

1 Q. **Reference: Regulated Activities Evidence**

2 A forecast conversion factor of 612 kWh/bbl is proposed for the 2013 Test Year.
3 This forecast conversion factor results from a ten-year regression analysis of
4 conversion factor versus Holyrood gross monthly average unit loading, with a
5 station service factor of 6.6% applied to the gross energy production. Provide the
6 detailed regression analysis used to derive the 2013 Test Year fuel conversion factor
7 of 612 kWh per barrel. (Regulated Activities Evidence, page 2.46, lines 22 to 24)

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10 A. To derive the 2013 Test Year fuel net conversion factor of 612 kWh/bbl, Hydro used
11 the past ten years of monthly operating data at the Holyrood generating station,
12 i.e.:

- 13 i. Unit average gross loading (kW)
14 ii. Fuel consumption rate (bbls/hour)

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16 The data is attached as Table 1. A linear regression analysis was performed using
17 Microsoft Excel in order to correlate gross average unit loading and fuel
18 consumption rate. The result of the regression analysis and an indication of the
19 correlation are presented in Table 2 and Chart 1, respectively.

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21 In 2013, Hydro is forecasting the average unit loading to be 87.5 MW while the unit
22 is operating (on a net basis). The methodology and formulas that result in a net
23 forecast fuel conversion rate of 612 kWh/bbl are also outlined in Table 2.

Table 1
Holyrood Fuel Conversion Rate
Data Used in the Regression Analysis (Part 1 of 3)

Month	Year	Total Unit Operating Hours	Gross Average Unit Loading (kW)	Gross Consumption Rate (bbl/Hr)
1	2003	2,225	159,039	233.1
2	2003	1,939	152,905	226.9
3	2003	2,108	144,146	212.6
4	2003	1,438	141,391	210.2
5	2003	1,298	88,466	136.8
6	2003	621	72,658	114.9
7	2003	0	0	0.0
8	2003	394	109,402	167.8
9	2003	951	121,437	184.4
10	2003	1,913	122,562	183.5
11	2003	1,390	106,016	156.7
12	2003	2,061	98,331	148.5
1	2004	2,101	106,002	157.9
2	2004	2,076	120,034	181.8
3	2004	1,951	130,734	196.3
4	2004	1,616	131,689	195.0
5	2004	730	112,977	169.7
6	2004	624	69,805	109.5
7	2004	0	0	0.0
8	2004	500	113,318	168.8
9	2004	782	114,773	170.7
10	2004	1,220	84,154	127.4
11	2004	1,515	115,631	169.8
12	2004	1,894	133,981	197.9
1	2005	2,232	114,830	170.0
2	2005	1,869	135,930	199.0
3	2005	2,185	118,112	177.0
4	2005	1,299	84,756	131.6
5	2005	288	69,411	111.7
6	2005	81	99,877	151.3
7	2005	643	115,827	173.0
8	2005	376	99,757	151.7
9	2005	678	92,637	144.4
10	2005	1,165	91,479	139.3
11	2005	1,420	82,662	126.4
12	2005	1,655	65,648	105.5
1	2006	1,573	70,555	110.5
2	2006	1,344	73,482	114.2
3	2006	1,735	72,752	115.3
4	2006	1,389	89,576	136.4
5	2006	813	77,455	120.8
6	2006	108	58,509	94.6
7	2006	0	0	0.0
8	2006	0	0	0.0
9 ⁽¹⁾	2006	11	39,010	169.8
10	2006	883	81,488	124.6
11	2006	1,355	55,340	92.9
12	2006	2,052	59,589	95.1

Table 1
Holyrood Fuel Conversion Rate
Data Used in the Regression Analysis (Part 2 of 3)

Month	Year	Total Unit Operating Hours	Gross Average Unit Loading (kW)	Gross Consumption Rate (bbl/Hr)
1	2007	2232	60,211	94.6
2	2007	1977	77,925	117.3
3	2007	1680	106,138	160.2
4	2007	1478	99,247	150.5
5	2007	1475	94,494	146.0
6	2007	1311	86,219	130.2
7	2007	721	112,542	173.0
8 ⁽¹⁾	2007	105	91,196	169.5
9	2007	0	0	0.0
10	2007	1031	100,023	149.6
11	2007	1430	82,957	126.7
12	2007	1783	90,872	138.0
1	2008	1920	111,252	164.2
2	2008	1386	136,750	200.9
3	2008	1810	83,646	128.0
4	2008	1526	72,108	110.9
5	2008	949	93,441	141.2
6	2008	247	70,173	107.4
7	2008	0	0	0.0
8	2008	0	0	0.0
9	2008	0	0	0.0
10	2008	660	99,852	155.4
11	2008	1314	110,537	163.9
12	2008	1750	97,051	145.8
1	2009	2232	92,576	139.1
2	2009	1952	86,745	131.3
3	2009	2006	77,566	118.8
4	2009	1376	77,201	119.0
5	2009	503	74,694	118.5
6	2009	200	71,091	116.4
7	2009	0	0	0.0
8	2009	0	0	0.0
9	2009	0	0	0.0
10	2009	644	75,298	117.0
11	2009	1440	75,700	115.0
12	2009	2032	78,024	118.6
1	2010	2107	81,906	128.3
2	2010	1549	82,415	127.2
3	2010	1803	75,749	120.0
4	2010	1247	76,985	121.6
5	2010	680	72,920	118.9
6 ⁽¹⁾	2010	96	83,246	142.7
7	2010	0	0	0.0
8	2010	0	0	0.0
9 ⁽¹⁾	2010	5	38,391	264.9
10	2010	666	70,184	113.6
11	2010	1303	73,847	115.4
12	2010	1727	74,294	119.3

Table 1
Holyrood Fuel Conversion Rate
Data Used in the Regression Analysis (Part 3 of 3)

Month	Year	Total Unit Operating Hours	Gross Average Unit Loading (kW)	Gross Consumption Rate (bbl/Hr)
1	2011	2,037	77,676	121.7
2	2011	2,000	85,344	131.9
3	2011	1,799	84,075	129.9
4	2011	1,205	75,640	117.2
5	2011	572	72,994	115.8
6	2011	247	71,342	113.9
7	2011	0	0	0.0
8	2011	0	0	0.0
9	2011	0	0	0.0
10	2011	659	71,770	111.5
11	2011	1,306	81,673	126.1
12	2011	2,040	80,565	122.6
1	2012	2,181	84,168	130.8
2	2012	1,893	85,815	131.6
3	2012	1,718	88,363	136.4
4	2012	848	82,420	129.2
5	2012	529	79,936	128.5
6	2012	275	80,683	128.7
7	2012	0	0	0.0
8	2012	0	0	0.0
9	2012	0	0	0.0
10	2012	423	68,480	111.5
11	2012	992	87,972	135.9
12	2012	1,823	92,417	145.2

Note 1: September 2006, August 2007, June 2010 and September 2010 removed from regression analysis as they were outliers

Table 2 - Regression Analysis

2003-2012 Linear Regression (Gross)

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.997
R Square	0.995
Adjusted R Square	0.995
Standard Error	2.092
Observations	96

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	81230.1	81230.1	18561.7	0.0
Residual	94	411.4	4.4		
Total	95	81641.5			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	14.3372	0.9440	15.1885	0.0000	12.4630	16.2115	12.4630	16.2115
X Variable 1	0.00137	0.0000	136.2412	0.0000	0.0014	0.0014	0.0014	0.0014

Calculation of 2013 Test Year Conversion Rate:

1 Unit net average loading (kW)	87,470	
2 Station Service Factor	6.56%	
3 Unit gross average loading (kW)	93,610	Line 1/(1-Line 2)
4 Regression Slope (m)	0.00137	(from regression equation)
5 Regression Y-Intercept (b)	14.3372	(from regression equation)
6 Fuel consumption rate (bbls/hour)	142.94	Line 5 + Line 4 x Line 3
7 Net fuel conversion factor (kWh/bbl)	612	Line 1/Line 6

Chart 1

Regression Correlation Chart

