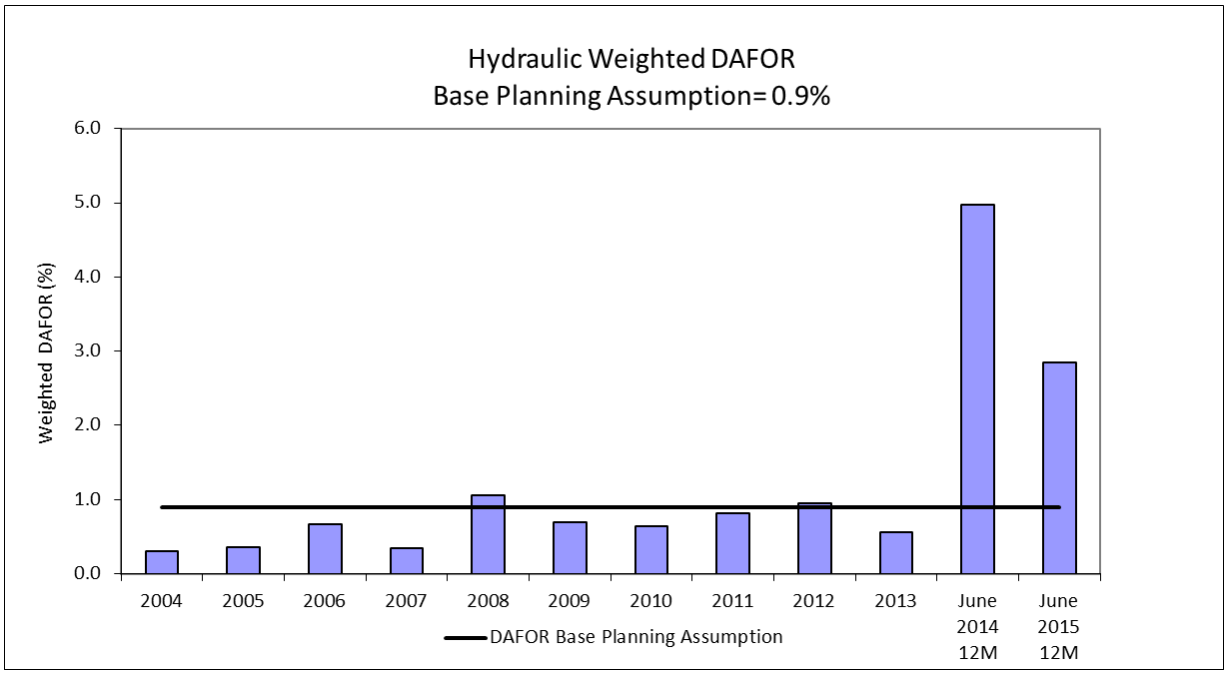
Hydro's current generation planning assumptions for DAFOR and UFOP are:

	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	20.62
Gas Turbines - New			5.0	5.0

4.0 Hydraulic Unit Forced Outage Rate Performance

The hydraulic units forced outage rates are measured using the CEA metric, DAFOR. Detailed results for the 12-month period ending June 30, 2015 is presented as well as the data for the 12-month period ending June 30, 2014 and the Hydro Generation Planning Assumption for the forced outage rate.

Generating Unit	Maximum Continuous Unit Rating (MW)	12 months ending June 2014 (%)	12 months ending June 2015 (%)	Hydro Generation Base Planning Assumption (%)
All Hydraulic Units - weighted	**954.4**	**4.98**	**2.85**	**0.90**
Hydraulic Units				
Bay D'Espoir 1	76.5	0.03	13.75	0.90
Bay D'Espoir 2	76.5	3.58	0.00	0.90
Bay D'Espoir 3	76.5	0.00	0.00	0.90
Bay D'Espoir 4	76.5	0.78	0.23	0.90
Bay D'Espoir 5	76.5	2.26	0.00	0.90
Bay D'Espoir 6	76.5	48.76	15.39	0.90
Bay D'Espoir 7	154.4	1.24	0.84	0.90
Hinds Lake	75	0.12	0.30	0.90
Upper Salmon	84	1.32	1.17	0.90
Granite Canal	40	1.52	0.37	0.90
Cat Arm 1	67	0.00	0.60	0.90
Cat Arm 2	67	1.65	1.91	0.90
Paradise River	8	0.58	0.00	0.90



The weighted "All Hydraulic Units" DAFOR was 2.85% for the current 12 month period ending June 30, 2015. The forced outage to Unit 6 at Bay d'Espoir was the primary contributor to the DAFOR of 2.85% as compared to a base plan of 0.9%. This one forced outage, contributed 52% of the total DAFOR in this asset class.

Considering the individual units performance, the assumed Hydro Generation Base Planning DAFOR was materially exceeded for Bay d'Espoir Unit 6, and Bay d'Espoir Unit 1. Also, there were minor exceedances compared to base plan for the Upper Salmon Unit and Cat Arm Unit 2, for the current period.

The DAFOR at Bay d'Espoir Unit 6 was as a result of a failure of the in-service rectifying transformer, followed by a failure of the spare replacement transformer. The in-service rectifying transformer failed on January 30, 2014 and the unit was returned to service on February 1, 2014 using the spare transformer. This spare transformer failed on February 17, 2014 and, with no other spares available, a new transformer had to be procured. The unit was returned to service on August 5, 2014 with a new rectifying transformer.

If the two rectifying transformer failures had not occurred, the DAFOR for Unit 6 would have been 0.0% and the weighted "All Hydraulic Units" performance would have been 1.87%, compared to the

plan of 0.9%. If the in-service transformer had failed but the spare had not, the Unit 6 DAFOR would have been 0.18% and the weighted "All Hydraulic Units" DAFOR would have been 1.82%, compared to plan of 0.9%.

Prior to the in-service rectifying transformer failure, Hydro had established the replacement of the rectifying transformers in its 20 year capital plan. A review of the transformers' condition in 2013 resulted in all seven rectifying transformers in Bay d'Espoir being planned for replacement by the end of 2015. Unit 6 and Unit 7 transformers were replaced in 2014. The remainder of the transformers will be replaced in 2015. By November 2015, all Bay d'Espoir units will have new in-service rectifying transformers, and a critical spare transformer will remain in inventory.

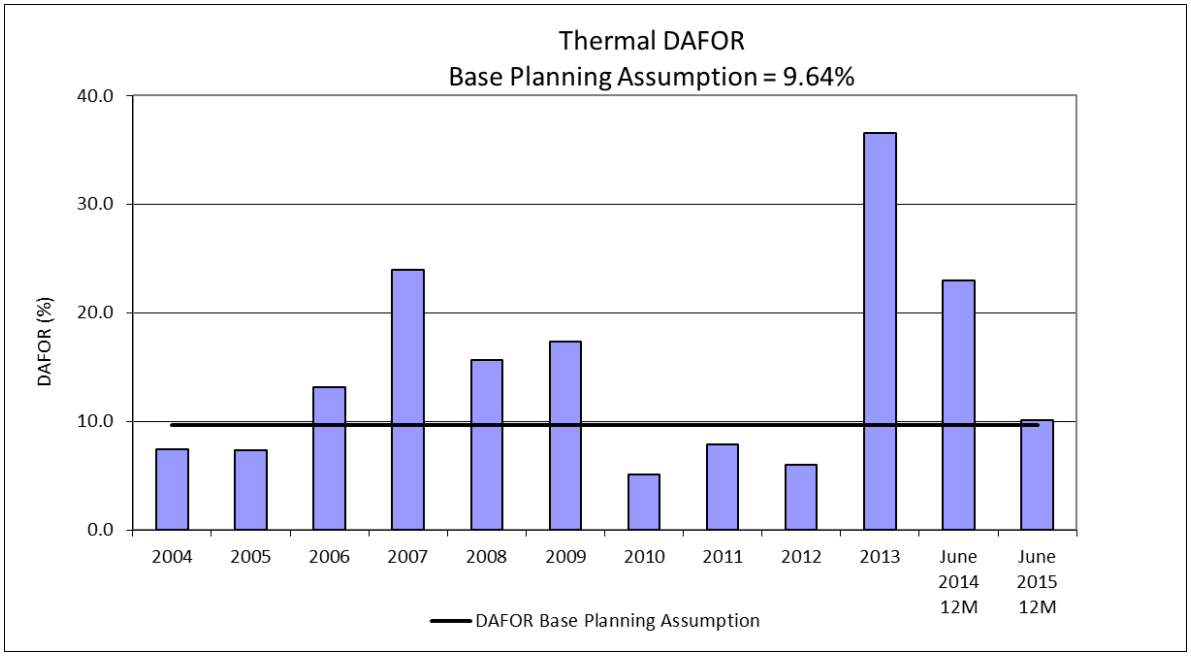
Bay d'Espoir Unit 1 DAFOR of 13.75% compared to a base plan of 0.9% was the result of a forced extension of a planned outage. The planned annual maintenance was scheduled from April 26, 2015 to May 15, 2015. The extension is the result of having to replace the turbine bearing. It was identified in the annual work plan to check the turbine bearing clearances due to an increase in bearing temperatures. The bearing clearances were checked and damage was found to the turbine bearing, so it was recommended to replace the bearing. Vibration issues were experienced with the unit after the bearing was replaced, which extended the planned outage. Two vibration experts have been involved in troubleshooting the issue, as well as the Original Equipment Manufacturer (OEM), but to date no cause has been determined. Investigation into this issue is ongoing. The vibration levels were determined to be acceptable in the 45 MW range and as a result the unit was returned to service on July 8, 2015, but-derated to 45 MW.

The DAFOR for Cat Arm Unit 2 was 1.91% compared to a base plan of 0.9%. The actual DAFOR was attributable to two forced outages, of approximately 2 days each. The DAFOR for the Upper Salmon unit was 1.17% compared to a base plan of 0.9%. The actual DAFOR was primarily attributable to one outage of about two days and three one day outages.

5.0 Thermal Unit Forced Outage Rate Performance

The thermal units forced outage rates are measured using the CEA metric, DAFOR. Detailed results for the 12-month period ending June 30, 2015 is presented as well as the data for the 12-month period ending June 30, 2014 and the Hydro Generation Base Planning Assumption for the forced outage rate.

Generating Unit	Maximum Continuous Unit Rating (MW)	12 months ending June 2014 (%)	12 months ending June 2015 (%)	Hydro Generation Base Planning Assumption (%)
All Thermal Units - weighted	**490**	**22.99**	***10.06***	**9.64**
Thermal Units				
Holyrood 1	170	39.10	13.20	9.64
Holyrood 2	170	3.61	11.06	9.64
Holyrood 3	150	10.87	5.67	9.64



For the 12-month period ending June 30, 2015, the weighted all thermal units DAFOR of 10.06% was not materially different than the assumed Hydro Generation Base Planning DAFOR value of 9.64%, and improved compared to the previous 12-month period rate of 22.99%. The variance compared to plan in the current period was attributable to exceedances for Units 1 and to a lesser extent, Unit 2.

Unit 3 DAFOR was materially improved compared to the previous period of 10.87% and finished the current period at 5.67% compared to plan of 9.64%.

The DAFOR for the three Holyrood units combined, at 10.06%, is less than the "Sensitivity" value of 11.64%.

The DAFOR performance for Holyrood Unit 1 (170 MW) was materially affected by several events.

For the month prior to the planned annual unit maintenance outage, July 8 – August 5, 2014, the unit was derated to 155 MW due to *fouled* air heaters. Combustion gases containing ash and other contaminants pass through the air heaters and over time this contamination or *fouling* can restrict airflow enough to limit available load. Once this happens, the unit must be taken off line to wash the air heaters. This is a normal maintenance activity and was done during the planned outage.

From November 2 to 19, 2014, there was a forced extension to the 2014 planned maintenance outage due to concrete damage found in the condenser cooling water sump. The damage was a safety hazard that had to be mitigated prior to returning the unit to service.

During the 2014 maintenance outage, repairs and adjustments were made to one of the turbine bearings to improve operation. This work was a follow-up to the work that was done in 2013 following the January 2013 failure. Subsequent to the turbine bearing adjustments, the turbine rotor had to be re-balanced. This is an iterative and time consuming process that requires the unit to be brought on line for measurements and calculations and taken off line for placement of balance weights. Four iterations were required to successfully balance the rotor. This work started November 19, and the unit was deemed within standards and returned to service November 30. As system load permitted, Hydro took an additional day to complete another adjustment, improving balancing results even further, on December 3 and the unit was returned to service December 4.

From March 11 to 13, 2015 the unit was taken off line for a forced outage to replace a bearing in the west forced draft fan motor. The bearing has been sent out for a failure analysis. The results

pointed to a shock loading while stationary as the cause of the eventual failure. The source of the shock loading could not be confirmed but may have happened during transportation/handling of the motor or during installation of the bearing. There were no signs of electrical arc damage or other operational problem.

From March 13 to 30, 2015 the unit was derated to 160 MW due to airflow limitations related to the commissioning of the new variable frequency drives on the forced draft fans. Changes were made after the critical system load period had ended to correct this issue. However the expected results were not achieved. Testing indicated that the problem may be related to unit fouling or airflow control. Both of these items will be addressed during the 2015 planned maintenance outage. From May 14 to 19, 2015 the unit was derated to 155 MW due to the same airflow limitations as described above.

Holyrood Unit 2 (170 MW) DAFOR performance was affected by several events.

From September 17 to October 13, 2014, the unit was returning to service after a major turbine and generator maintenance outage and the turbine rotor required rebalancing. This is an iterative and time consuming process that requires the unit to be brought on line for measurements and calculations and taken off line for placement of balance weights. Four iterations were required to successfully balance the rotor. An extraction pump was delayed returning from overhaul, which limited the available load during the balancing activities.

From October 13 to 24, 2014 the unit was derated due to fuel system restrictions. The heavy fuel oil could not be supplied to the burners fast enough to reach the maximum load due to wear of components such as pumps and burners. Operational adjustments were made to restore full load capability Fuel delivery limitations returned and from November 9 to 20, 2014, the unit was again derated due to fuel system component issues. The west fuel oil pump was replaced in late December to mitigate further issues.

From December 19 to 21, 2014 the unit experienced a forced outage due to arcing of a failed electrical lead on the west forced draft (FD) fan motor. Investigation of the arcing revealed that the connectors were not correctly sized and they were replaced. The failed lead was a recently

installed connection. The other motor leads were not suspected to have a similar issue as the other motors had not been recently re-connected. Through scheduled maintenance activities, all other Unit 1 and Unit 2 FD fan motor leads will be inspected in the 2015 maintenance season.

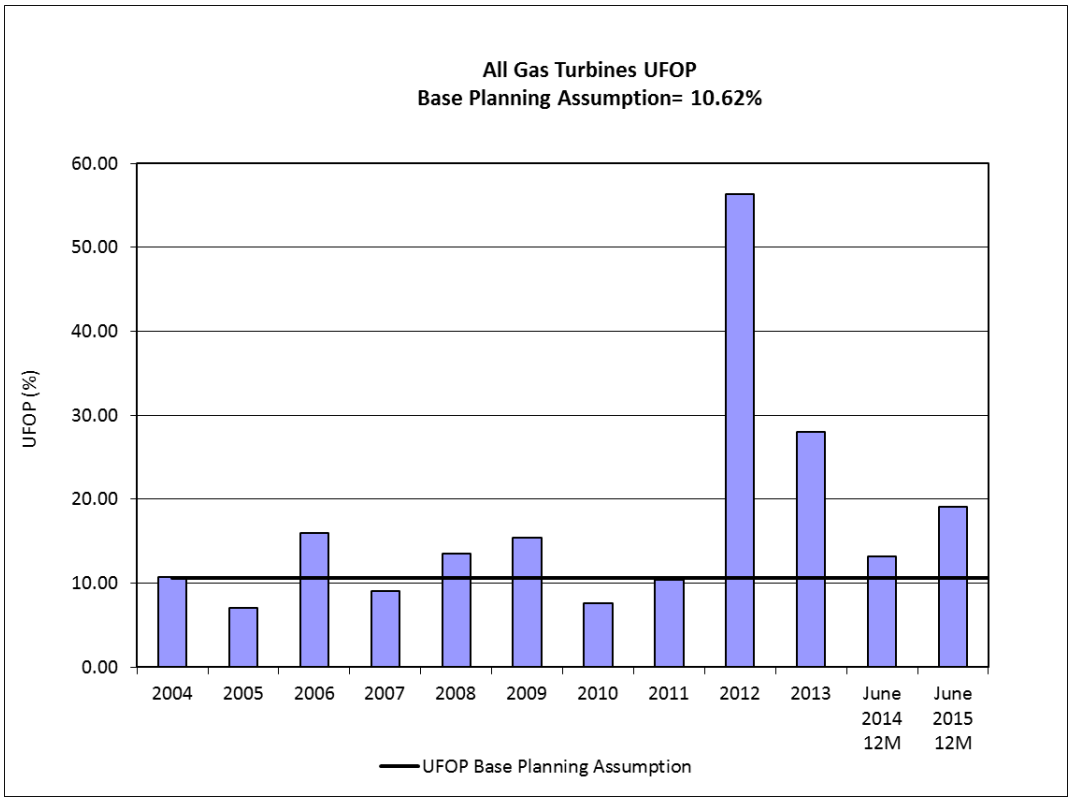
From December 26 to 28, 2014 the unit was off line for a forced outage to replace a failed gasket in the steam inlet line to the turbine upper control valves. The gasket was replaced with an alternate design that has been successfully used in the same flange of Unit 1.

6.0 Gas Turbine UFOP Performance

The combined UFOP for all gas turbines was 19.14% for the 12-month period ending June 30, 2015. This was higher than the base plan of 10.62%, but was slightly better than the "sensitivity" UFOP of 20.62%. The current period declined from the previous period UFOP of 13.32%. The current period UFOP was impacted by the Hardwoods and Stephenville units. Hardwoods UFOP for the current period was 36.76% compared to a plan of 10.62%. The Stephenville unit's current period UFOP of 16.40% which declined compared to the previous period.

Combustion Turbine Units	Maximum Continuous Unit Rating (MW)	12 months ending June 2014 (%)	12 months ending June 2015 (%)	Hydro Generation Base Planning Assumption (%)
All CTUs	**248.5**	**13.32**	19.14	**10.62**
Holyrood CT*	123.5		1.33	10.62
Stephenville	50	11.41	16.40	10.62
Hardwoods	50	17.66	36.76	10.62
Happy Valley	25	0.00	0.02	10.62

*data presented from March to June 2015 only



The All Gas Turbine Units UFOP base plan was exceeded in the current period due to the Hardwoods and Stephenville Gas Turbines UFOP.

From July 25 to September 25, 2014, a forced outage of Hardwoods Gas Turbine was the primary contributor to the unit's UFOP. This outage was due to a grounding issue which caused a fire in the motor control center. The affected equipment was replaced. An investigation into the incident resulted in a number of recommendations, some of which are complete and others are in progress.

A forced outage of Hardwoods End B from December 12 to 30, 2014 resulted from a flexible fuel line failure. Replacement of the specific affected fuel lines was completed at both Hardwoods and the sister unit in Stephenville, and the replacement of all flexible fuel lines is being completed during planned maintenance outages on both units in 2015.

In 2015, a forced outage of Hardwoods End B beginning on March 1 impacted the unit's performance to date. The unit has been derated by 25 MW since March 1. The outage was due to a fire caused by a failed component on a fuel oil vent line. The failed components were replaced on both End A and End B at Hardwoods, and the same components were immediately verified to be fit for service and not requiring immediate replacement at the Stephenville facility. These components will be replaced during an upcoming maintenance outage at Stephenville. There was internal damage caused to the Hardwoods End B turbine during the fire event. Following a review of this damage it was decided to overhaul the unit during the summer maintenance period. While the Hardwoods fuel system inspection and refurbishment work is completed, the End B turbine is being removed from site for the overhaul. A leased unit is being installed in its place to be available upon completion of the fuel system and will remain there while the turbine overhaul is completed at an off-site repair facility.

The Stephenville Gas Turbine experienced a forced outage from May 1, 2015 to May 27, 2015 due to an alternator bearing problem. The bearing was inspected, repaired, and all operating parameters checked and confirmed prior to return to service.