



Specific Issues Regarding First Nations and Wind Energy Development in Québec

August 28, 2006

Tim Weis, M.Sc.

Final Report

Specific Issues Regarding First Nations and Wind Energy in Québec

Expert report prepared for the Assembly of First Nations of Québec and Labrador
in Régie de l'énergie file R-3595-2006

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Sustainable Energy Solutions

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About the Author

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Tim Weis is part of the Sustainable Communities Group at the Pembina Institute working on renewable energy analysis and planning. He has done technical research and analysis on implementing renewable energy and energy efficiency options with many First Nations communities in Canada. Tim is also currently doing his PhD at the Université du Québec à Rimouski in Environmental Science, studying wind energy development in Canadian First Nations. Tim has also worked with Yukon Energy Corporation's as well as Aurora College, Inuvik examining wind energy challenges in Nordic conditions. Tim has a Master's degree in Mechanical Engineering where he studied rime ice adhesion to wind turbine blades. Tim has a Bachelor degree in Mechanical Engineering with an option in Environmental Engineering.

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About the Pembina Institute

The Pembina Institute creates sustainable energy solutions through research, education, consulting and advocacy. It promotes environmental, social and economic sustainability in the public interest by developing practical solutions for communities, individuals, governments and businesses. The Pembina Institute provides policy research leadership and education on climate change, energy issues, green economics, energy efficiency and conservation, renewable energy, and environmental governance. More information about the Pembina Institute is available at www.pembina.org or by contacting: info@pembina.org

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Cover photo: Weather Dancer I developed by Piikani First Nation.
Photo credit: Tim Weis, The Pembina Institute.

1 Introduction

The Government of Québec has shown national leadership by calling for an additional 2 000 MW of wind energy development in the province in addition to over 1 000 MW of wind energy already developed or planned.

The Pembina Institute has been working with First Nations across Canada for the past ten years looking at local renewable energy options; a list of the communities that the Pembina Institute has worked with and their location appear below.

Yukon

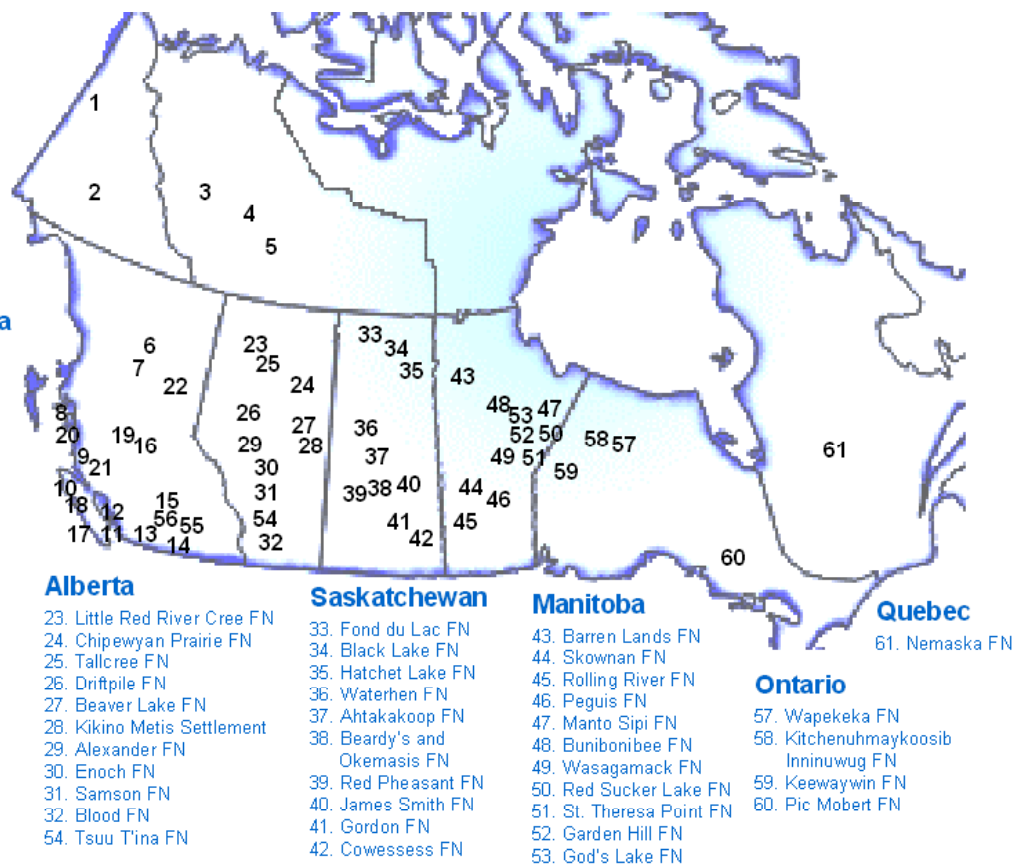
1. Old Crow
2. Pelly Crossing

NWT

3. Norman Wells
4. Wha Ti
5. Yellowknife

British Columbia

6. Kwadacha FN
7. Tsay Keh FN
8. Gitga'at FN
9. Oweekeno FN
10. Ka:'yu:'k't'h' / Che:k'tles7et'h' FN
11. Hupacasath FN
12. Bowen Island
13. Tsleil-Waututh FN
14. Douglas FN
15. Xení Gwet'in FN
16. Quesnel
17. Uchucklesaht FN
18. Ehattesaht FN
19. Kluskus FN
20. Kitasoo FN
21. Tsawataanaieuk FN
22. Dawson Creek
55. Skatin FN
56. Samahquam FN



Based on this experience, the Pembina Institute recognizes that many First Nations are not only eager to participate in wind energy specifically, but also recognize the economic development opportunity that wind energy offers to First Nations who are able to participate. At the same time, we recognize that the First Nations wish to ensure that such development respects their rights, interests, territories and activities.

This testimony will discuss specific issues pertaining to the current call for wind energy projects in Québec as it pertains to First Nations, in particular the expected geographic area of wind energy development, barriers to First Nations' participation in wind energy development and the 25 MW constraint proposed for projects specifically for First Nations in the recent Québec energy strategy. This discussion is based on documents provided by Franklin Gertler & Associates, submitted to the Régie and the author's general familiarity with the issues in the Québec context.

The author has received a mandate from Franklin Gertler & Associates to prepare this expert report and to provide it to that firm with a view to preparing for the Assembly of First Nations Québec-Labrador's evidence in its application R-3595-2006 regarding the Régie's decision D-2005-201 (*Décision approuvant les modifications aux exigences minimales et à la grille de sélection applicables à l'appel d'offres pour le second bloc d'énergie éolienne de 2 000 MW*).

2 Geographic Area of Development

2.1 Scale of Proposed Wind Development

In a competitive market such as the current Hydro-Québec RFP process, the price of electricity will be a dominant factor in determining which areas gets developed first. This price is heavily influenced by the local wind regime, often referred to by its “Batelle Wind Class” which ranges from 1 to 7, with 7 being the best for wind power development. Figure 1 displays these wind classes for Québec with class 1 shown in dark blue and class 7 in red.

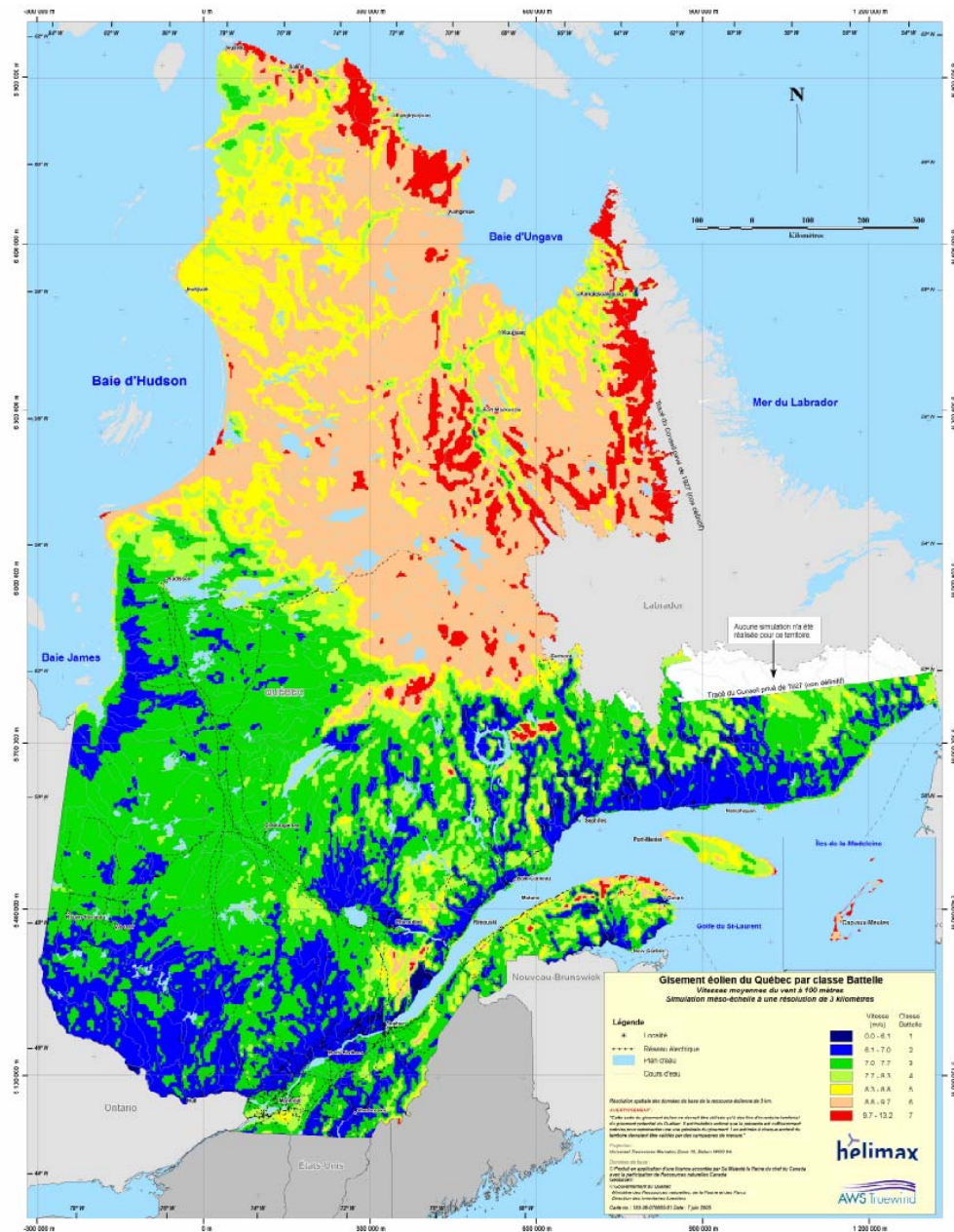


Figure 1: Wind map of Québec (80 m hub height)

There are many factors that contribute to the geographic footprint of wind farms, including changing wind turbine technology, local topography and access to local land. From a physical point of view, the combination of wind speed, electrical grid access and road access dictate exploitable areas of land for development. At a local level, constraints such as setback distances from roads, homes, local infrastructure and protected areas such as parks also come into play.

The 2005 document *Inventaire du potentiel éolien exploitable du Québec*, prepared by Hélimax Énergie Inc. and AWS Truwind Inc.¹ (Hélimax/Truwind), concludes that regions with Batelle class 7 winds have 2006 production costs ranging from 5.0 to 5.6 ¢/kWh depending on the location within the province, while class 6 production costs range from 5.9 to 6.7 ¢/kWh.

Northern Québec (Nord-du-Québec) and the North coast of the St. Lawrence (Côte-Nord) are henceforth collectively referred to in this report as the *Northern Regions*. It is clear from Figure 1 that the Northern Regions have very significant wind energy potential, however accessing much of this potential is limited by transmission lines, road access and other logistical issues which also increase the relative costs for areas that are developable. The Hélimax/Truwind study suggests that approximately 2 000 MW of the vast potential in the North is accessible without major grid upgrades². Given the distances involved from major centers such as Montréal and Québec, coupled with the relatively higher cost of development the sites in the North are at a disadvantage. In the opinion of the author, this disadvantage begins to disappear when the cost of production of more accessible sites approaches a 10% increase in costs.

The aforementioned study, which takes into account land access constraints such as those mentioned above suggests that the capacity for wind energy development in the top two wind classes outside of Northern Québec at prices at or below 6.2 ¢/kWh³ is approximately 1 000 MW as shown in Table 1.

Table 1: Hélimax/Truwind wind energy development estimates in Québec⁴

Region	Class 7		Class 6	
	Production Cost in 2006 (¢/kWh)	Development Potential (MW)	Production Cost in 2006 (¢/kWh)	Development Potential (MW)
Bas-Saint-Laurent/Gaspésie*	5.1	205.3	6.0	394.7
Sud-du-Québec	5.0	1.4	5.9	81.9
Saguenay-Lac-Saint-Jean	5.1	54.8	6.1	280.7
Abitibi-Témiscamingue	5.2	0.0	6.2	0.0
Côte-Nord	5.5	262.9	6.6	3 349.0
Nord-du-Québec	5.6	46 886.2	6.7	192 367.5
Total		47 410.6		196 473.8
Total <0.066 \$/kWh outside North		262		757

*includes les Îles de la Madeleine

¹ Hélimax Énergie inc. and AWS Truwind LLC, (2005) *Inventaire du potentiel éolien exploitable du Québec*, submitted to Ministère des ressources naturelles et de la faune du Québec, this report is available in full at: www.regie-energie.qc.ca/audiences/3595-06/Requete3595/B-3-P-19-InventairePotentielEolienQc_3595_10avr06.pdf

² Ibid. Table 5-3, pg. 35

³ 6.2 ¢/kWh is just over a 10% increase of the 5.5 ¢/kWh estimated as the cost of production in class 7 zones in the Northern Regions.

⁴ Hélimax et al. Calculated from Tables 5-2 and 6-1 to 6-6, pg. 31-33 and 48-50

Most of the province of Québec falls under settled and unsettled land claims, notably much of the North Coast of the St. Lawrence and Northern Québec, the two regions of largest wind energy potential as can be seen in Figure 2.

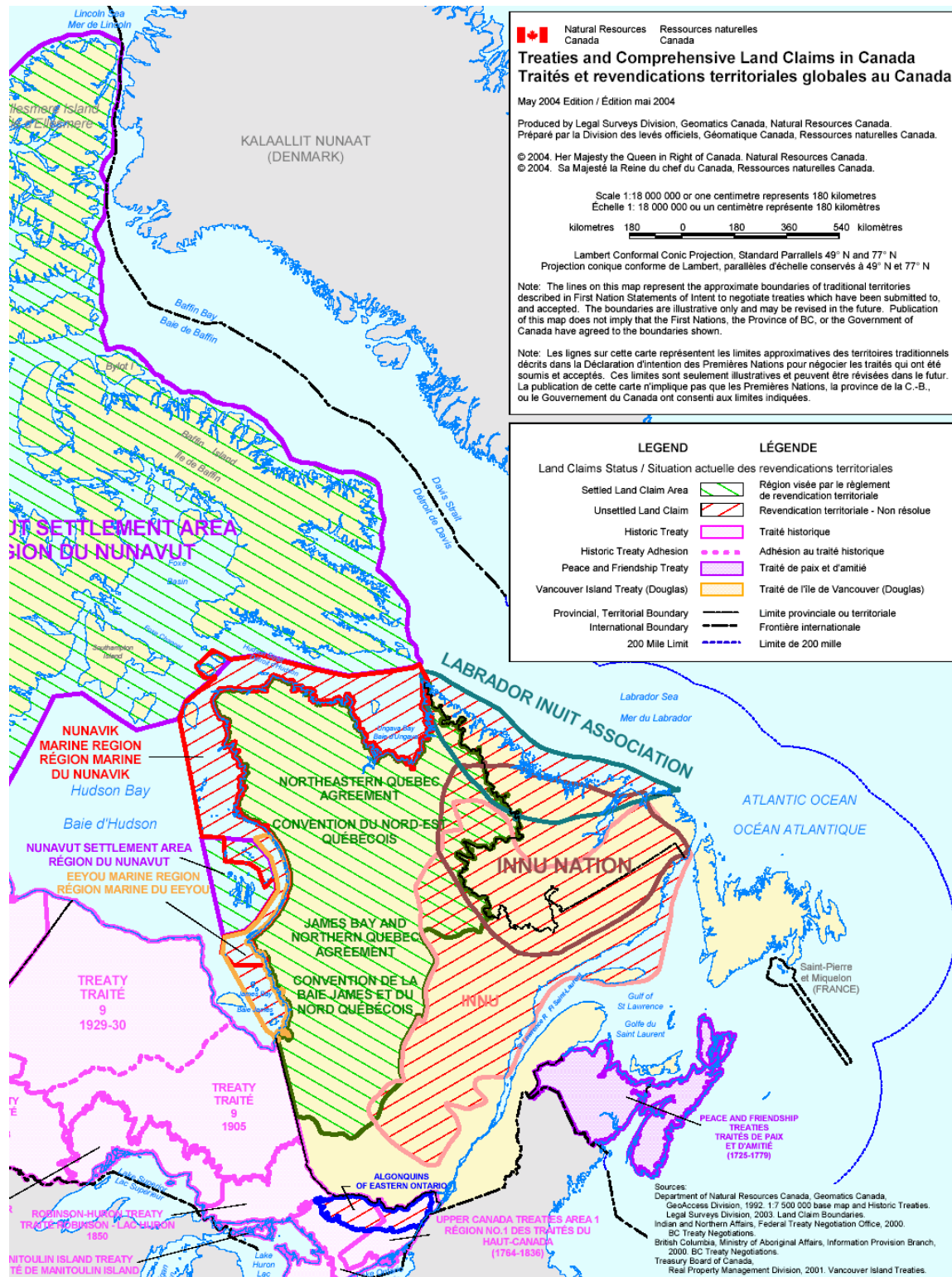


Figure 2: Land claims in Québec

Hydro-Québec's initial wind energy bidding process awarded almost 1 000 MW of projects, to be developed in the Gaspésie region. According to the aforementioned Hélimax/Truwind study it can therefore be concluded that much of the most lucrative locations within the Gaspésie have already been developed, such that much of the most cost-effective sites remaining may be outside of the Gaspésie. As can be seen in Figure 3, the current Québec electrical transmission system does not cover much of the North, it does however extend into some of the regions of the highest wind energy potential in the province in both of the Northern Regions.

While it is not certain what the final outcome of the bidding process will be, in my opinion it is reasonable to conclude that competitive projects will be submitted in the current call for tenders to be developed on land that is on areas of settled and unsettled lands claims, in particular the James Bay and Northern Québec Agreement, the Northeastern Québec Agreement and Innu unsettled land claims.

The evaluation, planning and development of a wind farm is an ongoing process over several years that begins with market and wind studies, assessment of technologies, acquisition of land all of which begin several years prior to the awarding of wind power contracts. Therefore where consultation needs to take place it should occur well before projects are finalized and approved.

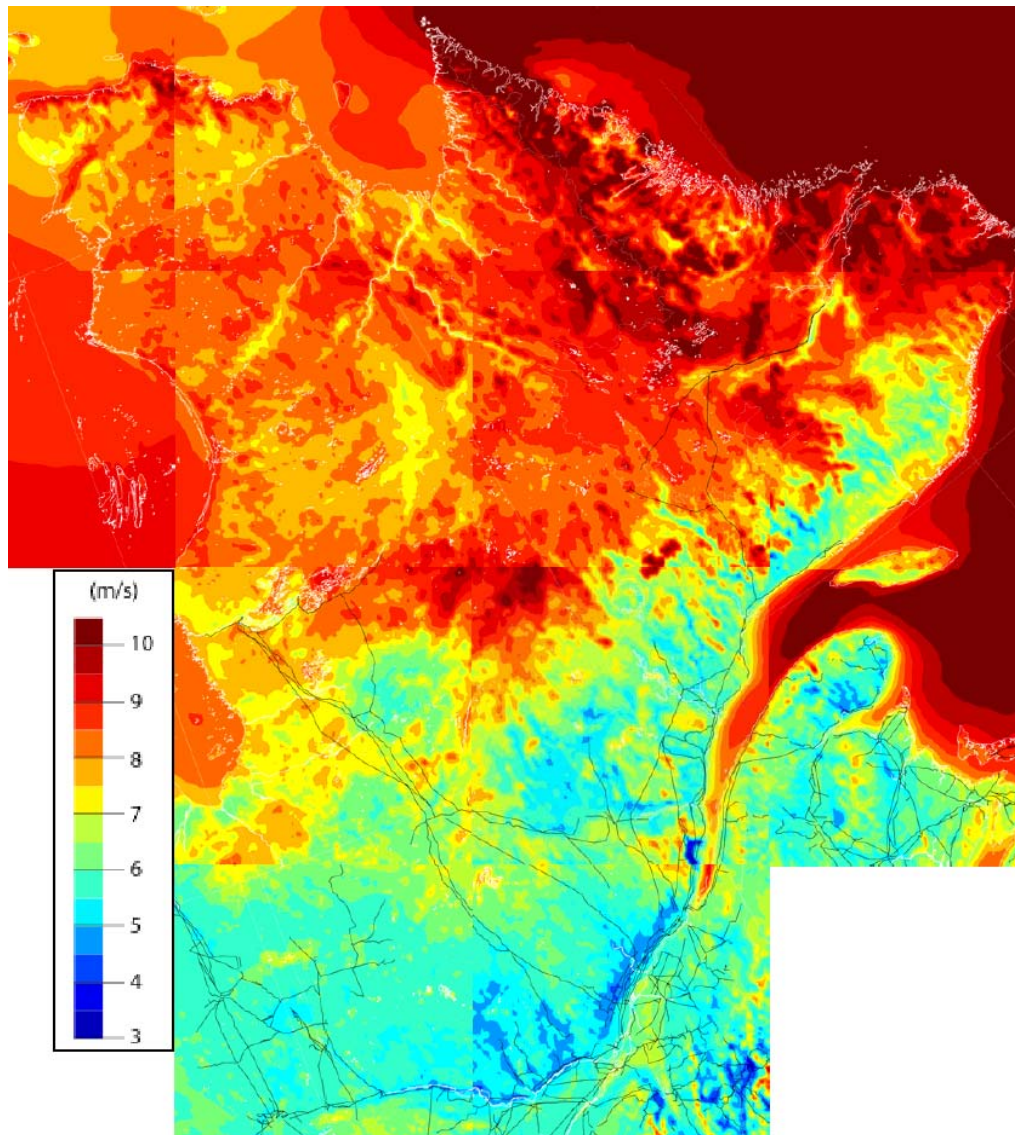


Figure 3: Wind maps of Québec at 80 m hub height, showing major transmission lines⁵

2.2 Local Impacts of Development

Wind energy is widely considered to be a *low-impact* form of renewable energy. As such the global benefits of wind energy systems generally outweigh their local impacts. Nonetheless there are local impacts where the power plants are developed.

Many factors come into play in the physical size of a wind farm including local geographic constraints, turbulence created by neighboring turbines and political constraints. As a general rule, using current technology wind farms occupy approximately 30-40 ha per MW, but can be significantly larger for the aforementioned reasons, but rarely smaller because of the turbulence or “shadow” that neighboring turbines produce. The actual footprint of a wind farm includes the

⁵ source: Environment Canada, Canadian Wind Atlas (www.windatlas.ca)

turbine, access roads and equipment only take up about 5% of the land area, the visual and air space impact of a 100 MW is therefore on the order of at least 3 500 ha or 35 km².

The most significant impact of wind farm development is the visual impact on the landscape as the machines often have hub heights of 80 m or more. Other impacts include local land disruption during construction, permanent access roads to each machine for maintenance, the need for new transmission corridors and the area of development to be kept clear of forest re-growth.

Noise and bird collisions are not usually considered to be major environmental issues with modern turbines whose development has undergone the necessary environmental impact assessments. The impacts wind farms may have on hunting in a northern context has not been well studied.

3 Barriers to First Nations

Despite the interest of many First Nations across Canada to date there is only one utility-scale wind energy project developed by a First Nation in Canada, namely the Weather Dancer I, a single 900 kW turbine built on the Piikani First Nation reserve in southern Alberta.⁶

While each First Nation has its own strengths and faces its own challenges, there are certain obstacles or barriers that First Nations face when trying to develop renewable energy projects such as wind energy.

Technical capacity, conflicting Federal and Provincial jurisdictional issues as well as local social and political issues are often cited as challenges facing First Nations when pursuing such projects. A 2005 report produced by the Assembly of First Nations entitled *Challenges to Implementing Renewable Energy and Energy Efficiency Projects in First Nation Communities* states:

Many First Nations face issues that require immediate attention and the allocation of resources, such as ensuring drinking water is safe, and cleaning up contaminated sites. As a result, First Nations generally do not have the time, financial and human resources or capacity to address longer-term, strategic planning issues, such as emergency preparedness, comprehensive community planning and climate change. These issues are important and deserve attention but are often, by necessity, given a lower priority than the more immediate, “crisis” issues we must address.⁷

The same report details challenges in the following categories: Capacity, Planning, Policy and Regulation, Economic, Technical and Social. In the current context, economic issues seem to be the most relevant as wind energy projects are capital intensive. Most First Nations do not generate significant untied revenue. Most of the money at the disposal of Chief and Council is earmarked from Indian and Northern Affairs Canada for specific local projects. First Nations typically need to look to financial institutions to raise capital, but have little experience in doing so while the financial institutions may be weary to lend with limited accessible collateral.

To overcome capital funding constraints most First Nations utility developments have been partnerships with private companies. Examples include:

- ✓ Piikani First Nation partnered with EPCOR (900 kW wind energy project)⁸
- ✓ Hupacasath and Ucluelet First Nations partnered with the City of Port Alberni and Synex Energy (6.5 MW mini-hydro project)⁹
- ✓ Ojibways of the Pic River First Nation partnered with Innergex II Income Fund (Umbata Falls mini-hydro project)¹⁰

⁶ A 50 kW turbine is owned and operated by Eskasoni First Nation in Nova Scotia.

⁷ Assembly of First Nations (2005) *Challenges to Implementing Renewable Energy and Energy Efficiency Projects in First Nation Communities*

⁸ <http://www.epcor.ca/Communities/Alberta/Operations/PowerGeneration/WeatherDancer.htm>

⁹ http://www.ippbc.com/2005/feds_support_hupacasath's_china_creek_hydro_project_at_groundbreaking_ceremony/

¹⁰ http://www.ainc-inac.gc.ca/nr/prs/m-a2006/2-02772_e.html

For all these reasons, in order to foster First Nations' involvement in wind energy projects a policy framework where private developers are encouraged to partner with the communities is key.

4 Wind Farm Economies of Scale

990 MW of wind energy have been approved by Hydro-Québec to be installed in the Gaspésie of the St. Lawrence River. The successful bids are listed in Table 2 below. It can be seen that most of the bids are for wind farms that are close to 100 MW in size; in fact, there is only one successful bid below 100 MW, namely the Montagne-Sèche 58.5 MW project to be built in 2011.

Table 2: Successful bids for Gaspésie wind development

2006	100.5 MW	Anse-à-Valleau
2006	109.5 MW	Baie-des-Sables
2007	150.0 MW	St-Ulric/St-Léandre
2008	109.5 MW	Carleton
2009	150.0 MW	Les Méchins
2010	100.5 MW	Mont-Louis
2011	58.5 MW	Montagne-Sèche
2011	100.5 MW	Gros-Morne phase 1
2012	111.0 MW	Gros-Morne phase 2

According to the Hélimax/Truewind report, wind projects in Québec are likely to cost on the order of 1.7 M \$/MW installed. Development and construction is typically 20-25% of the overall costs. These costs include such things as a wind monitoring program, feasibility studies, plant design, environmental permitting, most of which are fixed regardless of the size of the project. Additional costs include road construction, substation installation, tower foundation construction and turbine erection, which are variable with the size of the project, but clearly have economies of scale associated with them. In 2002, The Ontario Select Committee on Alternative Fuels estimated that the relative cost of a 25 MW wind farm would be 5% higher per installed MW than a 100 MW wind farm, a significant impact on projects that typically have narrow profit margins to begin with.

In addition there is presently a global shortage of wind turbines¹¹ as the demand for turbines has outpaced suppliers manufacturing capacity. While it is difficult to predict how much longer this shortage will last, in the near future manufacturers are likely to favor large orders over comparatively smaller ones in terms of priority of supply, commissioning and servicing of projects.

Therefore, it is my opinion that the 25 MW increments proposed for First Nation projects in the Québec energy strategy is an unusual constraint that is likely to not only increase the relative cost of a project, but may also impede its ability to be developed in a timely manner.

¹¹ http://www.sustainablebusiness.com/features/feature_template.cfm?ID=1313, http://www.canwea.ca/downloads/en/PDFS/WPPI_Letter_-_Lunn.pdf

5 Conclusions

Of the 990 MW of wind energy that were awarded in the initial call for tenders, no First Nations' partners were in any of the projects despite the Gaspésie being the traditional and current home to several Mi'kmaq Nations. Given the financial barriers that many First Nations face, without a specific incentive to do so for developers, Québec First Nations are unlikely to participate in the current call, despite the likelihood of projects being developed on lands where First Nations consultation may be required particularly in Northern Quebec and much of the North shore of the St. Lawrence River.

The 2006-2015 Québec energy strategy appears to attempt to address this issue by setting aside 500 MW of wind energy development for First Nations that is limited to 25 MW blocks.¹² While this provision will help encourage projects with First Nations, the 25 MW constraint is likely to increase the per MW installed cost compared to unconstrained projects in the current open tender. Finally, unlike the 2 000 MW tender that is already in the process of being developed, the 25 MW blocks have yet not been approved by the Government nor put forward by Hydro-Québec, as such their availability to First Nations is not guaranteed.

¹² <http://www.mrn.gouv.qc.ca/publications/energie/strategie/strategie-energetique-2006-2015.pdf>, pg 34