Date : 6/19/2012 8:34:55 AM
From : "Bown, Charles W."
To : "Parsons, Walter"
Subject : wind scope
Attachment : NFL3 Proposal for Wind Capacity Assessment rev 3 - NR.docx;
Walter;
I've revised the scope and copied that section below. The doc is also attached with tracked changes.
Charles

A number of non-government organizations and private citizens have questioned the need to build the Muskrat Falls Generating Station and the associated HVdc transmission system as the next option for the Isolated Island of Newfoundland. These groups have promoted a wind power solution as replacement for 824 MW Muskrat Falls Generating Station and ultimately the 500 MW Holyrood Thermal Generating Station as a viable alternative.

The basic question is "Can sufficient wind generation be installed on the Island to provide a firm supply of electricity to Island customers?" The Island of Newfoundland is a large Island with varying wind resources available across the Island. At this time, the probability of the entire island becalming is unknown. The transmission system is also limited in power transfers west-east to the Avalon Peninsula and would likely require upgrades and cost to customers is an important consideration.

The purpose of the MHI study is to provide a learned opinion on the reasonableness of this question considering the application of new technology, the situation in similar jurisdictions (for example Hawaii and Ireland) and the application of statistical methods for firm assessment (i.e. capacity credit). For a good discussion of the issues surrounding capacity credits, visit this reference.[1]

The assessment should determine:

a) If the wind power solution can work for the isolated island power system to replace planned new sources of electricity composed of traditional base load and peaking thermal plants.
b) What is the capacity credit[2] of wind power on the Island of Newfoundland? Can there be sufficient wind power investment to provide a reliable firm supply for island customers with overbuild.

Study Goals:

1. Perform a desktop exercise to review existing literature, working group papers, technical resources, and industry know-how to describe the common nomenclature in the industry, identify existing wind farm applications in isolated networks, identify the key issues in their application, document known issues with these applications.

2. When the key facts noted above are considered together with the situation on the Island of Newfoundland, describe the applicability of the key issues and whether there is any merit in proponent claims that wind power can be a sole solution for Newfoundland.

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[1] http://windfarmrealities.org/?p=200

[2] The capacity credit for intermittent generation, the additional conventional capacity required to maintain a given level of reliability and thus the overall system margin are all related to each other. The smaller the capacity credit, the more capacity needed to maintain reliability, hence the larger the system margin. The amount by which the system margin must rise in order to maintain reliability has been described in some studies as "standby capacity", "back-up capacity" or the "system reserves". But there is no need to provide dedicated "back-up" capacity to support individual generators. Source: http://www.wind-works.org/articles/GridIntegrationofWindEnergy.html

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Project: Assessment of Wind Capacity Credits for the Isolated Island of Newfoundland

Client: Government of Newfoundland and Labrador – Department of Natural Resources

PROJECT PROPOSAL - DRAFT

Proposal Prepared for:

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File: NFL3

Date: June 14, 2012

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Scope of Services

1.0 Introduction

This proposal is in response to an enquiry from the Government of Newfoundland and Labrador, Department of Natural Resources to carry out the goals listed below in the scope of work.

Manitoba Hydro International (MHI) possesses a roster of well-qualified personnel to draw upon for this assignment. In particular MHI staff have been engaged in generation planning projects in several countries throughout the world and can count on the support of Manitoba Hydro's 6000 plus employees. Our human resources capabilities are available to cover all disciplines and tasks required for the successful completion of this project. We are proposing various experts to meet the requirements of this important work, all of which have worked extensively in their relevant fields. The staff CVs are available on request.

2.0 Objective

A number of non-government organizations and private citizens have questioned the need to build the Muskrat Falls Generating Station and ~~is~~ the associated HVdc transmission system as the next option for the Isolated Island of Newfoundland. These groups have promoted a wind power solution as replacement for 824 MW Muskrat Falls Generating Station and ultimately the 500 MW Holyrood Thermal Generating Station as a viable alternative.

The basic question is "~~if cost is not a factor,~~C ~~c~~an sufficient wind generation be installed on the Island to provide a firm supply of electricity to Island customers?" The Island of Newfoundland is a large Island with varying wind resources available across the Island. At this time, the probability of the entire island becalming is unknown. The transmission system is also limited in power transfers west-east to the Avalon Peninsula and would likely require upgrades and cost to customers is an important consideration.~~.~~

The purpose of the MHI study is to provide a learned opinion on the reasonableness of this question~~assumption~~ considering the application of new technology, the situation in similar jurisdictions (for example Hawaii and Ireland) and the application of statistical methods for firm assessment (i.e. capacity credit). For a good discussion of the issues surrounding capacity credits, visit this reference.[1]

[1] http://windfarmrealities.org/?p=200

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~~A qualitative assessment of the state and application of wind technologies is required when applied to the Island of Newfoundland. Examination of similar isolated jurisdictions would give an indication into state of the art in wind power. New technologies from manufacturers would also be factored into this assessment.~~

The assessment should determine:

a) If the wind power solution can work for the isolated island power system to replace planned new sources of electricity composed of traditional base load and peaking thermal plants.
b) What is the capacity credit[2] of wind power on the Island of Newfoundland? Can there be sufficient wind power investment to provide a reliable firm supply for island customers with overbuild.
~~c) What would be an optimal mix of resources if wind power cannot provide the entire energy and capacity requirement?~~

~~Nalcor has indicated that it is updating their 2004 study[3] which outlines wind penetration limits based on higher fuel costs and additional transmission capacity. From page 1 of the Introduction,~~

> ~~*"The ability of wind generators to operate is contingent on its availability (i.e. whether or not the wind is blowing) and therefore cannot be turned on at will. It therefore cannot displace the need for and availability of generating sources that can be dispatched to meet the constantly changing customer demands. In the Newfoundland context, while wind offers the opportunity to displace a portion of the oil fired energy produced at the Holyrood Thermal Generating Station on the Island of Newfoundland, no amount of wind capacity could displace the entire facility without significant investments in other (most likely fossil fueled) dispatchable sources."*~~

~~This statement is prefaced with the basic assumption that wind cannot be treated as a firm resource.~~

~~The purpose of the MHI study is to provide a learned opinion on the reasonableness of this assumption considering the application of new technology, the situation in similar jurisdictions (for example Hawaii and Ireland) and the application of statistical methods for firm assessment (i.e. capacity credit). For a good discussion of the issues surrounding capacity credits, visit this reference.[4]~~

Study Goals:

1. Perform a desktop exercise to review existing literature, working group papers, technical resources, and industry know-how to describe the common nomenclature in the industry, identify existing wind farm

[2] The capacity credit for intermittent generation, the additional conventional capacity required to maintain a given level of reliability and thus the overall system margin are all related to each other. The smaller the capacity credit, the more capacity needed to maintain reliability, hence the larger the system margin. The amount by which the system margin must rise in order to maintain reliability has been described in some studies as "standby capacity", "back-up capacity" or the "system reserves". But there is no need to provide dedicated "back-up" capacity to support individual generators. Source: http://www.wind-works.org/articles/GridIntegrationofWindEnergy.html

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applications in isolated networks, identify the key issues in their application, document known issues with these applications.

2. When the key facts noted above are considered together with the situation on the Island of Newfoundland, describe the applicability of the key issues and whether there is any merit in proponent claims that wind power can be a sole solution for Newfoundland.

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~~3. Identify the steps required, data necessary and potential outcomes if MHI were to undertake a detailed study. A complete study would examine the mix of generation sources available on the Island of Newfoundland, examine the quality of wind resources and location, match technology to the intended application, develop options for a generation resource plan, identify control and dispatch issues, determine installed capacity and energy requirements to maintain reliability, determine the amount of investment required to meet the future load demand over a stated period, and calculate the cumulative present worth for scenario comparison.~~

The Consultant will also provide such advice and other services as may be required from time to time by the Client.

3.0 Proposed Team

Paul Wilson – Managing Director, MHI
Role: Project Director

Danny Northcott, P.Eng. – Power System Simulation and Project Engineer, MHI
Role: Project Manager

Dr. David Jacobson, P.Eng. – Interconnections & Grid Supply Planning, Manitoba Hydro
Role: AC integration and Industry Trends

Tom Molinski, P.Eng. – Emerging Energy Systems Section Head, Manitoba Hydro,
Role: Wind Turbine Technologies, cold weather operation

Kelly Hunter, P.Eng. – Senior Export Market Intelligence Engineer, Manitoba Hydro
Role: Generation Resource Capacity Planning

Red, Participation is to be confirmed.

Rick Horocholyn – Financial Specialist, Manitoba Hydro
Role: Financial modelling and rates analysis

Individuals from the design services team for the final report publication.

~~[3] NLH System Planning & System Operations, "An Assessment of Limitations for Non-Dispatchable Generation on the Newfoundland Island System", October 2004~~
~~[4] http://windfarmrealities.org/?p=200~~

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4.0 Proposed Services

The Services which the Consultant shall perform or cause to be performed include the following:

1. Industry Assessment of Wind Farm Applications in Isolated Islands (Desktop Study)

   Perform a desktop exercise to review existing literature, working group papers, technical resources, and industry know-how to describe the common nomenclature in the industry, identify existing wind farm applications in isolated networks, identify the key issues in their application, document known metrics with these wind farm applications.

Task 1.1:	Review and report on Industry Trends in Isolated Island scenarios (CIGRE, IEEE, IEE, IEC, etc.)	David Jacobson
Task 1.2:	Review and report on Wind Turbine Technologies applied to Isolated Island scenarios (Examine other Isolated power systems: Ireland, UK, Tasmania, Hawaii, Spain-Canary Islands, or others as applicable).	David Jacobson
Task 1.3:	Review and report on Wind Turbine Technologies applied in Isolated Island power systems, turbine technology matches, and applications in extreme cold weather climates.	Tom Molinski
Task 1.4:	Review and report on best practices and existing metrics by region for Wind Capacity Credit assessment.	David Jacobson
Task 1.5:	Review key factors in integration issues for a high penetration of variable generation (wind turbines). This will include grid planning, real time control, reliability assessment, and turbine maintenance and operations KPIs.	Tom Molinski
Task 1.6:	In consultation with Nalcor, review and document the important considerations for a high level of wind power penetration on the Island of Newfoundland.	All

2. Assessment of Wind Farm Applications for Newfoundland

   When these key facts noted in Task 1 above are considered together with the situation on the Island of Newfoundland, describe the applicability of the key issues and whether there is any merit in proponent claims that wind power can be a sole solution for Newfoundland.

Task 2.1:	Develop a technology compliance matrix for wind farms applied to the Island of Newfoundland and identify critical gaps in the technologies.	Tom Molinski
Task 2.2:	Examine the Generation Resource Plan for the study period. Match base load forecast to generation resource requirements factoring in generation reliability, wind resource energy and capacity	Kelly Hunter

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	availability, transmission requirements, reactive power requirements, frequency control requirements, operational requirements. A simple desktop model will be built to demonstrate the capability. Simple assumptions on fuel pricing and base load thermal generation will be utilized in this model.	
Task 2.2:	Estimate capital budget implications for investment in wind farm technologies including generation, control and communications, transmission, operations and maintenance for wind to be the sole generation source on the Island.	Tom Molinski and David Jacobson
Task 2.3:	Develop a task list of activities necessary to perform a full capacity credit assessment for the Island of Newfoundland.	David Jacobson
Task 2.4:	Identify the steps required, data necessary and potential outcomes if MHI were to undertake a detailed capacity credit study for the Island of Newfoundland.	David Jacobson
Task 2.4:	Draft the MHI report on Task 1 and 2 study and findings. Preparation of a final report anticipated to include, as a minimum the following: • An executive summary; • A description of the methodology used to complete the Services; • A discussion of the results of the review, including a discussion of the materiality of any observations and recommendations made as well as a discussion of the steps taken to address such matters.	Danny Northcott

3. **OPTIONAL** and contingent on completion of Tasks 1 and 2 – Perform the Wind Capacity Credit Assessment for the Island of Newfoundland. A complete study would examine the mix of generation available on the Island of Newfoundland, examine the quality of wind resources and location, match technology to the intended application, identify control and dispatch issues, determine installed capacity and energy requirements to maintain reliability, identify generation mix scenarios, determine the amount of investment required to meet the future load demand over a stated period, and calculate the level unit rate cost for consumer comparison. A budget and scope of work document would be prepared for the Clients consideration.

Task 3.1:	Examine the quality of wind resources and location through published data. No wind measurements will be undertaken.	Not assigned
Task 3.2:	Examine the mix of generation available on the Island of Newfoundland as required to support a high penetration of variable generation. Formulate a generation resource mix scenarios for the Island of Newfoundland based on wind, thermal and available hydro sources.	

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Task 3.3:	Determine installed capacity and energy requirements to maintain reliability over the study horizon, to be determined in consultation with the client.	
Task 3.4:	Identify control and dispatch issues applicable to the Island of Newfoundland isolated power system.	
Task 3.5:	Estimate the amount of investment required to meet the future load demand over a study horizon.	
Task 3.6:	Calculate the Cumulative Present Worth of the identified scenarios to provide a basis of comparison to Muskrat Falls, the thermal base case, and the identified wind scenarios.	
Task 3.7:	Draft MHI report on study and findings. Preparation of a final report anticipated to include, as a minimum the following: • An executive summary; • A description of the methodology used to complete the Services; • A discussion of the results of the review, including a discussion of the materiality of any observations and recommendations made as well as a discussion of the steps taken to address such matters.	

4. Present the report to the Client, and provide support to the Client until the project closes.

Schedule Item Scheduled Completion Date

- Dates are to be determined.

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5.0 Financial Proposal

To be prepared once the Scope of Work is finalized.

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6.0 Contract Terms

The Consultant acknowledges that the Client is relying on the skill and knowledge of the Consultant in performing the Services. The Consultant shall exercise the degree of skill, care and diligence required by customarily accepted practices and procedures for such a Contract.

The Consultant shall only use key personnel to perform the Services who have been named by the Consultant in the Proposal and who have been accepted by the Client. The Consultant may only substitute or replace the accepted key personnel with the prior written agreement of the Client.

The provision of these services under the existing or similar contract would be acceptable to MHI.