

Board Staff Interrogatory #035

Ref: Ex. E1-T1-S1, page 5, lines 30-31

Issue Number: 5.1

Issue: Is the proposed regulated hydroelectric production forecast appropriate?

Interrogatory

Surplus Baseload Generation ("SBG") forecasts are based on Ontario electricity demand and generation supply forecasts:

- a) Are these forecasts prepared by OPG or another agency?
- b) What is the source and reference for these forecasts? Please file any reference documents.
- c) If prepared by another agency, did OPG provide specific inputs to the forecast, or, advise on the inputs?
- d) What economic and supply forecast factors are most important in determining the level of SBG?

Response

- a) OPG prepared the forecasts of Surplus Baseload Generation ("SBG") shown in Ex. E1-T1-S2, Table 1 and described in Ex. E1-T1-S1, section 2.5.
- b) OPG has not prepared any reference documentation as part of production of its SBG forecast.

OPG's proprietary forecasts of supply and demand, including SBG, are prepared using a large number of publicly available sources which contain forecast and/or actual production, price, cost, economic and/or financial information. Some of this information is used as direct inputs into OPG's forecast process, some as indirect inputs and some used to validate OPG's assumptions and results.

OPG derives forecast spill from its regulated hydroelectric assets due to SBG using the following general process:

- OPG's hourly forecast for Ontario's primary demand is subtracted from the hourly forecast for baseload energy production to derive total SBG. Baseload energy supply includes both OPG and non-OPG generating facilities.

- 1 • For hours where baseload energy supply exceeds demand, there is a potential for
2 SBG. Beyond a certain threshold of SBG, OPG assumes that market participants will
3 take actions to manage the potential over-supply situation.
4
- 5 • To derive the SBG that must be managed by the prescribed assets, OPG makes
6 assumptions regarding the energy curtailment available from wind generators, export
7 quantities and Bruce Power facilities.
8
- 9 • OPG generally has assumed for purposes of the test period forecast that
10 hydroelectric spill will occur at Sir Adam Beck Generating Station prior to spilling from
11 non-regulated plants. During actual operations however, market, transmission system
12 and/or hydrological conditions may result in SBG spill occurring at locations other
13 than forecast, as was the case in 2009.
14

15 c) Not applicable (refer to part a).
16

17 d) As noted in part b) above, total SBG is derived as the difference between primary
18 demand and baseload generation.
19

20 The economic factors driving SBG are primarily related to the drivers of the demand
21 forecast. OPG's proprietary demand forecast reflects a consensus economic forecast and
22 is prepared assuming normal weather conditions.
23

24 OPG's proprietary baseload generation forecast is based on publicly available sources as
25 outlined in part b) as well as OPG's own market intelligence. Critical forecast elements
26 include assumptions pertaining to other market participants, such as the re-
27 commissioning schedules for Bruce Power's Unit 1 and Unit 2, the impact of new wind
28 power additions and expected river flows (which impact the forecast output of OPG's
29 hydroelectric fleet).

Board Staff Interrogatory #036

Ref: Ex. E1-T1-S1, page 6, lines 2-4

Issue Number: 5.1

Issue: Is the proposed regulated hydroelectric production forecast appropriate?

Interrogatory

The SBG estimates are 0.2 TWh in 2010, 0.5 TWh in 2011 and 0.8 TWh in 2012.

- a) How many hours of operation of the Niagara Plant Group would these energy levels equate to?
- b) The SBG levels increase year-to-year. What mitigation actions has OPG considered to minimize SBG over the 2011-2012 period?
- c) Is OPG expecting to be compensated by any other agency for its actual (if they occur) SBG levels in the 2010-12 period?
- d) Does OPG plan to seek such compensation?
- e) Does OPG consider SBG to be eligible for CMSC payments?

Response

- a) In 2009, the median hourly output of the Niagara Plant Group (Sir Adam Beck and DeCew Falls Generating Station) was approximately 1,500 MW. The approximate equivalent number of hours of the Niagara Plant Group operation, based on 2009 median hourly output and the Surplus Baseload Generation ("SBG") estimates, are 130 hours in 2010, 330 hours in 2011 and 525 hours in 2012.
- b) Generally, the accountability for mitigating SBG rests with the IESO, rather than with any given market participant. However, market participants can assist through various actions suggested by the IESO.¹ When SBG is anticipated, OPG establishes offer prices for the energy from the prescribed assets such that any reductions in output necessary are enacted based on market economics and taken into consideration constraints arising from:
 - Public and employee safety
 - Asset protection and technical considerations
 - Environmental considerations

¹ IESO Forecast Surplus Baseload Generation Report <http://www.ieso.ca/imoweb/marketdata/sbg.asp>

- 1 • Legal and regulatory requirements
- 2
- 3 c) No.
- 4
- 5 d) No.
- 6
- 7 e) No.

Board Staff Interrogatory #037

Ref: Ex. E1-T1-S2, Table 1

Issue Number: 5.1

Issue: Is the proposed regulated hydroelectric production forecast appropriate?

Interrogatory

Table 1 summarizes the hydroelectric production forecast. Line 17 of Table 1 is the total TWhs from the regulated plants.

Is the line 17 total equal to total energy delivered net of SBG, i.e., potential production is line 17 plus line 21 (SBG)?

Response

Yes, the "Total" production on line 17 of Ex. E1-T1-S2, Table 1 is forecast energy production net of the "Forecast SBG Adjustment" on line 21.

AMPCO Interrogatory #019

Ref: Ex. E1-T1-S1, page 5

Issue Number: 5.1

Issue: Is the proposed regulated hydroelectric production forecast appropriate?

Interrogatory

OPG observes that “[d]uring 2009, SBG [surplus baseload generation] was more prevalent in Ontario than it has been for many years.” Please quantify the SBG impact on OPG for 2008 and 2009, in both energy and financial terms.

Response

Surplus Baseload Generation (“SBG”) was negligible in 2008. OPG estimates that in 2009, for the company as a whole, SBG-related production losses were 0.6 TWh. Of this number, OPG estimates that approximately 0.19 TWh is attributable to the regulated hydroelectric facilities.

OPG has no estimates available of the financial impact of SBG during 2009. Because SBG impacts both the regulated and unregulated facilities, and due to the variability of market prices and the dynamic nature of the electricity markets (i.e., many interdependent variables), such quantification would be difficult to perform.

CCC Interrogatory #022

Ref: Ex. E2-T1-S1, page 6

Issue Number: 5.1

Issue: Is the proposed regulated hydroelectric production forecast appropriate?

Interrogatory

Please provide a detailed description of how OPG prepares its forecast of Surplus Baseload Generation.

Response

See the response to the interrogatory in Ex. L-01-035.

CCC Interrogatory #023

Ref: Ex. E1-T1-S2, pages 2-7

Issue Number: 5.1

Issue: Is the proposed regulated hydroelectric production forecast appropriate?

Interrogatory

In each year since 2007 OPG's hydroelectric production forecast has been understated relative to the actual production. Has OPG considered revising its forecasting methodology in light of this? If not, why not? Why should parties have confidence that the forecast numbers for the test period are appropriate?

Response

As shown in Ex. E1-T1-S2, Table 1, production forecast model results compare very well with actual production results when actual flows were used as model input ("imputed generation"). Therefore, OPG is not considering a major revision to its forecasting methodology, but, as discussed below, it is continuing to investigate refinements to its flow forecasting tools. The model's performance in forecasting production based on actual flows should provide parties with confidence in its accuracy, and the existence of the Hydroelectric Water Conditions Variance account insulates both customers and OPG from any variation between forecast and actual water conditions.

The challenge in improving the production forecast is to accurately forecast the Niagara and St. Lawrence River flows. There is a great deal of uncertainty associated with predicting natural systems, and changes in weather patterns can change flow trends within a relatively short time frame. OPG continues to carry out statistical analysis regarding the accuracy and potential bias of the flow forecasts. This analysis does not suggest that there is any systematic bias in the forecasted water flows.

As described in Section 4.0 of Ex. E1-T1-S2, relatively dry conditions meant that river flows were below normal when the forecast plans were prepared for the years 2007, 2008, and 2009. Based on water conditions in the upper Great Lakes basin and normal precipitation, it was assumed that the trend of below normal flows would continue. However, above normal precipitation in the Lake Erie basin in the fall of 2006 resulted in flows recovering to above normal levels during the first part of 2007, before dropping again to below normal for the remainder of the year. Above normal precipitation occurred again during the winter of 2008 and flows recovered to and remained around normal levels for much of 2008 and 2009.

In contrast to the aforementioned years, the forecast production plan for 2010 is expected to exceed actual production results for 2010. Actual production during the first half of 2010 is 2

1 per cent lower than that forecast. Actual flows during the first half 2010 have been lower than
2 forecast.

3
4 While not a fundamental change to the forecasting methodology, the Niagara Plant Group is
5 currently assessing the performance of the Advanced Hydrologic Prediction System
6 developed by the U.S. National Oceanic and Atmospheric Administration and adapted by the
7 Great Lakes Environmental Research Laboratory specifically for the Niagara River, as an
8 alternative flow forecasting tool to the traditionally used Hydrological Response Model for the
9 Great Lakes. Once sufficient experience is acquired with the new system over a variety of
10 hydrologic conditions to ascertain that similar or improved results are achieved, it is
11 anticipated that this new system will be implemented. In addition, the Niagara Plant Group
12 continues to assess and refine the minor adjustments that are applied to the flow forecast
13 values to reflect seasonal variations and retardation effects.

CME Interrogatory #024

Ref: Ex. E1-T1-S1, and E1-T1-S2

Issue Number: 5.1

Issue: Is the proposed regulated hydroelectric production forecast appropriate?

Interrogatory

At Exhibit E1, Tab 1, Schedule 1, page 5, OPG indicates that Surplus Baseload Generation ("SBG") is a condition that occurs when electricity production from hydroelectric baseload facilities is greater than Ontario demand. The evidence indicates that during 2009 SBG was more prevalent in Ontario than it has been for many years, and that SBG is forecast to continue through the test period. In connection with this evidence, please provide the following additional information:

- (a) Please describe the conditions that have given rise to the much more prevalent SBG problem and, in particular, indicate the extent to which generation from renewable generation sources such as wind and solar and/or natural gas fired generation is a cause of the problem.
- (b) What conditions would need to exist to enable wind and solar and/or natural gas fired generation to be curtailed in order to assure that little or no SBG occurs in any year so that all available hydroelectric generation capacity is used throughout the entire test period?
- (c) How much lower would the test period revenue deficiency be if no SBG were forecast for the test period and all available hydroelectric capacity could be used throughout the entire test period?

Response

- a) SBG occurs when baseload electricity supply exceeds Ontario demand. Generally speaking, SBG exhibits:
 - a seasonal component, occurring most often in the spring and fall when generally moderate temperatures result in low demand and hydroelectric generation is high;
 - a weekly component, occurring most often on weekends and holidays when electricity demand is low; and
 - a daily component, occurring most often during overnight off-peak periods when electricity demand is low.

Witness Panel: Hydroelectric
Deferral and Variance Accounts, Payment Amounts and Regulatory
Treatments

1 Relative to the forecast of supply and demand used in EB-2007-0905, the increased
2 prevalence of SBG in 2009, during the periods above, was primarily due to:

- 3
- 4 • Low demand: During the spring to fall period, Ontario demand during the off-peak
5 periods and exports were below forecast.
 - 6
 - 7 • High hydroelectric generation: High inflows in 2009 resulted in higher than expected
8 hydroelectric supply during off-peak periods.
 - 9
 - 10 • High combined cycle gas turbine generation: Natural gas generation during off-peak
11 periods exceeded forecast levels.
 - 12
 - 13 • High wind generation. At times, wind generation exceeded forecast.
 - 14

15 At various times, combinations of the factors above resulted in baseload supply
16 exceeding market demand during off-peak periods in the spring and fall of 2009.

17

18 b) As indicated in the response to the interrogatory in Ex. L-01-036 part b), the management
19 of SBG, including potential curtailments in generation, is the accountability of the IESO.
20 OPG is unaware of the specific commercial or operational conditions that would lead the
21 IESO to curtail wind, solar and/or natural gas generators.

22

23 c) Under the scenario where there is no SBG during the test period, the hydroelectric
24 revenue deficiency would decline by \$32.5M, moving from a deficiency of \$27.7M to a
25 sufficiency of \$4.8M. As stated in Ex. E1-T1-S1, section 2.5, significant SBG is forecast
26 to continue through the test period and will impact production at the regulated
27 hydroelectric facilities.

28

29 The derivation of this impact is shown in the attached version of Ex. I1-T1-S1, Table 4,
30 which calculates the deficiency/sufficiency for this scenario.

1

Table 4
Summary of Revenue Deficiency - No SBG
Test Period January 1, 2011 to December 31, 2012

Line No.	Description	Regulated Hydroelectric		
		2011	2012	Total
		(a)	(b)	(c)
1	Forecast Production (TWh) ¹	19.8	19.8	39.7
2	Prescribed Payment Amount (\$/MWh) ²	36.66	36.66	N/A
3	Indicated Production Revenue (\$M) (line 1 x line 2)	727.0	727.0	1,454.1
4	Revenue Requirement (\$M) ³	727.7	721.6	1,449.3
5	Revenue Requirement Deficiency (\$M) (line 4 - line 3)	0.6	(5.5)	(4.8)
6	Revenue Requirement Deficiency - OPG Proposal	13.9	13.8	27.7
	CHANGE IN DEFICIENCY	(13.2)	(19.2)	(32.5)

Notes:

- 1 Reg. Hydro production from Ex. E1-T1-S1 Table 1, adjusted for SBG of 0.5TWh in 2011 and 0.8 TWh in 2012.
- 2 From EB-2007-0905 Payment Amounts Order.
- 3 Ex. 11-T1-S1 Table 1 (line 24) adjusted for increase in GRC of \$6.6M in 2011 and \$11.5M in 2012.

2

Witness Panel: Hydroelectric
Deferral and Variance Accounts, Payment Amounts and Regulatory
Treatments

PWU Interrogatory #008

Ref: (a) Ex. E1-T1-S1, page 5, line 30 to page 6, line 4. With regard to Surplus Baseload Generation ("SBG") factored into OPG's hydroelectric forecast production, OPG states:

Significant SBG is forecast to continue through the test period based on Ontario electricity demand and generation supply forecasts. Consequently, an additional forecast SBG adjustment has been integrated into the regulated hydroelectric production forecast totals for 2010, 2011, and 2012, and itemized separately in line 21 of Ex. E1-T1-S2 Table 1. The specific SBG adjustments included in the forecast are: 0.2 TWh in 2010, 0.5 TWh in 2011, and 0.8 TWh in 2012.

(b) IESO's May 2010 18-Month Outlook, page iii:

http://www.theimo.com/imoweb/pubs/marketReports/18MonthOutlook_2010may.pdf

From June 2010 to November 2011, approximately 2,900 megawatts ("MW") of new and refurbished supply are scheduled to enter commercial operation. Of that, approximately 470 MW of new generation has been announced under the Feed-in Tariff ("FIT") program and 180 MW contracted under the Renewable Energy Supply III ("RES III") program.

(c) IESO, FiT Dispatch and Operability, Gordon Drake, March 10, 2010. Slide 2:

<http://www.theimo.com/imoweb/pubs/consult/se57/se57-20100310-FiT-Dispatch-Operability.pdf>

- Initial applications for FiT program totaled more than 9,000 MW
 - o Wind: 79%
 - o Solar: 16%
 - o Other: 5%
- Significant volumes of FiT projects are expected to connect to the distribution system
- Agreement with Samsung introduces another 2,500 MW of generation
 - o Wind: 80%
 - o Solar: 20%

(d) Ontario Government Newsroom. Ontario's Coal Phase Out Plan. September 3, 2009:

<http://news.ontario.ca/mei/en/2009/09/ontarios-coal-phase-out-plan.html>

1 Since 2003 coal-fired generation in Ontario has been decreasing. The
2 closure of the coal-fired Lakeview Generating Station in 2005 eliminated
3 carbon dioxide emissions equivalent to taking approximately 500,000
4 cars off Ontario roads.

5
6 Ontario Power Generation ("OPG") will continue to reduce carbon
7 dioxide emissions through an ongoing coal phase out plan which targets
8 emissions from coal at 19.6 million tonnes in 2009 and 15.6 million
9 tonnes in 2010. By 2011, coal electricity generation will be cut by two-
10 thirds.

11
12 **Issue Number: 5.1**

13 **Issue:** Is the proposed regulated hydroelectric production forecast appropriate?

14
15 **Interrogatory**

- 16
17 a) In setting out provisions in relation to SBG's associated with the hydroelectric production
18 forecast, Ref (a), has OPG taken into account:
19
20 i) Increasing penetration of renewable generation as set out in Ref (b) and Ref (c)? If
21 so, please describe how this has been factored in.
22
23 ii) The reduction of coal generation over 2010 and 2011 that would result from Ontario's
24 Coal Phase Out Plan set out in Ref (d)? If so, please describe how this has been
25 factored in.
26
27 b) Please confirm that spilling of water at OPG's regulated facilities is a likely outcome of
28 SBG.
29
30 c) What is the financial impact of spilling of water at the regulated hydroelectric facilities on
31 OPG?
32
33 d) What is the economic impact of spilling water at the regulated hydroelectric facilities on
34 Ontario's power system (e.g., HOEP)?
35
36 e) Please describe any changes that OPG can make in its operation of its regulated
37 hydroelectric facilities to avoid spilling water in accommodating SBG.
38
39 f) Does OPG modify the operation at regulated hydroelectric facilities when the operation of
40 other hydroelectric facilities is capable of storing a portion of the surplus water as a result
41 of SBG? If so, does this result in incremental costs related to generation loss?
42
43 g) If the response to f) is yes, has OPG estimated its possible capacity and energy losses
44 incurred by compensating for SBG at its hydroelectric facilities?
45

- 1 h) If the response to g) is yes, what are the estimated losses incurred at the regulated
2 facilities for 2010, 2011 and 2012? What are the losses in terms of SBG volume reported
3 in Exhibit 1, Tab 1, Schedule 1?
4
- 5 i) In anticipating periods of SBG, will OPG be able to operate some of its hydroelectric
6 facilities at a suboptimal operating point (e.g., is OPG considering keeping its forebays at
7 levels that would reduce its capability to meet peak load that could have a negative
8 impact on OPG's revenue)?
9
- 10 j) If OPG can operate some of its hydroelectric facilities at a suboptimal operating point at
11 times of SBG, under what conditions will OPG be able to do so?
12
- 13 k) Is the use of the Sir Adam Beck Pump Generating Station an alternative to spilling water
14 to meet SBG?
15
- 16 l) If the response to k) is yes, how will this alternative be impacted by the Niagara Tunnel
17 project?
18
- 19 m) Please identify any direct and/or indirect impacts on safety, reliability and the asset life of
20 OPG's prescribed hydroelectric facilities (e.g. control mechanisms) resulting from the
21 changes in the operation of the regulated hydroelectric facilities related to SBG.
22
- 23 n) With regard to any impacts described in response to m), what would be the anticipated
24 costs, if any, related to these impacts?
25
- 26 o) If costs are identified in response to n), would any of such costs apply to the test years?
27
28

29 **Response**
30

- 31 a) i)
32 Yes, increasing penetration of renewable generation has been considered. Please see
33 Interrogatory response L-1-035 for additional details.
34
- 35 a) ii)
36 As the regulated hydroelectric generation is a baseload supply, their forecast output is
37 not affected by assumptions regarding the availability of OPG's coal generation.
38
- 39 b) The energy quantities listed in line 21 of Ex. E1-T1-S2, Table 1, represents OPG's
40 expectation of spill at regulated hydroelectric stations.
41
- 42 c) Spill at regulated hydroelectric facilities results in lost revenues less any avoided
43 production costs.
44

- 1 d) Operation of the Ontario power system is the accountability of the IESO. OPG cannot
2 assess the impact of spill on the Ontario power system.
3
- 4 e) OPG's operations of the regulated hydroelectric stations in situations of anticipated
5 surplus baseload generation ("SBG") is described in OPG's response to the interrogatory
6 in Ex. L-1-036 part b).
7
- 8 f) Historically, OPG has utilized all available hydroelectric storage prior to spilling water.
9 OPG's operation at the regulated facilities in situations of anticipated SBG is addressed
10 in part e) above.
11
- 12 g) No.
13
- 14 h) Not applicable.
15
- 16 i) See part e) above. When hydroelectric storage capability exists, the stored water is
17 available for use at a later period. Utilizing hydroelectric storage capability is not
18 considered suboptimal as the stored water remains available for use at a later period.
19
- 20 j) See part i) above.
21
- 22 k) The storage capability of the Sir Adam Beck Pump Generating Station ("PGS") is used
23 based on the comparative economics of the pump/generate cycle (see Ex. E1-T2-S1,
24 page 2, lines 6-15) regardless of whether SBG is anticipated or not.
25
- 26 l) The PGS will continue to be used based on the comparative economics of the
27 pump/generate cycle.
28
- 29 m) When market economics dictate a reduction in Sir Adam Beck generation because of
30 SBG (refer to Ex. L-1-036, part b)), the operators reduce water flow through the Sir Adam
31 Beck generating units. This is done in a way to minimize the wear and tear on the units.
32 SBG levels over the test period are anticipated to have immaterial impacts on reliability
33 and asset life, and no impacts on public or employee safety. If no other options for use of
34 this water (e.g., economic pump into the PGS reservoir, store in Grass Island Pool, or
35 transaction with New York Power Authority) are available, it will become part of the spill
36 over Niagara Falls. Other than utilizing the limited storage in the headponds, the DeCew
37 Falls and R.H. Saunders Generating Stations are not used to manage SBG.
38
- 39 n) Not applicable, See response to part m).
40
- 41 o) Not applicable, See response to part m).

VECC Interrogatory #007

Ref: Ex. E1-T1-S2
Ex. E1-T1-S2, Table 1

Issue Number: 5.1

Issue: Is the proposed regulated hydroelectric production forecast appropriate?

Interrogatory

For 2007-2009 inclusive, although budgeted production was significantly less than actual production, the imputed production (using ex post actual water flows in the forecast model) was very close to actual for these years.

- a) Has OPG investigated whether there is some systematic bias in its forecasted water flows?
- b) To what extent has/can OPG improve its water flow assumptions used in its forecasting model?
- c) Do OPG's actions in operating its hydroelectric facilities materially affect the water flows used ex post for the imputed production levels?

Response

- a) See the response to Interrogatory L-04-023.
- b) See the response to Interrogatory L-04-023.
- c) No, the water flows used for the imputed production values are a result of natural hydrology.