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15 May 2020

Attention: Jodi Triggs
Senior Manager Electricity Market and Reform
By email market.operator@powerwater.com.au

Dear Jodi,

Generator Forecasting Compliance Procedure

I write in response to the call for submissions to the *Consultation Impact Statement: Introduction of Generator Forecasting Compliance Procedure – D2020/172480*, released on the 16th of April 2020 by Power and Water Corporation.

Epuron is the owner and operator of the 4MW Uterne solar power plant at Alice Springs, the 1.8MW solar power plant at Yulara and also the three integrated high penetration solar power stations at Ti Tree, Kalkarindji and Alpurrurulam (Lake Nash), known as TKLN Solar which total 1MW. Epuron also developed the 25MW Katherine solar power plant, which has recently been sold to ENI Australia Ltd and is now under construction. Katherine Solar is likely to be the first large solar generator connected through the new NT GPS and the Generator Forecasting Compliance Procedure. Also relevant is that Epuron operates the three TKLN sites with on-site 10-minute cloud forecasting capability.

The Generator Forecasting Compliance Procedure is a new document released due to clause 3.3.5.17 (f) of the Network Technical Code, which requires the System Controller to publish a procedure that specifies the process that will be used to detect and respond to non-compliance of this clause. This proposed procedure seeks to address that obligation and provide sufficient detail to generators to fulfil their compliance obligations under the Code.

The procedure seeks to outline the approach to:

- assessing the compliance of generators' forecasts,
- notifying generators of non-compliance,
- calculating the constraint to be applied to any non-compliant generators, and
- the process to return the generator to service and lift constraints.

Epuron approves of the creation of this document as a required part of the updated Network Technical Code. Epuron's comments and response to questions are below.

Notes on specific sections of the document:

1. On page 2:
   "The forecast (in MW) is the expectation of the minimum output that can be sustained over each five-minute period."
   Epuron believes it should read: "The forecasting (in MW) is the expectation of the **maximum** output that can be sustained over each five-minute period." The minimum output for an inverter-based generator is zero and the forecast needs to be the maximum continuous output that can be sustained over each period. The generator will then be dispatched somewhere between the minimum (zero) and the maximum (forecast). I believe the confusion here comes from the desire

to ensure that the forecast value is continuous over the time period but that is implicit in the second part of the sentence.

2. On page 3:
   "The firm offer [$t_0 – t_{5min}$] must be the capacity of the generating system for that interval and therefore the generating system must follow a dispatch instruction up to the firm offer in accordance with the requirements in clause 3.3.5.14."
   There seems to be an assumption that at five minutes prior to generation the firm offer can be accurately calculated using forecasting technology. Although forecasting whether it is cloudy or clear can be quite accurate at that time scale, using forecasting to derive accurate power plant output is non-trivial. Generators will need to use technology, experience and probability to give accurate forecasting values. Therefore, although this quoted statement is correct, leniency needs to be provided throughout the forecasting process, especially initially, to ensure the best outcome is achieved.

3. On page 3:
   "The constraint is considered a forced outage issued by the *System Controller* and can only be removed following the successful completion of the return to service process."
   PWC is applying a process used in outages of thermal generation in the past to new technology and in this case the timing of the process doesn't correctly apply. An issue of this nature is a software issue and fixes to this software issue can be implemented very quickly (minutes to hours). The algorithms used are constantly updated to ensure better accuracy which benefits all parties including the *System Controller*. The slow return to service process is more suited to hardware issues on inverter or thermal generation. The constraint should be automatically removed after a set time-period of compliance, such as 24 hours.

4. On page 4:
   "The capacity forecasting performance requirements must be met even if a generator has responded to a frequency disturbance."
   This wording of this is ambiguous about whether this applies to the time-period which included the frequency disturbance or it applies to the forecast in the time periods following the frequency disturbance.
   During the time-period of the frequency disturbance, the disturbance is of a higher importance than adhering to a previously created forecast. Non-adherence to the previous forecast during this period because of a frequency disturbance does not allude to an issue with the forecasting equipment. Also if the generator is disconnected from the grid (as per NT GPS requirements) then while disconnected the previous forecasts should not apply.
   However if this applies to time-periods beyond the frequency disturbance (and the generator is not disconnected due to NT GPS requirements) then Epuron agrees. There may be a generator outage beyond this (for example a hardware fault) but that would be dealt with as part of a type 1 GOTR.

5. On page 6:
   "The generator shall not modify the forecasting algorithm at any time without prior notification being issued to the System Controller"
   Epuron strongly disagrees and argues that there are two issues with this statement.
   Firstly, this is an overreach by the System Controller. The System Controller does not own and is not responsible for the forecasting. The generator owns the forecasting system and is responsible for it's operation and is therefore able to modify it's own equipment without oversight. If the generator modifies the forecasting algorithm to the detriment of the forecasting accuracy then it shall be taken care of via the non-compliance process.

Secondly, and as discussed previously, this statement does not appreciate the quickly advancing nature of the forecasting technology. Forecasting technology has advanced rapidly in the last few years and continues to improve. This is in the order of updates and changes every few weeks. Modifications may be minimal and most changes will be imperceptible to the System Controller but overall the system will trend towards being more reliable and more accurate. For example, the cloud forecasting system installed at Ti Tree Solar is much more advanced now then it was when installed several years ago. System Control is demanding the introduction of cutting edge advanced solar forecasting as mandatory in new solar projects and as a part of this must recognise that advancements continue to improve the situation for all parties.

6. On page 7 in response to the type 2 non-compliance diagram:
   The process for a type 2 non-compliance (algorithm failure) is exceedingly lengthy. While Epuron appreciates that the System Controller requires accuracy in forecasting to manage the grid there is already a process via the constraint calculation to manage issues with forecasting accuracy. There are many examples that could occur where the fix to an algorithm failure can occur very quickly (such as less than an hour) or where non-compliance only occurs on very specific instances (such as a type of cloud only seen one or two times a year). This would be very difficult to work through the GOTR and re-testing process. Epuron suggests that the guidelines allow the constraint calculation process to manage algorithm accuracy and remove type 2 non-compliance from the guidelines completely.

Epuron notes that although on-site 10-minute forecasting has been in operation in Australia for several years now, obtaining longer term forecasts requires more advanced forecasting techniques blending on-site forecasting with satellite imagery forecasting. Such techniques are now commercially available but represent the cutting edge of new technology that is yet to be proven on a utility MW scale. Therefore, implementation will be difficult and it would be beneficial to trial or have a pilot implementation.

Katherine Solar is currently finalizing commissioning as the first utility scale generator which will be required to meet these forecasting guidelines. For the first year of operation (to enable optical and satellite forecasting to be tested on a full year of weather conditions) Epuron suggests that Katherine Solar and PWC work together as a pilot project to determine which parts of the forecasting guidelines need revision, ensure system security and remove the likelihood of unnecessary curtailment.

We look forward to engaging further with PWC on the changes to the NTC and the exciting renewable technology opportunities in the Northern Territory.

Please do not hesitate to contact us if we can usefully provide any further information.

Yours sincerely,

MARTIN POOLE
EXECUTIVE DIRECTOR
EPURON