

QUÉBEC CONTROL AREA
2006 INTERIM REVIEW
OF
RESOURCE ADEQUACY

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1. Executive Summary

This Québec Control Area 2006 Interim Assessment ("2006 Interim Review") of its 2005 Triennial Review of Resource Adequacy covers the period between November 2006 and October 2010. The planning year corresponds to a hydraulic cycle beginning in November and ending in October of the following year. It is conducted to comply with the Reliability Assessment Program established by the Northeast Power Coordinating Council (NPCC) and the resource adequacy review guidelines as outlined in the NPCC B-8 Document "Guidelines for Area Review of Resource Adequacy".

The 2006 Interim Review underlines the changes in assumptions that have been made since the 2005 Triennial Review and assesses the impact of these changes on the reliability of the Québec Control Area.

The results of this 2006 Interim Review show that the Québec Control Area complies with the NPCC resource adequacy reliability criterion under both the base case and the high case scenarios of demand.

2. Introduction

This 2006 Interim Review is the first update of the 2005 Triennial Review of Resource Adequacy approved in March 2006. The major assumptions of this 2006 Interim Review are consistent with the second follow up of the Procurement Plan 2005-2014 of Hydro-Québec Distribution (HQD) filed with the Québec Energy Board in October 2006.¹

3. Assumption Changes

3.1 Demand forecast

Base case scenario of demand

Last winter period, the observed internal peak load was 33 224 MW as compared to 36 272 MW forecasted in the 2005 Triennial Review. This important variation, around 3 000 MW, is mainly due to the climatic conditions (warm weather) during the winter 2005/2006. Moreover, the peak load occurred in February 2006 instead of occurring as usual in January. In Québec, the annual electricity peak load occurs in winter since more than 70 % of households use electricity for space heating.

For the second follow up of the Procurement Plan of HQD see: http://www.regie-energie.qc.ca/audiences/EtatApproHQD/Etat-avancement2006_PlanApprov_18oct06.pdf

The peak load forecast for the Québec Control Area for 2006 through 2010 has slightly decreased as compared to the forecast used in the 2005 Triennial Review. The annual growth rate for the base case scenario of demand for the period 2006/2007 to 2009/2010 is now 0,5% compared to 0,8% for the same period in the 2005 Triennial Review. The main explanations that have a negative impact on demand are the shutting down of certain industrial loads such as sawmills and paper mills, and higher load conservation measures implemented by Hydro-Québec Distribution.

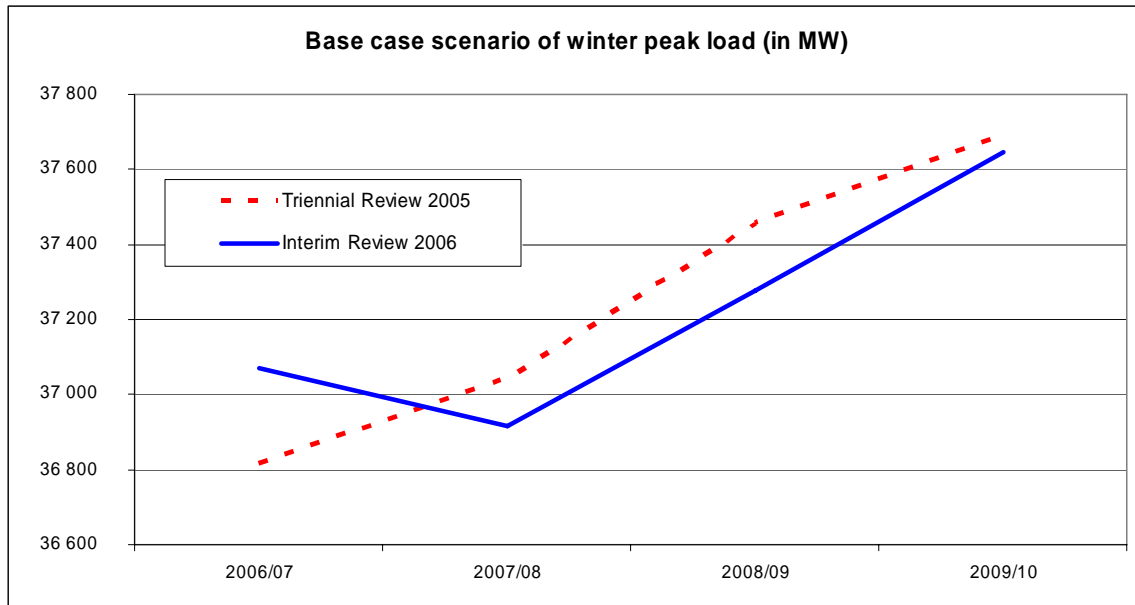
For the 2006/2007 winter, peak load is expected to reach 37 068 MW, an increase of 253 MW in comparison with the forecast of the 2005 Triennial Review. This increase is mainly due to firm sales outside Québec since the internal peak load forecast is slightly lower by around 50 MW. The increase in firm sales outside the Québec Control Area comes from a sale of about 300 MW of UCAP to New York and Nepoch for the month of January 2007.

For the following years of the assessment period, the three winter peak load forecasts are revised downward between 45 and 180 MW and are essentially due to the internal peak load forecast revision. The comparison of the 2005 and the updated Load Forecast is shown in Table 1.

Table 1 – Base Case Scenario of Peak Load Forecast (MW)

Winter peak	Triennial Review 2005	Interim Review 2006	Difference
2006/07	36 816	37 068	253
2007/08	37 041	36 917	-123
2008/09	37 456	37 275	-180
2009/10	37 692	37 647	-44
Average growth rate	0,8%	0,5%	

Figure 1



Load Forecast Uncertainty (LFU) is a measure of the possible outcome of the load given that the variables that impact the load are uncertain. It is due to load sensitivity to weather conditions and to uncertainty caused mainly by the evolution of economic and demographic parameters affecting load demand in the study period. In this Interim Review, load forecast uncertainty was revised slightly downward. Table 2 presents a comparison of load forecast uncertainty.

Table 2 – Comparison of Load Forecast Uncertainty (%)

Reviews of Resource Adequacy	Current year	+ 1 year	+ 2 years	+ 3 years
Triennial Review 2005	4,5%	4,6%	5,0%	5,4%
Interim Review 2006	4,0%	4,3%	4,6%	4,9%

In GE Mars model, the load forecast uncertainty is taken into account through load multipliers. In this review, the load multipliers go from one standard deviation to two standard deviations. In the 2005 Triennial Review, the load multipliers were limited to about 1,75 standard deviation.

High case scenario of demand

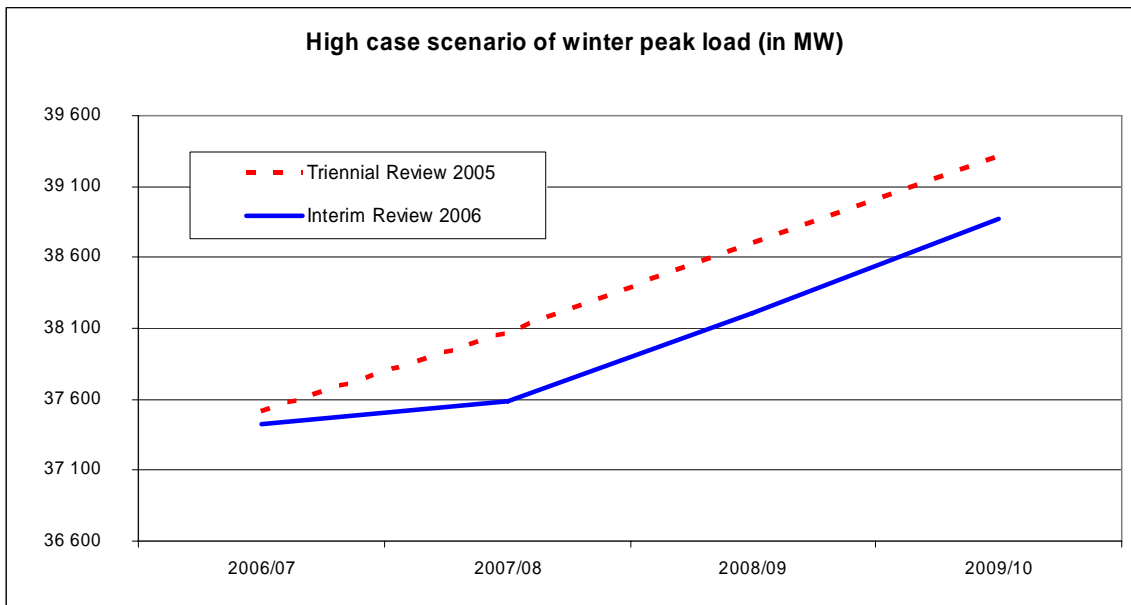
In comparison to the 2005 Triennial Review, the high case scenario of peak load has been revised downward by about 100 to 500 MW. This change is basically explained by the reduction of the forecast horizon and by the downward revision of the base case scenario of demand.

The Load Forecast Uncertainty for the High Load Forecast Scenario is only affected by weather conditions. The load sensitivity to weather conditions has been revised slightly (from 3,55 % to 3,5 %) in this Review.

Table 3 – Comparison of High Load Forecast Annual Peak Load (in MW)

Winter peak	Triennial Review 2005	Interim Review 2006	Difference
2006/07	37 509	37 427	-82
2007/08	38 069	37 581	-488
2008/09	38 699	38 211	-488
2009/10	39 313	38 870	-443
Average growth rate	1,6%	1,3%	

Figure 2



3.2 Resources

The total net planned resources present in this Interim Review are slightly lower than those forecasted in the 2005 Triennial Review.

For the 2006/2007 period, the reduction is more important and can be explained by two factors that are specific to this winter. First, a firm purchase of 200 MW of UCAP instead of a provision of 500 MW of reserve sharing reduced consequently the resources by 300 MW. Even if this amount (300 MW) is not included in this Review, it's still available in terms of reliability. Second, new restrictions at the Churchill Falls hydro unit reduced the deliveries by 135 MW. Table 4 below presents the total resources for all periods covered by this Interim Review.

Table 4 – Total Net Planned Resources (in MW)

Winter peak	Triennial Review 2005	Interim Review 2006	Total
2006/07	41 987	41 502	-485
2007/08	42 334	42 258	-76
2008/09	42 825	42 753	-72
2009/10	42 981	42 791	-190

For the complete period, the following changes to available resources were made since the publication of the 2005 Triennial Review :

- Investment in some distribution substations increased the potential of voltage reduction by 50 MW, for a total of 250 MW ;
- Increase of 30 MW of interruptible load from large industrial customers ;
- Reduction of new power purchases from Québec's Independent Power Producers (20 MW in 2006-2007, 53 MW in 2009-2010);
- Reduction of available and committed resources of Hydro-Québec Production by about 100 MW for 2006-2007 winter peaks to 2008-2009. For 2009-2010, the reduction reaches 215 MW :
 - o Additional restriction at Beauharnois «run-of-river» hydro unit due to ice cover formation (50 MW).
 - o Increased restrictions at Robert-Bourassa hydro unit (58 MW).
 - o Modification to the refurbishment program.

In this Review, the interruptible loads in Québec account for 1 265 MW, which are derated to 885 MW to account for operational constraints. These values are comparable to those retained in the 2005 Triennial Review. The change comes

from the location of some interruptible load. For example, the interruptible loads located in Québec’s Centre region are lower by 44 MW.

Wind power is completely derated in this Review. Hydro-Québec is in the process of evaluating the effective capacity value of wind power generation under winter peak conditions. The wind turbines to be installed in Québec will have cold weather adaptations able them to operate in cold environments up to -30°C. Nevertheless, because the peak loads occur in Québec when the weather is very cold, some site specific analyses should be done using constructed historical data. Based on these analyses, if some effective capacities values are determined, they will be applied in the future. For information, Table 6 presents the total wind capacity up to 2009-2010 winter peak period.

Table 6 – Total Wind Power Capacity (in MW)

Wind power capacity	2006/07	2007/08	2008/09	2009/10
Installed capacity	322	322	322	322
In construction and planned	-	452	615	1 065
Total	322	774	937	1 387

3.3 Transfer Limits

The transfer capabilities of Quebec’s transmission system are the same as those presented in the 2005 Triennial Review. The new interconnection of 1 250 MW with Ontario, announced on November 14th 2006, is not included in this Interim Review. The first phase of this interconnection will be implemented in May 2009 with a capacity of 900 MW. The second phase of implementation is expected in the spring of 2010. Nevertheless, the Ontario Area is not considered in the provision of 500 MW of reserve sharing in this study.

4. Results

Québec Control Area uses the Loss of Load Expectation (LOLE) approach in determining generation requirements with a criterion of 0.1 day per year. This criterion meets the NPCC resource adequacy criterion as showed in the Québec 2005 Triennial Review.

4.1 Base case scenario of demand

Tables 7 and 8 present the results of the Québec Control Area adequacy resources under the Loss of Load Expectation (LOLE) approach. The results of Table 7 indicate that the Québec Area is in compliance with the NPCC criterion under the Base Load Forecast Scenario for the entire period covered by this Review. For each year, the LOLE is under 0.1 day per year. In Table 8, the planned and required reserves are presented in relation to annual peak load and expressed in %.

Table 7 – Comparison of Planned and Required Reserves, and LOLE (Base Case)

Winter peak	Planned reserve (MW) ¹		Required reserve (MW)		LOLE (Day/year)	
	Triennial Review 2005	Interim Review 2006	Triennial Review 2005	Interim Review 2006	Triennial Review 2005	Interim Review 2006
2006/07	5 171	4 434	3 431	3 443	0,030	0,020
2007/08	5 293	5 341	3 642	3 711	0,035	0,025
2008/09	5 369	5 478	3 837	3 787	0,029	0,019
2009/10	5 289	5 144	3 781	3 940	0,024	0,020

(1) Difference between planned capacity resources and peak demand.

Table 8 – Planned and Required Reserves (in %) (Base Case)

Winter peak	Planned reserve (%) ²		Required reserve (%)	
	Triennial Review 2005	Interim Review 2006	Triennial Review 2005	Interim Review 2006
2006/07	14,0%	12,0%	9,3%	9,3%
2007/08	14,3%	14,5%	9,8%	10,1%
2008/09	14,3%	14,7%	10,2%	10,2%
2009/10	14,0%	13,7%	10,0%	10,5%

(2) Difference between planned capacity resources and peak demand expressed as a percentage of peak demand.

4.2 High case scenario of demand

Results of Table 9 indicate that the Québec Control Area is in compliance throughout the period covered by this Interim Review with the NPCC criterion under the High Load Forecast. For the entire period, the LOLE for the high case scenario of demand is under 0,1 day per year. In comparison to the results of the 2005 Triennial Review, the reliability of the Québec Control Area has improved in the high case scenario, except in 2009-2010. These results are mainly due to the downward revision of the high case scenario of demand (about 500 MW).

In 2009-2010, the combination of resources reduction (about 200 MW) and the treatment of uncertainty (weather conditions) offset the downward revision of demand (443 MW). As a result, the LOLE for this period is superior to the LOLE of the 2005 Triennial Review.

Table 9 – Planned Resources, Annual Peak Loads, Planned Reserves and LOLE (High Case)

Winter peak	Planned resources (MW)	Annual peak load (MW)	Planned reserve		LOLE (Day/year)	
			(MW)	(%)	Triennial Review 2005	Interim Review 2006
2006/07	41 502	37 427	4 075	10,9%	0,036	0,026
2007/08	42 258	37 581	4 677	12,4%	0,052	0,038
2008/09	42 753	38 211	4 542	11,9%	0,059	0,034
2009/10	42 791	38 870	3 921	10,1%	0,072	0,078

5. Conclusion

The Québec Control Area meets the NPCC Resource Adequacy Criterion under the base and high case scenarios of peak load forecast for the entire period covered by this Interim Review.