Electricity Transmission in Canada and Canada/US Electricity Trade

by
Jean-Thomas Bernard

GREEN
Department of economics
Quebec City, Qc, Canada

March 18, 2010

Order of Presentation

1- Canada/USA Electricity Trade: some facts

2- Canada Policy with respect to Electricity Transmission

3- Québec Energy Policy and Power Grid Expansion

1- Canada/USA Electricity Trade: some facts

Table 1
Electricity Exports and Imports between US and Canada 2009

	BC	Al	Sask	Man	Ont	Que	NB	NS	Canada
Exports									
Quantity (TWh)	6.2	0.2	-	9.2	14.8	18.6	1.9	~	51.1
Price (¢/kWh)	4.7	3.4	2.7	3.5	3.5	5.0	5.8	5.2	4.3
Imports									
Quantity (TWh)	10.8	0.7	0.3	0.2	3.0	1.1	1.1	0.3	17.5
Price (¢/kWh)	3.3	3.5	3.2	3.3	3.7	3.2	5.4	6.1	3.7
Net Trade	-4.6	-0.5	-0.3	9.0	11.8	17.5	0.8	-0.3	33.6

Source: National Energy Board

Table 2
Electricity Production and Trade 2008

	BC	AL	Sask	Man	Ont	Qué	NB	NS	Canada
Exports[a]									
Quantity (TWh)	8.1	0.2	0.1	9.9	18.5	17.4	1.4	~	55.7
Price (¢/kWh)	7.1	6.2	6.8	4.8	5.1	7.9	7.8	7.9	6.5
Imports[a]									
Quantity (TWh)	11.5	0.7	0.4	~	8.0	1.4	1.1	0.3	23.5
Price (¢/kWh)	5.3	6.3	4.8	5.6	5.7	6.0	7.7	8.4	5.7
Net Trade	-3.4	-0.5	-0.3	9.9	10.5	16.0	0.3	-0.3	32.2
Production[b] (TWh)	65.8	60.2	19.0	35.1	159.5	192.6	14.2	12.2	603.1

Source a) National Energy Board
b) Statistics Canada

Table 3
Electricity sales in U.S. 2008
(TWh)

New England	
Vermont	5.7
New Hampshire	11.0
Maine	11.7
Massachussetts	55.9
Rhode Island	7.8
Connecticut	30.9
Total	123.0
New York	144.1
Michigan	105.7

Source: Energy Information Administration

Table 4
Canada Electricity production by Source 2008

	TWh	%
Hydro	372.9	61.8
Nuclear	88.6	14.7
Steam	115.1	19.1
Internal combustion	1.0	0.2
Combustion turbine	23.6	3.9
Wind	1.8	0.3
Total	603.1	100.0

Source: Statistics Canada

Indice comparatif au 1er avril 2009

(Hydro-Québec = 100)

Tableau sommaire (excluant les taxes)

	Résidentiel	Général					
		Petite puissance	Moyenne puissance			Grande puissance	
Puissance		40 kW	500 kW	1 000 kW	2 500 kW[1]	5 000 kW[1]	50 000 kW[2]
Consommation	1 000 kWh	10 000 kWh	100 000 kWh	400 000 kWh	1 170 000 kWh	3 060 000 kWh	30 600 000 kWh
Facteur d'utilisation		35 %	28 %	56 %	65 %	85 %	85 %
Villes canadiennes							
Montréal, QC	100	100	100	100	100	100	100
Calgary, AB	177	132	109	144	160	196	207
Charlottetown, PE	252	201	171	218	253	225	237
Edmonton, AB[3]	149	110	80	104	124	127	126
Halifax, NS	187	141	127	145	151	161	170
Moncton, NB	170	135	117	148	172	146	147
Ottawa, ON	164	120	94	121	147	179	180
Regina, SK	159	98	100	113	112	126	113
St. John's, NL[4]	160	127	98	117	133	158	88
Toronto, ON	167	124	103	129	149	179	183
Vancouver, BC	104	90	67	78	87	102	89
Winnipeg, MB	101	76	69	72	73	82	76
Villes américaines							
Boston, MA	378	304	251	297	338	386	408
Chicago, IL[5]	219	149	132	176	205	249	139
Detroit, MI[3]	224	146	116	143	149	170	174
Houston, TX[5]	260	80	75	86	96	108	97
Miami, FL[3]	197	154	134	167	190	227	220
Nashville, TN	178	143	137	153	178	206	186
New York, NY[5]	369	287	250	305	273	319	337
Portland, OR	160	106	86	101	109	131	129
San Francisco, CA[3]	357	236	204	237	213	252	265
Seattle, WA	121	78	59	85	101	126	124
MOYENNE	**198**	**143**	**122**	**147**	**160**	**180**	**172**

1) Tension d'alimentation de 25 kV.
2) Tension d'alimentation de 120 kV.
3) Les factures correspondant aux niveaux de consommation de 250 000 kWh/an et plus ont été estimées par Hydro-Québec à partir du tarif général applicable.
4) Selon les tarifs de Newfoundland and Labrador Hydro pour les clients dont la puissance appelée est de 30 000 kW et plus, et selon les tarifs de Newfoundland Power pour les autres catégories de clients.
5) Les factures ont été estimées par Hydro-Québec et pourraient différer des factures réelles.

Canadian Wind Farms - CanWEA

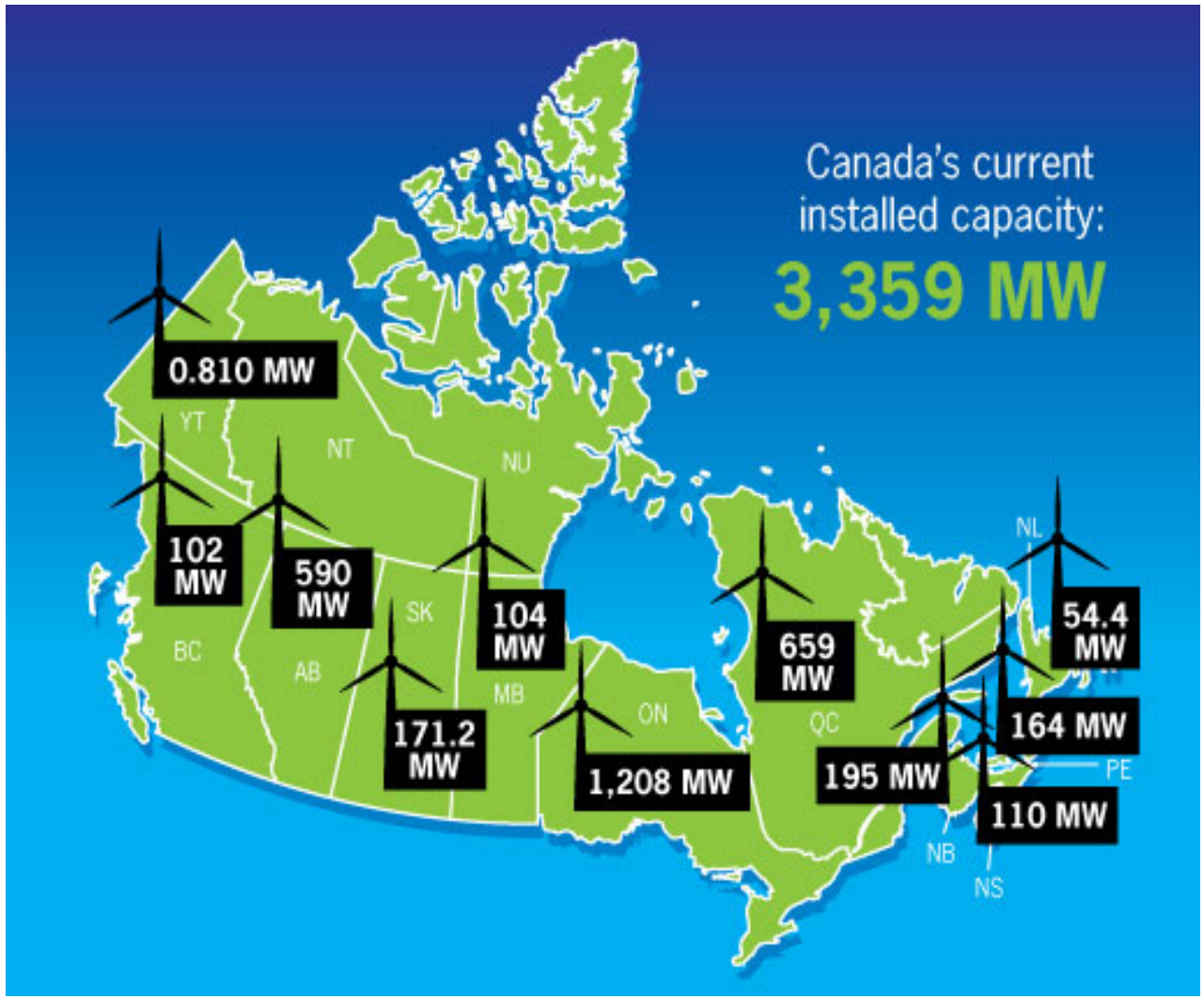


Table 5
Canadian Wind Power Projects to be completed before 2015 (MW)

British Columbia	**170.7**
Alberta	**455.0**
Saskatchewan	**24.75**
Manitoba	**138.0**
Ontario	**647.2**
Quebec	**2621.0**
New Brunswick	**114.0**
Nova Scotia	**193.0**
Total	**4363.65**

2- Canada’s Policy with respect to Electricity Transmission

Overview of Canada's Energy Policy

Canada's energy policy is guided by a series of principles, agreements and accords. The main principles of our energy policy are:

- **A market orientation**
  Markets are the most efficient means of determining supply, demand, prices and trade while ensuring an efficient, competitive and innovative energy system that is responsive to Canada's energy needs.

- **Respect for jurisdictional authority and the role of the provinces**
  Provincial governments are the direct managers of most of Canada's resources and have responsibilities for resource management within their borders.

- **Where necessary, targeted intervention in the market process to achieve specific policy objectives through regulation or other means**
  These policy objectives include issues of health and safety (e.g., pipeline regulation) and environmental sustainability.

3- Québec Energy Policy and Power Grid Expansion

Priorities of 2006 energy policy

1- Hydroelectric power development: 4500 MW to be ready to be built before 2012

2- Wind power development: 4000 MW in operation before 2015

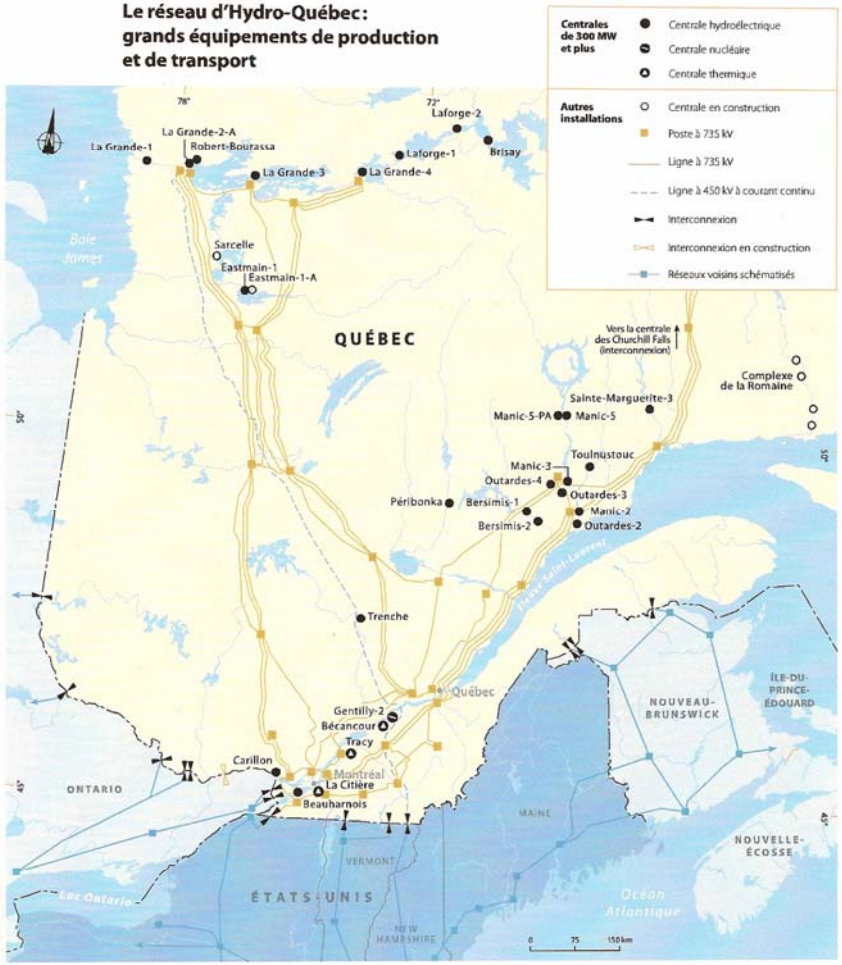
3- Energy efficiency: 10-15% decrease of energy use by source before 2015

4- Energy innovation

5- Approval of LNG terminals

Source: Gouvernement du Québec, Ministère des Ressources naturelles et de la Faune, *L'Énergie pour construire le Québec de demain, la stratégie énergétique du Québec 2006-2018*, 2006.

Le réseau d'Hydro-Québec : grands équipements de production et de transport



Import and Export Capacity
MW

Neighboring System	Import mode	Export mode
Churchill Falls	5150	-
New Brunswick	770	1100
Ontario	720	2545
New England	1970	2275
New York	1100	2125
Total	9700 (4650)[a]	8045

[a] Less Churchill Falls

Hydro-Québec Transmission Grid Investment 2009-2013
($ millions)

1- Integration of new power site	
Wind	1292
La Romaine	414
Eastmain-1-A et la Sarcelle	169
Capacity addition at existing power sites	69
2- Interconnection to neighbor	
Ontario (1250 MW)	251
New England (1200 MW)	406
3- Local expansion	1443
4- Maintenance	3700
Total	7744

Source: Hydro-Québec, Plan stratégique 2009-2013

Table 8
Cost of electricity production in Québec

	Capacity MW	Energy TWh	Unit cost ¢/kWh
1- Power stations developed before 2000	37 442	165,0	2,79
2- Recent projects			
Eastmain-1A and Rupert Diversion	888	8,5	5,0
Medium scale projects[a]	1 035	6,1	6,0-8,0
Wind power	2 000	6,0	10,3
3- Large scale projects			
La Romaine, Petit-Mécatina and others	4 500	23,6	~10,0

a: Mercier, Eastmain-1, Chute-Allard, Rapide-des-Cœurs, Péribonka
Source: information compiled by the author