SUMMARY NOTES

Resource Options Update: Wind

Dec 15, 2014
10:00 – 11:30
BC Hydro Dunsmuir

.TYPE OF MEETING	Wind Resource Meeting
ATTENDEES	Paul Rapp (Alterra); James Griffiths (Sea Breeze/CanWEA), Resja Campfens (Sea Breeze/CEBC); David Warner (EDF EN), Tom Levy (CanWEA), John Partyka (Aeolis), Ron Percival (Avro Wind), Paul Kariya (CEBC), Frankie Nash (CEBC), Vikas Karulkar (Senvion), Scott Cutler (MEM), Ian Baillie (CanWEA), Ron Zeilstra (FortisBC), Mike Hopkins (FortisBC), Nguyen Pham (FortisBC), Wagner Kseniuk (Aeolis)
BC HYDRO	Magdalena Rucker, Anne Wilson, Nan Dai, Randy Reimann
OBJECTIVES	Review results from action items from Sept 12 meeting; and report back on turbine characteristics after contacting turbine manufacturers
HANDOUTS	Live Meeting Presentation

MEETING SUMMARY NOTES

Agenda Review and Introductions

1. BC Hydro introduction to BC Hydro and FortisBC resource options data collection

Hydro welcomed FortisBC to the table and let people know that BC Hydro and FortisBC are embarking on a collaboration of the resource option data. Both utilities inventory resource options across the province and are working towards a similar time line. Hence, it makes sense to have a common view of their planning assumptions.

2. Action items from Sept 12 meeting

a. Review wind speed adjustment for the Peace Region

BC Hydro described that the modelled wind speeds from the 2010 Wind Data Study were validated for 30 points across the 4 modelling domains (VI, SI, PR and NC), using a mixture of BC Hydro, IPP, and Environment Canada data. The modelled wind speed bias was generally within ± 15% in VI, SI and NC, and there was no persistent bias in these regions. A persistent modelled wind speed bias ranging from -18% to -26% (i.e. underprediction of the observed wind speeds), however, was found for validation sites located in the high country east of the Continental Divide in the Peace Region. Hence, a 20% wind speed adjustment was applied to this area to correct for this persistent and significant under-prediction of the wind speed.

There was a question as to how the 20% was chosen. The goal was to apply a single correction factor, and hence the 20% was chosen because it lies in the range of bias that was observed.

b. AWS Truepower high resolution wind data

There was discussion of using the AWS Truepower high resolution wind data instead of the wind speed modelling completed by 3TIER for the 2010 BC Hydro Wind Data Study. It was explained that AWS Truepower undertakes mesoscale modelling and then runs the results through a microscale model to capture topographic effects at a horizontal grid resolution of 200 m. Because these two levels of modelling are computationally very expensive, only a meteorologically representative year, consisting of 366 days sampled out of a 15-year period, is modelled. This approach is suitable for wind resource assessment application, but BC Hydro requires time series data for the wind integration study, and hence the AWS Truepower data set is not suitable for this application. For the purposes of the wind integration study and the wind resource option work and, we are not necessarily looking for accurate, but for representative wind speed data. It is understood that the model will sometimes over-predict and sometimes under-predict the wind speeds, but on average, the wind speeds should be representative.

There was general agreement that for the purposes of the wind integration study and the wind resource option update, it made sense for BC Hydro to use the wind speed data from the 2010 BC Hydro Wind Data Study.

c. Review Loss Assumption

Feedback received suggested that the loss assumption of 18.6% from the 2010 BC Hydro Wind Data Study is on the low side of a range of 20% to 22% that would be considered fair for BC. This range does not include icing losses. Additional comments were that the loss assumption for power performance was too low, and that losses due to curtailment (e.g. wind sector management) were missing.

There was a comment that the assumed losses are on the high side for the Peace Region; and in particular that the array losses are very small or negligible due to orientation of the ridges to the pre-dominant wind direction and the unidirectional nature of the wind, and that there are almost no icing issues. An alternative view stated that there are array losses on ridgeline projects as well as icing losses in the Peace Region, but the icing losses are much less than 18%.

There was some discussion as to whether to take a regional look at icing losses; however, no operational data is available for the SI or NC region, and even within a region, icing losses may vary quite a bit between projects. Coming up with regional estimates may also suggest more accuracy in the data than what we really have.

It was mentioned that a Quebec company as well as NRCan have done some work on icing. This work may not be applicable as it is probably based on Quebec and Ontario icing issues. Icing losses also depend a lot on operating characteristics and hence a blanket treatment is difficult.

BC Hydro proposed to increase the losses to 20.4% to put the number more in the middle of the range, and then not consider icing losses any further (due to the difficulty in estimating icing losses).

There was general agreement that it was okay to use 20.4% for total losses. There was also recognition that this may overstate the losses in certain regions and for certain projects, but this is a difficult topic to handle in a generalized manner.

It was clarified that the Environmental components of the losses included blade degradation/soiling, lightning, cold temperature shut-downs, and high wind hysteresis. Site access is not included.

d. Information collected from manufacturers on turbine characteristics to develop updated power curves

BC Hydro received input from 5 different manufacturers on 15 turbine models. Nameplate capacity for the turbine models submitted was primarily in the 3.0 - 3.3 MW range. Only 1 turbine model was IEC class I; the rest were IEC classes II and III.

Since most of the turbine models are in the 3.0 to 3.3 MW range, BC Hydro is proposing to use a uniform nameplate capacity of 3.3 MW across all IEC Classes. There was general agreement that this assumption is fine.

In discussions with turbine manufacturers, the following points were made: 1) turbines with higher nameplate capacities tend to get installed in more complex terrain (so to save on construction costs) and 2) there is a tendency now to mix-and-match turbine models with different rotor sizes to meet the load requirements but have the best AEP (i.e. the IEC classification scheme seems to play less of a role now). It is not possible to do this kind of analysis for the resource options, since only information on the mean wind speed (i.e. not turbulence) is available. It was agreed in the meeting that for the purposes of this resource option update, BC Hydro will keep using the IEC classifications. However, it was suggested that BC Hydro considers 'pushing up' to the next classification (i.e., keep IEC Class the same, use IEC Class III instead of IEC Class II, and use IEC Class II instead of IEC Class I) to reflect higher production rates at the lower classes.

ACTION ITEM: BC Hydro to go back to the turbine manufacturers and explore the idea of pushing up the IEC classes, based on the mean wind speed alone.

It was also suggested that in addition to the 'ridge' and 'plateau' type of projects considered previously, there should also be a 'plains' category to account for that construction costs for 'plains'-type project are approximately a 1/3 less. It was suggested that EDF EN may be able to provide BoP cost estimates for 'plains'-type projects. However, BC Hydro does not think that there were any wind projects in the database that would fall under the 'plains' category, and if there any, the number would be so small that including the 'plains'- category does not make a material difference.

Hub Height

The feedback from OEMs was that new tower technology will allow hub heights to be 140m+. For BC, the general suggestion was to consider hub heights in the range of 100 m – 120 m for the near-term future (i.e. next 3-5 years). Based on this feedback, BC Hydro is proposing to increase the hub height from 80 m to 100 m. This is also the highest hub height that was modelled in the 2010 BC Hydro Wind Data Study. There was general agreement that going to a hub height of 100 m was reasonable, and that going any higher (i.e. 120m) was pushing it.

Power Curves

BC Hydro showed averaged normalized power curves for IEC Classes II and III, grouped by nameplate capacities. It was clarified that the difference in power curves between turbines with different nameplate capacity is due to that larger turbines have more inertia and need stronger winds to get the turbine going. So, if the rotor size is kept the same, but the size of the turbine is increased, then the power curve will shift to the left (i.e. worse efficiency).

BC Hydro proposed to use the avg power curve for the 3.0 – 3.3 MW turbines. General agreement that this was fine (but still subject to potentially pushing the IEC Classes).

There was a question about how uncertainties around wind speeds, power curves (i.e. lack of optimizing turbine to a given wind regime), etc are considered in the analysis. It was suggested that for planning purposes, it may be worthwhile having uncertainty bands around the resource options. BC Hydro mentioned a range of accuracy in the cost predictions of -10% to +40/60%; it is unclear, however, if/how the uncertainties around wind speed, power curves, etc are reflected in the current cost uncertainty band.

Another question was about whether BC Hydro is developing a forecast cost curve or is just taking a point in time. BC Hydro responded that we have been thinking about that and may be looking at sensitivity analysis as a way to consider forecasted cost curves. It was noted that there was an earlier agreement that BC Hydro would include what the trends are in the discussion. It was mentioned any discussions of future trends could include anti-icing equipment.

There was a question as to whether BC Hydro needed data from the Okanagan or elsewhere. It was clarified that the data would have to overlap with the simulated data which was modelled for the period 1998-2007. Also, no further validation is planned at this point.

It was asked whether a comparison of the power curves used in the last wind integration study and the new power curves could be provided. BC Hydro answered that it does not have the actual power curves from the 2010 BC Hydro Wind Data Study, but we can provide a comparison in the NCF between the original generation data set and the updated one with the new power curves.

ACTION ITEM: Once the updated generation time series are available, BC Hydro will send out a comparison of NCFs based on the original data set and the data set with updated assumptions.

In terms of pricing; BC Hydro will be collecting pricing from multiple sources. Engineering and construction firms will be sought for input on BoP costs. Turbine manufacturers as well as DNV-GL will be sought for input on turbine pricing as well as O&M costs. It was also suggested that IPPs such as EDF may be able to provide O&M cost estimates.

Once BC Hydro collects and summarizes pricing information, the wind engagement group will be brought back to review and provide comments on the draft results.

Also, there will be the kick-off meeting of the Technical Review Committee (TRC) for the wind integration study in early April. An information session with the wind engagement group will be held afterwards to inform them of the outcome of the TRC meeting.

BC Hydro thanked those who participated in the meeting.

Meeting close.