

**BEFORE THE
SITE EVALUATION COMMITTEE**

DOCKET NO. 2012-01

**APPLICATION OF ANTRIM WIND ENERGY, LLC
FOR A CERTIFICATE OF SITE AND FACILITY**

SUPPLEMENTAL PREFILED TESTIMONY OF

COLIN HIGH, Ph.D.

ON BEHALF OF

ANTRIM WIND, LLC

October 11, 2012

1 **Qualifications**

2 **Q. Please state your name, business address, employment and qualifications.**

3 A. My name is Colin High. My business address is 55 Railroad Row, White River
4 Junction, VT 05001. My employment and qualifications have not changed from what
5 was described in my prefiled direct testimony filed on January 31, 2012 in this docket.

6 **Purpose of Testimony**

7
8 **Q. What is the purpose of your supplemental testimony?**

9 A. The purpose of my supplemental testimony is two fold. First I will provide the
10 New Hampshire Site Evaluation Committee with an update regarding the data set relied
11 upon to calculate the marginal emissions rate in the “Avoided Emissions from the Antrim
12 Wind Project” report (the “Report”), which is contained in Appendix 10 of the
13 Application to this proceeding. The second purpose of this supplemental testimony is to

1 respond to statements made by Ms. Lisa Linowes in her Prefiled Testimony in this
2 proceeding regarding the Antrim Wind Project (the “Project”).

3 **Updated Data Regarding Emissions Rates**

4 **Q. What data set did the Report rely upon to calculate the marginal emissions**
5 **rate in your Report?**

6 A. The report relied upon Environmental Protection Agency (“EPA”) eGrid data
7 from 2007 regarding emissions rates. *See* Appendix 10 at 2. The Report indicates that
8 “The most recent year for which complete and consistent validated data are available
9 from the EPA is 2007. Changes since 2007 are not expected to have a significant effect
10 on this avoided emissions analysis”. *Id.* at 2, fn 1.

11 **Q. Since you submitted the Report, has additional data become available?**

12 A. Yes, since I submitted the Report, data for 2009 has become available. *See*
13 www.epa.gov/egrid.

14 **Q. Would the results in the Report be altered significantly if the EPA’s 2009**
15 **avoided emissions data were incorporated into the analysis?**

16 A. No, the results in the Report would not be altered significantly if the EPA’s 2009
17 data were applied to the analysis. The new data shows that there was a 4 percent
18 decrease in the EPA eGRID non-base load average emission rate between 2007 and 2009.
19 This change is due to a small decrease in coal and oil and a small increase in natural gas
20 and nuclear fuels used for generation in ISO-NE in 2009 when compared with 2007.
21 These changes in the generation mix are shown in the table below.

1 ISO-NE Fuel Source Mix for 2007 and 2009

Year	Coal	Oil	Gas	Nuclear
2007	15.1%	4.23%	40.83%	27.9%
2009	11.9%	1.5%	42%	29.76%

2
3 The data in the above table is from U.S. Environmental Protection Agency, eGRID 2007
4 and 2009 Summary tables at www.epa.gov/egrid, Office of Air and Radiation. As a
5 result of these changes in the ISO-NE generation mix, the revised avoided emissions
6 from the project would probably decline by about 4%. This is not a significant change in
7 the context of the total avoided emissions benefits resulting from the project. The overall
8 conclusions of the Report would remain largely unchanged if an analysis were performed
9 using the EPA's recently released 2009 data.

10 **Rebuttal Issues**

11 **Q. The prefiled testimony of Lisa Linowes, filed on July 31, 2012, discusses**
12 **several issues related to your report, including the Project's capacity factor, its**
13 **impact on regional air emissions, and the costs of development of wind power. Have**
14 **you reviewed this testimony?**

15 A. Yes. I have reviewed Ms. Linowes' testimony.

16 **Q. Please address Ms. Linowes' testimony regarding the projected generation**
17 **and capacity factor for the Project.**

18 A. In sections 8 and 9 of her testimony, Ms. Linowes states that the capacity factors
19 relied upon in the Application are higher than the average expected for inland wind

1 projects in New England and asserts that the capacity factor raises questions regarding
2 the quantification of the benefit to the public of emission-free generation.

3 The Applicant relied upon experienced experts to develop the capacity factor
4 range for the Project and those experts applied well established methods. I have no reason
5 to question the capacity factor range for the Project which was relied upon in the Report
6 and provided by V-Bar. With respect to any impacts on the measurement of total avoided
7 emissions, even if the capacity factors turn out to be closer to the average for the region,
8 the Project will still provide a significant amount of incremental emission free renewable
9 generation in New England at a lower cost than comparable sources.

10 **Q. Please address Ms. Linowes' testimony regarding the intermittent nature of**
11 **wind power and the ability of wind power to meet the region's demand for**
12 **electricity.**

13 A. Ms. Linowes states in her testimony that construction of wind energy in New England
14 will not eliminate the need to build generation in the region. However, demand for
15 electricity in New England can be met by a variety of resources, including wind. For
16 example, some of the additional generation could well be wind power developed at a
17 variety of locations within the ISO-NE region; a variety of facilities with different wind
18 regimes increases the overall predictability of the fleet of wind generators. It is also the
19 case that other renewables mentioned by Ms. Linowes, such as biomass, landfill gas,
20 small hydro, and solar, are likely to be built along with more natural gas combined cycle
21 units. The ISO-NE regional grid is an integrated system that is designed to provide

1 reliability while reducing air emissions and other environmental impacts and minimizing
2 costs. Wind can clearly play an important complementary role in the ISO-NE system.

3 **Q. Do you have any comments on Ms. Linowes' testimony regarding the emissions**
4 **reductions that the Project will provide?**

5 A. Yes. I will address three issues raised by Ms Linowes in Section 11 of her testimony
6 regarding emissions reductions: the Project's generation during the summer months,
7 greenhouse gas ("GHG") emissions reductions under the Regional Greenhouse Gas
8 Initiative ("RGGI"), and the accuracy of the data relied upon in the Report.

9 First, Ms. Linowes states that wind generation is lowest in the summer months when high
10 ozone days occur, and further asserts that "wind energy cannot reliably be expected to
11 produce at that time in the year". However, the avoided emissions calculation presented
12 in the Report uses a Time Matched Marginal Emission Model (TMM) of the ISO-NE
13 power market that calculates the avoided emissions on an hour by hour basis based upon
14 actual wind data from the Project site. Therefore the avoided emissions calculations
15 presented in the Report incorporate seasonal factors. Based on actual data from the site,
16 which has been considered in the TMM model, I have concluded that the Project will
17 reduce the occurrence of high ozone days in New England and Eastern Canada. There is
18 no need to further discount these emission reductions.

19 Second, Ms. Linowes states that "The State has already achieved its greenhouse gas
20 reduction goals under RGGI". This statement is incorrect and not relevant to the
21 consideration of the air emissions benefits of the Project. Although the RGGI participants
22 in the State of New Hampshire have met their targets in the first three-year compliance

1 period ending December 2011, the State of New Hampshire and all of the participating
2 states have a continuing obligation to reduce GHG emissions under RGGI. RGGI will
3 require further reductions in GHG emissions through the end of 2018. In the period from
4 2015 to 2018 the cap will decrease by 2.5% per year for a total reduction of 10% in the
5 period ending December 2018. The presence of additional wind energy in the generation
6 mix will be very important in achieving these goals.

7 Third, Ms. Linowes questions the use of historical data in the Report. She states that the
8 Report “bases emissions reductions on data from 2005 which is no longer representative
9 of emission levels in the region”. Ms. Linowes is factually incorrect – the emissions
10 reductions outlined in the Report are based on EPA emissions data from 2007, which was
11 the most recent data available when the Report was prepared. As I discuss in my
12 testimony above, if the analysis was performed using the 2009 data which recently
13 became available, the avoided emission from the project would likely decline by about
14 4%. This is not a significant change in the context of the total avoided emissions benefits
15 resulting from the project. Furthermore, Ms. Linowes asserts that the percentage of
16 energy produced by oil decreased from 22.0% in 2000 to 0.4% in 2012, and that the
17 Report failed to take changes in fuel source mix into account. In fact, the EPA data relied
18 upon in the report indicates that in 2007 oil consisted of 4.23% of the overall fuel source
19 mix in ISO-NE, and that in 2009 oil consisted of 1.5% of the overall fuel source mix in
20 ISO-NE. As stated above, the overall conclusions of the Report would remain largely
21 unchanged if an analysis was performed using the EPA’s recently released 2009 data, and

1 the changes in fuel source mix referenced by Ms. Linowes have essentially been
2 accounted for in the Report.

3 **Q. In response to Ms. Linowes' testimony, do you have any additional comments**
4 **regarding the measurement methods which are applied in the Report?**

5 A. Yes. On page 11 of her testimony, Ms. Linowes states that the model I have
6 employed is an "oversimplification of energy dispatch in New England". In fact, the
7 model applied in the report uses specific recent historical experience with respect to
8 variably dispatched fossil fuel units to determine the amounts of air pollution which will
9 be avoided by way of the Project. This model has been used in the evaluation of more
10 than 270 renewable energy and alternative energy projects in the United States and is
11 regularly relied upon by the United States Department of Energy. This model was
12 developed together with the United States Environmental Protection Agency and the
13 Department of Energy.

14 **Q. Do you have any comments on Ms. Linowes' testimony regarding the cost of**
15 **emissions reductions the project will provide?**

16 A. Yes. In section 12 of her testimony, Ms. Linowes disagrees with the statement in my
17 Prefiled Direct Testimony that "At the present time the development of commercial wind
18 power is, other than energy efficiency and conservation, one of the more cost effective
19 means of reducing carbon dioxide emissions and therefore of mitigating the pending
20 climate crisis". She concludes that "[t]he combination of low carbon values and high
21 power purchase rates make wind one of the most expensive, least cost-effective means of
22 reducing carbon".

1 While Ms. Linowes relies on the price of allowances in RGGI in her testimony, this price
2 is irrelevant to the determination of whether wind energy is a comparatively cost
3 effective means of reducing GHG emissions. Furthermore, the connection between the
4 current market price of carbon offsets and the comparative cost of renewable generation
5 is tenuous. In her testimony, Ms. Linowes does not provide alternative means of
6 reducing carbon, nor does she provide quantitative support or independent comparative
7 studies in support of her conclusions.

8 However, there is quantitative support for the conclusion that wind energy is a
9 comparatively low-cost renewable energy option. The United States Energy Information
10 Administration (“EIA”) Annual Energy Outlook for 2012 provides the following analysis
11 of the Levelized Cost of New Generation Resources for renewable generation plants to be
12 completed in the US by 2017:

13 U.S. Average Levelized Costs (2010 \$/megawatt hour)

14	Wind	\$ 96.0
15	Solar PV	\$ 152.7
16	Solar Thermal	\$ 242.0
17	Hydro	\$ 88.9

18 There are very few opportunities for significant new hydroelectric generation in New
19 England in the near future. If we exclude hydroelectric power the EIA cost analysis
20 shows that wind is the lowest cost renewable low emission generation resource available
21 in the US. In New England the two solar alternatives may have even higher costs than
22 those shown.

23 The data from the EIA confirms my conclusion that development of commercial wind

1 power is, other than energy efficiency and conservation, one of the more cost effective
2 means of reducing carbon dioxide emissions and therefore of mitigating the pending
3 climate crisis.

4 **Q. Do you have anything further to add to this testimony?**

5 **A.** No, not at this time.

6 913414_1