

July 9, 2014

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

**RE: Submission of Comments on IRP Analysis Plan**

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 Process Update & Intervenor Feedback documentation that was provided on June 4, 2014, and information included in and leading up to the Technical Conference held June 25, 2014.

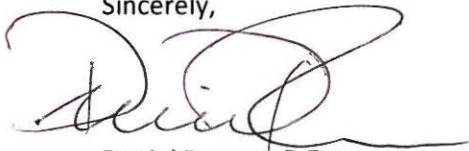
In general, we feel that the proposed IRP strategy has significant shortcomings with respect to the future cost of fossil fuels and carbon pricing. These shortcomings greatly reduce the effectiveness of this plan to adequately prepare our electrical system in the best interests of the environment and Nova Scotia's electrical stimulus. The following items that are detailed in the attached document will need to be addressed to alleviate these shortcomings:

- Fossil Fuel Price Forecast Assumptions
- Carbon Pricing Assumptions
- 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 analysis.

Sincerely,



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

### 1) Wind Assumptions

Scotian WindFields Inc. requests that the below points, regarding wind energy assumptions, be considered in upcoming analysis of Candidate Resource Plans.

- a. Wind energy supply in excess of an additional 100MW (as currently shown as a Supply Side Option) should be considered.
- b. Additional distribution-connected wind energy should be considered as a Supply-Side Option, with specific capital costs and integration costs considered.
- c. Integration Costs and Demand Reduction should be considered in anticipation of **>200MW by 2030** of wind generation under the upcoming Renewable to Retail framework.

### 2) Solar Assumptions

The Draft Supply-Side Options only consider “>10MW” each of transmission-connected solar thermal and solar photovoltaic supply options. Scotian WindFields Inc. requests that the below points, regarding solar energy assumptions, be considered in upcoming analysis of Candidate Resource Plans.

- 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. We recommend that large amounts (**>10MW**) of **individual and commercial-scale (1-100kW) solar thermal energy** be considered as a Supply-Side offset.
- c. 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.
- d. We welcome further discussion on the capacity factors of the various types of solar energy which were not discussed in the initial analysis provided.

### 3) Energy Storage Assumptions

Scotian Windfields Inc. requests that utilization of CAES, and other energy storage technologies be considered in high-RES Candidate Resource Plans.

The Capital Cost assumption for CAES is stated at **\$1,400/kW** in the provided Supply-Side Options which is similar to the average capital cost of various Natural Gas-fired Combustion Turbines (**\$1,100 - \$1,600**) that would also be considered in high-RES Candidate Resource Plans.

Scotian Windfields Inc. requests that energy storage technologies be considered in the transition to a high-RES world following the 2020 benchmark of 40% RES generation.

#### 4) Fuel Price Forecast Assumptions

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%**.<sup>1</sup>
- 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%**<sup>2</sup> and the Average Annual Increase of Heating Oil was calculated at **6.3%**.<sup>3</sup>
- c. Based on the above presented historical data, we **recommend that NS Power consider more representative energy inflation figures** in future IRP modelling.

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<sup>1</sup> 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>

<sup>2</sup> 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>

<sup>3</sup> 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 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<sub>2</sub> in 2020, escalating to US\$37/Ton CO<sub>2</sub> 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<sub>2</sub> in 2020, escalating to US\$40/Ton CO<sub>2</sub> in 2030.<sup>4</sup>
- c. The **Mid Case** forecasts a cost of Carbon at US\$15/Ton CO<sub>2</sub> in 2020, escalating to US\$60/Ton CO<sub>2</sub> in 2030.<sup>5</sup>
- d. The **High Case** forecasts a cost of Carbon at US\$25/Ton CO<sub>2</sub> in 2020, escalating to US\$90/Ton CO<sub>2</sub> in 2030.<sup>6</sup>

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<sup>4,2,3</sup>, Synapse Energy Economics Inc., 2013 Carbon Dioxide Price Forecast, (Massachusetts, 2013)

## **6) Suggested Candidate Resource Plans**

Scotian WindFields would to suggest a number of Candidate Resource Plan criteria to be included in the evaluation modelling. We understand that the five Draft Resource Plans, as presented in the June 25 Technical Conference, are preliminary in nature, however, we feel the range of plans considered in this initial analysis does not acceptably consider low-carbon or high-RES worlds.

None of the five Draft Resource Plans include the minimum coal use scenario, only one plan includes the medium coal use scenario and four plans include maximum coal use scenarios.

- a. A Candidate Resource Plan that includes a transition to an electricity supply that consists of **100% 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.
- b. A Candidate Resource Plan that includes a transition to an electricity supply that consists of **80% 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.
- c. A Candidate Resource Plan that includes a transition to an electricity supply that consists of **60% 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.
- d. A Candidate Resource Plan that includes the following criteria: **High DSM Case, Min Use Coal Case, High Wind Case.**
- e. A Candidate Resource plan that includes Scenario C GHG Emission cuts to **2.25MT in 2040.**
- f. A Candidate Resource plan that includes Scenario with GHG Emissions cut to **0MT in 2040.**