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July 15, 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 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 JUNE 30, 2016

NEWFOUNDLAND AND LABRADOR HYDRO

JULY 15, 2016

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Table of Contents

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 July 1, 2015 to June 30, 2016. The report also provides, for comparison purposes, the individual generating unit data on forced outage rates for the previous period July 1, 2014 to June 30, 2015. Further, total asset class data is presented on an annual basis for the years 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 June 30, 2016 Overview

Class of Units	July 1, 2014 to June 30, 2015 (%)	July 1, 2015 to June 30, 2016 (%)	Base Planning Assumption (%)
Hydraulic (DAFOR)	2.85	2.15	0.90
Thermal (DAFOR)	10.06	19.45	9.64
Gas Turbine (Combined) (UFOP)	21.19	5.54	10.62
Gas Turbine (Holyrood) (UFOP)	1.56[1]	2.53	5.00

The hydraulic DAFOR and the combined[2] gas turbine UFOP performance (in table above) all show improvement for the current period, the 12-month period ending June 2016 compared to the previous period, the 12-month period ending June 2015. There was a decline in Thermal DAFOR performance for 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 vibration problems experienced at Unit 1 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 June 2016 is 19.45% 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

[1] Only includes data from March 1, 2015 to June 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.

2012, the UFOP has been improving each year. For the current 12-month period ending June 30, 2016, performance was mainly affected by the forced outages to the Happy Valley unit. The decline in performance for the Holyrood CT is related to the data collection period. Performance data for the Holyrood CT for the 12-month period ending June 2015 includes four months of data where the 12-month period ending June 2016 includes a full year of data.

Note that the data in the charts for 2004 to 2014 are annual numbers (January 1 to December 31), while the data for June 2015 and June 2016 are 12-month rolling (July 1 to June 30 for each period).

3.0 Generation Planning Assumptions

The DAFOR and UFOP indicators used in Hydro's generation planning model are 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].

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 June 30, 2016, the gas turbine units performed well within this sensitivity range for UFOP. Both the hydraulic and thermal classes performed well 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]

[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.

[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)*

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

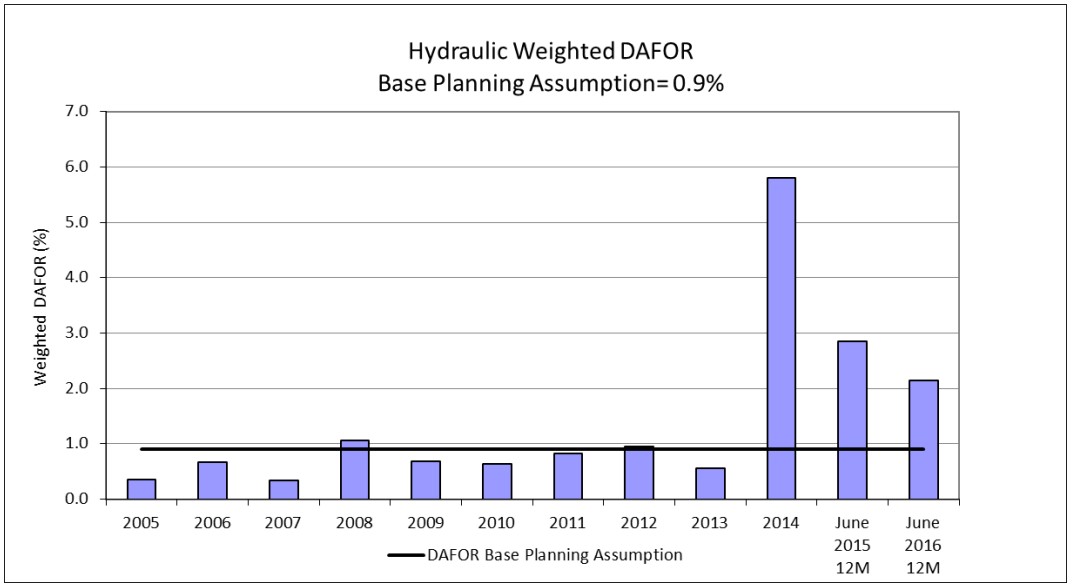
	DAFOR (%)		UFOP (%)	
	Base Planning Assumption	**Sensitivity**	**Base Planning Assumption**	**Sensitivity**
Hydraulic Units	0.90	0.90		
Thermal Units	9.64	11.64		
Gas Turbines - Existing			10.62	20.62
Gas Turbines - New			5.0	10.0[5]

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

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 June 30, 2016 are presented as well as the data for the 12-month period ending June 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 June 2015 (%)	12 months ending June 2016 (%)	Hydro Generation Base Planning Assumption (%)
All Hydraulic Units - weighted	954.4	2.85	2.15	0.90
Hydraulic Units				
Bay D'Espoir 1	76.5	13.75	17.69	0.90
Bay D'Espoir 2	76.5	0.00	7.44	0.90
Bay D'Espoir 3	76.5	0.00	0.00	0.90
Bay D'Espoir 4	76.5	0.23	0.11	0.90
Bay D'Espoir 5	76.5	0.00	3.36	0.90
Bay D'Espoir 6	76.5	15.39	0.00	0.90
Bay D'Espoir 7	154.4	0.84	0.00	0.90
Hinds Lake	75	0.30	0.05	0.90
Upper Salmon	84	1.17	0.00	0.90
Granite Canal	40	0.37	1.83	0.90
Cat Arm 1	67	0.60	0.01	0.90
Cat Arm 2	67	1.91	0.21	0.90
Paradise River	8	0.00	0.31	0.90



Considering the individual units performance, the assumed Hydro generation base planning DAFOR was materially exceeded for Bay d'Espoir Unit 1. Also, there were exceedances compared to base planning assumption for Bay d'Espoir Unit 2, Bay d'Espoir Unit 5, and Granite Canal for the current period.

The Bay d'Espoir Unit 1 DAFOR of 17.69% compared to the base planning assumption of 0.9% was the result of a forced extension of a planned outage. This one forced outage, contributed 52% of the total DAFOR in this asset class. The planned annual maintenance was scheduled from April 26, 2015 to May 15, 2015. The extension is the unanticipated 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. Therefore it was replaced with a new bearing. Vibration issues continued to be experienced at the unit after the bearing was replaced, which extended the planned outage. Two vibration experts, Hydro's Project Execution and Technical Services personnel, as well as the Original Equipment Manufacturer were retained to troubleshoot the issue, with the unit eventually being returned to service at a reduced capacity. The original turbine bearing was reinstalled after being refurbished (with reduced clearances) and, while the vibration issue remained, a further dismantling of the unit revealed other issues including a damaged thrust bearing. Additional repairs were made and a new thrust bearing installed, which resolved the vibration issue, and the unit was returned to service at full capability on September 30, 2015. The Unit 1 DAFOR was also impacted (5.02%) by the Unit being removed from service on May 21, 2016, as a result of a leak in Penstock 1, which provides water to both Units 1 and 2. The following detail relating to the Unit 2 DAFOR applies to Unit 1 as well.

The Bay d'Espoir Unit 2 DAFOR of 7.44% compared to the base planning assumption of 0.9% was the result of a forced outage, caused by a leak in Penstock 1, which supplies both Units 1

and 2. The forced outage started on May 21, 2016 after a leak was reported in the Penstock. A consultant was engaged to conduct an investigation into the issue, and a repair procedure was provided on June 2. The damaged section of penstock was repaired and Unit 1 was returned to service on June 3, 2016 at 1938 hours and Unit 2 was returned to service on June 3, 2016 at 2014 hours.

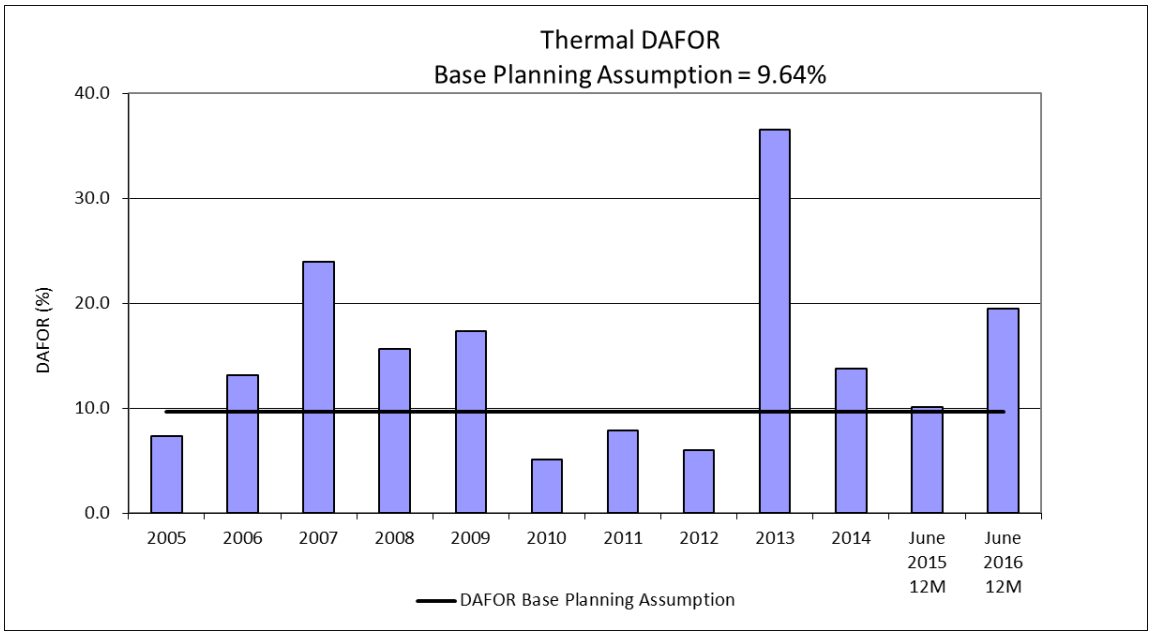
The Bay d'Espoir Unit 5 DAFOR of 3.36% compared to the base planning assumption of 0.9% was the result of a forced outage after the completion of planned annual maintenance. The planned annual maintenance was completed from May 27, 2015 to August 7, 2015. Upon starting the unit, a stator ground fault occurred, which required five days to repair before the unit was placed into service on August 12, 2015.

The Granite Canal unit DAFOR of 1.83% compared to the base planning assumption of 0.9% was the result of a forced outage after a lightning strike to transmission line TL263 which connects the unit to the grid. A bearing issue (low water flow on the shaft seal) was experienced on the restart of the unit. From August 10, 2015 to August 14, 2015, the unit incurred forced unavailability while repairs were completed to resolve this issue. From December 16, 2015 to December 17, 2015, the unit experienced forced unavailability due to debris on the intake trash rack.

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 June 30, 2016 are presented as well as the data for the 12-month period ending June 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 June 2015 (%)	12 months ending June 2016 (%)	Hydro Generation Base Planning Assumption (%)
All Thermal Units - weighted	490	10.06	19.45	9.64
Thermal Units				
Holyrood 1	170	13.20	20.66	9.64
Holyrood 2	170	11.06	26.46	9.64
Holyrood 3	150	5.67	8.91	9.64



For the 12-month period ending June 30, 2016 the weighted DAFOR for all thermal units of 19.45% is above the assumed Hydro generation base planning DAFOR value of 9.64%, and also exceeded the previous 12-month period rate of 10.06%. Unit 1 DAFOR was 20.66% and

Unit 2 DAFOR was 26.46%, and the performance for both units was above the base planning assumption of 9.64%. Unit 3 DAFOR was 8.91%, which is 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 May 14, 2015 to August 1, 2015, a derating to 155 MW occurred due to airflow limitations. During the 2015 planned maintenance outage from August to October, the air heaters were found to be heavily fouled. They were cleaned during the outage. It was expected that the air flow problem that led to the load restriction has been resolved as a result of this clearing. Testing of the air flow controls during the maintenance outage did not reveal any problems.

From November 27, 2015 to February 3, 2016 the unit was derated to 155 MW due to airflow limitations, suspected to be related to the new variable frequency drives on the forced draft (FD) fans. This was a continuation of the problems experienced prior to the annual maintenance outage. The air heater fouling that was discovered and corrected during the outage did not solve the problem with air flow. Boiler tuning may be effective in resolving this issue. This is not possible to complete until after the reheater tubes are replaced (see below).

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. Siemens has

been actioned to complete a holistic investigation of all VFD issues that have occurred at Holyrood. This was completed and presented to Hydro on July 7, 2016.

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 was presented 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.

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 after the repairs 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 can be replaced during the upcoming 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. He did not arrive until late in the day on May 27, 2016. 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 some 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. Siemens has been actioned to complete a holistic investigation of all VFD issues that have occurred at Holyrood since the drives were installed. This was completed and presented to Hydro on July 7, 2016.

On June 20, 2016 the annual maintenance outage began on this unit. Included in the scheduled work is the replacement of the lower reheater tubes.

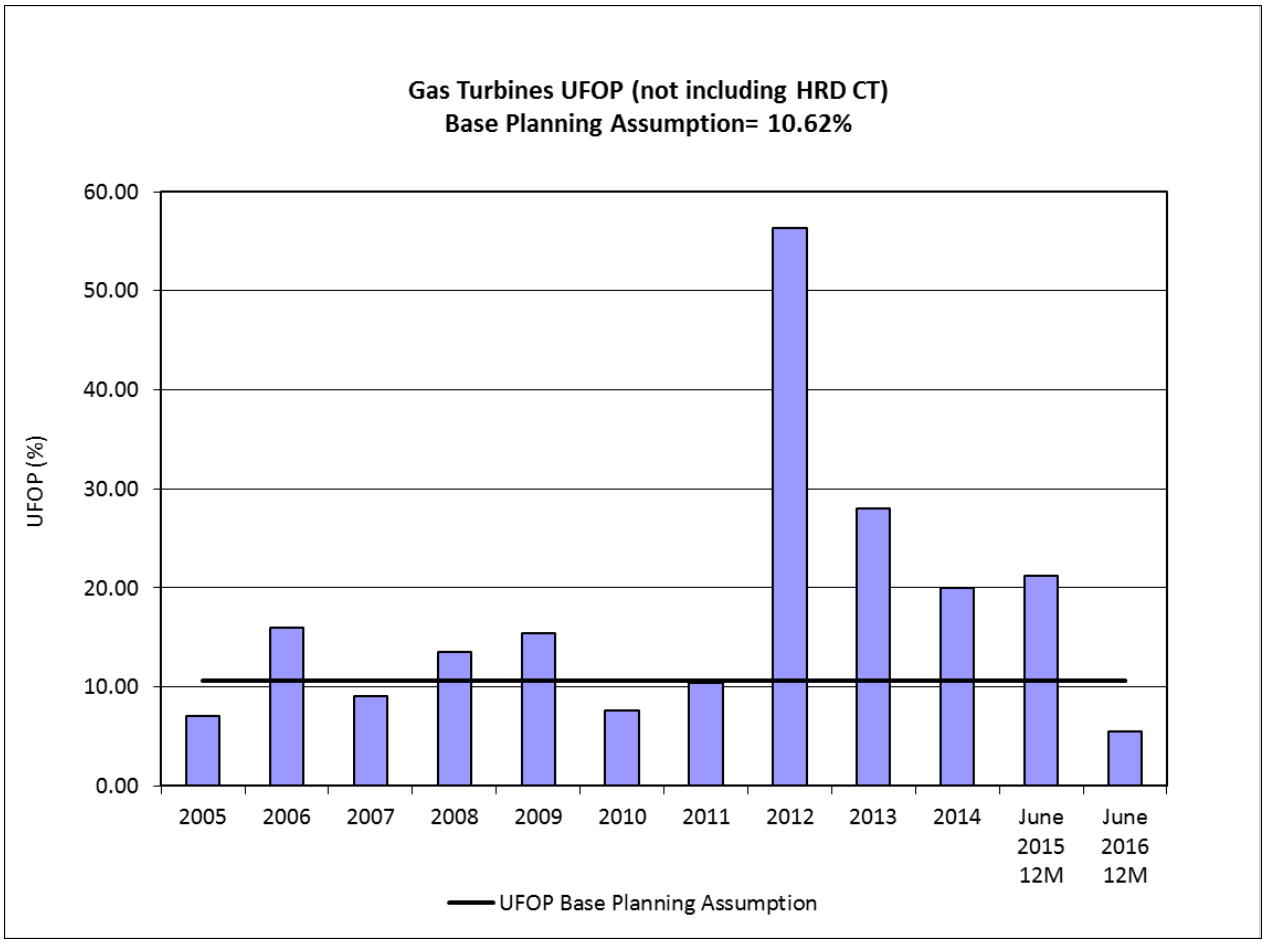
6.0 Gas Turbine UFOP Performance

The combined UFOP for the Hardwoods, Happy Valley and Stephenville gas turbines was 5.54% for the 12-month period ending June 30, 2016. This is better than the base planning assumption of 10.62%. The current period UFOP improved from the previous period UFOP of 21.19%. The Hardwoods UFOP for the current period is 1.84%, which is better than the base planning assumption of 10.62%. The Stephenville unit's current period UFOP is 3.59% compared to that of the previous period of 16.40%. Happy Valley's UFOP is 14.04% for the current period compared to 1.03% in the previous period.

Gas Turbine Units	Maximum Continuous Unit Rating (MW)	12 months ending June 2015 (%)	12 months ending June 2016 (%)	Hydro Generation Base Planning Assumption (%)
Combined Gas Turbines	125	21.19	5.54	10.62
Stephenville	50	16.40	3.59	10.62
Hardwoods	50	32.44	1.84	10.62
Happy Valley	25	1.03	14.04	10.62

The Holyrood (HRD) CT UFOP of 2.53% 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 June 2015 (%)	12 months ending June 2016 (%)	Hydro Generation Base Planning Assumption (%)
Holyrood CT	123.5	1.56	2.53	5.00



The UFOP for the Happy Valley gas turbine was impacted by a forced outage from September 9 to September 21, 2015 due to a vibration issue. The vibration issue was determined to be a result of a broken air pipe which was repaired and the unit was then tested and returned to service.