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Re: Energy Conversion Model (ECM) Guidelines – Third Stage

Musselroe Wind Farm (MRWF) appreciates the opportunity to submit comments to AEMO's Stage 3 Issues and Determination Paper on the ECM guidelines. We commend AEMO on their response to the views of participants submitted through Stages 1 & 2 and the direction AEMO is currently undertaking.

Further to our comments in Stage 1 and 2, we do not intend to re-visit the following areas as these matters appear satisfactorily settled:

- SCADA Local Limits;
- Maximum Capacity Limits; and
- Wind speed source definitions

Further, we support the comments and modifications noted by AEMO (and others) in respect of the following issues:

- The AER's comments on use of SCADA data for technical limits and bidding information for commercial changes;
- Strongly welcome AEMO review of CPF and reviewing inclusion of wind into MASS;
- That AEMO will investigate bidding of availability to further improve the accuracy of dispatch and pre-dispatch;
- That AEMO will work to ensure all appropriate transmission and distribution level constraints and run-back schemes are applied in NEMDE as required (particularly on the Norwood to Scottsdale line for MRWF); and
- The agreement by AEMO to further understand the benefits of estimated power.

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Our submission below will concentrate on the following areas:

- Additional MRWF information and considerations for Estimated Power;
- Some of the practical limitations on several AEMO data requests; and
- Answering the questions posed by AEMO.

There are several general areas that, although not directly related to specific sections in the draft report, we consider worthy of consideration:

- *Additional semi-scheduled information needs to be published:*
  At present, when issues are identified with AWEFS in the control room and AWEFS is turned off (i.e. persistence forecasting is used), this should be flagged in MMS data or communicated to the participant via SCADA data. Similarly, while UIGF continues to be used in dispatch, all the input data used by AWEFS/ASEFS should be published and publicly accessible. This improves understanding for the participant and market transparency.

- *Use of the term 'By agreement with AEMO':*
  There appears to be several areas where the term 'by agreement with AEMO' is used, and whilst recognising this is useful to assist existing operators where changes may be made to arrangements, it will likely result in ambiguity as new wind farms register in the NEM in the coming years. For instance, the optionality of providing an extreme wind cut-out signal will have no historical basis for AEMO consideration, hence will just be required of new entrants, thereby effectively removing any optionality and due consideration.

MRWF is pleased that AEMO will be continuing to work with participants in several key areas after the ECM consultation has finished in recognition that there is still more work to be completed! We would be happy to discuss this submission further should you so desire.

Kind regards

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Estimated Power: Answers to AEMO Questions

1) Do you agree with the name "Estimated Power"?

2) Should limits on connection assets be included or excluded from this definition?

3) Is one signal enough? Is there a need for a second signal such as a dynamic rate of change?

4) Do you have concerns about interaction between the "Estimated Power" value and the existing bid of ramp rate?

5) Do you agree with the level of detail in the definition?

6) Any other comments on the definition?

1) Agree with the name 'Estimated Power'

Yes. Although the industry typically uses terms such as Possible Power and Capable Power, these are SCADA reserved terms and reflect live conditions. The intention of this new term, in the short-medium term, is to reflect the capability of the plant is likely to be at the end of the next dispatch interval, approx. 6-7 minutes into the future. Therefore, perhaps additional wording can be used such as "..forecast in MW of active power at the sampled point and used to estimate the next dispatch interval subject only to .."

We consider this term could also be used across scheduled generation to help improve dispatch security, hence see the term and definition as technology agnostic.

2) Should limits on connection assets be included or excluded?

Excluded. The market operates on a gross pool arrangement whereby dispatch is optimised at the generator terminals, with revenue based on net metering. As additional hybrid generation solutions with batteries begin to be implemented, it is important to understand what is happening 'behind' the point of connection. Where additional connection assets are impacting dispatch, they will either need to be considered through network constraint equations, bid parameters, local limit or expected power.

3) Is there a need for a second signal such as a dynamic rate of change?

Given most scheduled generation send the plants dynamic rate of change, we see some merit in considering this value, especially since the rate of change can be very significant across large wind farms and especially once control set points are occurring around turbine minimum generation levels (for MRWF, approx. 25% WTG capacity). We see this as important for the determination of the dispatch target, as opposed to Availability as noted in item 4) below. To that end, application of the minimum rate of change for the farm of either the dynamic value or bid ramp rate seems appropriate.

However, as is shown in the following diagrams, the very nature of the expected power value being proposed, even as a pure SCADA value without consideration for where the plant will be at the end of the next dispatch interval, includes dynamic consideration of rates of change. Therefore, we do not consider the dynamic ramp rate will add any additional benefit compared with the implementation of the expected power.

Figure 1 (low wind) and Figure 2 (high wind) show close approximations[1] of expected power as defined in this consultation, for two days where light and moderate wind conditions were experienced. The data in these Figures are 1 second data matched with 5-minute market data on days that have been identified as highlighting interesting results. Using the preliminary definitions from the consultation paper, we have replicated the value that would be snapped by NEMDE if the Expected Power was being sent to AEMO approx. two minutes before the commencement of the dispatch intervals – this is shown on the graphs as 'EP(Mod)@datasnap'.

The blue arrows indicate significant differences between UIGF, Expected Power and EP(Mod)@datasnap. Figure 2 also highlights a period where a local limit (CBAC) was present (but no SDC), during high wind conditions with movement in operating turbines. It can be seen that the Expected Power values were clearly indicating unconstrained generation values.

In both Figures, the differential between the UIGF and the actual generation is significant and would be contributing to increased regulation requirements across the region.

[1] We use the term 'Close Approximation' as we have not conducted any due diligence on the value calculated to ensure it meets the proposed definition

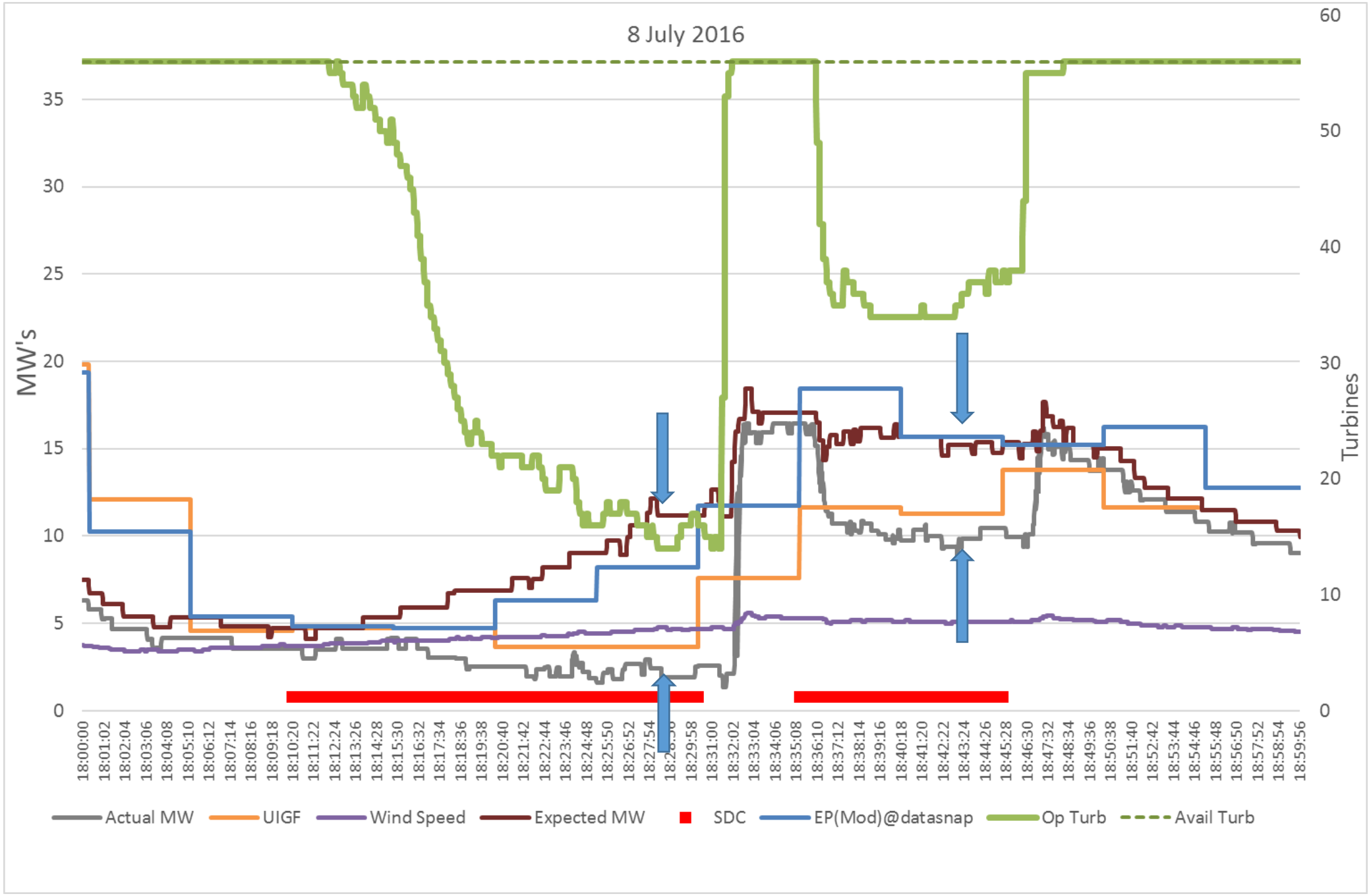

Figure 1: 8 July 2016

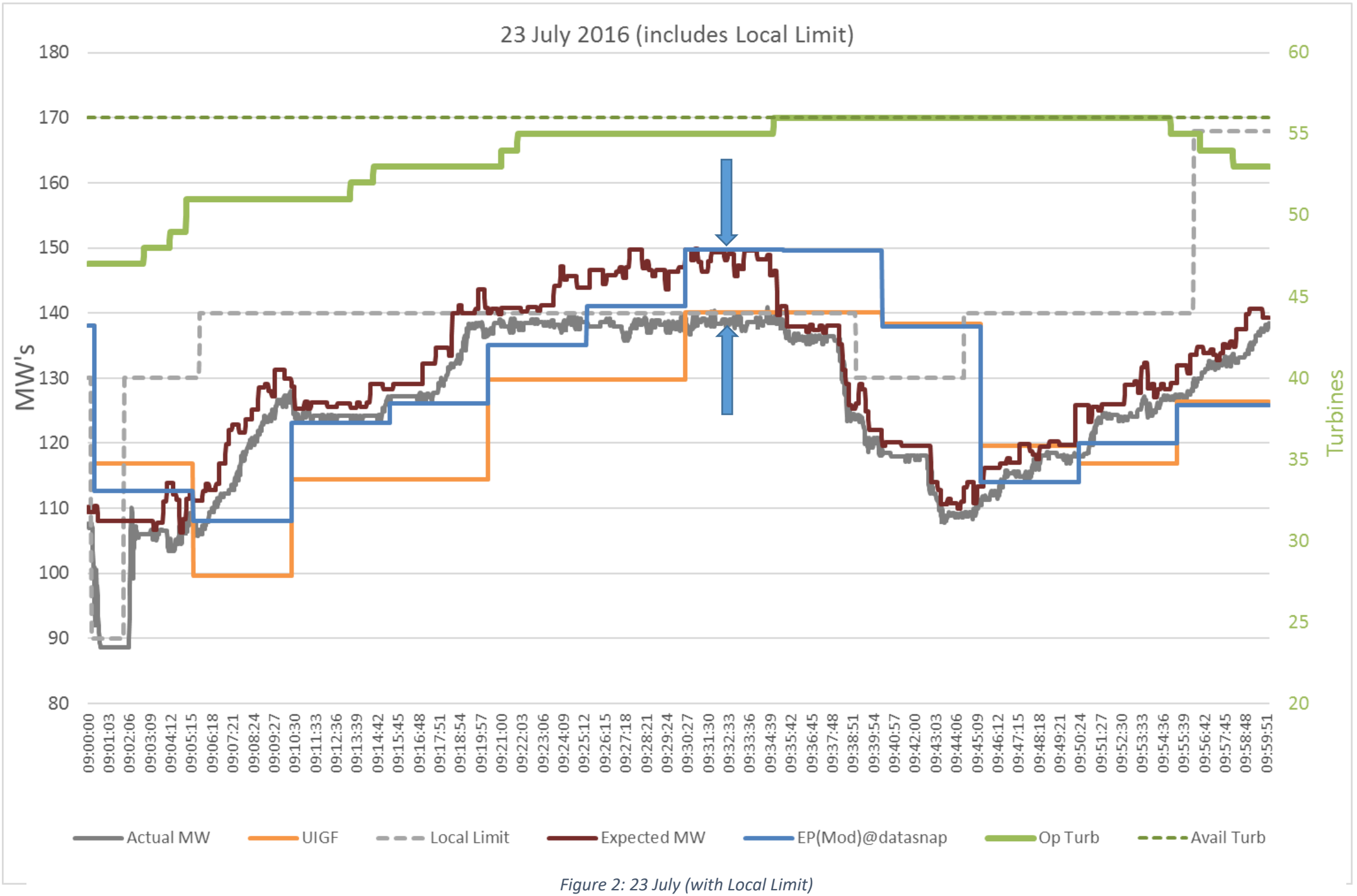

Figure 2: 23 July (with Local Limit)

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4) Interaction between the "Estimated Power" value and bid ramp rate?

Yes, Estimated Power adequately conveys the ramp capability inclusive of rate of change and we contend if sampling is improved along with bidding this should satisfactorily cover all requirements. Given the estimated power will effectively be the Availability of the wind/solar plant, and the bid ramp rate should only affect the dispatch target, we see no issue with the interaction between the two.

A scheduled generator, at present and appropriately, can bid a unit out of service by bidding the available MW's to 0MW from as high as 750MW (for example) in one dispatch interval, yet maintain the integrity of the rate of change limits through its dispatch targets with NEMDE managing dispatch accordingly.

Unless we are mistaken, NEMDE does not recognise the difference between semi-scheduled generation and scheduled generation, hence NEMDE should operate in a similar manner.

5) Do you agree with the level of detail in the definition?

The definition is prescriptive enough to ensure understanding and yet retains the ability for the OEM to produce a number to suit their control system setup.

Further to point 1 above, if the only references to wind and solar were removed and replaced with 'generating system', this definition could be applied to scheduled generation, which we suggest makes this a reasonable definition. The use of this concept across all generation types may assist with enhanced dispatch accuracy, especially during plant run-ups/run-downs, where dispatch non-conformances appear anecdotally to occur more regularly than during steady operations.

6) Any other comments?

The focus on ambient temperatures, while understandable, will be complicated, as it is generally the individual equipment operating temperatures of varying values, as influenced by ambient temperature changes, that will determine whether limits will be reached. Similarly, whilst we understand AEMO's intention to investigate future turbines available, we would encourage consultation with the OEM's and participants to explore a forecast MW value.

Again, the expected power value (and forecast mechanism that is yet to be developed) would take all climatic factors into consideration.