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October 14, 2016

The 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 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 Pennell

Tracey L. Pennell
Senior Counsel, Regulatory

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 SEPTEMBER 30, 2016

NEWFOUNDLAND AND LABRADOR HYDRO

OCTOBER 14, 2016

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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 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 October 1, 2015 to September 30, 2016. The report also provides, for comparison purposes, the individual generating unit data on forced outage rates for the previous period October 1, 2014 to September 30, 2015. Further, total asset class data is presented on an annual basis for years the 2005-2014. This report provides data on outage rates for forced outages, not planned outages.

The forced outage rates of Hydro's generating units are presented using two measures: Derated Adjusted Forced Outage Rate (DAFOR) for the hydraulic and thermal units 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 relatively low operating hours.

Utilization Forced Outage Probability (UFOP) 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. 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 are 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 converted 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 September 30, 2016 Overview

Class of Units	October 1, 2014 to September 30, 2015 (%)	October 1, 2015 to September 30, 2016 (%)	Base Planning Assumption (%)
Hydraulic (DAFOR)	2.82	2.02	0.90
Thermal (DAFOR)	9.86	19.72	9.64
Gas Turbine (Combined) (UFOP)	15.89	5.54	10.62
Gas Turbine (Holyrood) (UFOP)	5.01[1]	1.33	5.00

The hydraulic DAFOR and the combined[2] gas turbine UFOP performance (in table above) show improvement for the current period, the 12-month period ending September 2016 compared to the previous period, the 12-month period ending September 2015. There was a decline in Thermal DAFOR performance for the current period compared to the previous period.

[1] Only includes data from March 1, 2015 to September 30, 2015

[2] Combined Gas Turbines include the Hardwoods, Happy Valley, and Stephenville units. The performance of the Holyrood CT was not included in the combined base planning or sensitivity numbers as these numbers were set prior to the Holyrood CT's in service date.

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 penstock issues experienced on Units 1 and 2 at Bay d'Espoir.

The thermal units, in the 10 year period prior to 2014, exhibit more variability in DAFOR than the hydraulic units, but in many years were close to a consistent rate of approximately 10%. The forced outage rate of the current period ending September 2016 is 19.72% which is above the base planning assumption of 9.64%, and the sensitivity of 11.64%. This is primarily caused by an airflow derating on Unit 1 and boiler tube failures on Units 1 and 2.

Hydro's combined gas turbines' UFOP in the 10 year period prior to 2014 was generally consistent at approximately 10% until the year 2012 when the rate exceeded 50%. Since 2012, the UFOP has been improving each year. For the current 12-month period ending September 30, 2016, performance was mainly affected by forced outages to the Stephenville unit. Performance data for the Holyrood CT for the 12-month period ending September 2015 includes seven months of data where the 12-month period ending September 2016 includes a full year of data.

Note that the data in the charts for 2005 to 2014 are annual numbers (January 1 to December 31), while the data for September 2015 and September 2016 are 12-month rolling (October 1 to September 30 for each period).

3.0 Generation Planning Assumptions

The DAFOR and UFOP indicators used in Hydro's generation planning model is representative of a historic average of the actual performance of these units. These numbers are noted in the table below under the column "Base Planning Assumption"[3].

[3] Hydro is currently completing a risk assessment on thermal generation supply for the period up to interconnection with Labrador and Nova Scotia. As part of this risk assessment, Hydro is reviewing the recent availability results. The outcome of this review may reflect a new base planning assumption for various generation sources.

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. During the 12-month period ending September 30, 2016, the gas turbine units performed well within this sensitivity range for UFOP, while both the hydraulic and thermal classes performed outside of the sensitivity range for DAFOR. As part of the ongoing risk review considering energy supply up to Lower Churchill interconnection, Hydro is considering several years of data of DAFOR and UFOP and the resulting implication for meeting reliability criteria.

The new gas turbine (Holyrood CT) has a lower expected rate of unavailability than the original gas turbines, of 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.[4]

Hydro's generation planning assumptions for DAFOR and UFOP for the year 2016 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	10.0[5]

4.0 Hydraulic Unit Forced Outage Rate Performance

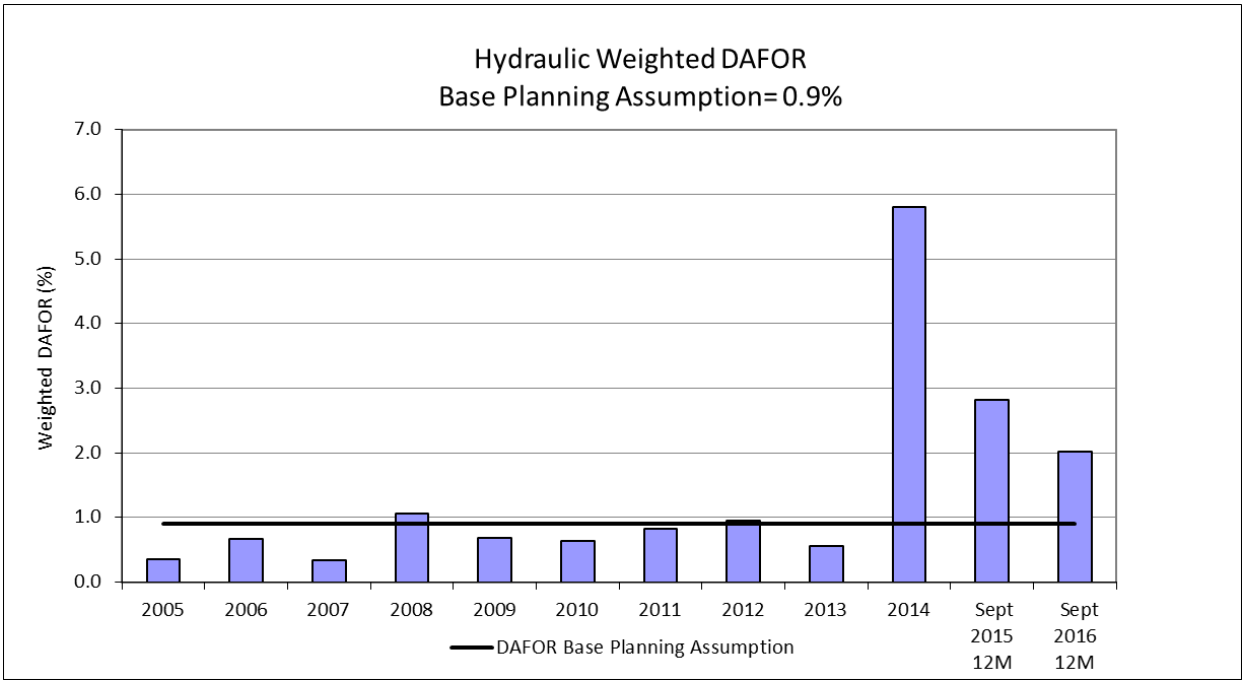
The hydraulic unit forced outage rates are measured using the CEA metric, DAFOR. Detailed results for the 12-month period ending September 30, 2016 are presented as well as the

[4] 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)*

[5] In previous reports this sensitivity value was reported as 5.0%. The generation planning sensitivity for the Holyrood CT was updated to 10 % in the September 2015 Q3 report for system planning purposes.

data for the 12-month period ending September 30, 2015. These are compared to Hydro's generation planning assumption for the forced outage rate.

Generating Unit	Maximum Continuous Unit Rating (MW)	12 months ending September 2015 (%)	12 months ending September 2016 (%)	Hydro Generation Base Planning Assumption (%)
All Hydraulic Units - weighted	954.4	2.82	2.02	0.90
Hydraulic Units				
Bay D'Espoir 1	76.5	25.64	10.57	0.90
Bay D'Espoir 2	76.5	0.00	13.52	0.90
Bay D'Espoir 3	76.5	0.00	0.00	0.90
Bay D'Espoir 4	76.5	0.23	1.33	0.90
Bay D'Espoir 5	76.5	2.46	0.63	0.90
Bay D'Espoir 6	76.5	0.00	0.18	0.90
Bay D'Espoir 7	154.4	0.00	0.00	0.90
Hinds Lake	75	0.32	0.06	0.90
Upper Salmon	84	0.98	0.00	0.90
Granite Canal	40	1.51	1.72	0.90
Cat Arm 1	67	0.63	0.13	0.90
Cat Arm 2	67	1.42	0.00	0.90
Paradise River	8	0.19	5.16	0.90



Considering the individual units performance, the assumed Hydro generation base planning DAFOR was materially exceeded for Bay d'Espoir Unit 1 and Bay d'Espoir Unit 2. Also, there

were exceedances compared to base planning assumption for Bay d'Espoir Unit 4, Granite Canal, and Paradise River for the current period.

The Bay d'Espoir Unit 1 DAFOR of 10.57% and Unit 2 DAFOR of 13.53%, compared to the base planning assumption of 0.9% were impacted by the units being removed from service on two separate occasions as a result of a leak in Penstock 1, which provides water to both Units 1 and 2. The first event occurred on May 21, 2016. A consultant was engaged to conduct an investigation into the issue, which contributed the leak to a localized issue caused by an improper weld. A repair procedure was provided on June 2, 2016, with repairs carried out and completed on June 3, 2016. Unit 1 was returned to service on June 3, 2016, at 1938 hours and Unit 2 returned to service a short time later at 2014 hours.

The second leak in Penstock 1 occurred on September 14, 2016. Considering this leak was similar to the first and located in the same area, a consultant was engaged to conduct a thorough investigation of the welds throughout the penstock, which included cutting a sample coupon, from the penstock wall, for testing. This investigation is ongoing, but actions are now underway to refurbish the welds along the upper section of the penstock between the Intake and Surge Tank. All efforts are being put in place to complete this work in advance of December 1, 2016 and at this time, Hydro has no indication this timeline is at risk. Hydro is committed to keeping the Board informed on the status of this effort.

The Bay d'Espoir Unit 4 DAFOR of 1.33% compared to the base planning assumption of 0.9% was the result of two forced outages. The unit experienced a starting failure on September 20 from 0545 hrs to 1316 hrs, which was related to generator power transformer. A new protection system had been installed on this transformer as part of the capital program, which required that the time settings be increased. A forced outage from September 22 at 0949 hrs to September 23 at 0843 hours, related to an issue with the Governor Permanent Magnetic Generator (PMG). One of the drive pins was broken and another was bent, which

caused erratic speed signals to the governor. The drive pins were replaced and the PMG was function tested, before being reinstalled and the unit returned to service.

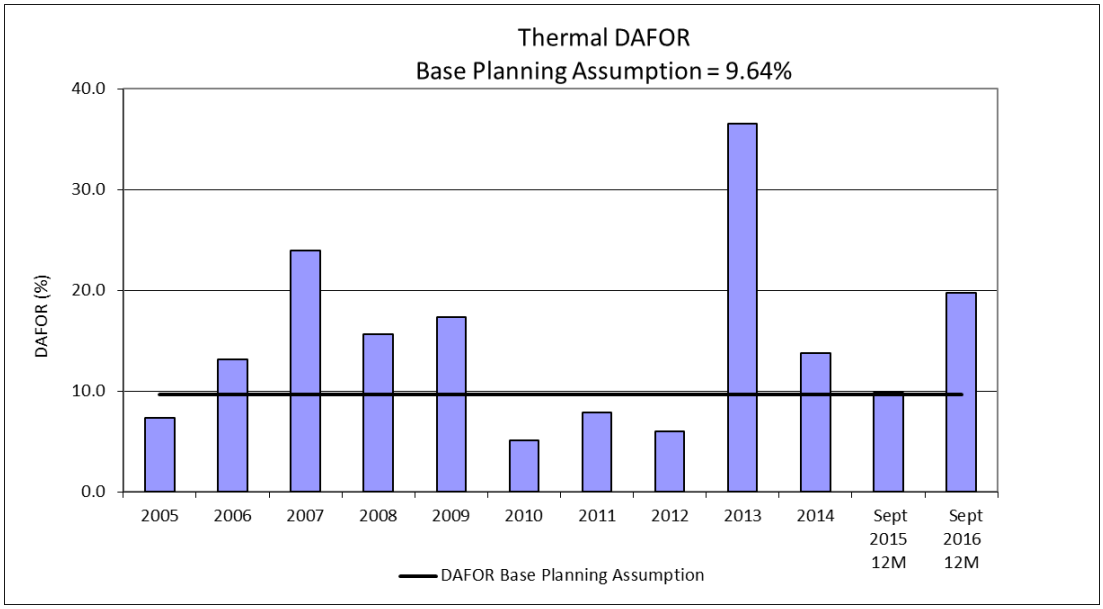
The Granite Canal Unit DAFOR of 1.72% compared to the base planning assumption of 0.9% was the result of the unit being unavailable from December 16, 2015 to December 17, 2015, due to frazil ice accumulation on the intake trash rack.

The Paradise River unit DAFOR of 5.16% compared to the base planning assumption of 0.9% was the result of a forced outage. A forced outage was experienced on September 23 from 0031 hrs to September 30 at 1805 hrs, which related to a governor low oil level alarm. This alarm was caused when a seal broke on one of the Governor servos, releasing oil from the governor oil sump into the powerhouse sump system. A new seal was installed and oil added to the governor system. There have been repeated trips of this plant over the past number of months. Hydro has investigated these trips and has determined that a number of trips that cannot be found to be associated with a plant issue, and may be connected to a distribution system issue. The plant is connected into the local distribution system, which is the original design and is not typical for a generating facility. This structural set up exposes the plant to disturbances on the distribution system potentially causing plant trips. To better understand if the distribution system is causing plant trips, a recloser in the nearby substation is being replaced with a modern recloser that will better capture system information. This information will assist in troubleshooting distribution issues and hopefully, reduce plant trips.

5.0 Thermal Unit Forced Outage Rate Performance

The thermal unit forced outage rates are measured using the CEA metric, DAFOR. Detailed results for the 12-month period ending September 30, 2016 are presented as well as the data for the 12-month period ending September 30, 2015. These are compared to Hydro's generation base planning assumption for the forced outage rate.

Generating Unit	Maximum Continuous Unit Rating (MW)	12 months ending September 2015 (%)	12 months ending September 2016 (%)	Hydro Generation Base Planning Assumption (%)
All Thermal Units - weighted	490	9.86	19.72	9.64
Thermal Units				
Holyrood 1	170	12.22	25.46	9.64
Holyrood 2	170	7.15	25.64	9.64
Holyrood 3	150	10.08	2.86	9.64



For the 12-month period ending September 30, 2016, the weighted DAFOR for all thermal units, of 19.72% is above the assumed Hydro generation base planning DAFOR value of 9.64%, and also exceeded the previous 12-month period rate of 9.86%. Unit 1 DAFOR was 25.46% and Unit 2 DAFOR was 25.64%, and the performance for both units was above the base planning assumption of 9.64%. Unit 3 DAFOR was 2.86%, which is significantly better than the base planning assumption of 9.64%.

The DAFOR performance for Holyrood Unit 1 (170 MW) was affected by several events in the current 12 MTD period.

From November 27, 2015 to February 3, 2016 the unit was derated to 155 MW due to airflow limitations. This was a continuation of the problems experienced prior to the 2015 annual maintenance outage. During the 2015 annual outage the boiler components were internally inspected in an attempt to diagnose and resolve the airflow limitations. Significant air heater fouling was discovered and corrected during that outage. It was thought that the problem had been resolved, however airflow limitations continued once the unit was put back on line after the annual outage. Boiler tuning would have been the next step in resolving this issue. Tuning requires the unit to be operated through a range of high and low loads while control parameters are manipulated. The reheater tube failures in February 2013 and subsequent unit derating (see below) occurred before the tuning could be completed, removing the opportunity. Tuning is currently planned for November 2016, after the annual maintenance outage is completed and when higher unit loads can be reached without significantly increasing risk to electrical system stability in the event of a unit trip.

On February 3, 2016 the east FD fan variable frequency drive failed and caused the unit to trip. Investigation by Siemens (the manufacturer of the drives) and plant engineering was conducted. Under a Siemens recommendation, a control card on the drive unit was replaced and the unit was returned to service on February 5, 2016. When the unit was returned to service the load was limited to 140 MW to make the unit more reliable in consideration of the boiler reheater tube failures experienced in Unit 2. Hydro engaged Siemens to review the VFD reliability. Siemens completed a review and provided a set of recommendations which have been implemented by Hydro.

On February 8, 2016 the unit experienced a tube failure in the reheater section of the boiler. The unit was operated with a deration to 50 MW until an opportune time to shut it down for repairs on February 16, 2016. Hydro considered the risk of additional tube failures and the favorable weather forecast at the time and proceeded with the replacement of the lowest wall thickness tubes during this outage. Sixteen lower

reheater tubes were replaced at that time. The unit was returned to service on February 26, 2016 with a derating to 120 MW to improve the reliability of the reheater until the remaining lower reheater tubes can be replaced during the upcoming scheduled annual maintenance outage.

On July 15, the unit was removed from service to repair a feedwater isolator gland failure, and to perform a wash of the air heaters and to repair cracks in the FD fan ductwork. The unit was returned to service after approximately 35 hours of outage time.

On August 27, 2016 the unit was taken off line in preparation for the annual maintenance outage. The work scope includes replacement of the lower reheater tubes. The boiler gas path work scope includes internal visual inspection and repairs, replacement of degraded steam coil air heaters, and ash removal from the economizer, air heaters, and stack breaching, as well as verifying proper function of the forced draft fans and their variable frequency drives. The unit is scheduled back in service by November 1, 2016. Boiler tuning is planned for November when electrical system conditions permit.

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

On January 6, 2016 the unit experienced a tube failure in the reheater section of the boiler. Upon discovery of the failure the unit was taken offline in a controlled shutdown and allowed to cool for internal inspection. Four failed tubes in the lower section of the reheater were identified and replaced. The unit was returned to service on January 15, 2016. As is common practice when returning the unit to service, a stepped approach to loading the unit was employed. Between January 15 and January 19, the unit was gradually loaded in steps between 70 MW and 140 MW. On January 19, 2016, when operating at 140 MW, the unit experienced another failure in the lower reheater section of the boiler. Again the unit was taken offline in

a controlled shutdown. Hydro considered the risk of additional tube failures and the favorable weather forecast at the time and proceeded with the replacement of the lowest wall thickness tubes during this outage. Over the period since the unit first went out of service January 6, 2016, 27 lower and three upper reheat tubes were replaced prior to the unit going back in service February 3, 2016. The unit was returned to service with a derating to 120 MW to improve the reliability of the reheater until the remaining lower reheater tubes were replaced during the scheduled annual maintenance outage.

On May 26, 2016 the west FD fan variable frequency drive failed and caused the unit to trip. Siemens (the manufacturer of the drives) was contacted immediately and a technician was dispatched to travel to site. In parallel, the plant Electrical Engineer (in consultation with Siemens), Electricians, and Operations conducted an internal investigation and determined that there were no current faults with the fan and it could be safely started. It was decided to put the unit back on line later in the day on May 26, 2016 while waiting for the Siemens technician. Because the reason for the trip had not been determined, the unit load was restricted to 50 MW (below UFLS).

The Siemens technician performed on-line diagnostics on May 27, 2016 and May 28, 2016. Overnight on May 28, 2016 the unit was taken offline for a full internal inspection of the drive under direction of the Siemens technician. A control card on the drive unit was replaced and the unit was returned to service the next morning on May 29, 2016. Hydro engaged Siemens to review the VFD reliability. Siemens completed a review and provided a set of recommendations which have been implemented by Hydro.

On June 20, 2016 the annual maintenance outage began on this unit. Included in the scheduled work was the replacement of the lower reheater tubes. The unit was returned to service on September 15, 2016. The unit was derated to 130 MW until

September 20 and to 150 MW until September 29 until on-line testing of the safety valves could be completed.

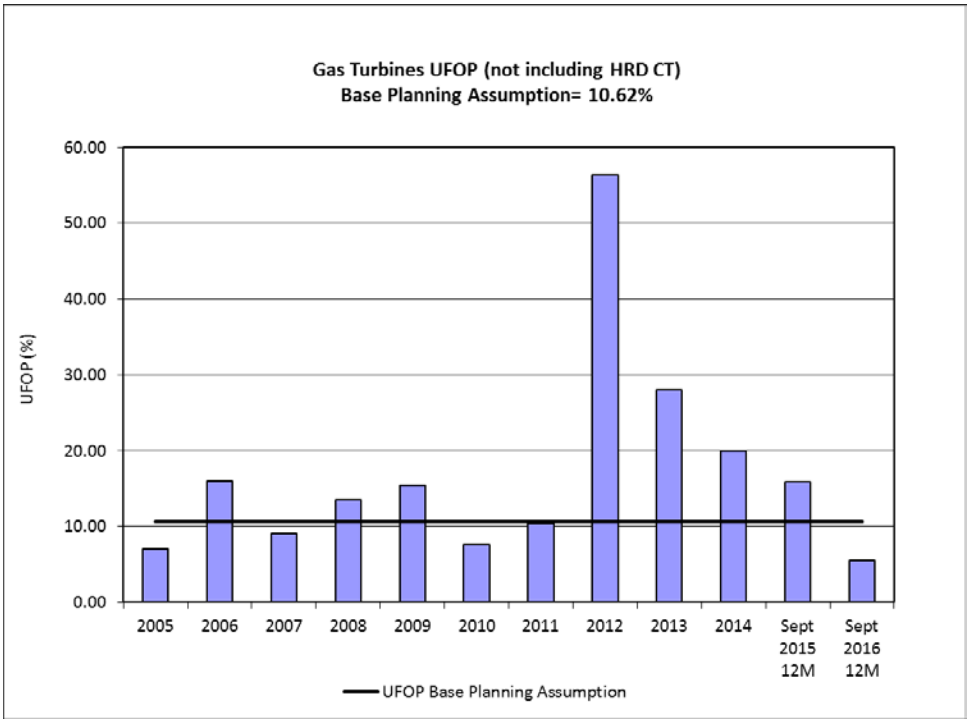
6.0 Gas Turbine UFOP Performance

The combined UFOP for the Hardwoods, Happy Valley and Stephenville gas turbines was 5.54% for the 12-month period ending September 30, 2016. This is better than the base planning assumption of 10.62%. The current period UFOP improved from the previous period UFOP of 15.89%. The Hardwoods UFOP for the current period is 2.16%, which is better than the base planning assumption of 10.62%. The Stephenville unit's current period UFOP is 12.03% compared to that of the previous period of 17.75%. Happy Valley's UFOP is 5.59% for the current period compared to 13.77% in the previous period.

Gas Turbine Units	Maximum Continuous Unit Rating (MW)	12 months ending September 2015 (%)	12 months ending September 2016 (%)	Hydro Generation Base Planning Assumption (%)
Combined Gas Turbines	125	15.89	5.54	10.62
Stephenville	50	17.75	12.03	10.62
Hardwoods	50	16.14	2.16	10.62
Happy Valley	25	13.77	5.59	10.62

The Holyrood (HRD) CT UFOP of 1.33% for the current period is better than the base planning assumption of 5.00%.

Combustion Turbine Units	Maximum Continuous Unit Rating (MW)	12 months ending September 2015 (%)	12 months ending September 2016 (%)	Hydro Generation Base Planning Assumption (%)
Holyrood CT	123.5	5.01	1.33	5.00



The Stephenville unit UFOP was primarily affected by the following events in the reporting period.

The UFOP for the Stephenville gas turbine was impacted by a forced outage from August 2 to August 5, 2016 due to a lube oil leak in the alternator module. The source of the leak was determined and the repair completed. The area was cleaned of oil and the unit returned to service.

There was another forced outage in August, from August 9 to August 19, 2016. This outage was due to the presence of debris on the metallic chip detectors during a routine inspection. A review of unit operation was completed in consultation with the overhaul facility, and the unit was returned to service with continued monitoring. No further issues have been found to date. The debris was analyzed and found to be minor very fine particles and not a cause of concern. The lubricating oil was analyzed and found to be in satisfactory condition for continued operation.