27 May 2016

Clare Greenwood
Energy Forecasting
Australian Energy Market Operator

Submitted Electronically:

Dear Ms Clare Greenwood,

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Re: Energy Conversion Model Consultation – First Stage – May 2016

Infigen Energy Limited appreciates the opportunity to make a submission in response to the first stage of rules consultation on amendments to the Wind and Solar Energy Conversion Model (ECM) prepared by AEMO 2016.

The related bodies corporate of Infigen Energy Limited that participate as semi-scheduled generators in the NEM are Woodlawn Wind Pty Ltd and Lake Bonney Wind Power Pty Ltd, but for convenience we will simply refer to “Infigen Energy” in this submission.

As Infigen Energy’s business is the generation of utility scale renewable electricity, we are eager to engage in the process of maintaining a reliable, transparent and flexible electricity market. As a wholesale generator, our core operations in the NEM are focused on the appropriate dispatch of our generation and ensuring market stability and system security is maintained. Infigen supports the ECM proposed changes by AEMO as it identifies significant opportunities for intermittent generation dispatch outcomes and forecasting improvement in the NEM. It should also provide a more reflective performance measurement of semi-scheduled generators for FCAS regulation causer pays factor which is of benefit to the entire market.

Our submission on AEMO’s draft ECM amendments relates to the key amendments regarding provision of Local Limit, Wind Speed and Possible Power in the wind ECM (sections 3.1, 3.2 & 3.3 of AEMO’s Issues Paper). We will not address the minor changes detailed in Appendix A or the solar ECM amendments.

SECTION 3.1 NEW SCADA LOCAL LIMIT

The proposed Local Limit definition states:

- *"In MW, the lower of plant availability and of the limitation on capacity of connection assets on the export of energy from the wind/solar farm. When implemented in AWEFS/ASEFS1, the Local Limit is used to cap the UIGF for the wind/solar farm in the dispatch timeframe. The Local Limit excludes limits on a transmission network and distribution network (as required by clause 3.7B(c)(6) of the Rules) or limits otherwise agreed to be managed by AEMO.*
- *Change to the Wind and Solar ECM Guidelines, to mandate the provision of a real-time SCADA 'Local Limit' for existing and future semi-scheduled generating units; and*
- *Changes to AWEFS/ASEFS1 to:*
    - *Apply the SCADA 'Local Limit' as a cap on the 'Dispatch UIGF', if the incoming quality of SCADA 'Local Limit' is "Good" AND its value is greater or equal to zero AND its value is below a generating system's nameplate rating Else*
    - *Ignore the SCADA 'Local Limit'"*

1. **Do you agree that the requirement for a SCADA Local Limit will improve your dispatch outcomes?**

Infigen Energy believes that the appropriate application of a SCADA Local Limit could improve the dispatch outcomes of the park during certain maintenance procedures and contingency events.

Infigen does not believe that plant availability in this data point is necessary or would add any benefit as it is already provided to AEMO through the number of available turbines data points.

2. **Do you agree with the proposed validation of the SCADA Local Limit, and the proposed validation range (see Section 3.1.6)? If not, how should quality be handled?**

Infigen Energy believes the handling and validation of the SCADA Local Limit is very important as it has the possibility of erroneously reducing the parks maximum availability if not appropriately handled. Infigen also believes more detail regarding the inclusion of the Local Limit in the UIGF calculation process is required before it can make a full assessment of the validation. In particular with regards to the inclusion of manual SCADA caps, that may be short term and how that could reduce future semi-dispatch cap values in the instance of short term local limits.

AEMO then proposes that if the data quality is good (all checks pass), the Local Limit will be used to cap the Dispatch UIGF value, which Infigen in is accordance with.

3. **What types of limits affect your semi-scheduled generating unit? Who is responsible for determining those limits, how dynamic are they, how often do they occur, and how they are applied?**

There are a variety of local limits that affect Infigen's semi-scheduled generating units. Our semi-scheduled wind farms are limited locally by connection assets being unavailable due to maintenance or outages, local network protection runback schemes and manually imposed farm-wide constraints.

These constraints can come in the form of static constraints, which set an upper limit for the wind farms based on the transformer or reactive power equipment availability or a dynamic constraint which is managed by the SCADA system.

These constraints can be implemented by planned or unplanned outages of the connection assets in the order of less than 10 periods of limitations a year that can last for less than an hour to more than a week.

Following a semi-dispatch cap period NEMDE occasionally removes the dispatch cap when it underestimates possible production. This can result in a rapid ramp up from wind farms affected. Infigen may impose a manual cap to better control its wind farms ramp rates in conformance to NEMDE's expectations.

4. **Please quantify for your wind/solar farm(s) the likely impact of the exclusion of distribution network constraints not managed by AEMO from the SCADA 'Local Limit' definition (see Section 3.1.1).**

The expected impact on Infigen Energy's existing semi-scheduled wind farms is not relevant, but may become an issue for future assets. Infigen is of the opinion where distribution network constraints exist and affect a semi-scheduled generator then it should be reflected in the SCADA Local Limit setpoint for dispatch targets to remain accurate. It would also be useful as a market participant to understand what kind of distribution network constraints are active in the region.

5. **What do you estimate are your upfront and ongoing costs in providing and maintaining a SCADA 'Local Limit'?**

The upfront cost of implementing this Local Limit will vary across Infigen's wind farms however the ongoing costs are not expected to be high.

6. **Are there other options available to manage the local limit issue not canvassed in this paper?**

While Infigen Energy believes there may be other options for managing the local limit, from the alternatives presented the current option is believed to be the most efficient.

Infigen Energy sees a potential management strategy available in using the Available Capacity bids already submitted by wind farms in the NEMDE dispatch process. For maintenance events this is a practical management strategy that is already undertaken when a static limit is in place. A review into the user interface of the online portal would further increase the efficiency of making availability bids.

7. **Are there any other related matters you wish to raise?**

No.

SECTION 3.2 CHANGES TO SCADA WIND SPEED

The proposed SCADA Wind Speed definition states:

- *"Measurements from turbine nacelle anemometers are much preferred over measurements from meteorological mast(s).*
- *A single wind speed measurement must be representative of wind conditions across the site for calculation of dispatch UIGF. For large wind farms an average of several turbine nacelle wind speed measurements may be used to achieve this."*

1. **Do you agree that the proposed changes will improve your dispatch outcomes?**

Infigen believes that, depending on the configuration, nacelle based averages may be more accurate. Infigen does believe that overall the changes will improve the accuracy of the measurements AEMO receives.

2. **What do you estimate are your upfront and ongoing costs in applying this proposed definition?**

Some of Infigen's wind farms already produce wind speeds that conform with this definition and the other wind farms do not currently produce wind speeds at the appropriate granularity which will require significant work and costs to update.

3. **The vendor of AWEFS prefers wind speed measurements from turbine nacelle anemometers over meteorological mast measurements. Do you agree, and what information can you give about the suitability and relative accuracy of the two measurement types for your wind farm(s)?**

Lake Bonney currently samples 5 second instantaneous turbine wind speeds and takes an average over at least three of these samples (15 seconds) and updates this every 5 seconds. For Lake Bonney it is believed that nacelle based wind speeds are more accurate than met mast based wind speeds.

Woodlawn wind farm currently provides met mast data to AEMO however it is agreed that nacelle based wind speeds would provide a more accurate estimate for future forecasts.

Note that averaging wind speeds can introduce error to the possible energy calculation when wind speed is not uniform across the site and a SCADA Possible Power value is likely to represent a more accurate estimation than using the average wind speed of several turbines.

SECTION 3.3 NEW POSSIBLE POWER

The proposed SCADA Possible Power definition states:

- *"The estimate by the wind farm's control system of active power (in MW) available from the current wind and available turbines."*

1. **Do you agree with the definition of SCADA Possible Power?**

Infigen agrees with the definition of possible power assuming that the definition of 'available turbines' includes turbines paused due to network constraints or connection asset constraints but otherwise available to generate. Otherwise it is believed this could

significantly reduce estimates of Possible Power and would be an incomplete measure of current Possible Power.

Infigen suggests further analysis into the use of two distinct data points for Possible Power: 'available turbines' and 'turbines generating'. 'Available turbines' would produce a possible power estimate for optimising dispatch decisions. 'Turbines generating' would produce a possible power estimate that would correlate to real park production and may be used under certain circumstances for short-term forecast.

2. **Does your wind farm control system currently produce an estimate of Possible Power, or an equivalent? If not equivalent, what can it produce?**
3. **How is this estimate calculated?**

Lake Bonney:

Infigen Energy currently calculates instantaneous farm possible power by measuring wind speed and estimating power for both turbines generating (i.e excluding paused turbines) and turbines available (i.e including paused but ready to run turbines) for Lake Bonney 2 and 3. Infigen Energy believes the appropriate estimate of Possible Production should use turbines available and is known as the "Future Possible Power" data point at Lake Bonney.

Woodlawn:

Woodlawn SCADA currently calculates an "Estimate Output" based on the number of turbines with communications and a 10 minute average of wind speed for the wind farm. Infigen does not believe this estimate would provide an accurate estimate of possible production as it does not exclude turbines that are stopped or paused due to an alarm or fault.

4. **If the control system does not currently produce a suitable Possible Power estimate, what would be the implementation costs of doing so?**

Infigen Energy believes this amendment will necessitate a moderate amount of work and costs to update our existing set of transmitted SCADA data streams at Woodlawn to include the proposed Possible Power, with negligible ongoing cost.

5. **How should data quality, validation and update frequency issues be handled for Possible Power?**

Infigen Energy is of the view that AWEFS should generate the UIGF value based on the lowest value of Registered Capacity, Possible Power or Local Limit .
If the SCADA Possible Power data quality isn't good, wind speed based possible power should be used.

Infigen Energy also see a material benefit in exploring the calculation of a forecasted Possible Power figure looking 5-10 minutes ahead of time. This would assist in providing a more realistic production trajectory over the dispatch interval.

Infigen Energy hopes there will be further discussion of the discussed amendments. Should you have any queries regarding this submission, please do not hesitate to contact me directly by telephone (02) 8031 9971 or email niva.lima@infigenenergy.com.

Yours sincerely,

Niva Lima
Manager Operations Control Centre