Supporting Localization of Wind Technology Manufacturing through Large Utility Tenders in Québec:

Lessons for China

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1. Introduction

This case study summarizes the experiences of Québec, Canada in supporting local wind technology manufacturing through two large utility tenders for wind power. These efforts are of particular interest for two main reasons:

- The first tender (at 1,000 MW of wind), when released in 2003, represented the largest single award for wind generation capacity in the history of the global wind industry. It has since been surpassed by the second tender (at 2,000 MW), which doubled the size of the first tender.
- The tenders are relatively unique in that they mandate the use of local content in an attempt to stimulate economic development in the target region by attracting international technology leaders in the wind power technology industry. This sort of mandated local content in wind turbine project development has only been used in a few other countries to date (e.g., China, Spain, Brazil).

The unique characteristics of the Québec experience are particularly relevant to China, as China is also using local content requirements in combination with government tenders. And because China is considering even larger tenders than has been the case in the recent past with its wind concessions, the experience from Québec with such large tenders is relevant. Both Québec and China share the dual goals of promoting domestic wind power technology industry development while increasing domestic installed wind power capacity. Québec's innovative approaches to (a) requiring/encouraging local manufacturing, (b) linking wind turbine manufacturers with project developers prior to bidding, and (3) allowing flexibility in project location, may all be of relevance as China considers changes to its wind concession program. Québec's approach to project bid evaluation may also be relevant.

This paper begins with a brief background on the status of wind development in Canada, and on the structure of Hydro-Québec generally. It then discusses Québec's first call for tenders, for 1,000 MW of wind, its results, technical criteria, and local content requirements, as well as the bid evaluation approach that was used. The second call for tenders, for 2,000 MW, is then described, and the key differences between the two tenders are highlighted. Finally, the report summarizes some of the potential implications of the Québec experience for several elements of China's wind power policies: earlier collaboration between developers and manufacturers, more detailed and refined local content requirements, site selection and wind resource measurement policies, and bid evaluation criteria.

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2. Background

2.1. Status of Wind Development in Québec

At the end of 2005, Canada had installed 590 MW of wind power. Québec province had 262 MW of wind power installed at that time, consisting of 100 MW from a tender issued by Hydro-Québec in 1998 and 1999 on two sites in the Gaspé peninsula, called Le Nordais;[3] and two more 54 MW wind farms commissioned in 2004: Mount Copper (owned by 3Ci and Creststreet Asset Management), and Mount Miller (owned by Northland Power Income Fund). A contact for a third 54 MW project (Murdochville) was signed in March 2005 by a Montreal-based company—3Ci, using Vestas 1.8 MW turbines.[4] Electricity from these projects is being sold to the large provincial utility, Hydro-Québec, through long-term contracts, and these projects helped set the stage for the utility to launch its subsequent large calls for tenders of 1,000 MW in 2003, and 2000 MW in 2005. Québec has an estimated 415 GW of wind potential, of which 100 GW is within 25 km of transmission lines, as illustrated in Table 1.

Table 1. Québec's Wind Power Potential and Costs[5]

Data	Wind Class		
	Very Good	Excellent	Exceptional
Average speed (m/s)	7.5	8.5	9.5
Capacity factor (%)	33.5	38.6	43.6
Total technical potential (before distance to transmission lines)			
-Rated capacity (MW)	359,184	54,840	1,452
-Energy (TWh/year)	1,054	185	6
Technical potential within 25 km of transmission lines			
-Rated capacity (MW)	97,560	3,840	0
-Energy (TWh/year)	286	13	0
Cost (2004 Canadian dollars – indexed at 2.1%/year for 25 years)			
-2004 technology (cents)	8.1	7.3	6.6
-2006 technology (cents)	7.8	6.9	6.3
-2008 technology (cents)	7.4	6.6	6.0
-2010 technology (cents)	7.0	6.3	5.7

The economic benefits expected from large-scale wind energy projects in Québec include: [6]

- Regional and industrial development;
- Job creation;
- Congruency with the tourism industry;

[3] Rowland, Kate. 2005. "Québec to Take the Lead in New Installations." *Windpower Monthly*. Volume 2, No. 9, October.
[4] "3Ci signs contract for third Québec wind project." *WindSight*, Québec Wind Industry News, March 2005.
[5] Hélimax Consulting. 2004. "The Potential for Wind Power in Québec." Executive Summary. Available: http://www.greenpeace.ca/e/campaign/climate_energy/documents/qc_wind_energy_0504.pdf
[6] Hélimax Consulting, 2004.

- Development of Québec expertise and leadership across North America;
- Exports of goods and services;
- Avoidance/reduction of greenhouse gas emissions;
- Compatibility between hydro and wind;
- Self-sufficiency and energy security;
- Price stability and portfolio diversification.

2.2. Hydro-Québec

Established in 1944, Hydro-Québec is a "provincial Crown corporation," meaning that it is publicly owned, with the Québec government being the sole shareholder and guaranteeing its borrowings. Aside from being involved in electricity generation, transmission and distribution, Hydro-Québec is also involved in oil and gas development, technology R&D, and project development. The company competes with other power producers, while its transmission and distribution activities remain regulated.[7] Hydro-Québec owns 33,892 MW of generation capacity, 93 percent of which is hydroelectric. Hydro-Québec is particularly interested in pursuing wind-hydro complementarity.

Hydro-Québec supplies up to 165 TWh of electricity to Québec each year, and sells power on the wholesale market both in and outside of Québec (including 4.4 TWh sold to other provinces and 0.475 sold internationally in 2004). The combination of the flexibility of the hydroelectric system and the opening of US electricity markets has helped Québec not only to cope with its own demand peaks, but to help meet peak demand for the entire northeastern US.[8] New projects under development by the company include hydro, wind, cogeneration, and biomass cogeneration power plants. Wind power represented less than one percent of total capacity at the end of 2004; but the recently announced tenders (totaling 3,000 MW) are estimated to bring wind power penetration in the province to 10 percent by the year 2013.[9]

Hydro-Québec's transmission grid is extensive, including 32,539 km of lines and 18 interconnections to other markets in Canada and the US.[10] The physical characteristics of Hydro-Québec's generation and transmission infrastructure allow it to access wind sites across a broad geographic area; its extensive transmission lines make more wind sites viable for

[7] Bill 116 accomplished the final functional separation of electricity production, transmission and distribution activities at Hydro-Québec. Three main divisions were accordingly established: Hydro-Québec Production, Hydro-Québec TransÉnergie and Hydro-Québec Distribution. Bill 116 stipulates that competitive bids are to be issued by distributors for new generation. Bill 116 also introduced the concept of "legacy electricity" (électricité patrimoniale): a 165 TWh set-aside for Hydro-Québec Production to supply directly to Hydro-Québec Distribution. Over and above the volume of legacy electricity, Hydro-Québec Distribution has to issue calls for bids to meet new demands from Québec markets. Québec's domestic consumption has now reached the legacy level, so any additional requirements have to be met at market prices.

[8] LaFrance, Gaetan. "Energy in Québec: Security and Future Prospects." Expert opinion presented to the Minister of Natural Resources, Wildlife and Parks, November 2004. Available: http://www.mrn.gouv.qc.ca/english/publications/energy/strategy-lafrance.pdf

[9] Bailey, Diane. "The Beginning of a Canada Boom." *Windpower Monthly.* December 2005. Note that the 10 percent penetration is expressed in terms of installed (rated) power. Since the wind farm in the first 1,000 MW tender in Québec has a capacity factor of around 36% and hydro has a capacity factor of some 60%, the penetration is only 6% in terms of energy (compared to e.g. 20% in Denmark).

[10] Hydro-Québec Financial Profile 2004–2005. Available: http://www.hydroQuébec.com/publications/en/financial_profile/2004_2005/pdf/profile_2004-2005_1-15.pdf

development, and its predominantly hydro-powered portfolio and associated storage capacity is a good complement to variable wind resources.[11]

3. First Call for Tenders: 1,000 MW

3.1. Overview

On the instruction of the provincial government, a Call for Tenders (CFT) for 1,000 MW of wind power was issued by Hydro-Québec on May 12, 2003 with a closing date of June 15, 2004, 13 months after the release of the CFT. The CFT contained the following key requirements:

- Projects must be installed on the Gaspé peninsula (a particular regional development area of Québec) between 2006 and 2012;
- Projects coming online in 2006 must utilize a minimum of 40 percent local content, increasing to 50 percent in 2007 and to 60 percent for 2008-2012;
- Bidders had to develop proposals in conjunction with wind turbine manufacturers.

3.2. Tender Results

A total of 990 MW of projects were selected for the first CFT, after the receipt and evaluation of proposals. The winning projects are listed in Table 2 below.

Table 2. Selected Projects, 1,000 MW Call for Tenders (2003-2004)

Developer	Site	Size
Cartier Wind Energy	Baie des Sables	109.5 MW
Cartier Wind Energy	Anse à Valleau	100.5 MW
Cartier Wind Energy	Carleton	109.5 MW
Cartier Wind Energy	Les Méchins	150 MW
Cartier Wind Energy	Montagne-Sèche	58.5 MW
Cartier Wind Energy	Gros-Morne I and II	211.5 MW
Northland Power Inc.	St-Ulric/St-Leandre	150 MW
Northland Power Inc.	Mont-Louis	100.5 MW
Total		***990 MW***

Although projects from two different developers were selected, all eight projects ended up proposing to utilize GE wind turbines. (Vestas Canada and Gamesa Eolica had also participated in the bidding process, but neither was selected.)

3.3. Technology

GE has agreed to meet the 60 percent local content requirement stipulated by the CFT by establishing a network of locally based component suppliers for its turbines. Component suppliers contracted by GE are in the process of setting up manufacturing plants in the region

[11] Bailey, Diane. "Showing the World how to do it in Québec." *Windpower Monthly*. Volume 2, No. 9, October 2005.

as detailed in Table 3. GE has contracted with local manufacturers to produce towers, nacelles, and blades. The combination of locally sourcing these three components, in addition to using local labor for assembly, allows GE to meet the 60 percent target. The company manufacturing towers and nacelles, Marmen Inc., has been making components for gas, steam and hydraulic turbines for GE since 1992. LM Glasfiber, the leading global wind turbine blade manufacturer, will manufacture the blades. LM is based in Denmark, and has facilities in India, China, Spain, Germany, the Netherlands, the US, and now Canada. LM set up a blade factory in Gaspé in January 2006. LM will manufacture blades for all 990 MW of projects using GE's turbines, and has agreed to meet demand for an additional 1,400 MW of capacity for the North American market from this factory.[12]

Table 3. Results of the Local Content Requirement: Factories and Jobs in the Gaspésie Region

Company name	Component	Production	Percent of total turbine content	Jobs
LM Glasfiber	Blades	240 MW/year	17 – 18%	100-120 persons
Marmen Inc.	Towers	150 units/year	20%	160 persons
Marmen Inc.	Nacelles	100 units/year	unknown	

GE hopes to make its Québec plants part of the GE global supply chain. In addition, according to the tender documents, GE can claim local content credit for components exported to markets elsewhere in Canada and the US.

3.4. Price

About 2.3 TWh of annual electricity production is expected from these projects, which involve a C$1.1 billion investment.[13] The average price paid for the electricity for the eight winning projects is C$0.065/kWh (~US$0.055/kWh); however, this does not include transmission costs which are paid by Hydro-Québec. The electricity price of C$0.065/kWh is given in 2007 prices, and is indexed to the development of the Canadian Consumer price index; with a 2% rate of inflation, this would largely correspond to a fixed-price contract of about C$0.075/kWh.

These prices are quite low by North American standards, indicating there has apparently been little impact on electricity costs from the local content requirements imposed by the Québec government. It should also be noted that bidders may wholly or partially index their bids with developments in exchange rates vis-à-vis the US dollar or Euros, with steel prices and with the US or Canadian Consumer price Index. This indexation is valid between the time of the bid and the commissioning of each wind farm, after which the base price is fixed (and subsequently only indexed by the Canadian CPI). This double indexation feature has helped to

[12] LM Glasfiber A/S. Press Release: "LM Glasfiber signs contract to supply blades for 2,400 MW capacity for GE Energy in Canada." March 10, 2005. http://www.lmglasfiber.com; "Blade maker announces Québec factory." *WindSight,* Québec Wind Industry News, March 2005.

[13] TransCanada News Release, 2005. "Cartier Wind Energy to Become Québec's Largest Wind Energy Producer." February 2, 2005. http://www.transcanada.com/news/2005_news/2002_02_25.htm

ensure that developers dare undertake development of wind farms within a time span up to seven years at competitive prices. The indexation formulas used by bidders may vary within a framework set out in the tendering document. To ensure fair comparison between bids, Hydro-Québec evaluates bids using future prices of these indices–either taken from futures (hedging) markets, such as the foreign exchange market or generally recognized, independent price forecasts, e.g. for steel prices.

The price risks inherent in long-term tendering processes such as the Québec tender are unavoidable, but by offering to take over these risks at a known (hedgeable) cost, Hydro-Québec has probably been able to minimize project costs compared to a situation where developers would have to carry these risks themselves.

Electricity from natural gas plants reportedly costs about C$0.075/kWh, and hydro ranges from C$0.045 for extremely efficient sites to C$0.085 for other sites. According to experts, Québec is running out of low-cost hydro sites, so the higher price is more realistic for future development. Additionally, 2005 gas price increases makes the prices quoted above unlikely to be representative of current or future prices. Consequently, compared to the prices Hydro-Québec is facing for gas and hydro power, wind power looks quite competitive.

3.5. Local Content Requirements[14]

Regional Specifications

The tender was developed to specifically target the regional county municipality of Matane and the administrative region of Gaspésie-Iles-de-la-Madeleine as a site for wind technology industry development. The requirements for project location and local technology manufacturing focused on this region, and were set by a government decree, with Hydro-Québec reflecting this decree in its CFT. The bid evaluation criteria of the CFT further stipulates that the siting of the project within the eligible region is a minimum requirement for participation in the bidding process.[15]

A key goal of issuing these tenders for wind farms has been to trigger job creation in the region, and develop wind turbine manufacturing capacity throughout the province. The Gaspé Peninsula, the site of the development, has historically relied on fishing, forestry and mining for its industrial base, but has suffered economically in recent years with mine closures and fishery declines. It is for this reason that the Québec government is hoping to bring in the wind industry and boost the economic development of the region.[16]

Gaspésie is not an unreasonable location for a wind turbine manufacturing industry; it has a year round port, in addition to road and railway connections to enable the transport of large

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[14] Hydro-Québec, 2003. *Call For Tenders A/O 2003-02*, "Appendix 9: Expenditures and Investments – Regional content and Québec Content Outside of the Eligible Region." Available: http://www.hydroQuébec.com/distribution/en/marcheQuébecois/ao_200302/doc_appel.html.

[15] The CFT document further stipulates that if a wind farm straddles the Gaspésie border, at least 75 percent of the installed capacity of the wind farm must lie within the eligible region. (Hydro-Québec, 2003. *Call For Tenders A/O 2003-02*, Chapter 3: Bid Assessments, Minimum Requirements and Evaluation Criteria). Available: http://www.hydroQuébec.com/distribution/en/marcheQuébecois/ao_200302/doc_appel.html.

[16] Rowland, Kate. "Québec to Take the Lead in New Installations." *Windpower Monthly*. Volume 2, No. 9, October 2005.

components to the coast of New England and the Maritimes, as well as Ontario via the St. Lawrence River. [17]

Determining Local Content

In this CFT, developers were able to select their own project sites, with the only requirement that they be located within the Gaspé Peninsula. To ensure that the local manufacturing requirements were achieved, developers were required to submit proposals in conjunction with wind turbine manufacturers. The local content requirements had to be met within the Gaspésie region in order to promote economic development in this specific location; meeting the requirements with Canadian-sourced or even provincially-sourced components was insufficient.

The CFT document contains detailed instructions for the calculation of the local and regional content requirements. The regional content of a wind farm is defined as the percentage of expenditures and investments associated with the project that are realized in the eligible region in relation to the project's total costs. For purposes of determining the regional content and Québec content outside of the eligible region, the *total cost* of the end project corresponds to the total development and construction costs of the wind farm, including the collector system as defined in Section 2.9 (iii) of the call for tenders document.[18] The *total cost* of a wind farm project does not include the following: transforming station, cost of acquiring the land where the wind farm is located, wind farm operating costs, cost of debt service, any subsidies provided, corporation tax, capital tax, sales taxes, and net earnings in the eligible region.[19] The percentage of regional content is obtained by dividing the eligible regional expenses by the project's *total cost* and then multiplying the result by 100.

For purposes of determining the regional content of the *total costs* related to a wind farm project, the allowable regional expenses include:

- Acquisition of wind turbines (and components) by the bidder;
- Bidder's payroll;
- Acquisition of goods and services (excluding the wind turbines) by the bidder.

Sales tax is never included in allowable regional expenses.

For the following components, the allowable regional expense is equivalent to the total cost (before taxes) of the component, but only when the components are manufactured as follows:

- Tubular tower: manufactured entirely in the eligible region using non-machined plates (i.e. steel plates that have not been rolled, bent or welded outside of the eligible region);
- Blade: manufactured entirely in the eligible region through the successive assembly of its respective composite materials (fiberglass, plastic materials, wood, resin and adhesives);
- Hub/drive shaft: no prior machining performed outside the eligible region;

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[17] Saulnier, Bernard et al. (Hydro-Québec Research Institute.) "Characterization of Wind Energy in Hydro-Québec Power System." Presentation, Wind Diesel 2002 Workshop, Anchorage, Alaska. September 23-24.

[18] "Total cost" in this context is specifically defined in the CFT document.

[19] Hydro-Québec Distribution, 2003. *Call for Tenders A/O 2003-02*. Available: http://www.hydroQuébec.com/distribution/en/marcheQuébecois/ao_200302/doc_appel.html.

- Nacelle shell/hub casing: manufactured entirely in the eligible region through the successive assembly of its respective composite materials (fiberglass, plastic materials, wood, resin and adhesives).

These special rules of origin encourage local manufacturing by easing the normal value-added criterion. If components are manufactured in a way that does not comply with these requirements, the allowable regional expense associated with the component will be determined based on the added value to the regional economy of the expense, and will not include inputs that have not been manufactured in the eligible region.[20] The regional content shall consist of the value added by the component to the regional economy that corresponds to:

- Wages and benefits;
- Direct taxes (excluding corporate income tax);
- Rent;
- Financial expenses;
- Depreciation costs;
- Manufacturer's gross profit margin for the component involved;
- Purchases of goods and services acquired from permanent establishments located in the eligible region in view of manufacturing the component involved, provided that said goods and services are not linked to the components.

Local content credit can be obtained not only for local expenditures on the Hydro-Québec wind projects, but also for wind components exported to markets elsewhere in Canada and the US. R&D expenses are explicitly not permitted as part of the regional content requirements since it is difficult to discern whether such expenditures actually result in benefits to the region. Bidders must submit yearly follow-up reports to Hydro-Québec of the regional content and Québec content for the project, which will be verified by an independent auditor.[21] If project developers fail to meet the local content requirements as described above, various penalties apply.

Penalty Structure

The tender document stipulates fines on the project developers for not meeting target electricity generation, and for not meeting local content requirements. If local content requirements are not met, the following penalties shall be applied for each percentage point of deficit:

- For the first three percentage points of deficit, the penalty is equal to the contract capacity, multiplied by $2,000/MW, multiplied by the number of percentage points of deficit;
- For deficits greater than three percentage points, an additional penalty shall apply equal to the contract capacity, multiplied by $8,000/MW, multiplied by the number of percentage points of deficit beyond the first three;
- Any deviation in content within the Gaspésie region as outlined in the bid will entail a penalty of $1000/MW times the contract capacity and points of deficit.

[20] Hydro-Québec Distribution, 2003.
[21] Hydro-Québec Distribution, 2003.

When turbine manufacturers supply products to more than one bidder, the added value of its supplies must be prorated based on each bidder's orders.[22]

3.6. Bid Evaluation Criteria

Bids submitted to this 1,000 MW CFT were evaluated based on a series of criteria, in three stages. First, the bids were evaluated based on the minimum requirements of the CFT related to project siting, the financial security of the bidder, the bidder's experience, technological maturity of the wind turbines proposed for use, the feasibility of integrating the proposed generation facilities into the electrical grid, the minimum guaranteed regional content, and minimum wind measurement criteria. The section below elaborates on the details of a few of these minimum criteria that are perhaps most relevant to the Chinese situation.

Minimum Criteria

Technological Maturity Criteria: According to the CFT, the wind turbines proposed by the bidder "must have reached a proven level of technological maturity" and "must be commercially available." Wind turbine models are considered to be technologically mature if they are being operated in at least three wind farms that have been commercially delivering electricity for at least one year with an adequate level of performance. However, the tender document specifically states that this requirement is not intended to exclude bids using advanced versions of proven wind turbines, such as updated models by the same manufacturer of a proven wind turbine technology.

The tender document specifically states that demonstration projects for new wind energy technologies are not admissible, and that wind turbines with less than three years of demonstration experience are not eligible.

Local Content Criteria: Included among minimum criteria is the requirement that—at a minimum—the wind turbine nacelles must be manufactured in the target region. The evaluation criteria for local content specifically state that all nacelles used in the wind farm project must originate from an assembly facility located in the Gaspésie region, and that the bidding documents must include a statement from the designated wind turbine manufacturer of its intent to set up and operate a nacelle assembly facility in the region.

The wind turbine manufacturer is permitted, when stating its intent to locally manufacture components, to specify a minimum order size that it is willing to deliver. Since this is a 1,000 MW CFT, the manufacturer may specify any minimum capacity less than or equal to 1,000 MW as a requirement for locating manufacturing facilities in the Gaspésie region.

Wind Measurement Criteria: The first CFT requires that each bidder have wind measurements taken at the site identified in its bid for a period of at least eight months.

Weighted Evaluation Criteria

Any bids that met the minimum requirements described above continued to the next stage of the evaluation process, in which they were ranked based on six criteria.[23] These include:

[22] Hydro-Québec Distribution, 2003.

- Cost of electricity;
- Regional content in excess of the minimum requirements;
- Financial strength;
- Project feasibility;
- Relevant experience of the developer.

These criteria were weighted with maximum point values (as listed in Table 4) and each bid was scored accordingly, and then bids were ranked according to the number of points obtained. (More details on definitions and formulas used to calculate the above criteria can be found in the bid documents.)

In the final step of the bid assessment process, various combinations of bids are formed, based on the ranking of projects as described above. Combinations are assessed to identify the combination with the lowest total cost in $/MWh, and includes the diversity of pricing formula, the transmission costs, the annual amount requested, the total amount requested, and any links between various bids arising from minimum order requirements specified by turbine manufacturers. The goal of this final process is to determine a combination of bids as close to the requested amount of 1,000 MW as possible, based on the lowest cost per kWh of energy for the conditions requested, and taking transmission costs into account.[24]

This somewhat complex two-stage bid assessment process is rather unique on the global scene. It allows the purchaser of energy to maintain a strong competitive pressure on the cost of energy, while at the same time meet local content rules, and create a large enough project size to meet a manufacturer's minimum manufacturing volume requirement.

A flow chart illustrating the bid evaluation process is illustrated in Figure 1.

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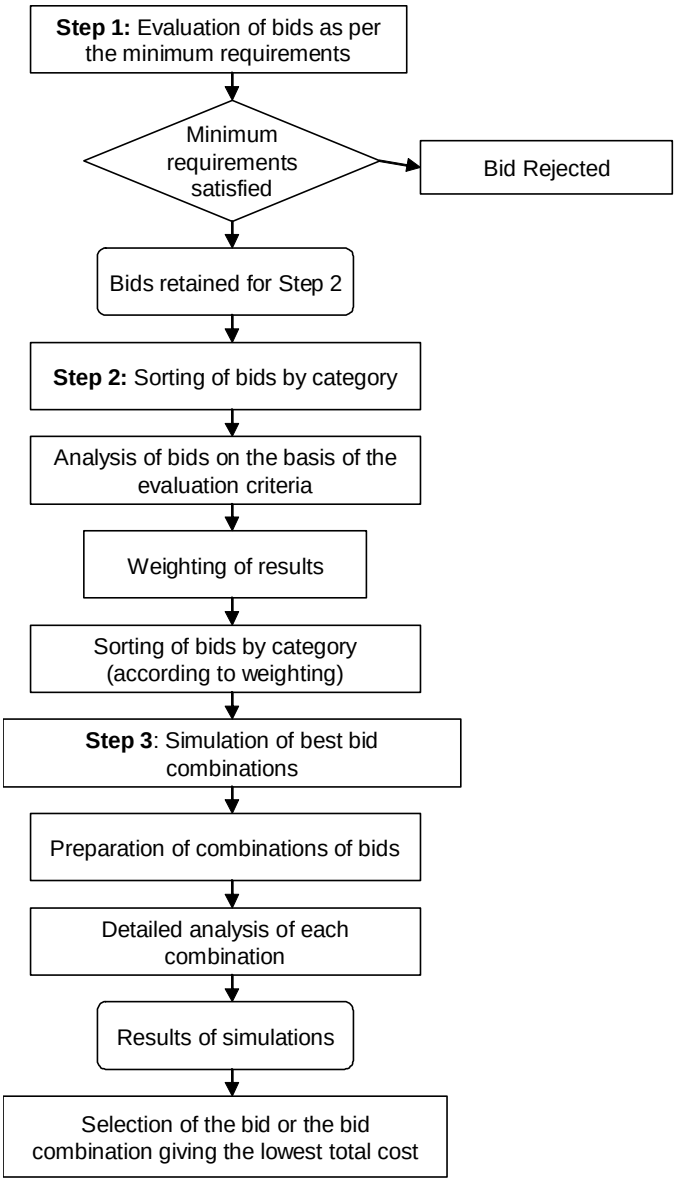
[23] Possible interactions with other bids are not considered at this stage.

[24] The process of determining combinations is described in more detail in the second CFT document (Hydro-Québec Distribution, 2005. *Call for Tenders A/O 2005-03*, Section 3.4: Simulation of Bid Combinations, and Section 3.5: Consideration of Transmission Costs). Available: http://www.hydroquebec.com/distribution/en/marchequebecois/ao_200503/doc_appel.html

Figure 1. Summary of the Bid Analysis Process[25]



4. Second Call for Tenders: 2,000 MW (in progress)

Hydro-Québec issued a second large CFT for 2,000 MW of wind power on October 31, 2005, with bids due on April 17, 2007, 18 months after the release of the CFT.[26] The tender documents included the following guidelines:

- Projects must come online between 2009 and 2013;
- 30 percent of the cost of wind turbines must be spent in the Gaspésie region;

[25] Adapted from *Call for Tenders A/O 2003-02 and 2005-03*, Appendix 3.
[26] Hydro-Québec Distribution, 2005. *Call for Tenders A/O 2005-03*. Available: http://www.hydroquebec.com/distribution/en/marchequebecois/ao_200503/doc_appel.html

- 60 percent of the entire project costs must be spent within Québec;
- Projects can be installed anywhere in the province (not limited to Gaspé Peninsula.);

Although there are many similarities between the two calls for tenders, several new elements were introduced in this second call for tenders, as described below.

4.1. Local Content Requirements

While the first tender required projects to be located within the Gaspe Peninsula, the second tender expanded the eligible location of projects to all of Québec. Project developers still select the specific sites for their development.

There is also more flexibility in this CFT in terms of the local content requirement since only 30 percent of the turbine price has to be spent within Gaspésie; the first CFT required 60 percent of total project investments to be spent in Gaspésie by the third stage of the project (beginning in 2008). This second tender maintains the 60 percent level for expenditures within the entire Québec province, and the Gaspésie-specific requirement is reduced to 30 percent of the turbine price.

While the first call for tenders required that at a minimum wind turbine nacelles be locally manufactured in the eligible region, no such specifics are stipulated in the second CFT. The bid must include a joint statement from the bidder and his designated wind turbine manufacturer in which they confirm that they have signed a firm agreement regarding the manufacture, delivery and price of the wind turbines required for the bidder's wind farm project, including how local content requirements will be met.

Because the first CFT technology supplier (GE) was able to meet the 60 percent content requirement by manufacturing only the "lower-tech" components (blades, towers, nacelles) locally, the second CFT offers extra credit for manufacturers that meet the local content requirements by manufacturing the high technology components of a turbine (either the gearboxes or the generators) in Québec. The value of these specific high-tech components is 200 percent of the actual value when manufactured in Gaspésie, and 150 percent when manufactured elsewhere in the province.[27] According to GE, it will be very challenging for gearbox and generator manufactures to locate to Gaspésie because of the lack of existing local infrastructure and expertise. CanWEA, in an attempt to ease the constraints that local content requirements place on wind turbine manufacturers, had requested that Hydro-Québec change its requirement to just 10 percent for this round so that manufacturers would only have to locally source 1 major turbine element to be eligible.[28]

As in the first CFT, the wind turbine manufacturer may make its commitment to implement new wind turbine component manufacturing facilities contingent upon obtaining a minimum number of wind turbine orders (in MW) arising from this CFT. Specifically noted in this second CFT is a warning that in setting a minimum number of wind turbine orders, the manufacturer restricts Hydro-Québec's flexibility, making a smaller number of potential order combinations among bidders possible. Additionally, the CFT specifies that in order to ensure

[27] Hydro-Québec Distribution, 2005; Bailey, 2005.
[28] "CanWEA calls for more Québec wind." *WindSight*, Québec Wind Industry News, January 2005.

an adequate level of competitiveness, there is a maximum limit of 1,500 MW set on the upper limit that may be specified as the minimum quantity of orders needed by a manufacturer to establish local manufacturing facilities in the eligible region. Further, the manufacturer is able to specify a timeline for wind turbine delivery over the project period. This is in order to ensure a minimum capacity each year or to ensure there will be no "middle" years during the project period with 0 MW of orders, between years with orders.

As with the first CFT, this CFT gives manufacturers an opportunity to meet part of the local content requirement by exporting components made in Gaspésie to other markets. However, the expenses associated with meeting the obligations of suppliers from the first CFT cannot be included in this CFT, to avoid a situation in which the same local expense (such as the manufacture of a component for export purposes) is being counted twice for both tenders. [29]

4.2. Bid Evaluation Criteria

Table 4 compares the bid evaluation criteria and weighting systems of Hydro-Québec's first and second calls for tenders.

Table 4. Comparison of Evaluation Criteria, First and Second Calls for Tenders

Criteria	Weighting (points)	
	1st CFT (1,000 MW)	2nd CFT (2,000 MW)
Cost of electricity	35	45
Regional content in excess of the minimum requirements	30	20
Québec content outside eligible region	15	NA
Québec content in excess of the minimum requirements	NA	15
Financial strength	5	4
Project feasibility	5	4
Relevant experience	10	3
Sustainable development	NA	9
Total	*100 points*	*100 points*

The cost of electricity was given 35 and 45 percent of the total weighting in the first and second CFTs, respectively. If a bidder was able to exceed the minimum local content requirements, this would provide an additional 45 or 35 percent of the scoring in the first and second CFTs. Issues related to the experience and financial strength of the developer and the feasibility of the project were weighted with 20 or 11 percent, depending on the CFT.

Several small changes were made in the evaluation criteria used in the second CFTs compared to the first CFT, mostly related to the differences in the local content requirements of each tender. The most significant change from the first to the second call is the introduction of "sustainable development" criteria, which is worth nine percent of the total score. Evaluation for sustainable development includes an examination of whether the project includes the following:

[29] Hydro-Québec Distribution, 2005.

- Participation of municipalities, Regional County Municipalities (RCM) or aboriginal communities of Québec in the wind farm for 10 percent and more (equity participation); [30]
- Support from local elected representatives;
- Amounts paid to municipalities, RCM and aboriginal communities (including estimated profits in the event of participation in the equity of the wind farm);
- Application of the terms of reference regarding the siting of wind farms on farmland and in woodlands;
- Amounts paid to private landowners.

The above sub-criteria have point values specified in the CFT that contribute to the overall score under the sustainable development criteria above.

4.3. Additional Changes

Technological Maturity Criteria

The second CFT builds upon the requirements of the first CFT mandating the use of advanced and proven wind turbine technology, but specifically elaborates on the language concerning using new, advanced versions of proven wind turbines. It states that since this project takes place over several years into the future, Hydro-Québec will accept the substitution of the wind turbines being proposed in the bidding documents with wind turbines of a more recent model between the effective date of the contract and the date on which the turbine purchase orders are submitted, provided that all other requirements are still met. These more recent turbines must originate from the same manufacturer as designated in the bidding documents.

Additionally, the second CFT mandates that the bidder submit a statement on the useful life of the proposed wind turbines by an accredited certification organization, issued in accordance with the second edition of IEC 61400-1 (or more recent) standards. The second CFT also has language specifically requesting that its proposed wind turbines be designed to operate in cold climates down to -30°C, and that the bidder submit a statement to this effect produced by a certification organization as above. This is a non-standard requirement for wind turbines due to the specifics of the Québec climate during the windy winter season, where it is also essential to meet the annual peak electricity demand. By issuing a very large tender, the utility can probably make turbine manufacturers engage in this extra development effort without incurring a major cost penalty.

Wind Measurement Criteria

The first CFT had little in the way of wind measurement requirements aside from requiring that each bidder have wind measurements taken at the site identified in its bid for a period of at least eight months. The second CFT elaborates on this requirement, mandating that wind conditions for the proposed site be evaluated simultaneously with an adequate number of anemometer towers and wind vanes, as determined by the overall project size (<25 MW = 1

[30] Projects receive extra points if they have at least 10 percent equity participation by municipalities or First Nations (Native American) communities, or if they can demonstrate that local elected representatives unconditionally support the project (Hydro-Québec Distribution, 2005).

anemometer; 25-75 MW = 2 anemometers; >75 MW = 3 anemometers). Further details are given in the tender document about required measurement heights, data recovery rate, software programs and methodologies that are to be used in order to ensure measurement and analysis quality.

Project Timeline

This tender includes an extended deadline for proposals at the request of industry stakeholders. This extension allows potential developers to monitor the wind resources in sites over two winters (the time of high production in Canada), and gives turbine manufacturers more time to build up partnerships in Québec and examine alternatives for meeting the local content requirements.[31]

Project Size

The 2,000 MW size was selected to entice new turbine manufacturers to join in the bidding. The second CFT, double the size of the first, is thought to be sufficiently large enough such that GE, the manufacturer selected to meet the entire first CFT, will not be able to meet the entire order. Although GE is the frontrunner this round as the only major turbine manufacturer with local manufacturing capacity, it is reportedly concerned about the delivery schedule for these projects, which will overlap with the first round CFT, and has stated that it likely will not have the production capacity to meet the combined demand.[32] There is concern that GE's dominance in the region would allow it to operate as a monopoly, raising its prices. Although GE's presence is expected to bring economic development benefits to the region, if it can charge monopoly prices for their technology as the only manufacturer able to meet local content requirements in the region, this would defeat the purpose of the tenders. With the expanded tender size, and the greater lead time for responding to the tender, the hope is that four to five manufacturers will participate in this round of bidding, and a competitive price will result.[33]

5. The Québec Experience, Lessons for China

Several aspects of the Québec wind power tendering experience may provide relevant examples and lessons for the Chinese context.

5.1. Innovative Mechanisms from the Hydro-Québec CFTs

Collaboration between Developers and Manufacturers

The two large wind power tenders led by Hydro-Québec illustrate a program model that requires project developers to work in collaboration with turbine manufacturers in formulating bids that include local content requirements. The relatively long lead time between when the tender is released, and when the bids are due, is intended to facilitate this interaction and collaboration as both types of companies make plans for entry into the Canadian wind market. In the case of the second CFT, the tender document was released on October 31, 2005 and bids are not due until April 17, 2007, giving potential bidders about 18

[31] Bailey, Diane. "Government Invites Bids for Huge Volume of Wind." *Windpower Monthly*, December 2005.
[32] Bailey, Diane. "Handcuffed by Local Content Demands." *Windpower Monthly*, Volume 2, No. 9, October 2005.
[33] Bailey, Diane. "Government Invites Bids for Huge Volume of Wind." *Windpower Monthly*, December 2005.

months to prepare their proposals. The bidding documents also contain additional requirements regarding how developers and manufacturers must continue to communicate with regards to local content requirements throughout the project cycle to ensure all agreed collaborations are carried out.

There are also some disadvantages to this model, such as the need to allocate longer intervals of time for solicitation responses, slowing down the overall timeline for project development. However, requiring collaboration among developers and manufacturers during the bidding process is the most certain way of ensuring that local content requirements are met. This process forces manufacturers to provide specific plans for localization to developers before any contracts are signed. This in turn provides more certainty to developers regarding the final project price, and the price of the wind electricity. These factors, in combination, provide bid evaluators comprehensive information about both developers' and manufacturers' plans, allowing them to make the best possible decision in selecting the tender winner(s).

China has already begun to require greater collaboration between developers and manufacturers in its Wind Concession program. However, the detailed requirements for such collaboration as seen in the Québec experience may be relevant.

Structuring Local Content Requirements

The local content requirements established in Québec are detailed, and innovative. Some of these concepts and approaches merit consideration in China.

For example, Québec allows local content credit for components manufactured locally, but exported to other countries or regions. Giving credit to manufacturers for local content on turbines or components that are exported elsewhere might encourage manufacturers to set up facilities in China to serve regional markets as well as the Chinese domestic market. Québec may not have enough demand for wind on a long-term basis to maintain a manufacturing base only serving that local demand, but the government recognized it could serve as a manufacturing hub for the rest of the country, or the continent.

The Hydro-Québec tenders also combine provincial and regional local content requirements, with separate requirements set for Québec, and for the Gaspésie region. A similar technique could be used in China if the government wanted to encourage wind industry development in a specific part of China, rather than just in China generally, although there may be disadvantages to limiting the options of manufacturers looking to relocate in China.

The Hydro-Québec tenders also provide extensive formulas and details for calculating local content requirements that could serve as a model for China. The first CFT included requirements for locally manufacturing specific components, while the second CFT provided additional points in the bid evaluation process for local manufacturing of "high-tech" components and local manufacturing in excess of the minimum requirements. Variations of these details might be considered in China. The tenders also include requirements for ongoing monitoring of the achievement of the local content requirements. Additionally, the penalty structure for not meeting local content requirements outlined in the Québec tenders could be a useful example for China to follow as a means of encouraging compliance.

In China, placing a 70 percent local content requirement on all concessions—and now on all large wind projects—leaves little room for flexibility at the provincial or regional policy levels. Since the Québec model is still relatively new, it still remains to be seen whether these tenders will be successful in bringing a thriving industry to the region. Nonetheless, some innovative approaches have been developed, and similar approaches might be considered in China.

Of note in the Québec experience is the fact that there are no conditions of local, Québec-based ownership of the turbine manufacturing companies or wind farm development companies. Chinese policy makers have discussed mandating that the 70 percent local requirement apply not just to project costs, but also requiring that companies are owned by a Chinese company or a majority of Chinese investors. If this becomes standard policy in China, pre-existing companies like GE offering advanced wind technology will be unable to meet local content requirements, or may be forced to partner with a local company (although such joint-venture collaborations have not proven successful in the Chinese wind industry in the past).[34] Limiting participation by stringently imposing local ownership as well as local content requirements may be detrimental to encouraging new entrants in China's still immature market

The Québec CFTs allow wind turbine manufacturers to set minimum total capacity requirements, and annual capacity requirements, below which they are not willing to establish local manufacturing facilities in the eligible region. This is an interesting element of these tenders, since Hydro-Québec has clearly recognized the need for a sizable, stable market in order to encourage local manufacturing—this has been identified as crucial to attracting local manufacturing in the wind turbine industry.[35] Consequently, the result of the first CFT was that the entire tender was awarded to one wind turbine manufacturer, GE. This decision may have been a result of GE setting a minimum total capacity requirement, or just a result of bidders proposing the use of GE turbines performing well on the bid evaluation criteria.

In either case, the result of the first CFT is that GE is now the only wind turbine manufacturer that is locally manufacturing wind turbine components in the Gaspésie region. As previously discussed, this could create a situation in which GE is a monopoly supplier in the region. In the second CFT, the tender size was intentionally made large enough so that more than one manufacturer would be forced to enter the market to meet demand. GE has stated that it will not be able to manufacture sufficient components to be able to meet demand from both tenders, and the second CFT specifically states that a single manufacturer must set its minimum capacity requirement below 1500 MW. However, it is still possible that one manufacturer could be selected to manufacture all the turbines for the 2000 MW call if one company were willing and able to do so. If there is only one primary manufacturer this presents the risk of charging monopoly rents and thus driving up the price of the equipment (the opposite result from what is intended by encouraging local manufacturing).

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[34] Lewis, Joanna I. Chapter 5 in *From Technology Transfer to Local Manufacturing: China's Emergence in the Global Wind Power Industry,* Ph. D. Thesis, Energy and Resources Group, University of California Berkeley, August 2005.

[35] Lewis, Joanna and Ryan Wiser. "Fostering a Renewable Energy Technology Industry: An International Comparison of Wind Industry Policy Support Mechanisms." Lawrence Berkeley National Laboratory No. 59116, November 2005;

Lewis, Joanna and Ryan Wiser. *A Review of International Experience with Policies to Promote Wind Power Industry Development*. Prepared for the Energy Foundation China Sustainable Energy Program, March 2005 (available in English and Chinese).

In China, a very limited number of manufacturers can meet the local content requirement stipulated by the wind concessions today, and this has slowed installations since the annual production capacity of these manufacturers is limited. The Chinese government can look to the Québec case for methods of ensuring that the forthcoming tenders force the entry of new firms into the market that are able to meet local content requirements. China's current local content requirement in its wind concession projects (70 percent) already is higher than the requirements in both Québec tenders—the first CFT started at 30 and increases to 60 percent over six years, while the second CFT has a 60 percent local content requirement at the provincial level beginning in the year 2009. The Québec model of phasing in more stringent local requirements over time in the context of a single, multi-year tender may be a useful model for the Chinese context.

Site Selection and Wind Resource Measurements

Unlike in the Chinese wind concession program, the Québec proposals do not stipulate up front where the wind farms must be located, just that they must be located within the designated province or region since they are to provide power to the Hydro-Québec utility. The only additional requirement that affects the choice of site proposed by the bidders surrounds wind resource measurements. Bidders must have collected wind resource data over a minimum time period, using a minimum required number of anemometers which is related to the total project size. It is expected that bidders will have conducted rigorous analysis on the expected electricity generation potential of the site prior to submitting their bids, and that such analysis will be done using state-of-the-art software tools accepted by the industry. The long time period between the bid announcement and submission dates make such rigorous measurement and analysis feasible.

The Chinese wind concessions to date have been conducted for pre-selected sites, with wind resource data made available by the government to interested parties. However, this pre-selection of sites puts the burden of wind resource assessment on the Chinese government and affiliated organizations, rather than on private developers who have an interest in ensuring that extremely high quality data are collected to inform their investment decisions before bids are submitted. The Québec approach also allowed private developers to maintain proprietary control over their wind resource data since it is kept confidential throughout the bid evaluation process. This structure also promotes competition among developers for the best wind sites, and creates opportunities for the development of other wind sites that may not have been identified by the regional government. Therefore, incorporating further flexibility with regard to site selection might be beneficial in the Chinese tenders as well.

Bid Evaluation

The technological maturity evaluation criteria used in the Québec CFTs mandates that bidders use commercially available and proven wind turbine technology. (Note that this is different from mandating that bidders use the best available technology, which could in some cases rule out using locally-manufactured technology.) The requirements also leave room for upgrading to advanced models of proven wind turbines. This is a particularly useful strategy since the projects take place over several years, with turbines being installed several years after the contract is signed. These requirements allow project developers to upgrade their proposed turbines to more advanced turbines, while still mandating that they stick to the same wind turbine manufacturer, as they are only allowed to upgrade to a more advanced model by the same manufacturer. They are specifically not allowed to switch to turbines made by a different

manufacturer. It has been reported that switching manufacturers has been a problem in the Chinese wind concessions, and the method utilized in Québec is one way to address these concerns, while still allowing for technology upgrades within the time frame of the project lifetime.

An innovative evaluation criterion that was introduced in the second CFT is "sustainable development." Although the definition of "sustainable development" is open to question, for the purposes of this Québec CFT, it has been defined as incorporating local concerns and local participation into the project design. This can be in the form of engaging local stakeholders (government officials, indigenous communities) in order to gain their support for the project, or in the form of local investment in the project. In the case that payments will be made directly to local landowners or investors, additional credit is given to the bidder. This is a way to encourage local ownership of the project without mandating it—which would significantly restrict flexibility. This also provides incentives for project developers to engage local stakeholders and gain their support for the project; this is very important since public opposition has been a significant barrier to wind farm development in other countries such as the United States.[36]

A key feature of the two large Québec tenders for wind power is that they are not issued as request for proposals (RFPs) but as actual tenders—though with a right to refuse excessively high prices. The difference is that the final contracts are actually part of the tendering document. This reinforces the transparency of the tendering process, which is rather unique viewed in a global perspective. The detailed conditions are known up front, and the process leaves no room for subsequent back door negotiations or modified conditions since the final contracts are published on the web site of the energy regulator, La Régie de l'énergie.

Another important element is the fact that bidders must post performance bonds, both in the project phase and during the operational phase. The second (2,000 MW) tender also requires bonds to ensure the proper dismantling of the wind farms after they have ceased operating. The size of the bonds is related to the credit rating of the bidders or of their parent companies if they are posting the bonds. Companies with higher credit ratings face less stringent requirements than companies with low credit ratings or no rating. Companies without a credit rating may voluntarily wish to obtain a credit rating in order to obtain the same less stringent demands for performance bonds. If the bidder takes this option, the company must make a non-refundable payment of C$10,000 in the case of the first CFT, and C$12,000 in the case of the second CFT. This amount was reportedly established based on the unit price billed by the credit rating agency for conducting the evaluation, but it may also serve to weed-out any unserious bid entries. This non-refundable payment may not be used towards the deposit required if the contract is awarded to that party.

Finally, the experience and financial strength of the developer is considered in bid evaluation, as is project viability more generally. In addition, whether a project is able to exceed the minimum local content requirement is strongly considered in bid evaluation. These elements of bid evaluation may have relevance in China.

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[36] See, for example, the Cape Wind project in Massachusetts: Gnaizda, Matt. First Offshore Wind Farm Faces Powerful Opposition." *Epoch Times Los Angeles*, May 17, 2006. http://www.theepochtimes.com/news/6-5-17/41635.html

5.2. Conclusions

Québec, Canada is one of a few locations in the world that is using a unique portfolio of local content requirements and other incentives to spur the development of a local wind turbine manufacturing industry within its borders. The province's first large solicitation for wind power projects, a 1,000 MW Call for Tenders that was issued in 2003 and finalized in early 2005, was successful in attracting a leading global company in the wind turbine industry to set up manufacturing and assembly facilities in the targeted Gaspésie, Québec region. Its second call, for twice the installed capacity of the first, aims to bring in even more manufacturers within the broader Québec province. Since China has a very similar goal of stimulating the development of a domestic wind turbine manufacturing industry, there are likely many characteristics of the Québec case that can inform Chinese policy makers looking to formulate policies to achieve this goal.

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Appendix I

Policy Support for Wind Energy in Canada[37]

Federal

- **Wind Power Production Incentive**. The WPPI will provide financial support for the installation of 1,000 megawatts of new capacity until 2007. The level of the WPPI incentive is considerably less than that offered by governments in other countries. [Note: In the Québec wind tenders 75% of this federal incentive is handed over to Hydro-Québec since the utility wishes to ensure a level plying field between developers who receive the incentive and those who do not. Developers cannot reserve this incentive in advance, therefore the utility takes on the risk that the developer may not receive this support. The developer is, however, required to apply for the incentive, and the 25% is considered as a reimbursement of administrative costs in this context.]
- **Procurement Targets**. The federal government has committed to purchase 20 percent of their electricity needs from renewable sources, including wind, by 2005.
- **Class 43.1 Accelerated Capital Cost Allowance**. Class 43.1 provides for accelerated write-off of certain equipment that is designed to produce energy from alternative renewable sources, including wind. It allows taxpayers to deduct the cost of eligible equipment at up to 50 percent per year, on a declining balance basis.
- **Market Incentive Program**. The MIP is a $25-million Government of Canada initiative through the Action Plan 2000 on Climate Change to stimulate emerging markets for renewable electricity. It aims to establish such emerging renewable energy sources as full-fledged competitors in the electricity market by 2010, and to reduce current and future greenhouse gas and other air emissions from electricity generation. Funding is available through the MIP until March 31, 2006.
- **Canadian Renewable and Conservation Expenses**. The CRCE is a category of expenditures intended to promote the development of conservation and renewable energy projects. It allows investors to fully write-off certain intangible costs associated with investments such as feasibility and resource assessment. The system is usually operated through a system of "flow-through shares," which essentially allows wind developers to sell their initial 100 percent tax write-off to profit-making companies, which can use the CRCE allowance to reduce their own tax payments. In the case of wind power, this incentive can be used with pilot turbines placed at a future wind farm site in order to do a concrete evaluation of the wind resource.[38]

Provincial

- **Renewable Portfolio Standard**. A provincial RPS requires generators in the province to secure a percentage of their electrical needs from renewable energy sources. Such

[37] Canadian Wind Energy Association. "Frequently asked questions on wind energy." Available: http://www.canwea.ca/en/faq.html

[38] The system is similar to that used by Canadian mining companies to do test mining on future mine sites.

standards are being actively developed, but are not yet implemented, in Alberta, Ontario, New Brunswick, Nova Scotia and Prince Edward Island.

- **Requests for Proposals.** Provinces can issue RFPs for the development of renewable energy projects. In early 2004, Québec, New Brunswick and Saskatchewan had already issued such RFPs.
- **Green Power Procurement**. Provincial governments can commit to purchasing a certain percentage of their electricity needs from renewable sources, including wind. Alberta and Ontario already have such programs in place.
- **Favorable Tax Treatment.** Provinces can offer favorable tax treatment for renewable energy development. Ontario and British Columbia currently offer such tax incentives.