



**association to protect  
AMHERST ISLAND**

*Without prejudice to all our rights*

**File No. EB-2014-0300**

Feb. 20, 2015

Ontario Energy Board  
P.O. Box 2319  
2300 Yonge St, 27th Floor  
Toronto, Ontario, M4P 1E4

**Attn: Ms. K. Walli, Board Secretary**

Dear Ms. Walli:

Re: EB-2014-0300 Windlectric's Proposed Amherst Island Wind Energy Project:

**Intervenor Response to Interrogatories on Evidence Submitted by the  
Association to Protect Amherst Island (APAI)**

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Further to Procedural Order #2, issued on January 8, 2015 please find enclosed the Association to Protect Amherst Island's response to the interrogatories filed by Board Staff on Jan. 29, 2015. Board Staff Interrogatories 1- ii ; 1- iv ; and 1- vii will follow in separate e-mails.

APAI is very grateful to the Board for extended the deadline on this submission.

APAI is sending two copies of this response by regular mail.

Yours truly,

*Original Signed By*

Laurie Kilpatrick  
Association to Protect Amherst Island  
c/o 4175 South Shore Rd.  
Stella, Ontario K0H 2S0  
Telephone: 613.634.3057

cc: Parties

EB-2014-0300

**BOARD STAFF INTERROGATORIES TO APAI**  
**Interrogatory #1 of 3**

Re: REA Matters, Ancillary Infrastructure Construction and Transmission Project  
Schedule Impacts

**Reference:**

- a. APAI Letter to the Board dated January 19, 2015
- b. APAI Intervenor Evidence, Island Dock Study Schedule
- c. APAI Intervenor Evidence, Letter to Bruce Campbell dated January 12, 2015
- d. APAI Intervenor Evidence, Construction Windows
- e. APAI Intervenor Evidence, Official Report of Debates of February 18, 2014 (statement by MPP Laurie Scott)
- f. APAI Intervenor Evidence, Letter to MOECC dated October 24,
- g. APAI Intervenor Evidence, Letter to MOECC dated December 16, 2014
- h. APAI Intervenor Evidence, Letter to MOECC dated January 6, 2015
- i. APAI Intervenor Evidence, Letter to MOECC dated January 15, 2015
- j. APAI Intervenor Evidence, Letter to MNR dated November 29, 2014
- k. APAI Intervenor Evidence, Letter to Transport Canada dated January 22, 2015

**Preamble:**

Reference (a) states in part:

We find that the Construction and the In-Service Schedule (Exhibit B, Tab 2, Schedule 1, p.6 of 9) lacks in important detail. In addition the Applicant does not include or address any matters, external, that could impact on these schedules. [...]

APAI believes that Windlectric's schedules do not take into account the realities of living on a very unique and small Island. We maintain that this fact has already resulted in

delays to their schedule. **APAI submits that the schedules are not credible. [Emphasis added]**

Administrative issues and evidence include:

- construction of Windlectric's permanent dock is not included in the construction schedule
- dock construction could be further restricted by ice from mid January to the end of March and the arrival of the very small Loyalist ferry
- construction on the Amherst Island and Millhaven Ferry Terminals will begin this summer, this is not mentioned as a factor affecting the timeline in Windlectric's report [...]
- Windlectric's FIT contract could be at risk of being terminated by the OPA in the same way that the Horizon Wind Big Thunder Project FIT contract was terminated [...]

APAI recognizes that issues related to the environment, heritage noise and health are not within the purview of the OEB however we maintain that the new information could result in further delays to the REA approval and the project schedule and it is APAI's position that the Board requires this information to make its decision. [...]

- Amherst Island has 25 species at risk, including birds, reptiles (eg. the threatened Blandings Turtle) and fish. The schedule needs to include the construction windows required by the various agencies responsible for these permits. APAI asserts that taking these windows into consideration is critical to the public's understanding of the project and to approving the transmission project.

- The REA for the Windlectric wind energy project has not yet been issued and the MOECC's technical review of the Windlectric project is ongoing. The MOECC has made it clear that the review process is iterative and that all new information must be considered in its technical review. [] **APAI is aware that Windlectric has reviewed a draft of the REA approval and has information on the conditions of approval.** [Emphasis added]

Reference (i) submits that Stantec's assessments are incomplete.

## Interrogatory #1 of 3

### Question/Request: 1-i

**i. Windlectric has applied for a leave to construct. Please indicate whether the construction of a permanent dock is critical to the construction of the project, more particularly to the construction of the applied-for transmission infrastructure.**

### Response/Request:

Construction of Windlectric docks on the Island and on the Mainland is critical to the construction of the transmission project and particularly to the construction of the applied-for transmission infrastructure.

Windlectric plans to use the Island dock and ferry, known as the Frontenac II, in order to construct the Island dock for the wind project. Once the Windlectric docks and the new roads associated with the Windlectric dock and transmission project are in place, Windlectric will then be in a position to begin constructing the proposed transmission facilities.

In Windlectric's Response to APAI Interrogatories of Dec. 15<sup>1</sup>, the Applicant states:

*The Applicant does not expect to rely upon Amherst Island's ferry or its docks for purposes of constructing the proposed transmission facilities. The Amherst Island ferry and dock will only be used as needed by the Applicant to construct its own dock.*

*Access to the Amherst Island ferry and dock will be negotiated with the owners and operators of the ferry and dock if required. It is expected that this will be completed prior to commencing construction of the proposed transmission facilities.*

At present, the 38-car Amherst Island ferry is the only access to Amherst Island. There is no other way to access Amherst Island for construction purposes. Unlike Wolfe Island, Amherst Island does not have another dock that can be used for major construction purposes.

The Island ferry carries approximately 33 vehicles and the length limit for vehicles is 35 ft. There is also a height restriction of 10 ft. The Island ferry is side loading and therefore its capacity for managing construction vehicles is extremely limited.<sup>2</sup> The ferry must also be shared with 406 Islanders, visitors, construction vehicles, livestock trucking, emergency vehicles, and police as there are very few amenities and services on Amherst Island.

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<sup>1</sup> Windlectric, Response to Interrogatories; Exhibit B; Tab 1; Schedule 4; P.4 of 35.

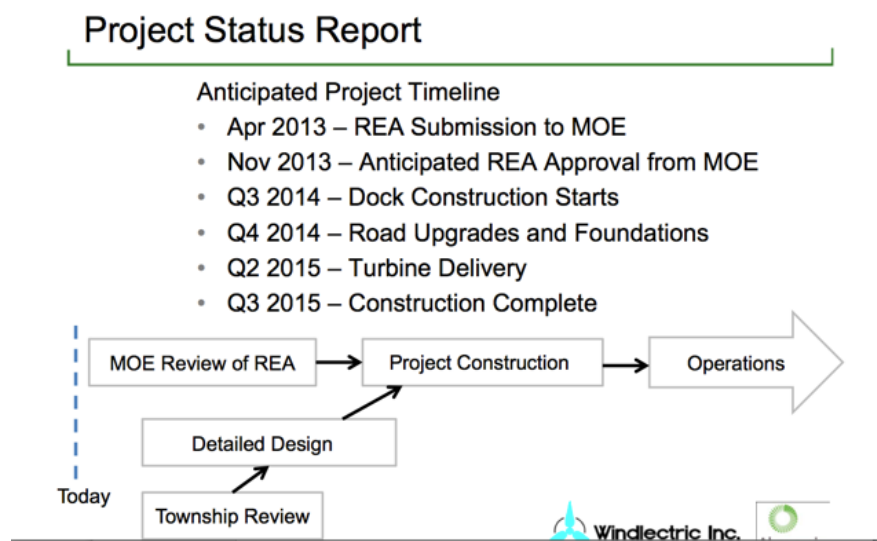
<sup>2</sup> AECOM Loyalist Township municipal consultation form

<sup>2</sup> AECOM Loyalist Township municipal consultation form

**Amherst Island's Side Loading Ferry, the *Frontenac II***



In January 2013, Windlectric Inc. shared the following project schedule at a Loyalist Township Town Hall meeting on Roads-Use<sup>3</sup>. Notably, Windlectric includes dock construction. This schedule allows 11 months after an REA to start construction on the docks, presumably allowing time for the winter freeze-up of the channel, the REA process, and time for the windows of construction related to species at risk.



**Question/Request: 1- ii**

**Please complete the table appended to reference (c) by highlighting APAI's concerns with each outstanding permit referenced, and highlight any projected delays.**

**Response:**

See FILE: OEB site APAI\_IRR\_EVD\_PERMITS CHART\_20150220

<sup>3</sup> Algonquin, Windlectric Presentation on the Amherst Island Wind Energy Project, Loyalist Township Town Hall Meeting January 2013.  
<http://amherstislandwindproject.com/Information%20presented%20at%20the%20Loyalist%20Township%20Jan%2029th%202013%20Meeting/Presentation%20at%20the%20Loyalist%20Township%20Meeting.pdf>

**Question/Request: 1 - iii**

**Please restate how the draft approval conditions associated with the REA and referenced at (h) would aid the Board in its decision in this proceeding.**

**Response: 1- iii**

The granting of a renewable energy approval is a milestone. There is no longer uncertainty about the decision and there is clarity about which issues are also of importance to the MOECC. Much of the evidence that APAI would present in the absence of an REA would no longer be relevant.

Once an REA is issued, it is possible to devise a more realistic schedule for the project. Windlectric's Request for Approval would focus on errors and corrections to the Application.

APAI has many concerns, for example the lack of Emergency Plans, Roads, Heritage Resources, Traffic by the School and through Stella, and use of the ferry. Once an approval has been given all of these issues are no longer in play. Unless MOECC has included certain conditions on the approval that impact these areas.

The conditions associated with the REA reveal the areas that the MOECC deems important and that Windlectric will have to honour these conditions in order to construct the project.

Windlectric has viewed the draft REA and therefore understands the issues that MOECC is concerned about and also is aware of APAI issues that have been rejected.

**iv. If feasible, please submit a credible schedule or schedules, and provide the underlying assumptions.**

**Response 1- iv:**

See Files:

APAI\_IRR-EVD\_PSSummary\_20150220

APAI\_IRR\_EVD\_PSSummary\_20150220

APAI\_IRR\_EVD\_Conflicts\_20150220

**Interrogatory 1 – Question v.**

**v. Please indicate whether any awarded FIT contract for an on-going project has been cancelled for failure to meet the contractual in-service date.**

**Response:**

To APAI's knowledge, two (2) wind energy FIT contracts have been terminated by the IESO/OPA. These contracts were the Horizon Big Thunder Wind Park (32 MW) and the Roubos Wind Farm (0.5 MW).

The Horizon Wind project failed to meet the contractual in-service date and was to our knowledge the first project to have their FIT contract cancelled by the OPA. Horizon Wind Inc. was proposing the development of an industrial wind turbine installation called Big Thunder Wind Farm on a portion of the Nor'Wester Mountain Range land.

A number of other issues were reported in the media as having contributed to OPA's decision to terminate the Horizon Wind contract, including lack of Aboriginal consultation, effects on the watershed, and tourism.

The Nor'Wester Mountain Range was designated one of the Top Ten Endangered Places in Canada in 2014<sup>4</sup> by Heritage Canada, the National Trust. In 2013, Amherst Island was listed on Heritage Canada, the National Trust's *List of the Top Ten Endangered Places in Canada* based on the significant threat of the Windlectric Wind Energy Project to Amherst Island's rich cultural and natural heritage<sup>5</sup>.

More recently, the OPA cancelled the FIT contract for the Roubos Wind Farm. This project received an REA in May 2014 and according to Mr. Orville Walsh who provides status updates on renewable energy projects, this is the only project that has been granted an REA and subsequently has had the FIT contract terminated.

The chart below, prepared by Mr. Orville Walsh, used data from the quarterly *Progress Reports on Contracted Electricity Supply* published by the Ontario Power Authority.

The wind projects that appear as cancelled on this status update are projects that have been reported terminated by the OPA/IESO.

OPA Terminated Feed-In Tariff Contracts				
Project Name	Supplier	Project City	Renewable Fuel	Termination Date
100Kw Minesing	Raymond Foster	Minesing	Solar (PV) (Rooftop)	2011-Q4
CEPEO Elementary Nouvel Horizon	Ameresco CEPEO Solar Inc.	Hawkesbury	Solar (PV) (Rooftop)	2012-Q4
Montague 250kW Solar	Scott Kelso	Montague	Solar (PV)	2012-Q4

<sup>4</sup> <https://www.heritagecanada.org/en/issues-campaigns/top-ten-endangered/explore-past-listings/ontario/nor'west>

<sup>5</sup> Heritage Canada, the National Trust, Top Ten Endangered Places in Canada 2013



PV-Rooftop			(Rooftop)	
Bioniche Life Sciences Inc.	Canada Solar Consortium Corp.	Belleville	Solar (PV) (Rooftop)	2012-Q4
Harmer 4892 FIT	Eugenia Developments Limited	Hillsdale	Solar (PV) (Rooftop)	2012-Q4
Harmer Hickling FIT	Eugenia Developments Limited	Shanty Bay	Solar (PV) (Rooftop)	2012-Q4
19 Waterman	Rooftop Energy Solution Inc.	Toronto	Solar (PV) (Rooftop)	2013-Q1
71 Kincort	Rooftop Energy Solution Inc.	Toronto	Solar (PV) (Rooftop)	2013-Q1
170 Midwest	Rooftop Energy Solution Inc.	Scarborough	Solar (PV) (Rooftop)	2013-Q1
Bayly Brock 250KV Solar PV System	Bayly Brock Properties Ltd.	Pickering	Solar (PV) (Rooftop)	2013-Q1
Big Thunder Beta Windpark	Big Thunder WindPark LP	Municipality of Neebing	Wind (On-Shore)	2014-Q3
Roubos Wind Farm	Willem Roubos	Palmerston	Wind (On-Shore)	2014-Q4
Nussbaumer Rooftop	Mark Nussbaumer	Pinewood	Solar (PV) (Rooftop)	2014-Q4
Vanden Dool Solar	Gary William Vandendool	Port Lambton	Solar (PV) (Rooftop)	2014-Q4
Rose City Islamic Centre Green	2325895 Ontario Inc.	Windsor	Solar (PV) (Rooftop)	2014-Q4

**vi. If applicable, please update the Board on recent developments:**

**a. If and when available, please submit a copy of the Independent Electrical System Operator's response to the letter at reference (c).**

— Reference (c) APAI Intervenor Evidence, Letter to Bruce Campbell dated January 12, 2015

**Response received:**

See: APAI\_IRR\_EVD\_Board\_Staff\_2015.01.26 Butler (Campbell) IESO to Large re Windlectric with Attachment re FIT Contracts\_20150220

**b. If and when available, please submit a copy of the MOECC's responses to the letters at references (f), (g), (h) and (i).**

— Reference (f) APAI Intervenor Evidence, Letter to MOECC dated October 24, 2014

This document was sent to the Technical Review Committee, MOECC  
c/o Ms. Suzanne Edwards

No Response Expected

— **Reference (g) APAI Intervenor Evidence, Letter to MOECC dated December 16, 2014**

This document is the Amherst Island Heritage Review, written by Harold Kalman, sent to Agatha Garcia-Wright MOECC.

Ms. Garcia-Wright responded on Jan. 13, 2015, acknowledging receipt of Dec 16 Report from Dr Kalman and that they have forwarded it to MTCS.

No further response as of 18-Feb-15

— **Reference (h) APAI Intervenor Evidence, Letter to MOECC dated January 6, 2015**

This letter was sent to Agatha Garcia-Wright from APAI, John Harrison concerning new studies to indicate the Hatch Noise Assessment is inadequate.

No Response received as of Feb. 18, 2015

— **Reference (i) APAI Intervenor Evidence, Letter to MOECC dated January 15, 2015**

This letter was sent to Ms Sarah Paul MOECC concerning groundwater studies on Amherst Island.

No Response received as of Feb. 18, 2015

**c. If and when available, please submit a copy of the MNR's response to the letter at reference (j).**

— Reference (j) APAI Intervenor Evidence, Letter to MNR dated November 29, 2014

This letter was sent to Min. B. Mauro. It indicates a Failure of Algonquin Power/Windlectric Inc to comply with MNRF technical requirements in its submission on Natural Heritage and Environmental Impact Assessment in support of its REA application. MNRF staff have simply accepted the proponent's assurances rather than conducting a compliance review or

audit of field studies in relation to the Ministry's technical requirements.

No Response received as of Feb. 18, 2015

**d. If and when available, please submit a copy of Transport Canada's response to the letter at reference (k).**

Reference (k) APAI Intervenor Evidence, Letter to Transport Canada dated January 22, 2015

Please NOTE, there were two letters dated and sent to Transport Canada on February 2, 2015 (not Jan 22 as stated). The first letter contained an error and the second letter is the REVISED copy of that same letter.

No Response received as of Feb. 18, 2015

**Question vii:**

**If APAI of any independent third party review of the source documentation contained in the studies including portions of the studies that are part and parcel to this application please indicate so.**

A summary of the expert studies and their respective file names can be found in:  
 APAI\_IRR\_EVD\_Board\_Staff\_\_APAI\_Expert Studies Final\_20150220

**Question viii:**

**Does APAI have any concern with the accuracy of the studies or portion of the studies that are part and parcel to this application? If so, please indicate what the studies are and APAI's specific concerns.**

**Response 1-viii-A:**

Reference: Exhibit C; Tab 2; Schedule 1; Figure 4C  
 Exhibit E; Tab1; Schedule 1; Page 1 of 12; Lines 5-15

APAI has concerns related to the Project Substation as outlined in the APAI letter to the OEB of Feb. 12, 2014<sup>6</sup>. This letter is part of APAI's response to Board Staff Interrogatory 1-viii-A.

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<sup>6</sup> [APAI LETTER WIndlectric Substation\\_20150212](#)

In addition, APAI believes that the coordinates for two of the poles on the transmission line routing from the submarine cable (Island portion) to the Project Substation are incorrect.

Using the coordinates provided in Windlectric's application (see chart below), APAI has mapped the trajectory of the transmission line (see map below) and it appears that the locations of Poles 9 and 11 are in error.

This is of particular concern as this error occurs at the boundary of two landowners' properties and therefore could impact the landowner agreements.

In addition, there is a discrepancy between the lots and lands surveyed for Windlectric's Stage 2 Archaeological Assessment and the lots that are identified as locations for the transmission line and associated infrastructure. The Final Stage 2 Archaeological Assessment<sup>7</sup> reports that survey work was carried out on Lots 33-36, as stated below.

*4.15 S06, SUBSTATION, OPERATION AND MAINTENANCE BUILDING LOCATION (O&M), LAYDOWN AND STORAGE AREA This combined group comprises several different Project components in an area north of 2<sup>nd</sup> Concession Road, west of Stella 40 Foot Road and south of Front Road, occupying parts of Lots 33-36, Second Concession, Amherst (Figure 5). The complex incorporates an area of approximately 25 ha of ploughed ground that was pedestrian surveyed and an area of approximately 0.45 ha of ground that required test pit survey due to the presence of extremely shallow and exposed bedrock between the substation location and the laydown and storage area (Photos 22 and 23). The S06 access road will follow an existing access road for most of its length. There is also approximately 800 m of collector line that will run from the substation toward Front Road and the Amherst Island cable landfall and temporary dock area. This part of the Project was surveyed on December 8 and 14, 2011 and on April 26, 2012.<sup>8</sup>*

According to Windlectric's Application, the Project Substation will be situated on Part Lots 31, 32 and 33<sup>9</sup>:

***(a) Project Substation** As described in Exhibit B, Tab 2, Schedule 1, the Project Substation will have a footprint of approximately 0.3 ha and will be situated on Part Lots 31, 32 and 33, Concession 1 in Loyalist Township, which is approximately 1.3 km southwest of the town of Stella on Amherst Island, as shown in Figures 3(b) and 4(c) of Exhibit C, Tab 2, Schedule 1. This property is comprised of a single, privately owned parcel of agricultural land. Windlectric has entered into an option to lease the relevant property, which will support the Project Substation, as well as any ancillary buildings, equipment and cables required in this location. This option to lease, which also covers a portion of the overhead Transmission Line, requires an amendment to reflect the final project design. Windlectric has been in discussion with the relevant landowner and it is anticipated that the amendment will be executed shortly.*

If it is true that the Substation is situated on Lots 31 and 32, as well as Lot 33 and the locations of Poles 9 and 11 are incorrect, the relationship of these discrepancies to the amendment in the landowner agreement referenced above if any, needs to be clarified by

<sup>7</sup> [http://amherstislandwindproject.com/Technical%20Documents%20Final/10\\_Stage2\\_Arch/Stage2-Arch\\_Entire-report.pdf](http://amherstislandwindproject.com/Technical%20Documents%20Final/10_Stage2_Arch/Stage2-Arch_Entire-report.pdf); P. 17 (or P.23 of 55)

<sup>8</sup> Windlectric Inc. Stage 2 Archaeological Assessment, Oct. 12, 2012

<sup>9</sup> Exhibit E; Tab1; Schedule 1; Page 1 of 12; Lines 5-15

Windlectric. Related concerns were expressed by APAI in our letter of Feb. 12, 2015 to the OEB<sup>10</sup>.

If the developer is now including Lots 31 and 32 in the substation footprint, there is another important issue. According to the Final Stage 2 Archaeological Assessment, Stage 2 archaeological assessment of these lots was not carried out and consistent with the Ontario Heritage Act, an assessment will need to be conducted in advance of construction on the footprint.

**Windlectric Figure 4(c): Exhibit C; Tab 2; Schedule 1: Routing from Submarine Cable to Project Substation**<sup>11</sup>

<b>POLE LOCATIONS</b>		
<b>POLE #</b>	<b>NORTHING</b>	<b>EASTING</b>
<b>STATION</b>	4 892 083.000	363 119.700
1	4 892 039.000	363 144.100
2	4 891 940.000	363 199.800
3	4 891 837.000	363 173.500
4	4 891 756.000	363 226.600
5	4 891 665.000	363 286.600
6	4 891 555.000	363 358.900
7	4 891 457.000	363 423.500
8	4 891 353.000	363 393.800
9	4 891 353.000	363 368.400
10	4 891 219.000	363 315.900
11	4 891 219.000	363 251.300
<b>STATION</b>	4 891 117.000	363 259.700

### **APAI Map of Transmission Poles with Incorrect Coordinates**

Source: Map prepared for APAI by Wayne Gulden, February 2015

<sup>10</sup> [APAI LETTER\\_WIndlectric\\_Substation\\_20150212](#)

<sup>11</sup> EB-2014-0300 Windlectric Application; MAPS; Exhibit C; Tab 2; Schedule 1; Figure 4C



----- End of Question viii (A) -----

### **Board Staff Interrogatory 1- Question viii**

#### **Response 1-viii - (B):**

Reference: Exhibit B; Tab 2; Schedule 1; Page 6 of 9; Windlectric Response to Interrogatories; Dec. 15, 2014.

APAI has previously identified a significant concern with the absence of a Project Schedule in the Windlectric Application.

Windlectric has only provided the duration of certain activities and this information is not tied to a schedule. Windlectric Inc. needs to file a project schedule with the OEB, including an in-service schedule. Other applicants provide GANTT charts in their applications.

There is further information on the project schedule in APAI's response to Board Staff's Interrogatory 1-iv requesting a credible schedule with assumptions.

**Board Staff Interrogatory 1- Question viii****Response 1– viii (C)**

Reference: Exhibit F

**System Impact Assessment and Consumer Impact Assessment Require Updating**

The SIA was issued on April 18, 2012. Since that time the number of generation facilities in service near Amherst Island has increased. To name a few, the Napanee Generating Station was announced in Sept. 2012; the Ernestown Wind Park became operational in October 2014; and a number of solar installations in Loyalist Township/Kingston west, including the 100 MW Sol-Luce project are not included.

The Consumer Impact Assessment (CIA) was submitted by Hydro One on April 16, 2012, at a time when the expected in-service date for the Windlectric Generation Project was November 2014.

The approximate location of the Amherst Island transmission connection to Hydro One's network is shown as being approximately 1.5 km. to the east of the location proposed in the Applicant's evidence.

APAI also questions whether the projected load growth up to 2017 has changed with the dramatic increase in residential housing in the area of Odessa and Amherstview.

- ix. At reference (a), APAI mentions changes to the transmission line noted in the applicant's Modification Report #1. To APAI's knowledge, have there been any changes to the transmission route since the filing of the application. If so, please file relevant evidence.**

**Response 1-ix :**

To our knowledge there has been no change to the transmission line since Windlectric's application was submitted to the OEB.

APAI does have an issue however with the siting and trajectory of the transmission cable.

APAI is not clear from the evidence presented of the actual trajectory of the cable from the mainland to the Island. It appears that this is still in question. APAI recognizes that the mainland cable landing has a number of conflicts, including a skiff shipwreck<sup>12</sup>; and an intake pipe and the mainland dock location is still in flux.

If the underwater cable landing on the Mainland goes in a straight line to the cable landing site on the Island, it will pass over the bubbler at the site of a second ship wreck (the North Amherst Wreck), which the proponent admits could be the Schooner Two Brothers. A ship famous in the Flight of the Royal George.

The construction that will take place in the lakebed at this location is cause for concern as it could interfere with this potentially significant heritage resource. It is therefore important to have the UTM readings for the "North Amherst Wreck"<sup>11</sup> and the Transmission cable in order to be sure the construction in the lakebed and the cable do not have an impact.

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<sup>12</sup> Windlectric's Underwater Archaeological Assessment, p. 37 for map  
[http://amherstislandwindproject.com/Technical%20Documents%20Final/04\\_Underwater-Arch/\\_UnderwaterArch\\_Entire-Report.pdf](http://amherstislandwindproject.com/Technical%20Documents%20Final/04_Underwater-Arch/_UnderwaterArch_Entire-Report.pdf)



EB-2014-0300

**Board Staff Interrogatory #2 of 3**

## Financial Viability

**Reference:**

- a. APAI Letter to the Board dated January 19, 2015
- b. APAI Intervenor Evidence Investor Slide dated November 25, 2014
- c. APAI Intervenor Evidence, Economic Risk Analysis p.7-10; Financial Analysis of the Amherst Island Project
- d. APAI Intervenor Evidence Deborah Barrett's Letter dated January 22, 2015

**Preamble:**

At reference (a), APAI states in part:

...that the project has been designed as if no one lives on Amherst Island or ever did. \$260 M of construction on a very small Island presents significant challenges for the developer and untold disruption to Island way of life.

Further at reference (a), APAI notes:

Windlectric's plan for the transmission project is based solely on economics. They have pushed for the least expensive option for Windlectric and highest profits for the parent company Algonquin Power.

Elsewhere in the evidence, APAI suggests that Windlectric Inc. has not provided the necessary assurances regarding its financial capability.

**Question/Request:**

**i. Please confirm that the author of the slide at reference (b) is the parent's, Algonquin Power.**

**Response (2i):**

APAI Intervenor Evidence-Investor Slide dated November 25, 2014 is part of the presentation by Algonquin Power, as follows:

Algonquin Power & Utilities Corp; Presentation on Generation, Transmission, Distribution; November 25, 2014; p.35 or p.38 of 70.

[http://investors.algonquinpower.com/interactive/lookandfeel/4142273/AQN\\_Investor\\_Day\\_Book\\_2014.pdf](http://investors.algonquinpower.com/interactive/lookandfeel/4142273/AQN_Investor_Day_Book_2014.pdf)

**2ii. Please provide the source for the numbers used in the financial analysis at reference(c).**

**Reponse (2ii):**

See Attachment 1 prepared by Dr. John Harrison. Please note that Dr. Harrison's CV is included in the Appendix of the response.

**iii. Please confirm whether APAI has concerns with Windlectric financial capability. If so, please specify what these concerns are.**

**Response 2(iii):**

APAI has serious concerns with the financial viability of Windlectric and their capacity to develop, operate and own the Amherst Island Wind Energy Project. APAI also has concerns regarding liability and insurance and Windlectric's capacity to deal with the costs associated with serious accidents and emergencies. Further, to our knowledge, there is no reference in the Application that Windlectric Inc will necessarily be responsible for decommissioning the proposed project.

According to the OEB Application, Windlectric Inc. is responsible for developing, owning and operating the Amherst Island Wind Energy Project. This would include the Transmission facilities.

This is a significant undertaking for a company that has two directors, no employees, no financial assets, no construction record, no safety history and no evidence of liability insurance.

As the Applicant says in its Response to APAI's Interrogatories

*It, (Windlectric) does not own and has not developed any other operational facilities<sup>13</sup>.*

b. APAI has no evidence that the interests and assets of Amherst Island residents and Loyalist Township will be protected from the very real risks posed by the current transmission project design.

Windlectric has not provided evidence or a satisfactory answer to APAI's interrogatory regarding insurance:

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<sup>13</sup> Windlectric Response to APAI Interrogatories, Dec. 15, 2014

*Does Windlectric Inc. have sufficient assets and insurance to protect the leaseholders and landowners of Amherst Island in the event that there is a marine accident including a spill, an industrial accident, a fire or lightning strike or any other type of accident that could harm an individual or the environment on land or in the channel between Amherst Island and the Mainland?*

*The Applicant notes that appropriate insurance will be maintained during construction and during the operating life of the transmission facilities, and that it will ensure that any contractors it engages carry appropriate insurance as well.*

APAI needs proof that Windlectric has sufficient liability insurance to protect residents, visitors and workers for the duration of the twenty-year life of the project. Otherwise, legal action will be the only way to seek compensation.

c. As a shell company, Windlectric can be easily dissolved in the event that there is harm to people or the environment from an accident. Island residents and Loyalist Township will be left to deal with the fallout.

d. APAI, on three occasions<sup>14</sup> has witnessed the disregard that Windlectric has for the rules that are in place to protect people and the environment.

Once there is an approval APAI has no doubt that Windlectric will disregard the commitments and promises made by Windlectric<sup>15</sup> in public meetings such as, only using the Island ferry to build their docks; avoiding Island roads when our school buses are using them; respecting construction hours; and not blocking roads without prior approval.

e. The Applicant's incomplete studies conclude there will be no impacts on the environment or on the health of the people living here. Our studies provide evidence that there will be serious impacts to a majority of Islanders and to the Island environment as a result of the ill-conceived siting and design of the generation project and the Transmission Project.

Windlectric has not in any way acknowledged the risks that have been identified in thousands of comments from the public. In addition, the project design has not been changed to address the issues expressed by the public. Windlectric' states on its website that:

*Revisions were undertaken primarily in response to comments from the MOE. These revisions have been submitted to MOE and are now included as part of the Amherst Island Wind Power Project REA application.*<sup>16</sup>

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<sup>14</sup> This refers to Windlectric accessing road allowances and our ferry dock without permission of the appropriate officials and ploughing in owl habitat during the restricted period.

<sup>15</sup> Presentation roads use

<sup>16</sup> <http://amherstislandwindproject.com/public-information.html?folderid=link0>

APAI also understand that the public will not be consulted in the development of the emergency or safety plans associated with the project. (marine, land, electrical transmission, etc.) This is of great concern to APAI.

The fact that Windlectric has chosen Front Rd. and our only village Stella as a primary transportation route despite thousands of comments provided to the developer and to the MOE by Islanders and Loyalist Township suggests there is something very wrong with the REA process.

For the authorities, including the OEB, to allow thousands of oversize trucks with aggregate and turbine components to travel with their approval:

- from Windlectric's dock and the site of the Transmission facilities located one-half kilometer from our school and main Island meeting place;
- east along Front Rd. past the school and community centre, where there are no sidewalks;
- to the only four-way intersection on Amherst Island Island;
- through that intersection that is the only access to the Frontenac II Ferry and is the busiest corner on the Island;
- through the heritage waterfront village of Stella that Windlectric has defined as a cultural heritage landscape;
- where the houses are within metres of Front Rd. and the buildings are built heritage resources, including a blacksmith shop, dance hall, Irish land agent's home, general stores etc)
- past all of the protected properties on Amherst Island, again all being located at the roads edge.

is beyond belief. To those of us who live here and travel to the mainland for high school work, appointments and all amenities including gas this route is a life changing disruption to our way of life and a threat to our health and livelihood.

*f. It is anticipated that the transmission facilities will be operated pursuant to a services agreement between Windlectric and Algonquin Power.<sup>17</sup>*

APAI believes the contents of this 'anticipated' service agreement needs to be made available to the Parties. As stated above, Windlectric, is a shell company and can walk away from the project and leave Islanders to deal with a mess. APAI needs assurances that this will not happen.

Evidence in support of APAI's concern is included one of the landowner agreements in Windlectric's Application, as follows:

*The Transferee shall have the right to abandon the electric transmission facilities, or any*

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<sup>17</sup> Windlectric Response to APAI interrogatories, Dec. 15, 2014

*part thereof, during the term of this Easement and Right-of-Way.*<sup>18</sup>

It is astounding that Windlectric would include such a clause in a landowner agreement given its promises in writing<sup>19</sup> that it will decommission.

g. Between 2013 and 2014 APAI submitted a total of fourteen separate (14) letters dealing exclusively with decommissioning of the Amherst Island Wind Project.<sup>20</sup>

- Five (5) letters were sent to the Ministry of the Environment. The MOE responded to one of these letters in a letter that covered many issues and simply cited the minimum requirements of the regulations with respect to decommissioning in their renewable energy application.
- Four (4) letters on decommissioning were sent to different Ministers, no responses were received.
- Five (5) letters were sent to Windlectric Inc.. APAI did not receive a response to any of these letters.

h. Windlectric Inc. has not agreed to APAI's request that Windlectric establish a fund or bond to pay for decommissioning costs of the proposed transmission facilities or the generation project. Therefore, it is not clear how decommissioning the transmission facilities and the wind project more generally will be funded and who will do it. Will it be the Province, Loyalist Township and/or the landowners?

The Director of Planning for Loyalist Township made the following comments in the Municipal Consultation Form and submission to Windlectric Inc. This report was approved by Loyalist Council on March 22, 2013.

*Amherst Island is a remote site and has logistical constraints that increase the cost to decommission. The concern is whether the Province or the Proponent should provide some sort of financial assurance in the form of security. The Township should raise this concern and the proponent should commit to timing the decommissioning i.e. within six (6) months of closing and take no more than one (1) year to complete. (p.11-12)*

Mr. Sean Fairfield, Senior Manager, Algonquin Power wrote to Loyalist Township on April 8, 2013 and stated the following:

*The project developer (Windlectric Inc. – a subsidiary of Algonquin Power Co.) is responsible (not the landowners) for all financial issues (including safety and*

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<sup>18</sup> Forms of Land Owner Agreements

<sup>19</sup> Sean Fairfield Letter to Loyalist Township

<sup>20</sup> See APAI Decommissioning File on OEB site.

*decommissioning costs) regarding the proposed construction and operation.*<sup>21</sup>

It is unclear whether Mr. Sean Fairfield has signing authority for Windlectric Inc.

h. Windlectric may sell or abandon the project at some point during the twenty years. APAI has had no assurances that a new owner would respect the agreements made by Windlectric.

i. Dr. Harrison's study on Economics and Engineering<sup>22</sup> states that Algonquin Power does not appear to include the cost of decommissioning in their cost estimates for the project. This is another of APAI's concerns.

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<sup>21</sup> <https://loyalist.civicweb.net/FileStorage/C1521567272645DBB3849D72F90612B5-S>

<sup>22</sup> Harrison, John Economics and Engineering Risk Analysis

EB-2014-0300

**Board Staff Interrogatory #3 of 3: Process****Reference:**

- a. APAI Letter to the Board dated January 19, 2015
- b. APAI Intervenor Evidence William Barrett's Letter dated January 2, 2015
- c. APAI Intervenor Evidence, Katherine Little's Letter dated January 5, 2015

**Preamble:**

At the reference, APAI states in part:

The public has had little to no opportunity for public consultation on either the original siting, the siting alternatives for the Transmission Project or on the project details within the REA process.

[...]

The Applicant suggests that the OEB application process provides the opportunity for public consultation on the transmission project. This is not a solution to the lack of consultation as only a limited number of issues would be addressed in the hearing.

**3. Questions/Request:**

**i. Please confirm that APAI understands that the Board does not hold public consultations on any of the different aspects of the overall wind project, rather a public hearing on the application before it.**

**Response:**

APAI confirms that we understand that the public hearing is on Windlectric's Application for Leave to Construct and not on the different aspects of the overall wind project.

**ii. Please indicate whether Windlectric responded to any of the comments at references (b) and (c).**

**Response:**

As of Feb. 20, 2015, William Barrett and Katie Little have not received responses to their letters of comment.

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## ATTACHMENT 1

### **Question/Request 2(ii):**

**Please provide the source for numbers used in the financial analysis at reference (c)**

### **Response 2(ii):**

#### **Sources for the Numbers Used in the APAI Engineering and Economic Analysis of the Windlectric Project**

The following report addresses the sources of the numbers used in the APAI Engineering and Economic Risk Analysis (The Economic Report). This present response also compares the financial analyses prepared by APAI and Algonquin Power. The Algonquin Power analysis was buried in the 2013 Algonquin Power Investor Presentation and came to APAI's attention only after the APAI Engineering and Economic risk Analysis was completed and distributed. This response also makes use of information provided in the 2014 Algonquin Power Investor Presentation and a Clark Consulting report prepared for Loyalist Township and sponsored by Algonquin Power.

#### **Development Costs**

Algonquin Power Co. (APCo) gives the capital cost of the project as \$230 million in the 2011 Q3 report and raised it to \$260 million in the 2014 Q3 report. See Appendix 1.

#### **Decommissioning Costs**

APCo has provided no estimate for the decommissioning cost of the Windlectric project. APAI therefore made a conservative analysis of the cost. The initial estimate was based upon decommissioning as the mirror image of construction:

Service roads will start with excavation of topsoil and subsoil and backfilled with rock fill and gravel; the roads will be decommissioned by removing the gravel and rock fill and backfilling with subsoil and topsoil. The rock fill and gravel will be barged onto the island for construction and will need to be barged off again.<sup>23</sup> The island roads will be destroyed during construction and will need to be repaired. Similarly the island roads will be destroyed during decommissioning and will need to be repaired. During construction, at least 9 oversize trucks will be needed to deliver components for each turbine to its site via barge, island roads and service roads. Similarly, 9 oversize trucks will be needed to remove them. And so on.

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<sup>23</sup> This is an island project with nowhere to dispose of concrete, rock fill, turbine blades and much else. Even recyclable material will need to be removed from turbine sites and barged to the mainland and on to recycling centres.



APAI's initial decommissioning cost estimate was based upon the observation by Mr. John Foster<sup>24</sup>, a spokesman for TransAlta (the owner of the Wolfe Island wind energy plant) that the capital cost of the Wolfe Island project was equally divided between the cost of the turbines and ancillary equipment and the cost of the on-site construction. The Amherst Island wind project is also an island project and therefore it was reasonable to put the cost of construction at \$100 million or more, half the capital cost of the Amherst Island project. Therefore, the cost of decommissioning would also be about \$100 million or more.

More recently, Clark Consulting wrote a report for Algonquin Power on the impact of the Windlectric project on the local economy.<sup>25</sup> Presumably with input from Algonquin Power the report gave a breakdown of the capital cost; this is shown in Table 4.2 extracted from the report. Clark Consulting's estimate of the construction cost is \$85 million. To be conservative, APAI reduced the decommissioning cost to \$75 million.

Table 4.2 shows a breakdown of the construction capital cost by location of supplier. Loyalist Township, the County of Lennox and Addington and the City of Kingston are generally treated as a single local labour market.

Table 4.2 Capital Cost Breakdown - Construction Stage

	Local	Other Ontario	Outside Ontario	Total	Percent Total
Pre-construction Activity	\$500,000	\$8,600,000	\$ 500,000	\$9,600,000	4.2%
Turbines and Related Machinery	\$0	\$41,700,000	\$100,000,000	\$141,700,000	62.5%
Construction Materials and Equipment	\$33,980,000	\$28,700,000	\$ 0	\$62,680,000	27.6%
Construction Labour	\$2,220,000	\$9,800,000	\$ 900,000	\$12,920,000	5.7%
TOTAL	\$36,700,000	\$88,800,000	\$101,400,000	\$226,900,000	100%
Percent of Total	16.2%	39.1%	44.7%	100%	

There will be salvage value. Based upon recent scrap material prices, APAI estimates the salvage value to be \$6.3 million. See Appendix 2.

<sup>24</sup> Presentations to Probus (a Kingston association of professional and business people) and to the Kingston Branch of the Institute of Electrical and Electronics Engineers (IEEE) by John Foster, at the time a representative of TransAlta, the owner of the Wolfe Island wind energy generating system.

<sup>25</sup> While APAI has a .pdf copy of the 2014 report it does not have a web link to the file. Through Algonquin Power Windlectric will be able to provide the OEB with a copy.

Mr. Sean Fairfield, Senior Manager, Algonquin Power, has written a letter dated April 8<sup>th</sup>, 2013 to Loyalist Township to assure the Township that Windlectric will cover the full cost of decommissioning the Amherst Island wind project<sup>26</sup>.

### **Financial Carrying Cost**

There are a variety of ways that a project of this magnitude can be funded. APAI based its financial analysis on bank financing of 80% of the capital cost at 5%, a rate communicated to APAI during a May 2014 private conversation with the renewable energy manager at a major Canadian bank. This was the basis for the financing of a low-risk wind energy project elsewhere in Ontario. APAI will not divulge the names of the banker or the bank.

### **Operation and Maintenance (O & M) Costs**

The International Energy Agency puts O & M costs in the range \$10 to \$30/MWh of generated electricity.<sup>27</sup> A report from Wind Energy Update, the 2010 Wind Energy Operations and Maintenance Report, puts the O & M cost at \$27/MWh. The respected IEEE Spectrum has read and reported on this report.<sup>28</sup> APAI did not have the funds to buy the report itself.

APAI chose a conservative \$20/MWh for its analysis. This estimate is close to the \$21/MWh later found in the 2013 Algonquin Power Investor Day Presentation<sup>29</sup> (See Appendix 3).

APAI is not party to the contracts between land owners (lessors) and Windlectric (the lessee) and therefore has no direct evidence for the annual payments to the lessors. Nevertheless, APAI's educated estimate of \$5000/MW, for a total of \$375,000 for the 75 MW project is close to Windlectric's \$345,000 annual royalty payment estimate later found on slide 58 of the 2013 Algonquin Power Investor Day Presentation (See Appendix 3).

The annual cost of insurance and municipal tax and benefit (\$15,000/MW) was an educated estimate, based upon costs for projects elsewhere, and can be verified by

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<sup>26</sup> To quote: "The project developer (Windlectric Inc. – a subsidiary of Algonquin Power Co.) is responsible (not the landowners) for all financial issues (including safety and decommissioning costs) regarding the proposed construction and operation."

<sup>27</sup> [http://www.windpowermonthly.com/news/1010136/Breaking-down-cost-wind-turbine-maintenance/\(2010\)](http://www.windpowermonthly.com/news/1010136/Breaking-down-cost-wind-turbine-maintenance/(2010))

<sup>28</sup> <http://spectrum.ieee.org/energywise/green-tech/wind/trouble-brewing-for-wind>

<sup>29</sup> The 2013 Investor Day Presentation came to the attention of APAI only after the APAI Engineering and Economic Analysis has been distributed. The impact of the numbers given in the 2013 and 2014 Investor Day Presentations is discussed below.

Windlectric. However, the APAI estimate was very close to the \$14,000/MW subsequently found in Table 4.3 of the Clark Consulting report (See Appendix 3).

### **Return on Investment**

The return on investment predicted by APAI was based upon the development cost, financing cost, decommissioning cost and O & M cost outlined and justified above. However, there is one more factor that determines the return on investment: the productivity of the wind energy plant. This is where APAI and Windlectric part company. Windlectric has never justified its stated production estimate of 247 GWh/annum. APAI has gone to great lengths to demonstrate that this estimate is excessive and unjustifiable.

Windlectric did make measurements of the wind resource on Amherst Island, but so do all developers for their project sites during the project development stage. The 247 GWh/annum (a capacity factor of 38%) was the predicted energy production at the time the contract with the Ontario Power Authority was announced, now some 4 years ago.

APAI's prediction was a far more modest 26%. It was based upon the actual performance of the wind energy plants that have been operating in Ontario since July 2006 and the comparative wind speed predictions given by the Ontario Wind Atlas. The prediction is rigorously justified in the APAI manuscript: *Engineering and Economic Analysis of the Algonquin Power Company Amherst Island Wind Energy Generating System*. This was submitted to the OEB as part of its evidence. Pages 3 to 7 of the evidence document have been extracted and are attached as Appendix 4; references are now included in this extract.

Furthermore, it is expected that the 26% capacity factor will follow that of the other Ontario wind energy plants in declining by 1%/annum. APAI predicted a long term capacity factor of 20%.

The APAI analysis is not the only reference to the underperformance of wind energy plants relative to optimistic company predictions. Fitch, a well-known ratings agency has analyzed the under-performance of 17 wind energy plants in the USA. Again, APAI does not have the resources to buy the Fitch report but the news release that accompanied the report was included in the evidence provided to the OEB by APAI.

Perhaps more sobering for Ontario, Algonquin Power and its investors is a recent article from Spiegel Online International, a well-respected German media source.<sup>30</sup> The article was based upon a study by the head of the investment committee at the German Wind Energy Association. The study looked at the business affairs of over 170 commercial wind parks over the course of 10 years. On average investors received an average of 2.5%/annum instead of the promised 6 to 8%.

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<sup>30</sup> <http://www.spiegel.de/international/business/wind-power-investments-in-germany-proving-riskier-than-thought-a-946367.html> The subtitle reads: "Gone with the Wind: Weak Returns Cripple German Renewables"

The APAI Engineering and Economic Report determined the return on investment (internal rate of return or IRR) for three scenarios: capacity factors of 26%, 20% and 38%:

**Table 1: Predicted Internal Rate of Return**

Assumptions: 5.0% Loan Rate; \$20/MWh O&M; 80% Bank Financing; Decommissioning Cost Included.

APAI Year-One Scenario: 26% CF	APAI Long-Term Scenario: 20% CF	Windlectric Scenario: 38% CF
-0.5%	-4.5%	5.5%

### Update to Return on Investment<sup>31</sup>

After the Engineering and Economic Risk Analysis report had been distributed, the 2013 Algonquin Power Investor Day Presentation (see Appendix 3) came to APAI's attention as did, later in 2014, the Q3 2014 quarterly report and the 2014 Investor Day Presentation (see Appendix 5) .

The most recent Windlectric revenue prediction, \$39.5 million/annum (Appendix 3), suggests that Windlectric has set its sights higher with a prediction of 290 GWh/annum. This corresponds to a phenomenal 44% capacity factor. This is significantly higher than the average capacity factors for any of the very high wind resource Central Plain states: North Dakota, South Dakota, Nebraska, Kansas, Oklahoma or Texas (See Appendix 6). As noted above, the capital cost has also increased to \$260 million. More recently, the Bank of Canada overnight lending rate and the Bank of Canada bank rate have been reduced by 25 basis points.

Algonquin Power is predicting an internal rate of return of 11% (see Appendix 3), far higher than that predicted by APAI. The following analysis pinpoints the difference. There is no significant disagreement on the O & M and "other" costs and APAI accepts Windlectric's and Clark Consulting's estimates. APAI accepts Windlectric's financing scenario of 50% bank financing and has lowered its estimate of bank financing to 4.75%. Similarly APAI accepts that the capital cost has been raised to \$260 million. The corporate tax rate is assumed to be 27%. Where a difference comes is in the predicted capacity factor and the inclusion of the decommissioning cost.

The following table is based upon standard EXCEL spreadsheet software for the determination of the net present value and internal rate of return (IRR) for a proposed project.

Source	Capacity Factor (%)	IRR (%) No Decommissioning	IRR (%) With Decommissioning
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<sup>31</sup> Table 2 from the APAI "Evidence Concerning the Premature Nature of the Request by Windlectric for a 115 kV Connection to the Ontario Grid (EB 2014-0330) was based upon TD Action Notes. This table is now corrected by returning to the original source, the Algonquin Power Q3 2014 Report. See Appendix 5.

APAI With Decline	20	(1.0)	(3.8)
APAI No Decline	26	2.1	(0.5)
Algonquin Power Nov. 2013	44	10.8	6.5

Numbers in brackets are negative.

The APAI internal rate of return estimate for the Windlectric project, with Windlectric's latest prediction of a 44% capacity factor and with no allowance for decommissioning, is 10.8% which matches Algonquin Power's estimate of 11% (Appendix 3). However, once an allowance for decommissioning is added this is reduced to 6.5%. APAI recognizes that Windlectric may choose to delay the decommissioning cost to the end of the project. In that case less than the full \$70 million needs to be set aside at the beginning of the project. However, once the internal rate of return drops below the rate of inflation there is no advantage in delaying the set-aside for decommissioning.

Algonquin Power has made a commitment to Loyalist Township in writing that it will decommission the wind energy plant at the end of its operation. Therefore it is surprising that no allowance has been made by Algonquin Power for this commitment.

In Appendix 5 APAI has derived the cost/MW for Algonquin Power wind energy projects under construction or development. The Windlectric project comes in #1 (equal) at \$3.5 million/MW, compared to a weighted average of \$2.0 million/MW. This is not surprising for an island project with all of its logistic problems. The derivation follows directly from data provided by Algonquin Power.

### **Summary**

APAI has made a rational, conservative and justifiable estimate of the likely capacity factor for the Windlectric wind energy plant. On this basis the internal rate of return for the project will be negative. Therefore it is not in the interest of Algonquin Power Company, its investors, the Ontario electricity consumer, the Ontario government or the local municipality to proceed with the project. It is APAI's belief, based upon this analysis as well as many other factors, that the Ontario Energy Board should reject the application for a 115 kV connection or at the very least schedule an oral hearing to hear the case for rejecting the application.

**Curriculum Vitae: John Harrison**

PhD University of Leeds, England (1964)

Postdoctoral Training: Cornell University, USA (1964 – 1967); University of Sussex, England (1967 – 1969).

Employment: Physics Department, Queen's University:

Assistant (1969-1973), Associate (1973-1978), and Full Professor (1978-2002)

Presently: Emeritus Professor.

Teaching:

A wide range of courses over a long career: 1<sup>st</sup> year physics for physics students and life science students, second year courses in mechanics, thermodynamics and applied physics, third year courses in laboratory techniques and quantum mechanics, fourth year courses in quantum mechanics, statistical mechanics, solid state physics and advanced laboratory techniques, graduate courses in solid state physics and macroscopic quantum behaviour; all to physics and engineering physics students. In addition, founded and supervised for many years the final year Engineering Physics Thesis.

Multi-terms as Academic Adviser for Honours Physics students and as Chair of Undergraduate Studies.

Other Activities:

Co-Editor and then Editor of the Journal of Low Temperature Physics (1979-2002); Associate Editor (Condensed Matter Physics) of the Canadian Journal of Physics (2002-2004)

Natural Sciences and Engineering Research Council Grant Selection Committee for Condensed Matter Physics (3-year term in the late 1980s); Ontario Council on Graduate Studies Selection Committee for the Polanyi Prizes (Physics, Chemistry, Medicine, Literature and Economics) (3-year term in the early 1990s).

Canada's delegate to Commission C5 (Low Temperature Physics) of the International Union of Pure and Applied Physics (2 separated 3-year terms).

Member of the International Committees of the Conference Series on Phonon Physics and the Conference Series on Low Temperature Physics.

Member of the Royal Military College Promotion Committee (3-year term in the late 1990s); Member of the Review Committees: Physics Department, Dalhousie University, Physics and Engineering Physics Department, McMaster University.

Numerous committee assignments within Queen's University.

Honours: Killam Fellowship (2-year term in the mid-1980s)

Invited Talks: U. Toronto, McMaster, U. Alberta, Simon Fraser U., UBC, Dalhousie U., Trent U., Memorial U., U. Ottawa, U. Waterloo, RMC, U. Manitoba, Brown, Case Western, Cornell, U. Rochester, Cambridge U., Manchester U., U. Nottingham.

Publications: Many in peer-reviewed journals and in peer-reviewed and non-peer-reviewed conference proceedings.

More recent invited conference presentations:

J P Harrison, "*Disconnect between turbine noise guidelines and health authority recommendations*", Proceedings of the World Wind Energy Conference (2008).

J P Harrison, "*Inadequacy of wind turbine noise guidelines and their application*", Canadian Acoustics Association Conference (2009).

J P Harrison, "*Wind turbine noise*", Symposium: The Global Wind Industry and Adverse Health Effects, Bulletin of Science, Technology & Society 31, 256 (2011)

**NB: Assistance with the financial analysis was received from senior executives in the commodities finance field.**





## **Appendix 1: Capital Cost of the Proposed Windlectric Project**

### **From Q3 2011 Algonquin Power Report**

<http://investors.algonquinpower.com/Cache/1500037383.PDF?Y=&O=PDF&D=&fid=1500037383&T=&iid=4142273>

#### **Amherst Island**

The Amherst Island Wind Project is located on Amherst Island in the village of Stella, approximately 25 kilometres southwest of Kingston, Ontario. The 75 MW project was awarded a FIT contract by the OPA as part of the second round of the Ontario Power Authority's ("OPA") Feed-in Tariff ("FIT") program.

On August 2, 2011, the Ontario Ministry of Energy directed the OPA to offer FIT contract holders the opportunity to have the OPA's termination rights under the FIT contract waived. The FIT contract stated that the OPA had the option to terminate the FIT contract until the OPA had issued a Notice to Proceed ("NTP") and APCo had paid the incremental security required by the NTP. APCo exercised this option on August 9, 2011. As required by the waiver, APCo intends to submit a domestic content plan by October 14, 2011 and provide a statutory declaration regarding equipment supply commitments by November 30, 2011. APCo expects to complete the waiver requirements within the time frames set out in the waiver.

The project is currently contemplated to use more efficient Class III wind turbine generator technology and will be developed by APCo. APCo forecasts that the available wind resource could produce approximately 247 GWh of power annually, depending upon the final turbine selection for the project. **Funding for the total capital costs, currently estimated to be \$230 million,** will be arranged and announced when all required permitting and all other pre-construction conditions have been satisfied. Environmental studies and engineering are underway. The submission of the renewable energy application is targeted for the summer of 2012. Construction will commence shortly following the approval of the application and is expected to take 12 to 18 months.

### **From Q3 2014 Algonquin Power Report**

<http://investors.algonquinpower.com/Cache/1001194045.PDF?Y=&O=PDF&D=&fid=1001194045&T=&iid=4142273>

#### **Amherst Island Wind Project**

The Amherst Island Wind Project is located on Amherst Island near the village of Stella, approximately 15 kilometers southwest of Kingston, Ontario. In February 2011, the 75 MW project was awarded a Feed in Tariff ("FIT") contract by the OPA as part of the second round of the OPA's FIT program. The Renewable Energy Approval ("REA") application was submitted in April 2013 and posted to the environmental registry in early January 2014. The REA has now been issued in draft form for comment. APUC has provided its comments back to the Ontario Ministry of the Environment requesting certain technical changes. Once the REA is issued in final form, it may be appealed by interested parties within 15 days of its release. If the REA is appealed, the appeal process is expected to take a maximum of 6 months. The project has a planned construction time frame of 12 to 18 months with most of the construction expected to occur in 2016.

The Amherst Island Wind Project currently expects to use wind Class III large-rotor direct drive wind turbine generator technology. **Due to delays in the regulatory approval process, changes in the foreign exchange rates and more detailed engineering estimates, total capital cost are now expected to be approximately \$260 million.**

## Appendix 2: Salvage Value of the Project

The Stantec Decommissioning Plan Report<sup>32</sup> notes: "As much of the facility would consist of reusable or recyclable materials there would be minimal waste as a result of decommissioning the facility." There is no engineering study to back this up.

Much of the facility in fact will consist of between 60,000 and 90,000 cubic metres of concrete and aggregate. There is no possible use for this material on a 16,000 acre island; it will have to be removed by truck and barge to a landfill site. Algonquin Power has assured Loyalist Township that no use will be made of the limited island landfill site. The blades are supposed to be taken to a registered landfill site for such hazardous waste but no such facility exists in Ontario. After 20 years there will be no more future for the generators and transformers than there would be for a 20-year-old car or truck, other than for scrap.

There is scrap value in the steel towers and the copper in the generators and cabling; there is potential value in the neodymium used in the generator magnets. The scrap value is estimated as follows, starting with the current scrap prices for steel and copper:

Scrap values as of July 22<sup>nd</sup>, 2013:<sup>33</sup>

Steel: \$264/tonne (1000 kg)

Copper: \$6.28/ kg

### Steel

Weight of steel tower: 300 tonnes<sup>34</sup>;

Weight of steel component of the nacelle: 50 tonnes (estimate);

Total steel: 350 tonnes.

**Scrap value of steel: \$0.09 million/turbine or \$3.0 million total**

### Copper

Weight of copper in a turbine: 5.6 tonnes/MW<sup>35</sup> (includes cabling).

Weight of copper in Siemens 2.3 MW turbine including cabling: 13 tonnes (estimate).

**Scrap value of Copper: \$0.08 million/turbine or \$2.7 million total**

### Neodymium

Weight of neodymium iron boride magnet in a turbine: 2 tonnes (estimate).

Weight of neodymium: 0.5 tonnes (estimate)

Cost of neodymium: \$75/kg<sup>36</sup>

Cost of neodymium: \$0.04 million/turbine or \$1.2 million total

The problem: "The neodymium-iron-boron material decomposes peritectically — it changes composition — when heated to its melting point," says Chumbley, lead researcher on the project. "So it can't just be melted down and reused. But it's too valuable to throw away, so there are literally warehouses full of 55-gallon drums of the stuff waiting to be recycled."<sup>37</sup> The future: The DOE Ames Lab is working on the problem: "Scientists at the U.S. Department of Energy's

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<http://www.amherstislandwindproject.com/Technical%20Documents/Decommissioning%20Plan%20Report%20Draft.pdf>

<sup>33</sup> Darin Horner – Lighting Dimension (Toronto), private communication, July 2013.

<sup>34</sup> Algonquin Power Co. Draft Road Use Report (Hatch, Oct. 24<sup>th</sup>, 2012)

<sup>35</sup> Ian Falconer, M.Sc. Thesis, University of Exeter, 2009.

<sup>36</sup> As of July 2013: <http://www.metal-pages.com/metalprices/neodymium/>

<sup>37</sup> US Department of Energy news release: <http://www.eurekalert.org/features/doe/2001-07/dl-nlf060502.php>

(DOE) Ames Laboratory are working to more effectively remove the neodymium, a rare earth element, from the mix of other materials in a magnet. Initial results show recycled materials maintain the properties that make rare-earth magnets useful.”<sup>38</sup>

**Assume that the problem will be resolved and allow a total scrap value of \$0.6 million**

**Conclusion: The scrap value of the Windlectric project is estimated to be \$6.3 million. This is approximately 8% of the estimated decommissioning cost.**

These scrap values are in 2013 dollars.

### Appendix 3: Algonquin Power O & M Estimate

Extract from Slide 58 from Algonquin Power Investor Day 2013<sup>39</sup>

## Amherst Island: 75MW wind

Amherst Island					
Year	2015	2016	2017	2018	2019
Revenues	39,532	39,690	39,848	40,008	40,168
Opex	(10,217)	(5,172)	(5,274)	(5,377)	(5,483)
Royalty	(293)	(345)	(345)	(345)	(347)
EBITDA	29,021	34,172	34,229	34,284	34,338
Net Income	9,536	13,478	13,684	13,899	14,124
Amherst EPS	0.50	0.73	0.76	0.80	0.85
FFO	21,243	26,606	26,887	27,180	27,485
FFOS	1.11	1.43	1.50	1.57	1.65
ROE	7%	11%	11%	12%	13%

Assumption Output	
Sources of Capital	
Debt	50%
Equity	50%
Share Price	6.75
ULAT IRR	10.96%
Capital Cost:	
PP&E	134,293
BOP	101,895
Total Capex	236,202

In line 3 of the upper table the annual operating expenditure is given as \$5.2 million/annum. Combined with Algonquin Power’s prediction of 247 GWh/annum for energy generation this amounts to an operating expenditure of \$21/MWh.

<sup>38</sup> News release Oct. 2012: <https://www.ameslab.gov/news/news-releases/reclaiming-rare-earths>

<sup>39</sup>

<http://investors.algonquinpower.com/Cache/1500054491.PDF?Y=&O=PDF&D=&FID=1500054491&T=&IID=4142273>

Table 4.3 is taken from the Clark Consulting report prepared for Loyalist Township and sponsored by Algonquin Power. The “Other (taxation, agreements, leases)” of \$1.05 million when divided by the 75 MW nameplate project power is \$14,000/MW.

**Table 4.3 - Operations Expenditures**

	Local	Other Ontario	Outside Ontario	Total	Percent Total
Labour	\$1,100,000	\$137,000		\$1,237,000	35.1%
Turbine Replacement Parts			\$866,250	\$866,250	24.6%
Non-specialized parts/ Equipment	\$201,750	\$100,000	\$70,000	\$371,750	10.5%
Other (taxation, agreements, leases)	\$1,050,000			\$1,050,000	29.8%
<b>TOTAL</b>	<b>\$2,351,750</b>	<b>\$237,000</b>	<b>\$936,250</b>	<b>\$3,525,000</b>	<b>100%</b>
Percent of Total	66.7%	6.7%	26.6%	100%	

**Appendix 4: Extract from “Engineering and Economic Risk Analysis ...”**

**CAPACITY FACTOR OF ONTARIO WIND GENERATING SYSTEMS**

The Independent Energy System Operator (IESO) publishes hourly power generation from the major Ontario wind-energy generating systems. The annual average capacity factor for each of these systems has been collected together in Table 3 in Appendix A<sup>40</sup> of the 2013 APAI report<sup>41</sup>, going back as far as 2006. The capacity factor is the primary factor in determining the viability of a wind-energy generating system. The annual average capacity factor is defined as the annual average power output of the system divided by the nameplate power.

Notably, there has never been a capacity factor of 38% in Ontario. The maximum is 36%, the minimum is 24% and the average is 30%.

For the wind-energy generating systems there are variations from year to year. This is largely because the annual-average wind speed varies from year to year, as does, for instance, the annual average temperature and precipitation. In turn, the output of a wind turbine magnifies this variation in average wind speed<sup>42</sup>. The capacity factors can be normalized to remove this variation, as outlined in Appendix B. Figure 1 shows the normalized capacity factor for those Ontario systems that have been in operation for 4 years or more.

<sup>40</sup> All lettered appendices refer to those in the 2013 report.

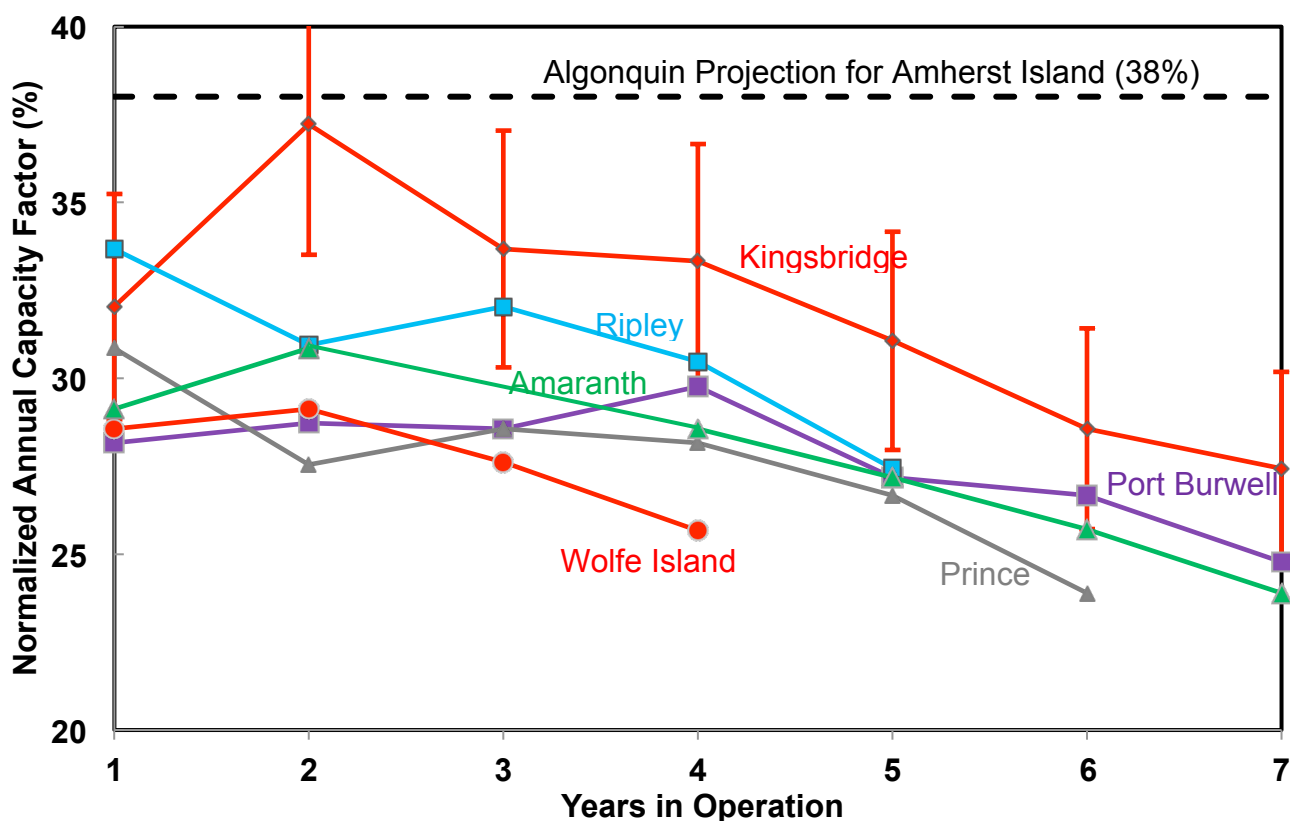
<sup>41</sup> A copy of an earlier 2013 report, with appendices and references is available at: <http://www.protectamherstisland.ca/issues/economics/>

<sup>42</sup> For a wide range of wind speed the power output varies as the cube of the wind speed.

Typically, these systems start within the first year or two at a capacity factor of about 30% (Kingsbridge, on the shore of Lake Huron, was an exception). Subsequently the capacity factors decline. This decline is about 1% per year or a relative decline of 3% per year. This augurs very badly for a generating system costed on the basis of a 20-year contract.

All of the analysis is based upon publically available wind energy generating system power output data provided by IESO.

**Figure 1: Normalized Capacity Factor for Ontario Wind Energy Generating Systems as a Function of Years of Service**



Of course Ontario is not the only place with disappointing output from its wind-energy generating systems.

- The Muir report from the UK showed a 24% capacity factor for the UK system over the period November 2008 to December 2010.<sup>43</sup>
- The New York State system, to the south of Amherst Island, had capacity factors of 19% for 2009 and 23% for 2010.<sup>21</sup>
- An analysis from Europe showed that over the years 2003 to 2007 the capacity factor of the EU15 56 GW system was 21%.<sup>44</sup>

<sup>43</sup> <http://www.masterresource.org/2011/06/overestimating-wind-power-from-the-uk-ny/>

This current report is not the only one to show the capacity factor declining with time. In an extensive analysis of the Danish wind energy system Paul-Frederik Bach found an average decline of just 0.3% per annum. Conversely, in his analysis of the Danish wind-energy system over the years 2004 to 2010 Wayne Gulden found an average decline of 1.5% per annum; Gulden normalized the capacity factors for the annual average wind speed. Gulden used the same technique to demonstrate that the Mars Hill installation in Maine, USA, is showing a declining capacity factor of a conservative 2.1% per annum. More recently, Hughes<sup>45</sup> has found, after correcting for the wind resource, that the overall UK system capacity factor declined from 24% at year 1 to 15% at year 10 to 11% at year 15. This is the same 1%/year decline that is demonstrated for the Ontario systems in Figure 1. Hughes analysis for the Danish on-shore system agrees with Bach's finding of 0.3%/year over a 15 year period. (However, he also finds that the Danish off-shore system declined at 1.7%/year over a 15 year period, from 39% at year 0 to 15% at year 10!)

One obvious problem with many wind-energy systems in Ontario is the high density of the turbines. In the words of Rolf Miller, Director of Wind Assessment at Chicago-based Acciona Windpower, turbines are being "shoe-horned in" in Ontario. The latest research from John Hopkins University recommends a separation of turbines of 15 blade diameters to avoid turbulent wake loss and hence loss of capacity factor.<sup>46</sup> For a modern 2.3 MW turbine with a 90 metre blade diameter this recommendation corresponds to a density of about 0.5 turbine/ km<sup>2</sup>. The Wolfe Island project, as an example, corresponds to 1 turbine/ km<sup>2</sup>, twice the recommended density which goes part way to explaining its poor performance<sup>47</sup>. However, this is only one possible cause of poor performance and does not explain the decrease in normalized capacity factor with time.

### **PREDICTION OF CAPACITY FACTOR FOR AMHERST ISLAND**

Amherst Island is a poor site for a wind-energy generating system because of the poor wind resource, the small area available and the increased capital expenditure required to build on an island. Helimax, a consulting company, studied possible sites in Ontario for

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[http://estaticos.soitu.es/documentos/2009/06/capacity\\_factor\\_of\\_wind\\_power\\_realized\\_values\\_vs\\_estimates.pdf](http://estaticos.soitu.es/documentos/2009/06/capacity_factor_of_wind_power_realized_values_vs_estimates.pdf)

<sup>45</sup> Professor Gordon Hughes was a senior advisor on energy and environmental policy at the World Bank until 2001. Gordon Hughes, "Performance of Wind Farms in the UK and Denmark", Renewable Energy Foundation (2012): <http://www.ref.org.uk/attachments/article/280/ref.hughes.19.12.12.pdf>

<sup>46</sup> <http://www.sciencedaily.com/releases/2010/11/101123174322.htm> ;

[http://www.nawindpower.com/e107\\_plugins/content/content.php?content.7257](http://www.nawindpower.com/e107_plugins/content/content.php?content.7257)

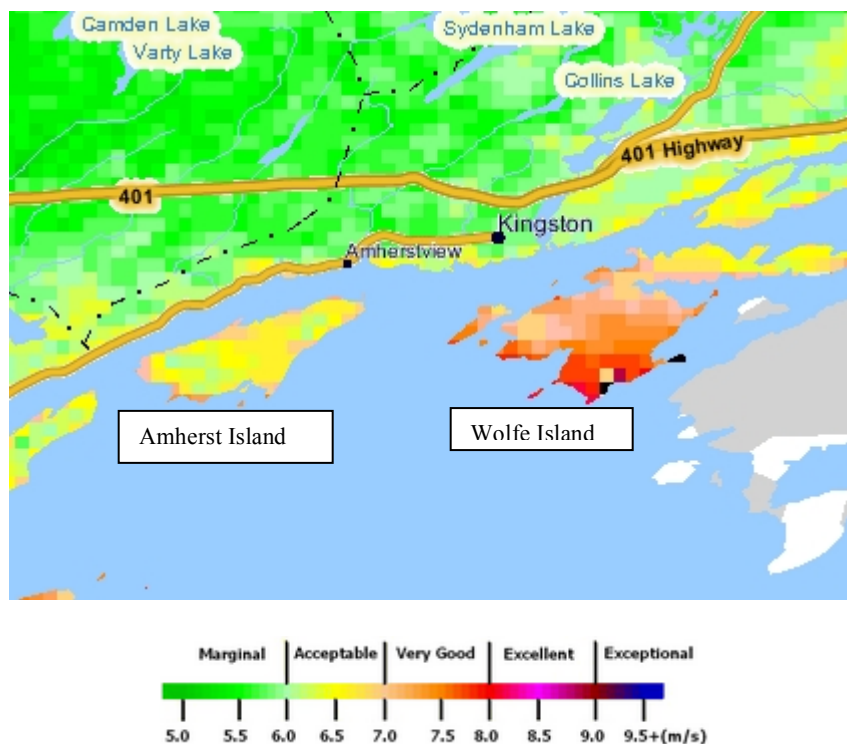
<sup>47</sup> The effect of the high density of the Wolfe Island project is quite apparent: in modest wind speeds the down-wind turbines rotate more slowly than the up-wind turbines!

the Ontario Power Authority and Amherst Island did not even make the list of 60 sites considered.<sup>48</sup>

A prediction for the capacity factor of a wind-energy development on Amherst Island can be made on the basis of the 4 years of operation of the nearby Wolfe Island wind-energy system. Figure 2 is extracted from The Ontario Wind Atlas, again publically available. On the right in shades of orange to red (very good wind resource) is Wolfe Island and on the left Amherst Island (acceptable wind resource). The wind speeds are those appropriate for a turbine hub height at 80 metres.

For the system at the western end of Wolfe Island, the average wind speed is 7.5 metres/sec and for Amherst Island the average wind speed is 6.5 metres/sec. As discussed in Appendix B of the 2013 report the power generated by a wind turbine varies with the cube of the wind speed. Compared with a turbine on Wolfe Island the power output of a similar turbine on Amherst Island would be reduced to  $(6.5/7.5)^3$  or 65%. Therefore, based upon the initial capacity factor of 28% for Wolfe Island, the expected capacity factor would be 18%, less than one half APCo's stated capacity factor.

**Figure 2: Ontario Wind Atlas for Eastern Lake Ontario.**



APCo plans to improve this by using the modern generation of so-called high-efficiency turbines. In the most recent design and operation report prepared for APCo by Stantec Consulting Ltd., the Siemens 2.3 - 113 2.3 MW turbine is proposed, together with an 99.5

<sup>48</sup> [http://www.powerauthority.on.ca/sites/default/files/page/4535\\_D-5-1\\_Att\\_1.pdf](http://www.powerauthority.on.ca/sites/default/files/page/4535_D-5-1_Att_1.pdf)

metre tower. With an average wind speed gradient parameter of  $0.20 \pm 0.05$ , appropriate for North America, the extra tower height will add  $(4.5 \pm 1)\%$  to the average wind speed, increasing it to 6.8 metres/sec. This is in line with the prediction of the Ontario wind atlas.

This extra wind speed will allow a  $14\%$ <sup>49</sup> increase in the power output. As shown in Appendix C, the use of the Siemens 2.3 - 113 will produce a 35% increase in the power output. Putting these two together, the Siemens 2.3-113 turbine on a 99.5 metre tower will increase the capacity factor by  $54\%$ <sup>50</sup>, from 18% to 28%.

However, as shown in Appendix D, wake loss will be a serious problem for the Amherst Island project, more serious even than for the Wolfe Island project.

**A best estimate is that the initial capacity factor will be 26%.**

The use of the newer turbine and the high tower will just about compensate for the poor wind resource and the high turbine density on Amherst Island, but at a cost, \$3.0 million/MW versus \$2.07 million/MW for Wolfe Island<sup>51</sup>. **It is also expected that this capacity factor will decrease with time in accordance with the 1% per year decline.**

APCo has stated that they have encouraging wind resource data for Amherst Island. Canadian Hydro Developers claimed similar encouraging data for Wolfe Island. The initial prediction for Wolfe Island was a capacity factor of  $40\%$ <sup>52</sup>. Even after 6 months of operation a spokes-person for TransAlta, the new owner of the project, claimed that the annual capacity factor would be 34%, as opposed to the actual normalized capacity factor of 28%.

In making a prediction for Amherst Island it is sensible to take the approach described above: use the by-now measured 4 years of capacity factor numbers for Wolfe Island, then compare the Ontario Wind Atlas data for the two islands and the power output specifications for the turbines in use on Wolfe Island and planned for the Amherst Island development.

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<sup>49</sup>  $1.045^3 = 1.14$

<sup>50</sup>  $1.14 \times 1.35 = 1.54$

<sup>51</sup> The \$2.07 million/MW was the initial estimate for the capital cost. This was increased to \$2.27 million/MW after approval to build was received from the Ontario government and to \$2.4 million/MW part way into construction. The increase was attributed partly to bad weather and partly to the difficulty of building on an island. A similar cost over-run will increase the APCo development to \$3.6 million/MW.

<sup>52</sup> Ian Baines, the initial developer, in a talk given to SWITCH (a green energy promotion organization) in Kingston, Ontario.



Appendix 5: (i) Extracts from the 2014 Algonquin Power Investor Presentation<sup>53</sup>

**UPDATE ON DEVELOPMENT STATUS – AMHERST**

**Amherst Island Wind: 75 MW**

Off-take Agreement

- Ontario Power Authority, 20 years

Resource Analysis


- 2005 – Present, including:
  - Over one year of 100m data
  - 8 months of LiDAR

Permitting Status

- REA expected in Jan/Feb 2015 if technical changes are pursued

Construction


- CapEx \$260 million
- COD Q3/Q4 2016, based on expected ERT process



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**DEVELOPMENT PIPELINE**

Project	Status	CapEx	EBITDA
Morse, SK	Construction	\$81 Million	\$9.9 million
Bakersfield I, CA	Construction	\$66 Million*	\$4.2 million
Bakersfield II, CA	Construction	\$30 Million*	\$1.8 million
Odell, MN	Construction	\$362 Million*	\$28 million
Val Eo, QC	Development	\$70 Million	\$6.9 million
Amherst, CA	Development	\$260 Million	\$30.4 million
Chaplin, SK	Development	\$340 Million	\$35 million
<b>Total</b>		<b>\$1,209 Million</b>	<b>\$116.2 Million</b>



\* CapEx prior to contribution from tax equity investor

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## (ii) Extract from the Algonquin Power Q3 2014 Report

Project Name	Location	Size (MW)	Estimated Capital Cost	Commercial Operation	PPA Term	Production GW-hrs
<b>Projects in Construction</b>						
Morse Wind <sup>1</sup>	Saskatchewan	23	\$ 81.3	2015	20	104.0
St. Damase <sup>1,2,4</sup>	Quebec	24	\$ 65.0	2014	20	76.9
Bakersfield Solar <sup>1,5</sup>	California	20	\$ 65.5	Q1 2015	20	53.3
		67	\$ 211.8			234.2
<b>Projects in Development</b>						
Chaplin Wind <sup>1</sup>	Saskatchewan	177	\$ 340.0	2016	25	720.0
Amherst Island <sup>1</sup>	Ontario	75	\$ 260.0	2016	20	247.0
Odell Wind Project <sup>1,6</sup>	Minnesota	200	\$ 361.5	2015	20	821.1
Val Eo - Phase I <sup>1,3,4</sup>	Quebec	24	\$ 70.0	2015	20	66.0
		476	\$ 1,031.5			1,854.1
<b>Total</b>		<b>543</b>	<b>\$ 1,243.3</b>			<b>2,088.3</b>

## APAI Derivation of the Relative Expense of Algonquin's Wind Projects

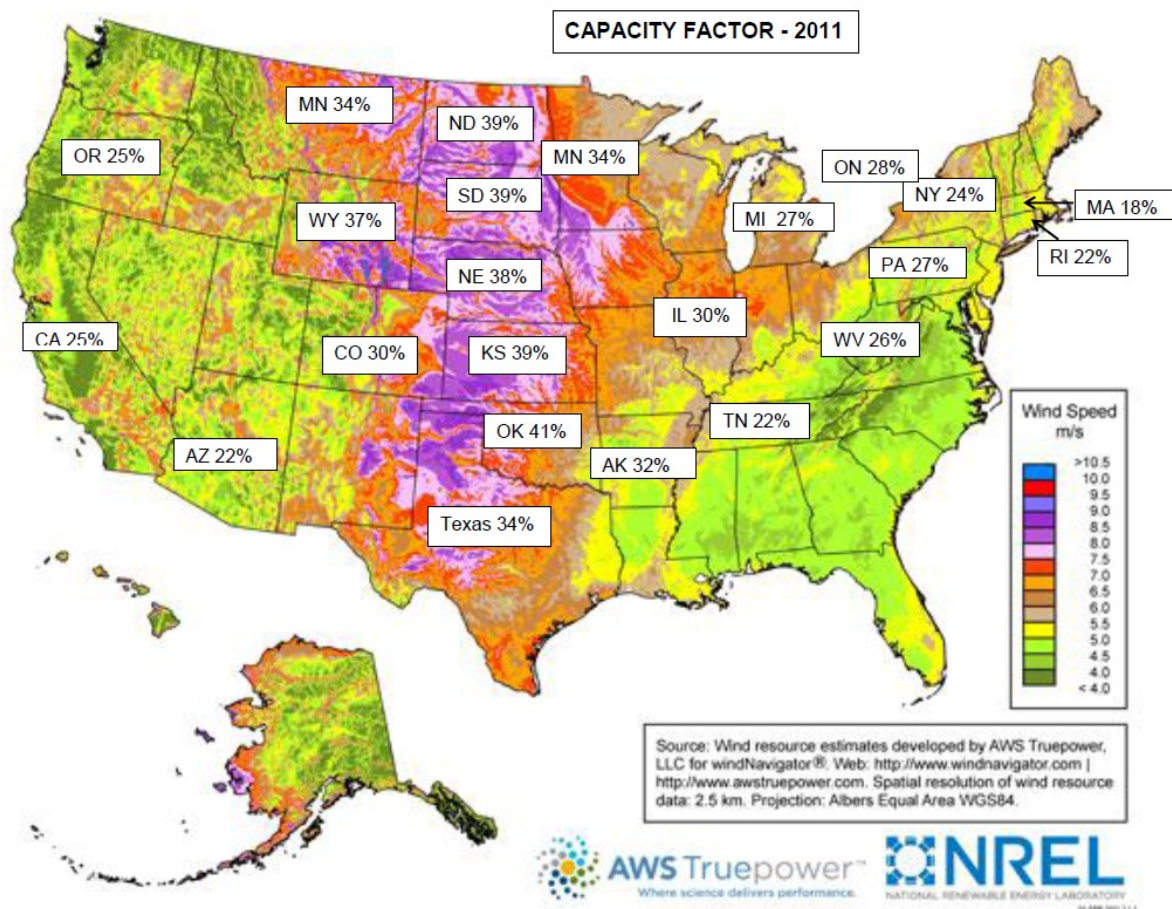
Wind Project	Timing	Total Cost (\$million)	Power (MW)	\$million/MW
Morse (Sask.)	Q1/15	81	23	3.5
St. Damase (QC)	Q4/14	65	24	2.7
Val Eo (QC)	Q4/15	70	24	2.9
Odell (MN)	Q4/15	362	200	1.8
Amherst Island	H2/16	260	75	3.5
Chaplin (Sask.)	Q4/16	340	177	1.9

Power (MW) is nameplate power. Note that Morse and Chaplin are in the high wind northern extension of the Great Plains.

The Amherst Island project at \$3.5 million/MW is higher in cost than the weighted average \$2.0 million/MW for the other projects on Algonquin Power's books. Building on an island is an expensive proposition, as was discovered by TransAlta with the cost over-runs for the Wolfe Island project. Already the capital cost for the Windlectric project has increased from \$230 million to \$260 million.

## Appendix 6: US and Ontario Capacity Factors

The figure shows the National Renewable Energy wind atlas for the USA. Superposed are the 2011 annual average capacity factors by State.<sup>54</sup> Those States within the high-wind Great Plains have worthwhile capacity factors for wind energy. The States to the east and west have significantly less wind and consequently lower capacity factors.



Ontario, to the north of New York State, has an annual capacity factor of about 30%.<sup>55</sup> The reason for the Ontario efficiency<sup>56</sup> being relatively high compared to New York State is that the wind energy plants mainly hug the shorelines of the Great Lakes (north shore of Lake Erie, shore of Lake Huron, Wolfe Island). The north-west shore of Lake Erie and the east shore of Lake Huron are on the eastern fringe of the high wind resource associated with the Great Plains. In addition some of the turbines installed along the north-west shore of Lake Erie are the new so-called high-efficiency turbines. These wind energy plants are relatively new; the decline in capacity factor has yet to show itself.

<sup>54</sup> These numbers are from the Energy Information Administration of the US Department of Energy.

<sup>55</sup> Source of data: IESO; see also page 111 of the 2011 Auditor General's Report.

<sup>56</sup> Original APAI figure based upon analysis of hourly output of wind energy for the period July 2012 to June 2013

