Scotian WindFields
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Sept 17, 2014

Nova Scotia Power Inc.
1223 Lower Water St.
Halifax, Nova Scotia
B3J 2W5

RE: Feedback for Incorporation into IRP 2014 Final Report

Scotian WindFields Inc. welcomes the opportunity to participate in the 2014 Integrated Resource Plan and submits the below comments and suggestions based on the IRP Technical Conference Analysis Results and Appendix (Draft Analysis) information that were provided on September 10, 2014, leading up to the Technical Conference held September 12, 2014.

In general, we feel that the proposed IRP strategy has been well laid out, but has significant shortcomings with respect to the future cost of fossil fuels, carbon pricing, and opportunities for increased grid reliability and possible operation strategies. These shortcomings greatly reduce the effectiveness of this plan to adequately prepare our electrical system in the best interests of the environment and Nova Scotia's electrical system. The following items that are detailed in the attached document and are submitted as final comment from Scotian WindFields for consideration of the Action Plan being developed as part of the 2014 IRP process:

- Fossil Fuel Price Forecast Assumptions
- Carbon Pricing Assumptions
- Opportunity to plan for and address future RES Operational Strategies
- Limited Candidate Resource Plans

Should you require any clarification or further details on and of the points included in this response, please do not hesitate to contact Scotian WindFields Inc. directly.

Thank you for your consideration of these comments and we look forward to further discussion and the issuing of the Final Report for the 2014 IRP.

Sincerely,

Daniel Roscoe, P.Eng.
Chief Operating Officer
Scotian WindFields Inc.

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1) Wind Assumptions

With consideration of the documentation provided on Sept 10, 2014, Scotian WindFields Inc. requests that the below points, regarding wind energy assumptions, be considered in upcoming analysis of the Action Plan being developed as part of the 2014 IRP process.

a. Additional distribution-connected wind energy should be considered as a Supply-Side Option, with specific capital costs and integration costs considered.
b. Integration Costs and Demand Reduction should be considered in anticipation of **>200MW by 2030** of wind generation under the upcoming Renewable to Retail framework.
c. Flexibility with the Surplus Energy available through the Maritime Link should be considered to work as a possible operational strategy for load-following and the real-time considerations of wind energy generation. Scotian WindFields Inc. request that this be considered as a possible option *in place of* the purchasing and deployment of additional Combustion Turbines and other dispatchable generation.
d. Scotian WindFields feels that greater consideration can be given to the planning of future RES and variable generation Operational Strategies – as is further outlined in **Section 6** of this response.

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2) Solar Assumptions

Scotian WindFields does not see that, in the documentation provided September 10, 2014, larger-scale generation from photovoltaics have been considered in the various models and sensitivities for the chosen Candidate Resource Plans. We would, then, restate our considerations for photovoltaics in Nova Scotia:

The Supply-Side Options only consider ">10MW" each of transmission-connected solar photovoltaic supply options. Scotian WindFields Inc. requests that the below points, regarding solar energy assumptions, be considered in upcoming Action Plan being developed as part of the 2014 IRP process.

a. We recommend that large amounts **(>10MW) of distribution-connected, individual and commercial-scale (1-100kW) solar photovoltaic energy** be considered as a Supply-Side Option.
b. Integration Costs and Demand Reduction should be considered in anticipation of **>100MW by 2030** of Solar Photovoltaic generation under the upcoming Renewable to Retail framework.
c. We welcome further discussion on the capacity factors of the various types of solar energy which were not discussed in the initial analysis provided.

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4) Fuel Price Forecast Assumptions

The analysis shown in the documentation provided on September 10, 2014 still considers these values presented in earlier documentation and it is not clear that greater sensitivity has been taken into account. We feel that these price ranges affect the NPV criteria of the Candidate Resource Plan selection process. Scotian WindFields has the below comments regarding the initial Assumptions for Fuel Price Forecast Assumptions, particularly for the long-term price forecasting for Natural Gas, Petroleum-based fuels and solid fuels.

a. The Average Annual Increase of fuel pricing for Natural Gas between years 2015 and 2040, as presented in the Draft Assumptions (Slide 58) is between 2.4% and 3.1%. This is exceedingly optimistic consider that the Average Annual Increase of Natural Gas pricing between years 1991 and 2013/2014 was calculated at **5.5%**.[1]
b. The Average Annual Increase of fuel pricing for HFO and LFO between years 2015 and 2040, as presented in the Draft Assumptions (Slide 72) is between 2.3% and 3.59%. This seems exceedingly conservative as the Average Annual Increase of WTI crude pricing between years 1990 and 2013/2014 was calculated at **6.1%**[2] and the Average Annual Increase of Heating Oil was calculated at **6.3%.**[3]
c. Based on the above presented historical data, we **recommend that NS Power consider more representative energy inflation figures** in future IRP modelling.

[1] As calculated from data provided by IndexMundi regarding $US/mmBTU monthly price of Natural Gas: http://www.indexmundi.com/commodities/?commodity=natural-gas&months=300
[2] As calculated from data provided by IndexMundi regarding $US/barrel WTI monthly price of Crude Oil: http://www.indexmundi.com/commodities/?commodity=crude-oil-west-texas-intermediate&months=300
[3] As calculated from data provided by IndexMundi regarding $US/gallon monthly price of heating oil: http://www.indexmundi.com/commodities/?commodity=heating-oil&months=300

5) Forecast Cost of Carbon

Scotian WindFields does not see that, in the documentation provided September 10, 2014, specific carbon pricing metrics have been considered in the various models and sensitivities for the chosen Candidate Resource Plans. We would, then, restate our considerations for carbon pricing in Canada – in preparation for the upcoming Action Plan being developed as part of the 2014 IRP process.

Scotian WindFields has the below comments regarding the Draft Assumptions for Carbon Pricing. Under the Case Development (Power) on Slide 60, it is stated that the assumed cost of Carbon is US$15/Ton CO_2 in 2020, escalating to US$37/Ton CO_2 in 2030.

The values for cost of carbon provided in the Draft Assumptions are associated with imported power. If and how carbon pricing is applied within Nova Scotia is vary significant variable as well.

a. The IRP model should consider the potential for NS Power to be required to pay a price on carbon emissions.

Regarding the cost of carbon emissions specifically, we have drawn our analysis from a report commissioned by Synapse Energy Economics Inc. on November 1, 2013 - "2013 Carbon Dioxide Price Forecast". This study considered the carbon price information from the most recent IRP efforts of 28 utilities. With the Canadian federal government's stated intention to harmonize carbon policy with the US and our economic interdependence, we feel it is reasonable to use US projections for Canadian pricing scenarios. We would request that the costs from this study for long-term carbon pricing be considered. The three key scenarios are itemized below:

b. The **Low Case** forecasts a cost of Carbon at US$10/Ton CO_2 in 2020, escalating to US$40/Ton CO_2 in 2030.[4]

c. The **Mid Case** forecasts a cost of Carbon at US$15/Ton CO_2 in 2020, escalating to US$60/Ton CO_2 in 2030.[5]

d. The **High Case** forecasts a cost of Carbon at US$25/Ton CO_2 in 2020, escalating to US$90/Ton CO_2 in 2030.[6]

[4,2,3,] Synapse Energy Economics Inc., 2013 Carbon Dioxide Price Forecast, (Massachusetts, 2013)

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6) Suggested Candidate Resource Plans

Scotian WindFields had suggested the consideration of the below six Candidate Resource Plans. Nova Scotia Power Inc. has responded to each of these requests in correspondence on July 30, 2014. Scotian WindFields would like to offer the comments that are given below as further consideration for the Action Plan being developed as part of the 2014 IRP process.

1) SWFI Requests [CRPs a, b, c respectively]: *"A Candidate Resource Plan that includes a transition to an electricity supply that consists of **100%, 80% or 60% (a, b, c respectively) Renewable Energy Sources by the year 2040** – Including Wind, Solar PV, Solar Thermal, Tidal, Legacy Hydro, Maritime Link/Muskrat Falls, Biomass and other sources for generation, with a phase-in approach to energy storage technologies."*

NSPI Response [48, 49, 50 Respectively]: *"Due to the operational issues and uncertainties of this CRP this has not been selected as a Candidate Resource Plan. However, CRPs 6 and 8 and Scenario "C" emissions sensitivity analysis (S2) may provide relevant information regarding this proposal."*

Scotian Windfields feels that the specific operation issues that have been identified as barriers to high-RES worlds within the IRP process present **an opportunity for further study**, within this IRP framework. We feel that the analysis and models used within this process could have been utilized to explore exactly what operational strategies, capital infrastructure and sustaining capital would need to be implemented to achieve this high-RES scenario.

2) SWFI Request: *A Candidate Resource Plan that includes the following criteria: **High DSM Case, Min Use Coal Case, High Wind Case.***
NSPI Response: *This proposal is being modelled as CRP 6.*

3) SWFI Request: A Candidate Resource plan that includes Scenario C GHG Emission cuts to **2.25MT in 2040.**
NSPI Response: "Scenario C emissions will be tested as sensitivity analysis case S2"

4) SWFI Request: *A Candidate Resource plan that includes Scenario with GHG Emissions cut to **0MT in 2040.***
NSPI Response: "NS Power is testing Scenario "C" emissions - 2.25 MT by the end of the planning period - please refer to sensitivity analysis case S2."

Scotian WindFields feels that Nova Scotia Power Inc. should consider future regulatory and emissions frameworks that would require net-zero GHG worlds.