Market Participant Comments and AESO Replies Matrix

Proposed New Section 304.9 *Wind and Solar Aggregated Generating Facility Forecasting* ("new Section 304.9")

Date of Request for Comment: April 7, 2017

Period of Comment: April 7, 2017 through May 5, 2017

ISO Rules	Market Participant Comments and/or Alternate Proposal	AESO Replies
New The AESO is seeking comments from market participants with regard to the following matters: 1. Do you agree or disagree with the proposed new Section 304.9? If you disagree, please provide comments. 2. Are there any subsections where the language does not clearly articulate the requirement for either the AESO or a market participant? If yes, please indicate the subsections and suggest language that would improve the clarity.	**Canadian Solar Industries Association ("CanSIA")** 1. Is the following a typo? "one (1) set of meteorological data collection equipment and related devices per 100 square kilometers of surface area within the facility". This appears to be a very large surface area. **Elemental Energy Inc. ("Elemental")** 2. **Data Collection Equipment and Availability Requirements** a) (6) The gross real power capacity of the PV plant at any point is based on irradiance and unless there is a curtailment directive, there is no unused capacity. The AC nameplate capacity remains unchanged. Please clarify. b) (7) How frequently does this need to be done? (a) Unless there is a partial shut down of the PV plant for O&M purposes, the entire nameplate capacity is available subject to irradiance.	1. The AESO agrees and has amended subsection 4(3)(a) of proposed new Section 304.9 to require one set of instruments for each meteorological parameter in accordance with the requirements in Table 1 – *Wind & Solar Aggregated Generating Facility Meteorological Data Requirements* ("Table 1") per 49 square kilometers of surface area within the facility. In addition, subsection 4(3)(b) of proposed new Section 304.9 has been amended to correspond with the revision described above. 2. a) The AESO anticipates that the AC nameplate capacity may change in circumstances such as a forced outage or planned maintenance. b) Subsection 4(6) of proposed new Section 304.9 requires the gross real capability to be determined and provided to AESO every 30 minutes.

	3. **Pre-Commissioning Facility Data and Records Requirements** 8(2) It is not typical for pre-construction solar developers to measure the meteorology of a site preconstruction. Most solar projects are financed based on industry standard modelled solar data sources (ie. Meteonorm, Solar Anywhere, etc). It is reasonable to request the modelled data from the owner. We strongly recommend changing this requirement to something more industry standard.	3. The AESO recognizes that an industry standard model can provide the necessary information for pre-commissioning facility data and records. Therefore, the AESO has revised subsection 8(2) of proposed new Section 304.9 to allow for industry standard models to be used, subject to AESO's approval.
	4. **Table 1 – Wind & Solar Aggregated Generating Facility Meteorological Data Requirements** The following data are non-standard for operating solar sites, are costly, and provide little value to owners or forecasters: Dewpoint, Relative Humidity, Precipitation, Diffused Horizontal Irradiance, Direct Normal Irradiance. These additional irradiance measurements are difficult to implement since certain parts of the instrument(s) may need to track the sun. Reliable operation is suspect when exposed to extreme weather. We strongly recommend removing this requirement, which burdens owners unnecessarily and adds little or no value to the AESO. The cost would be approximately $50,000 +.	4. The AESO requires the parameters in Table 1 in order to ensure sufficient data for accurate solar forecasting. The AESO's approach is based on the recommendations from the World Meteorological Organization[1] and the National Renewable Energy Laboratory[2], and aligns with the *ISO 9060 Solar energy – Specification and classification of instruments for measuring hemispherical solar and direct solar radiation*[3]. Table 1 has been revised to ensure clear differentiation between wind and solar forecasting requirements.
	NextEra Energy Canada, LP ("NextEra") 5. a) NextEra believes that the proposed requirement for existing wind facilities to have a second meteorological tower to be excessive. This proposed change would negatively impact the economics of existing wind facilities without adding significant benefits to the AESO. Our existing facility in Alberta already has a single met tower currently in place, and the information provided by the addition of another meteorological tower would have minimal impact on data collection for the site. We recommend that the proposed Section 304.9 only apply to new	5. a) A single meteorological tower may be utilized to measure both sets of data at the required heights. Therefore, existing wind facilities will not be required to build a second meteorological tower for the purpose of measuring the second set of data. The AESO has revised subsection 4 of proposed new Section 304.9 for clarification.

[1] World Meteorological Organization, *Guide to Meteorological Instruments and Methods of Observation*, 2014 edition.
[2] National Renewable Energy Laboratory, *Best Practice Handbook for the Collection and Use of Solar Resource Data for Solar Energy Application*, section 8.4, p199.
[3] International Standard Organization, *ISO 9060 Solar energy – Specification and classification of instruments for measuring hemispherical solar and direct solar radiation*.

	wind facilities. b) Additionally, the requirement to have 98% of data availability at all times with only 48 hours to fix any issues could be challenging for operators to meet. We would propose lengthening the timeline to fix any issues that may occur to 72 hours. c) We also believe that the accuracy requirement of diffuse and direct irradiance would require an expensive set of instrumentation/sensors, which seems excessive. We propose the following instead: • Diffused Horizontal Irradiance accuracy: +/-5% (daily integrals) • Direct Normal Irradiance: Can be calculated from diffuse and GHI components d) We would also like clarification on sunshine duration: +/-10% with a lower threshold of 120 W/m2 in the direct beam. Furthermore, we recommend changing accuracy of the back of module temperature to +/- 0.15°C (-27°C to +50°C). That spec would meet class A RTD specifications.	b) Subsection 5(3) of proposed new Section 304.9 aligns with the data availability requirements in proposed amended Section 502.8 of the ISO rules, *SCADA Technical and Operating Requirements* and is necessary to ensure the reliability of the Alberta interconnected electric system. c) See AESO reply #4. d) The AESO has removed the requirement for sunshine duration in proposed new Section 304.9 and agrees with the accuracy of +/- 0.15°C (-27°C to +50°C) for back panel temperature. Table 1 in proposed new Section 304.9 has been revised accordingly.
	TransCanada Energy Ltd. ("TCE") 6. Section 4(5) TCE would like the AESO to confirm if the data collected by the AESO will be treated confidentially or if it will be made publically available? 7. Section 8(2) The requirement to provide meteorological data and records for two calendar years prior to commissioning may not be possible for all projects. TCE suggests the AESO require the provision of data to that which is available prior to commissioning.	6. The AESO will treat all information received from market participants in accordance with Section 103.1 of the ISO rules, *Confidentiality*. 7. The AESO requires two calendar years of meteorological data and records prior to commissioning in order to ensure accurate forecasting.

	8. Table 1: Wind and Solar Aggregated Generating Facility Meteorological Data Requirements Could the AESO confirm that there will not be a requirement for solar facilities to provide wind speed, direction and relative humidity as currently indicated in the table.	8. Not confirmed. See AESO reply #4.
	WSP Canada Inc. ("WSP")	
	9. Regarding 'Data Collection Equipment and Availability Requirements' section 4(2) – will two complete sets of devices (temperature, RH, barometric pressure and precipitation) be required at hub height and 35 m?	9. Table 1 and subsection 4 in proposed new Section 304.9 have been revised to clarify the height of installation for each instrument.
	10. What specific devices need to be installed at hub height and at 35m?	10. See AESO reply #9.
	11. It would be helpful if 304.9 specifically stated what sensors are required at what heights. These devices will be installed for a number of years (20?) and failures will occur. In a wind facility, is it possible to install the temperature, RH, barometric pressure and precipitation sensors at ground level to allow for easier maintenance? Repairing or replacing sensors at height requires the scheduling of climbers and safe climbing conditions. Repair times could be several weeks for instruments installed at height. Having as many sensors as possible at ground level may negate the need to have two of each sensor as the wind facility operator can have spares on hand which could be replaced at any time and in most weather conditions. WSP recommends that anemometer and wind vanes be installed at hub height and 35 m and the remaining sensors be installed at ground level. Best practice is to install anemometers in redundant pairs for each height. Logic within the data logger can be used to compare the two wind speed values and only send the valid one to AESO. Having this failover system in place will provide more time to the wind facility operator to arrange for repairs. There are ultrasonic sensors available with heavy duty heating that would be very suitable for this application as they do not have any moving parts and do not require maintenance so will be accurate over the many years	11. See AESO reply #9.

	they are deployed. The robust heating will keep them operational in all but the most extreme icing conditions. Ultrasonic sensors measure both wind speed and direction so a mechanical wind vane, which are prone to icing, will not be required either. All boom dimensions should follow the IEC 61400-12-1 standards to minimize flow distortion. It is also recommended that facility operators maintain all meteorological equipment as per the manufacturer's recommendations.	
	12. Regarding 'Data Collection Equipment and Availability Requirements' section 4(2) – section 4(2) states 'two (2) sets of meteorological data collection equipment'. This could be interpreted that two data acquisition devices (data loggers) are required.	12. The AESO has revised subsection 4 of proposed new Section 304.9 to clarify that two sets of instruments for each meteorological data parameter are required. The AESO does not require a specified number of data loggers; however subsection 5(3) of proposed new Section 304.9 has been revised to clarify that data transfer equipment must be designed and maintained with an availability of 98% in accordance with Table 1.
	13. Regarding 'Data Collection Equipment and Availability Requirements' section 4(2b) – in a wind facility, lower blade tip height would be more useful in wind turbine performance analysis than a standard 35 m. Hub heights are increasing, so it is possible the forecasters would benefit long term from a lower blade tip height specification rather than a standard 35 m.	13. At this time, the requirement to take measurements at a height of 35 meters meets the AESO's forecasting needs.
	14. Regarding 'Data Collection Equipment and Availability Requirements' section 4(3) – section 4(3) describes the required number of meteorological data collection equipment required on a solar facility. Is there a similar section in 304.9 that describes the number of meteorological stations required for wind facilities varying in size?	14. See AESO reply #5(a). The AESO permits a single meteorological tower to be utilized to measure both sets of data, regardless of the size of the wind facility.
	15. Regarding 'Data Collection Equipment and Availability Requirements' section 4(6) – what is meant by 'gross real power capability'. A brief description/clarification would be useful.	15. Please refer to the AESO's *Consolidated Authoritative Document Glossary* for the definition of "gross real power".

	16. Also, how is this data to be submitted, in what format and over what period?	16. As outlined in subsection 4(6) of proposed new Section 304.9, gross real power capability is determined and submitted to the AESO every 30 minutes, with a precision to the nearest 2.0 MW. The AESO is developing a process to submit the data specified in subsection 4 of proposed new Section 304.9, which will be communicated in an Information Document to be posted on the effective date of proposed new Section 304.9.
	17. Does AESO require a prediction of turbine availability for a future number of hours/days? One option would be for AESO to host a central website through which all wind and solar operators enter their forecasted outages. Having this in a central location would facilitate a common interface for all users. The data collected on this site could then be easily merged with the real-time and static data that AESO is collecting for forecasting purposes. WSP has developed forecasting software for a number of wind farms within Alberta and could assist in the development of this website if required.	17. The AESO does not require a prediction of turbine availability at this time.
	18. Regarding 'Data Transfer Technical Specification' section 5(2) – how is the data to be submitted? Will the forecasting data be submitted along with the SCADA data specified in the functional specification directly from the site RTU?	18. See AESO reply #16.
	19. Regarding 'Data Transfer Technical Specification' section 5(3) – a 48 hour repair period is too short for sensors that are installed at heights. Most wind facilities will need to schedule a climber and may need to wait for acceptable climbing conditions. 48 hours is reasonable for sensors installed at ground level. Mandating redundant wind speed and direction sensors at each height that automatically failover to the known good sensor would increase data availability and provide the operator a wider window to repair the sensor.	19. See AESO reply #5(b).
	20. Table 1 – What is meant by an 'Ice-up Parameter'? Is this a calculated value or the output of an icing sensor? If it is an icing	20. Table 1 of proposed new Section 304.9 has been revised to clarify that the ice-up parameter is the output from an icing sensor and to indicate the height at which the icing sensor

	sensor, at what height(s) should the icing sensor be installed? It is possible to derive an icing flag from temperature, humidity and pressure values. WSP could provide some recommendations on how to specify the icing flag calculation if requested by AESO. Some turbines will also indicate icing conditions in their SCADA feed to the RTU. WSP has used this flag to control other processes (road warning signs) in previous projects.	must be installed.