Higher Profits and Lower Bills:

équiterre

Ontario Clean
Air Alliance
Research Inc.

JULY 14, 2010

Acknowledgements

We are deeply indebted to Hydro Québec for responding to our numerous information requests and for critically reviewing drafts of this report. We would also like to thank Angela Bischoff, Don Dewees and Pierre-Olivier Pineau for providing us with very insightful and helpful comments. However, they bear no responsibility for any remaining errors or the report's recommendations and conclusions. Editing and layout by Green Living Communications.

Thanks to the Taylor Irwin Family Fund at the Toronto Community Foundation for its generous financial support which made this project possible.

Équiterre
2177, rue Masson, bureau 206
Montréal (Québec) H2H 1B1
Tel: 514 522-2000
E-mail: info@equiterre.org
Website: www.equiterre.org

Ontario Clean Air Alliance Research Inc.
625 Church Street, Suite 402
Toronto M4Y 2G1
Tel: 416-926-1907 ext. 246
E-mail: contact@cleanairalliance.org
Website: www.cleanairalliance.org

Hydro Québec in 2008

Quebec is the fourth largest producer of hydro-electricity in the world behind China, Brazil and the United States.[1]

As a result of its low-cost heritage hydro-electric resources, Hydro Québec's electricity rates are amongst the lowest in North America. For example, residential electricity rates in Montreal are 39% lower than Toronto's and 68% lower than New York City's.[2]

In 2008, 89% of Hydro Québec's electricity was sold in Quebec and 11% was exported.[3]

In 2008, Hydro Québec's royalty, dividend and tax payments to the Province of Quebec equaled $3.345 billion.[4]

Strategic Plan 2009-2013

In 2009, Hydro Québec released its strategic plan for 2009 to 2013. According to Hydro Québec, by 2013 its net income (profits) is forecast to decline by 24%; the combined return of its royalty, dividend and tax payments to the Province of Quebec is forecast to decline by 21%; and its electricity rates are forecast to rise by 8%.[5]

Table 1 below compares key Hydro Québec financial indicators for 2008 and 2013.

Table 1: Hydro Québec Financial Statistics[6]

	2008 Actual	2013 Forecast	Percent Change
Net Income	$3.141 billion	$2.4 billion	-24%
Royalties	$552 million	$642 million	+16%
Dividends	$2.252 billion	$1.677 billion	-26%
Tax Payments	$541 million	$328 million	-39%
Return on Equity	15.4%	13.1%	-15%
Shareholders Equity	$22.062 billion	$19.215 billion	-13%

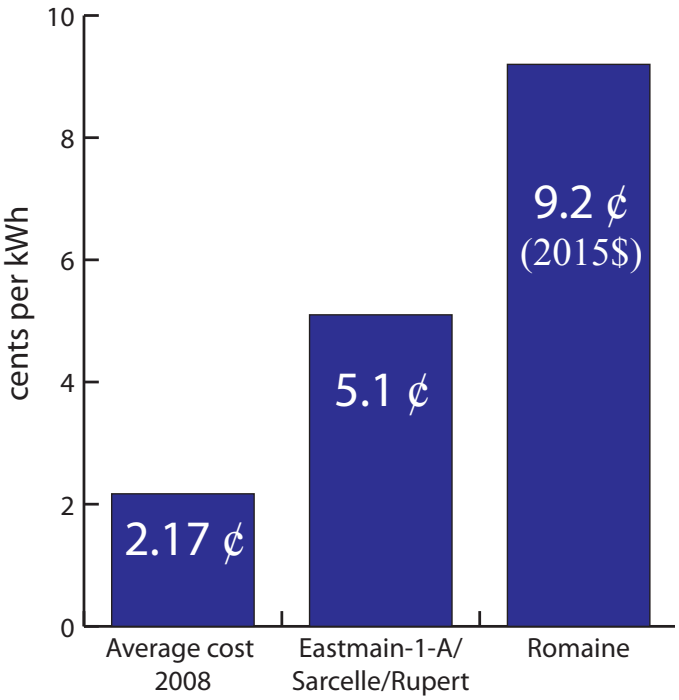
Hydro Québec's forecast of falling profits and rising prices is due to at least three important factors. First, the cost of electricity from new supply projects will be much higher than the cost from its existing heritage hydro-electric resources. In essence, Hydro Québec has already developed all of the province's low-cost hydro-electricity resources. Second, the electricity demands of its domestic customers are forecast to continue to rise and Hydro Québec is planning to meet this rising demand by building new, high-cost generating stations. Third, Hydro Québec's profits from its net electricity exports are forecast to fall by 43% per kWh between 2008 and 2013. [7a]

Figure 1 compares Hydro Québec's average cost of producing electricity in 2008 with the projected cost of: a) the Eastmain-1—A/Sarcelle/Rupert hydro-electric project which will come into service between 2009-2012; and b) the Romaine hydro-electric project which will be completed in 2020.[7b]

The cost of Eastmain-1-A/Sarcelle/Rupert is more than double that of Hydro Québec's heritage water power facilities.

The cost of Romaine is four times greater than Hydro Québec's heritage water power facilities.

Figure 1: Hydro Québec's Electricity Generation Costs[8]

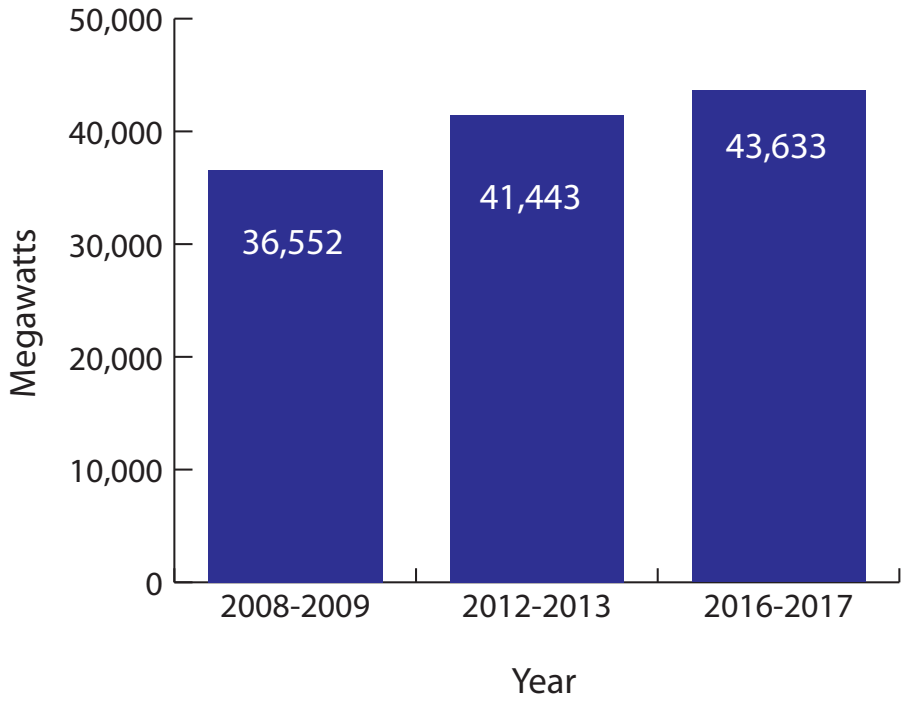


The costs for the Eastmain and Romaine projects do not include the cost of local community benefit agreements Hydro Quebec has signed.

Furthermore, according to Hydro Québec its total cost of **new** supply (generation and transmission) is forecast to increase from 5.85 cents per kWh in 2010 to 14.37 cents per kWh (2010 $) in 2016.[9] As a result, within the period of the next six years, Hydro Québec's cost of new supply will exceed the average price of its electricity exports, namely, 9 cents per kWh in 2008.[10]

As a result of forecast rising domestic demand, Hydro Québec's peak capacity requirements will rise by 13% by 2013 and by a total of 19% by 2017. See Figure 2 below.

Figure 2: Quebec's Peak Capacity Requirements[11]



A combination of rising costs and rising demand must inevitably lead to higher electricity prices for consumers or lower profits for Hydro Québec or both.

Hydro Québec is at a turning point. Having developed all of the province's low-cost hydro electric resources, it can no longer increase its profits and lower domestic rates by building low-cost hydro facilities. Now, new projects will mean higher rates and/or lower profits.

Fortunately, Hydro Québec has two viable options to meet its customers' electricity needs without building new, high-cost hydro-electric generating stations, namely, energy efficiency and greater coordination of its power system with Ontario's.

Energy Efficiency: Quebec's New Pot of Gold

By investing in energy efficiency, Hydro Québec can deliver multiple benefits to its customers and the Province of Quebec.

First, by increasing its customers' energy efficiency, it can lower its customers' electricity consumption and hence their electricity bills.

Second, electricity efficiency investments, by reducing electricity demand growth, will reduce the upward pressure on its electricity rates.

Third, electricity efficiency investments, by reducing domestic demand, can free up some of Hydro Québec's existing electricity supplies for highly profitable electricity sales to the U.S. or Ontario. Specifically, all energy efficiency investments that can save a kWh for less than the price of electricity exports will increase Hydro Québec's profits.

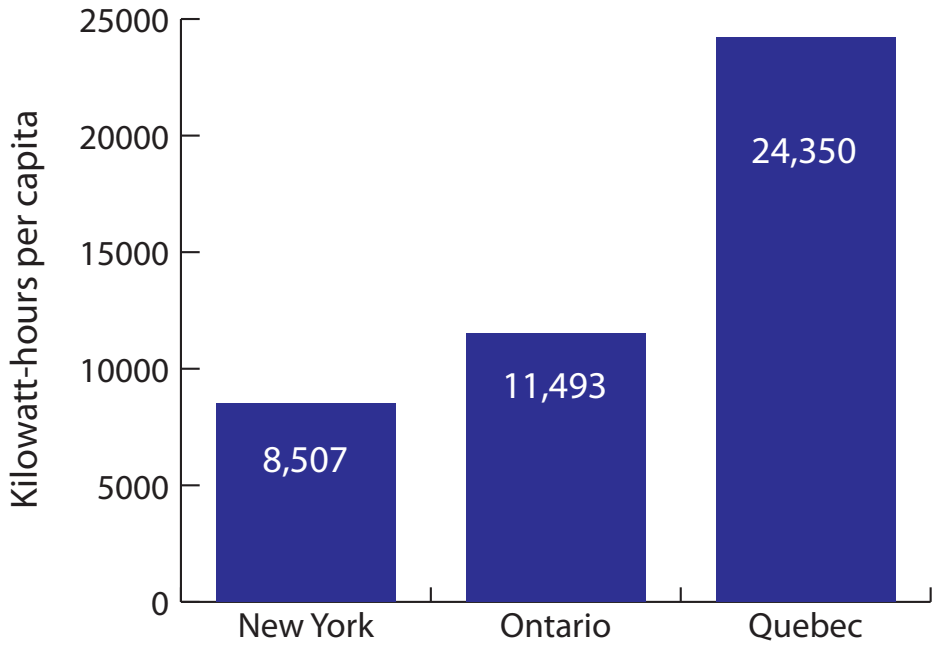
For example, in 2008, the average price of Hydro Québec's export sales was 9 cents per kWh. Assuming electricity prices in the future average at least 9 cents per kWh, then all energy efficiency investments that can save a kWh for less than 9 cents a kWh will increase Hydro Québec's profits.

Quebec's Electricity Consumption per Person

As a result of its very low electricity rates, Quebec's electricity consumption per person is very high. In fact, according to Professors Bertrand and Duclos, Quebec's electricity consumption per person is the highest in the world.[12] As Figure 3 reveals, Quebec's electricity consumption per person is double that of Ontario and almost triple that of New York State.

There are a couple of factors that partially explain Quebec's very high per capita electricity consumption. First the province has a large aluminum industry that is a significant power consumer. Second, the province is much more dependent on electric space heating than most other jurisdictions. If we exclude Quebec's use of electricity for aluminum production and space heating, the province's electricity consumption falls to 15,606 kWh per person.[13] (However, if we exclude Ontario's use of electricity for space heating, its electricity consumption falls to 10,479 kWh per person.[14]) Therefore, even if we exclude these factors, Quebec's electricity consumption per person is 50% greater than Ontario's and 80% greater than New York State's.

Figure 3: Annual Electricity Consumption Per Person, 2008[15]



Furthermore, while Hydro Québec forecasts that Quebec's electricity demand will grow by 7.5% by 2017[16], Ontario's electricity demand is forecast to continue to fall. Specifically, Ontario's demand for electricity fell by 10% between 2006 and 2009 and is forecast to continue to fall by a further 7.7% by 2018.[17]

These facts suggest that Hydro Québec has a very large untapped energy efficiency resource potential that can be harvested to reduce its customers' electricity rates and bills and to increase its profits.

Hydro Québec's Energy Efficiency Programs

Hydro Québec is planning to spend $3.5 billion to reduce its domestic customers' electricity consumption by 11 billion kWh by 2015.[18]

Assuming these energy efficiency investments have an economic life of only ten years, Hydro Québec's annual average cost of saving a kWh is approximately 4.7 cents per kWh.[19]

This means that Hydro Québec's average cost of saving a kWh is substantially lower than Hydro Québec's average revenue from exporting a kWh, namely 9 cents per kWh in 2008. Therefore, assuming an average export price of 9 cents per kWh, Hydro Québec's energy efficiency investments will increase its profits by $473 million per year.[20]

However, a review of Hydro Québec's energy efficiency incentives for its business customers reveals that it is not encouraging its customers to pursue all cost-effective energy efficiency opportunities. Hydro Québec should be encouraging all investments that can free up more of its existing hydro-electric generation capacity for export at an annual cost that is less than or equal to the market value of electricity exports (9 cents per kWh in 2008).

Hydro Québec's Energy Efficiency Incentive Payments for Large Industrial Consumers

Hydro Québec pays its large industrial consumers between 10 and 15 cents per kWh saved during the first year of operation of an energy efficiency investment.[21] Assuming these investments will actually deliver savings for ten years (a very conservative assumption), Hydro Québec's incentive is therefore equivalent to *average* annual payments of only 1 to 1.5 cents per kWh for ten years.

Needless to say, an average annual energy efficiency incentive of only 1 to 1.5 cents per kWh will not persuade large industrial customers to pursue all cost-effective energy efficiency opportunities.

Hydro Québec's Energy Efficiency Incentive Payments for Building Owners

For existing and new buildings Hydro Québec has a three tier energy efficiency incentive structure as shown in Table 2.

Table 2. Hydro Québec's Energy Efficiency Incentives for Existing and New Buildings[22]

Energy Savings	Energy Savings Incentive for Low Cost Measures	Energy Savings Incentive for Higher Cost Measures
Up to 10%	5 cents per kWh saved in the first year	15 cents per kWh saved in the first year
10% to 25%	10 cents per kWh saved in the first year	30 cents per kWh saved in the first year
More than 25%	15 cents per kWh saved in the first year	55 cents per kWh saved in the first year

As Table 2 reveals, the financial incentive varies with the cost of the measure and the magnitude of the savings achieved. For low cost and easy-to-achieve savings, the financial incentive is relatively low. For higher cost and harder to achieve savings, the financial incentive is higher. This incentive structure makes sense. However, the maximum incentive, 55 cents per kWh *saved during the first year*, is still much too low.

Assuming the energy efficiency measure lasts for just 10 years, an incentive of 55 cents per kWh saved *during the first year* is equivalent to an average annual incentive of 5.5 cents per kWh. If the energy efficiency measure lasts for 25 years, an incentive of 55 cents per kWh saved *during the first year* is equivalent to an average annual incentive of 2.2 cents per kWh. Once again, Hydro Québec is not encouraging its customers to pursue all their cost-effective energy efficiency opportunities.

Coordinating Ontario's and Quebec's Electric Power Systems

Demand for electricity in Quebec peaks on cold winter days, whereas Ontario's peak demand occurs on hot summer days when the province's air-conditioners are running full out. In other words, Quebec has surplus generating capacity in the summer and Ontario has surplus generating capacity in the winter. By more closely coordinating the two provinces' power systems, Hydro Québec's need to build new high-cost hydro-electric generating capacity to meet its winter peak demands will be reduced. Similarly, Ontario's need to build new high-cost natural gas-fired power plants to provide peak power on hot summer days will also be reduced.

Ontario's total wind power potential is 13 times greater than its total annual electricity consumption.[23] Nevertheless, wind power is intermittent and its production levels are much higher in the winter than the summer. For example, in August 2006 the average capacity utilization rate of Ontario's wind turbines was only 13%, whereas in February 2007 it was 43%.[24] Therefore, in the winter, Ontario can export its excess wind generation to Quebec and reduce Hydro Québec's need to build new, high-cost hydro-electric generating capacity to meet its customers' electricity needs.

Conversely, in the summer, when Ontario's wind generation is below average, Hydro Québec could increase the output of its hydro-electric generating stations and export electricity to Ontario. As a result, Ontario's need to build and operate new, high-cost natural gas-fired power plants on hot, smoggy summer days would be reduced.

For Quebec, this has the added advantage of reducing some of the impact of reversing normal seasonal water flows, e.g., creating high downstream water levels in winter rather than in spring and summer, the ecological equivalent of watering your garden in February.

Conclusions & Recommendations

Since Hydro Québec has already developed all of the province's low-cost hydro-electric resources, it can no longer increase its profits and lower its rates by building new water power generating stations. This means that Hydro Québec's policy of building new hydro-electric power plants is no longer in the financial self-interest of its customers or its shareholder — the Province of Quebec. To prosper in the 21st century, Hydro-Quebec must reduce its need for new, high-cost hydro-electric generating capacity by investing in energy efficiency and by better coordinating its power system with Ontario's.

The aggressive and cost-effective pursuit of energy efficiency by Hydro Québec will simultaneously reduce its customers' electricity bills, make Quebec's industries more competitive and free up more of its existing hydro-electric generating capacity for highly profitable exports to Ontario and the U.S.

Right now, Quebec badly lags its major North American competitors in electricity productivity ($ of Gross Domestic Product produced per kWh of electricity consumed). In 2008, Quebec produced just $1.60 (Cdn $) worth of goods and services for each kWh of electricity consumed in the province. By comparison, Ontario produced $3.95 (Cdn. $) and New York State produced $6.91 (U.S. $).[25]

The demand for electricity peaks in the winter in Quebec and in the summer in Ontario. By more closely coordinating the two provinces' power systems, Hydro Québec and the Ontario Power Authority can reduce Quebec's need for new high-cost hydro-electric generating capacity in the winter; and Ontario's need for new, high-cost natural gas-fired power plants to supply power on calm, hot summer days when the province's air-conditioners are running full out and its wind turbines are producing minimal power.

Increased Hydro Québec electricity exports, by displacing fossil power generation, will also help Ontario and U.S. States reduce their greenhouse gas emissions.

Recommendation #1

Hydro Québec should pursue all energy efficiency investments that can save a kWh at an annual cost that is less than or equal to the market value of its electricity exports (e.g., 9 cents per kWh in 2008).

Recommendation #2

After the implementation of Recommendation #1, if Quebec's domestic demand for electricity continues to rise, Hydro Québec should pursue all energy efficiency investments that can save a kWh at an annual cost that is less than or equal to its total (generation and transmission) cost of new supply (e.g., 14.37 cents per kWh in 2016).

Recommendation #3

Hydro Québec should reduce its need for new high-cost hydro-electric generation capacity by entering into a long-term agreement with the Ontario Power Authority to increase its imports of surplus wind power from Ontario in the winter and to increase its exports of surplus water power to Ontario in the summer.

Endnotes

1 Jean-Thomas Bernard & Jean-Yves Duclos, *Quebec's Green Future: The Lowest-Cost Route to Greenhouse Gas Reductions*, C.D. Howe Institute Backgrounder No. 118, (October 2009), p. 2.

2 Hydro Québec, *2008 Comparison of Electricity Prices in Major North American Cities*, p. 9. Available online at http://www.hydroquebec.com/publications/en/comparison_prices/index.html.

3 Hydro Québec, *Annual Report 2008*, p. 3. Available online at http://www.hydroquebec.com/publications/en/annual_report/index.html.

4 Hydro Québec, *Strategic Plan 2009-2013,* p. 76. Available online at http://www.hydroquebec.com/publications/en/strategic_plan/index.html

5 *Strategic Plan 2009-2013*, p. 76.

6 *Strategic Plan 2009-2013*, pp. 76 & 78.

7a *Strategic Plan 2009-2013*, p. 32.

7b Hydro Québec, *Financial Profile: 2007-2008*, p. 17; and *Strategic Plan: 2009-2013*, p. 19.

8 *Strategic Plan 2009-2013*, p. 30; Hydro Québec, Financial Profile 2007-2008, p. 17; and Hydro Québec Production, Complexe de la Romaine: Étude d'impact sur l'environnement, Volume 1, (December 2007), p. 2-16. Available online at http://www.hydroquebec.com/romaine/pdf/ei_volume01.pdf.

9 Hydro Québec Distribution, *Demande R-3708-2009 Coûts Évités*, (July 30, 2009), Annexe A, Tableau A-3. Available online at http://www.regie-energie.qc.ca/audiences/3708-09/Demande_3708-09/B-1_HQD-2Doc5_3708_30juil09.pdf.

10 Hydro Québec, *Annual Report 2009*, p. 96.

11 *Strategic Plan 2009-2013*, p. 5.

12 *Quebec's Green Future*, p. 2.

13 In 2008 the end-use electricity consumption of Quebec's aluminum industry was 23.8 billion kWh. Hydro Québec does not publicly reveal the province's end-use electricity consumption for space heating in kWh; however in 2008 the total end-use demand for electric space heating was 14,216 megawatts. Assuming the average annual demand for electricity space heating is equal to 30% of its peak demand, Quebec's end-use electricity consumption for space heating was 37.4 billion kWh in 2008.

Therefore Quebec's total end-use electricity consumption for aluminum production and space heating was approximately 61.2 billion kWh in 2008 or 35.9% of its total end-use electricity consumption, namely, 170.4 billion kWh.

Quebec's total electricity consumption equals its total end-use electricity consumption plus transmission and distribution losses, namely, 188.8 billion kWh in 2008. As a consequence, aluminum production and space heating are responsible for approximately 67.8 billion kWh (188.8 billion kWh x 0.359) of Quebec's total electricity consumption. Therefore Quebec's total electricity consumption in 2008 excluding electricity used for aluminum production and space heating was approximately 121 billion kWh (188.8 – 67.8) or 15,606 kWh per person (121 billion kWh/7,753,500 people).

Hydro Québec Distribution, *État D'Avancement 2009 Du Plan D'Approvisionnement 2008-2017*, (2008-10-31), pp. 11 & 13. Available online at: http://www.regie-energie.qc.ca/audiences/EtatApproHQD/Etat-avancement_2008_31oct08.pdf

North American Electric Reliability Corporation, *2009 Long-Term Reliability Assessment: 2009-2018*, (October 2009), p. 268. Available online at: http://www.nerc.com/files/2009_LTRA.pdf.

Hydro Québec, *Annual Report 2008*, p. 3.

14 Approximately 8.82% of Ontario's total electricity consumption is used for space heating in the residential and commercial sectors. Conservation Bureau, Ontario Power Authority, *Annual Report 2006: Chief Energy Conservation Officer,* p. 24 and Appendix 1.

15 In 2008 New York's electricity demand was 165.613 billion kWh; Ontario's was 148.676 billion kWh and Quebec's was 188.799 billion kWh. In 2008 New York's population was 19,467,789; Ontario's was 12,936,300 and Quebec's was 7,753,500. See North American Electric Reliability Corporation, *2009 Long-Term Reliability Assessment: 2009-2018,* (October 2009), p. 268. The population statistics are available online at: http://www.census.gov/popest/states/NST-ann-est.html; and http://www40.statcan.gc.ca/l01/cst01/demo02a-eng.htm.

16 *Strategic Plan 2009-2013*, p. 5.

17 IESO, *News Release*, "Wind Power in Ontario Generates New Record in 2009", (January 8, 2010); and North American Electric Reliability Corporation, *2009 Long-Term Reliability Assessment: 2009-2018*, (October 2009), p. 267.

18 *Strategic Plan 2009-2013*, p. 50.

19 Hydro Québec amortizes its energy efficiency investments over ten years. See Hydro Québec, *Annual Report* 2008, p. 84. We have amortized the $3.5 billion cost over ten years assuming electricity savings of 11 billion kWh per year and a return on capital of 8%.

20 11 billion kWh per year x (9 cents per kWh – 4.7 cents per kWh) = $473 million per year.

21 Hydro Québec, *Building Initiatives Program Major Customers Participant's Guide*, (September 2008), p. 37; *Industrial Initiatives Program Major Customers Participant's Guide*, (September 2008), p. 9; and *Plant Retrofit Program Major Customers Participant's Guide*, (September 2008), p. 10. Available online at http://www.hydroquebec.com/energywise/index.html.

22 Hydro Québec, *Empower Program for Building Optimization: Program Summary.* Available online at http://www.hydroquebec.com/business/appui_batiments/programme_en_bref.html

23 According to Helimax, Ontario's total land-based wind power potential is 1,711 billion kWh per year; and its off-shore potential is at least 111.5 billion kWh per year; whereas Ontario's total demand for electricity in 2009 was 139 billion kWh. Helimax Energy Inc., *Analysis of Wind Power Potential in Ontario*, Prepared for Ontario Power Authority, (November 2005), p. 15; Helimax Energy Inc., *Analysis of Future Offshore Wind Farm Development in Ontario*, Prepared for the Ontario Power Authority, (April 2008), p. 19; IESO, *News Release*, "Wind Power in Ontario Generates New Record in 2009", (January 8, 2010). Available online at: http://www.powerauthority.on.ca; and http://www.ieso.ca.

24 Don Tench, Director, Planning & Assessments, Independent Electricity System Operator, *Wind Integration in Ontario*, (2007).

25 In 2008 the gross domestic product of Quebec, Ontario and New York State was $302,225,000,000; $587,827,000,000; and $1,144,481,000,000 respectively. In 2008 the total electricity consumption of Quebec, Ontario and New York State was 188,799,000,000 kWh; 148,676,000,000 kWh; and 165,613,000,000 kWh. U.S. Bureau of Economic Analysis; Statistics Canada; and North American Electric Reliability Corporation, *2009 Long-Term Reliability Assessment: 2009-2018*, (October 2009), p. 268.

Équiterre
2177, rue Masson, bureau 206
Montréal (Québec) H2H 1B1
Tel : 514 522-2000
E-mail : info@equiterre.org
Website: www.equiterre.org

Ontario Clean Air Alliance Research Inc.
625 Church Street, Suite 402
Toronto M4Y 2G1
Tel: (416) 926-1907 ext. 246
Fax: (416) 926-1601
E-mail: contact@cleanairalliance.org
Website: www.cleanairalliance.org