Responses to Industrial Group Requests – received via email May 1, 2014

Request:

NSPI comments at page 11 "wind generation may be present at near nameplate capacity during some high load hours, it may not be there at all in other high load hours, “in ⅓ of the peak hours shown here wind generation is at 10% or less” and "The risk of overstating capacity value of wind is designing a system with inadequate firm capacity to serve load in all peak hours".

(1) Do NSPI’s comments suggest a presumption that the customers' Value of Lost Load (VOLL) is higher in high load (peak) hours than other hours?

(2) If so, what is the basis for this conclusion. If not, why is NSPI focusing on high load hours in this slide?

Response:

(1) No, NS Power is not suggesting that the VOLL is higher during peak load hours.

(2) Peak system demand hours are the most difficult hours for NS Power to meet system demand. If overstated by averaging, the capacity value of wind will erode the required planning reserve margin, calculated in the resource adequacy assessment, and thus affect the ability of NS Power to supply customer load in peak system demand periods when wind generation is not present.

Request:

On page 12 NSPI provides a chronological plot of LOLP, for 2016. At page 29 NSPI states "The LOLE study was conducted with 2006 load shape in order to match load to the AWST wind shape which is based on 2006 measurements.”.

(3) Can NSPI confirm that the foundation of the 2016 analysis is the 2006 hourly load and wind data? If so, how does the 2006 wind data at times of highest load compare to the graph and data with respect to the top 30 hours provided on slide 11 (wind generation at 10% or less for ⅓ of peak load hours, based on wind generation and load in 2010-2013).

(4) Are the two data sets (2006 and 2010-2013) reasonably consistent with respect to wind generation at times of peak load?

(5) How has NSPI satisfied itself that the limited data presented on slide 11 and the LOLE analysis are consistent?

Response:

(3-5) The LOLE study with the 2006 load-wind data set was conducted in order to confirm the results from the 2013 GE Energy – Renewable Energy Integration Study (REIS), which used the same data set based on wind speed measurements by AWST.

Since the GE Energy REIS was published, NS Power has seen evidence in other North American jurisdictions of large annual variations in ELCC of wind calculated by the LOLE methodology. The Company concluded that basing the ELCC of wind on one year of data can lead to results that do not align with actual data over a multi-year period.

Cumulative frequency analysis performed on the 2006 wind-load data set yields capacity value of wind of about 8 percent at 85 percent confidence level. This compares well to the analysis of 4 year wind-load data sets which yields capacity value of wind of 12 percent at 85 percent confidence level.

The data set on slide 11 represents 2010-2013 wind and load data while the LOLE study represents only one year of data based on 2006 AWST wind speed measurement. The chart on slide 11 illustrates the issue associated with the averaging nature of the LOLE methodology. If wind generation data on slide 11 is averaged, it produces a high average capacity factor which is not representative of wind generation that can be expected to be available during peak system demand and wind generation contribution to the planning reserve margin.

Request:

Cumulative Frequency Analysis "Using data in terms of hourly Capacity Factor" (page 15)

(6) Has NSPI attempted to examine the impact of "normalizing" units for size by utilizing capacity factor? Did the larger units have higher or lower capacity factors in the top 10% of load hours?

Response:

(6) In the referenced study, NS Power examined total wind generation output, taking into account all wind generators, and their capacity factors from the actual hourly generation data. NS Power did not analyze individual wind generator performance for peak system demand hours.

Request:

Data within each bin are from a single population

- No significant differences caused by increased diversity in later years of study period as additional wind farms come online (page 17)

(7) Please explain what is meant by these two points. Does the second point suggest that NSPI does not expect that there will be more diversity in wind generation when all projects under development are added to the system, or that this is an assumption.

Response:

(7) "Data within each bin are from single population" is a statistical term meaning that four years of wind and load data were considered in the statistical analysis, rather than each year individually.

The second statement is an observation that as wind diversity on the system has increased with incremental additions of new wind generating resources, there has been no measurable effect on the ability of wind generation to serve peak system demand.

Nova Scotia covers a relatively small geographical area which is already represented by wind generators from the perimeter and the core of the provincial land mass. Further geographic diversity of wind generation installations within the Province will not change the statistical significance of the data already available with respect to wind generation's ability to serve peak system demand.

Request:

On page 31, NSPI provides system assumptions related to Maritime Link. Maritime Link is assumed to come online 01/10/2017.

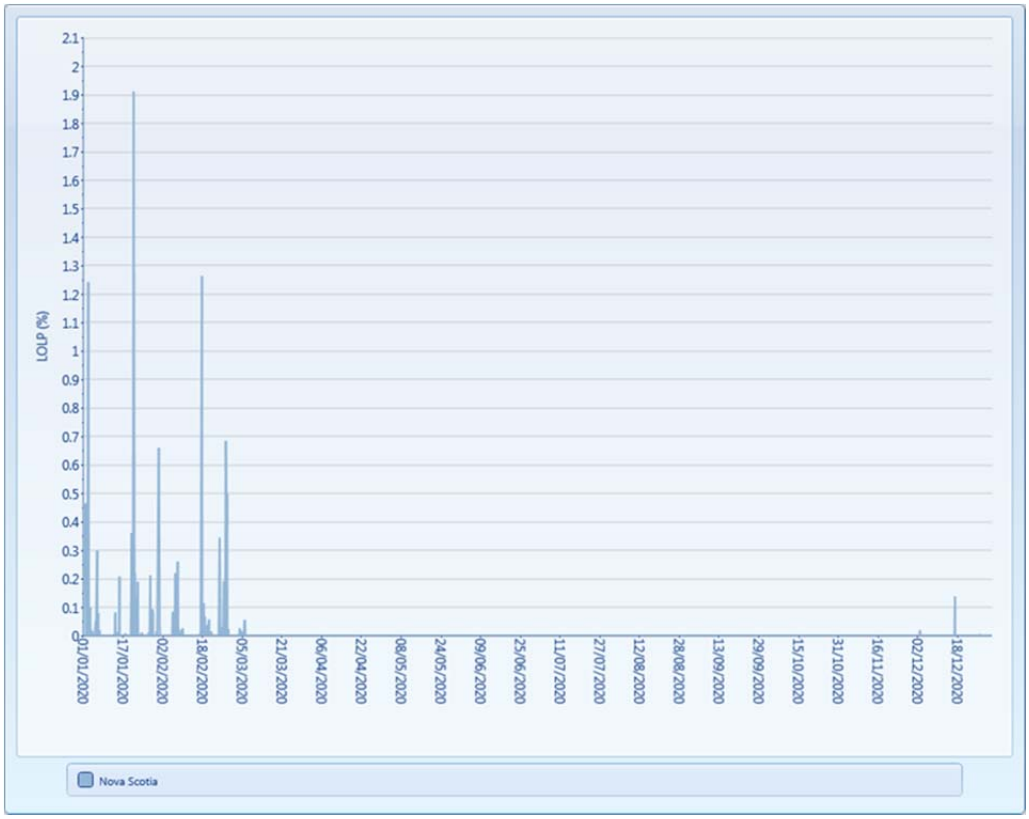
(8) Does a chronological plot of LOLP with Maritime Link in service appear consistent with the plot on slide 12? Please provide such a plot.

Response:

(8) The LOLE analysis was conducted for the year 2020 in order to be consistent with GE Energy REIS and in order to include the effects of Maritime Link on Effective Load Carrying Capability (ELCC) of wind generation.

The LOLP plot for the year 2020 appears similar to that of 2016 with respect to the temporal concentration of non-zero LOLP values, but the 2020 LOLP values are less severe than those in 2016, peaking at about 2 percent LOLP, versus 15 percent values as observed on the 2016 plot.

The decrease in LOLP severity in 2020 is attributed to the effects of Maritime Link and peak load forecast which is 20 MW lower in 2020 compared to 2016 in this study.



Request:

On page 21, NSPI states:

> Planning reserve requirement calculation is based on the NPCC accepted criterion of loss of firm load no more than 1 day in ten years or 0.1 days per year. This means that the system planning reserve is such that it allows the system to fail to meet peak system demand on the average for 2.4 hours every year, on average."

(9) Can NSPI confirm that the 1 day in ten years criterion means that some firm load will not be served once in ten years?

(10) The amount of energy not provided is not quantified. Can NSPI confirm that the criterion does not mean that load is not served for 24 hours once every ten years and therefore it is not appropriate to express the criterion as allowing "the system to fail to meet peak system demand on the average for 2.4 hours every year, on average."

Response:

(9) The one day in ten years criterion for determining the planning reserve margin is a statistical probabilistic approach to assessment of resource adequacy. The criterion specifies acceptable

loss of load probability used to determine appropriate planning reserve margin. It does not mean that in reality any firm system demand will be lost.

(10) The one day in ten years criterion does not specify the energy associated with the notional load interruption or the severity of the said interruption. The interpretation of the criterion to mean that the planning reserve margin required to meet the resource adequacy assessment which does not exceed the probabilistic loss of load expectation of more than 0.1 days per year is appropriate and also consistent with the interpretation within other NPCC and North American jurisdictions in general.