SUMMARY NOTES Resource Options Update: Wind

Sept 12, 2014
10:00 – 11:30
BC Hydro Dunsmuir

.TYPE OF MEETING	Wind Resource Meeting
ATTENDEES	Paul Rapp (Alterra); James Griffiths (Sea Breeze/CanWEA), Nicholas Heap, Resja Campfens (Sea Breeze/CEBC); Johnny Casana (EDP Renewables), David Warner (EDF EN), Tom Levy (CanWEA), John Partyka (Aeolis), Ryan Brown (EDP Renewables), Ron Percival (Avro Wind), Andrew Rabeau (Senvion), Sam Littlefield (EDP Renewables), Wagner Kseniuk (Aeolis)
BC HYDRO	Magdalena Rucker, Anne Wilson, Nan Dai
OBJECTIVES	Gather feedback on input assumptions for the wind data set
HANDOUTS	Background material distributed prior to meeting (attached)

MEETING SUMMARY NOTES

BC Hydro welcomed participants and introduced the purpose of the meeting, which was to collect feedback on input assumptions required for updating the wind time series data. This data set forms the basis for characterizing the wind resource potential in the province (e.g. annual GWh, monthly generation profiles), and is also used in the modelling work for the Wind Integration Study. BC Hydro is intending to update its Wind Integration Study. As part of this update, BC Hydro will be establishing a Technical Review Committee **(TRC)** to provide advice on BC Hydro's Wind Integration Study methodology. To provide a draft methodology for discussion to the TRC in November, some of the input data needs to be determined now. BC Hydro would like to gather feedback from stakeholders on the input data at today's meeting, in order to prepare for the TRC meeting to be held later this fall. Topics such as capital costs and project life will be dealt with at a later session. It was also mentioned that, in addition to the TRC, BC Hydro will be seeking feedback from stakeholders, such as the Clean Energy Association of BC and the Canadian Wind Energy Association at various times throughout the study.

Although there are wind farms operating in BC, BC Hydro is still in a place where it needs to rely on modelled wind data rather than actual data. For instance, 500 MW of operational capacity will operate differently than 1500 MW of wind capacity in the system. A goal for the initial meeting with the TRC is to provide a comparison between the modelled wind data and the actual wind data to ensure that the modelled wind data is adequately representative of actual observations. A similar comparison is planned between the simulated and actual day-ahead wind forecast errors.

A question arose as to how wind farms represented in the wind integration study are selected; i.e. are projects selected from one region or from across the province (which would see a greater ability to integrate effectively)? In the previous Wind Integration Study, BC Hydro selected projects in two ways: first to take the least cost resources (which in the case of the last IRP, was from the Peace Region); and secondly, to model diverse scenarios in which the projects are distributed evenly (in terms of installed capacity) across the four regions.

It was noted that this is a modelling/planning exercise which does not result in projects chosen for an acquisition process.

BC Hydro provided an update on the power curve studies. In 2012, BC Hydro commissioned DNV GL to update the power curves for IEC Class I and Class II turbines, and to provide a power curve for the relatively new Class III turbine category. DNV GL created these power curves by blending the power curves for a number of then current turbine models within each IEC class. These new power curves were then applied to the hourly wind speed time series (from the original 2009 Wind Data Study) to create new hourly wind power time series which were then used to update the wind resource option in the 2013 Resource Options Update. In the summer of 2014, BC Hydro again commissioned DNV GL to update the power curves. The results of this update are provided in the attachment.

It was clarified that the modelled wind speeds in the 2009 BC Hydro Wind Data Study were verified with actual wind speed observations at a number of sites. In general, the verification results suggested that the mesoscale modelling underestimated the wind speeds in the Peace Region by approximately 20%, and so a correction factor of 20% was applied to the Peace Region. It is not known whether these large errors occurred primarily on 'ridge' projects (i.e. on terrain that a mesoscale model would not be able to resolve) or not. It was requested that BC Hydro considers additional verification to confirm this assumption. It was also suggested that the bias might be caused by different hub heights.

ACTION: BC Hydro to look into testing the assumption that Peace Region wind speeds are ~20% higher than the modelling would indicate (i.e. may unfairly favour the Peace Region over other regions).

It was cautioned that there is a need to manage expectations – the purpose of the modelling is to provide representative wind speed time series, not necessarily accurate for each of the individual sites.

BC Hydro collected feedback on the following questions (refer to attachment for background information and questions where input was sought):

Question 1. List of Theoretical Projects (proposed change: none)

A discussion of the map occurred, and it was stated that there was generally good overlap between the potential sites identified in the BC Hydro Resource Option and sites which have investigative use permits and licenses of occupation. The largest disagreement lies in the Northeastern part of the province where there are several active investigative use permits, but no projects have been identified in the wind resource option. On the other hand, the wind resource option identifies several sites in the central North and in the area close to Liard River, which have not been staked by IPPs. It was suggested that it may be appropriate to update the list of projects with correspond with the currently held investigative use permits and licenses of occupation since it has been 6 years since the BC Hydro Wind Data Study was completed. It was generally agreed, that although this would be a 'nice to have', it is not critical to the study and that existing map would be fine to use. It was also noted that not all sites with investigative use permits are necessarily good sites suitable for development.

It was asserted during the scoping meetings that the mesoscale modelling done for the 2009 BC Hydro Wind Data Study was out of date and that modelling techniques have improved since then. BC Hydro followed up with 3TIER on this matter. 3TIER still uses the same mesoscale model, but now includes a feature of the model which was previously not used. This feature provides modest improvements over previous modelling results, but not enough improvements to warrant a new modelling study. Also, the modest improvements would not necessarily mean that the results are more accurate. The best way to improve the modelling would be to post process (i.e. adjust) the modelling results with actual observations from IPPs. This, however, would be a major undertaking in terms of contacting all the IPPs and assembling the observations (it would also require the participation of all the IPPs in order to make this approach worthwhile the effort). It was noted that this would be more important for developers but not so much for planning purposes.

It was suggested during the discussion that BC Hydro should contact AWS Truepower to see if their high resolution wind resource data could be useful.

Question 2. Turbine Size and Project Installed Capacity

During the initial scoping meeting a desire was expressed for the wind resource option update to be forward looking.

The general consensus of the stakeholders was that turbines continue to evolve and hence turbine size should be looked at. Rotor size is also increasing, and the efficiency of a turbine is a function of the turbine size and the rotor size.

It was suggested that BC Hydro contact turbine manufacturers for information on what turbine size will be prevalent in the next few years (i.e. technology that is available but not yet widely deployed).

ACTION: BC Hydro to consult with turbine manufacturers with regard to near-term trend on turbine size.

Question 3. Losses (current assumption 18.5% … should this be updated?)

It was suggested that the loss assumption may be too high, by perhaps 2 to 3 percentage points. Would need to look at the various loss components, particularly what is assumed for icing and curtailment. Turbine manufacturers now generally guarantee a turbine availability of around 97% which is higher than what would have been assumed in 2008. If guarantee is not met, then turbine manufacturer compensates wind farm owner.

It was suggested that BC Hydro goes back to DNV GL to review losses, and confirm if these numbers represent average losses, or are loss assumptions used by financial institutions.

ACTION: BC Hydro will go back to DNV GL and review loss assumptions. Alterra has also offered to review the various loss components and provide feedback on them, particularly on icing and curtailment.

Question 4: Hub Height (should a hub height greater than 80 m be used?)

It was suggested that a hub height of 80 m seems low, and that IEC Class II and III sites would likely gravitate towards higher hub heights (around 100 m) whereas IEC Class I sites would likely stay with lower hub heights (around 80 m). It was mentioned that some sites currently being developed are using shorter hub heights around 65 m. BC Hydro noted that the greater costs associated with the higher hub heights would have to be reflected in the cost analysis. It was mentioned that sometimes the extra cost due to the higher hub heights cancels out the revenue gain. In these cases, the wind farm owner usually goes with the smaller hub heights.

It was again suggested that BC Hydro consult with the manufacturers. The hub height also depends on the rotor size.

ACTION: BC Hydro to consult with turbine manufacturers with regard to near-term trends in hub heights.

Question 5: Turbine Efficiency

The new blended power curves provided by DNV GL were briefly discussed. Compared to the 2012 blended power curves, the IEC Class I power curve has decreased in efficiency, the Class II power curve remained approximately the same, and the Class III power curve increased in efficiency. It is speculated that the shift in the power curves may be associated with a broader range of specific turbine ratings that are available now (i.e. more possible combinations of turbine size and rotor size), and that turbine manufacturers may have been overly optimistic with the efficiency of Class I turbines in the past.

It was mentioned that for CanWEA's study on 'Assessment of the Estimated Costs of Wind Energy in British Columbia', CanWEA and its Advisory Board chose four representative turbine models. BC Hydro stated that it would like to stay with the blended approach.

It was discussed that the turbine efficiency is a function of turbine size and rotor size, and hence all three have to be considered together. It was suggested for BC Hydro to check with DNV GL to ascertain how recent DNV GL's information on the power curves is, and also to contact the main turbine manufacturers to obtain typical power curves for each IEC turbine class.

It was also discussed that most turbine manufacturers now have more sophisticated controls/software which allow the turbine to generate power above the high wind speed cut-off, but it is believed that modelling this improvement would not bring any material changes to the wind time series data.

ACTION: BC Hydro will speak to the manufacturers to get their views of data (e.g. hub height, turbine size, power curves), and then circulate the information back to this group for comment.

CanWEA representative offered to help in coordinating meetings between BC Hydro and turbine manufacturers at the upcoming CanWEA conference at the end of October.

BC Hydro thanked those who participated in the meeting.

Meeting close.