



29 March 2019

Market Operator
Power and Water Corporation

By email: market.operator@powerwater.com.au

Dear Market Operator,

Tetris Energy Submission on the Generation Performance Standards Consultation Paper and Supplementary Papers

Tetris Energy (Tetris) appreciate the opportunity to consider and comment on PowerWater's Generator Performance Standards Consultation Paper, released on 18 December 2018, as well as the Supplementary Papers on "Framework for the Future" and Contingency FCAS, released in March 2019. Tetris' main concern is the removal of the semi-scheduled generators concept, which results in a requirement that variable renewable generators behave in a fully dispatchable manner.

We understand this design choice is inspired by a philosophy of *technology agnosticism* and is attractive both for its appeal to the principle of parsimony and its attitude of impartiality, however, we believe that while simpler and in theory more equitable, this change fails to acknowledge fundamental technological differences between renewable and gas/diesel generators, and will result in the process of integrating variable renewable generators being unnecessarily complex and costly.

As such, Tetris believes that this approach will significantly impede the path to 50% renewable energy generation in the Territory.

Part 1: GPS Consultation Paper

1.1 Availability Forecast

Tetris acknowledges that accurate availability forecasts for all generators will be important to the dispatch process, however at present, the draft requirements are onerous and will be difficult to implement.

Short-term irradiance forecasting is an emerging technology that has not yet reached the level of maturity and reliability that would allow a solar PV plant to be managed as a fully scheduled generator.

We anticipate that a 95% confidence forecast of availability (presented by System Control on 18th February 2019, slide 20-22) will significantly underestimate the available power from PV plants, even minutes in advance, resulting in excessive curtailment.

Tetris strongly recommends that PowerWater Corporation (PWC) develop a clear, realistic and reasonable solar forecasting standard (in consultation with the solar forecasting industry), using only cloud cameras plus satellite imaging, to avoid the significant expense of additional batteries. Tetris also notes that the geographical distribution of large-scale solar farms is likely to smooth the solar generation coming into the Darwin grid, and this should be factored into the overall forecasting requirements.



1.2 Maximising Contingency Frequency Control Ancillary Services (FCAS)

Risk of uneconomic Battery Energy Storage Systems (BESS): Under the proposed forecasting requirements (presented 18th February, slide 20-22), it may be necessary to co-locate renewable generation with batteries in order to provide assurance of near-term power availability. However, comprehensive co-location of PV and batteries is neither a desirable nor economic solution for the Darwin-Katherine system, where larger batteries strategically located north of Channel Island Power Station (CIPS) will provide considerable benefit to network stability (contingency FCAS). The integration and balance of system costs for many on-site battery systems is much greater than that for a few single, centralised systems, and may deter investment.

An additional benefit of creating more reasonable solar forecasting requirements will be allowing more flexible FCAS provisions. If solar proponents do not need to co-locate batteries, they will be able to potentially procure contingency FCAS services from existing gas generators, maximising the use of existing infrastructure.

1.3 Reactive Power Capability

Tetris notes the proposed requirement in section 3.3.5.1 of the Network Technical Code to have a reactive power capability of at least the amount equal to the product of the rated active power of the generating system and 0.55. We note that this requirement is considerably greater than the National Electricity Market (NEM) requirement of 0.395pu. This will result in significant additional costs to proponents and is likely to be more than what is needed to control the local system voltages. Tetris recommends that the NEM standard of 0.395pu be adopted in the NT, which is already seen as a “safe harbour” by AEMO.¹

Part 2: Supplementary Paper #1: Framework for the Future

Tetris acknowledges PWC for the concept of the “Framework for the Future”, and strongly agree with the notion of setting the system up to succeed with increased renewables.

2.1. Solar Forecasting

Tetris acknowledges PWC’s position, including the need to receive high-quality, forward-looking forecasts. We also understand PWC’s legitimate concerns regarding securely managing the network (particularly the dynamics of gas units that can take 30 minutes to come online) and appreciate the effort gone to assess the capability of solar forecasting technology.

However, Tetris suggests that the examples referenced in the document are perhaps inconclusive, and additional research is required.

Reference to NEM forecast: Whilst we agree that a forward-looking forecast is required, we note that MT PASA and ST PASA do not enforce accuracy requirements on proponents. Rather, ST PASA takes the 50% POE forecast from AEMO’s Australian Solar Energy Forecasting System (ASEFS), and MT PASA develops a profile based on historical weather patterns.

ARENA report: Written by the CSIRO in 2016, the ARENA report appears to present the high-level considerations towards developing ASEFS. As such, it may not be appropriate to rely on this report

¹ AEMO, *Electricity Rule Change Proposal: Generator Technical Requirements*, August 2017,



alone to justify what commercial solar farms should be able to achieve in the DKIS with available technologies. Importantly, the ARENA accuracy results in the Supplementary Paper (figure 6) may overstate the capabilities of the NT sites, with the second site detailed in the ARENA report, Norwest, demonstrating lower accuracies than the Black Mountain site.

Acknowledging that this is an important factor of the system design, Tetris recommends that PWC engage relevant and detailed research to ensure solar forecasting is correctly understood. This could include:

1. Commissioning solar forecasting companies or the CSIRO to produce a report on technology capabilities, interpolating results from other Australian sites to account for the top end weather conditions;
2. Looking to the design and future results from the recently announced ARENA study in the NEM (both SolCast and Proa Analytics are conducting research into the accuracy of solar forecasts over several different geographical sites);
3. Working with the three formally announced solar farms to implement advanced cloud cam and satellite equipment, evaluating their performance as single farms and then as a system;

In the meantime, PWC should change the proposed forecast to 50% probability of exceedance (POE) forecasts, with requirements to operate within a pre-determined maximum and minimum bound.

Batteries are likely to be a critical aspect of the future system design, allowing a solar-dominated system to achieve a 50% renewable energy target (RET). If solar farms are required to both install batteries (for C-FCAS) and either spill significant energy or add additional batteries in order to provide guaranteed forecasts, the project economics will become challenging. However, if batteries are encouraged for frequency control, solar forecasting may well become a thing of the past, with batteries able to quickly and accurately respond to any cloud conditions through regulation and contingency FCAS.

2.2 Semi-scheduled

Tetris appreciates the additional clarification, however, maintain that there is clear value in having a “semi-scheduled” category (albeit with a different definition and application to the NEM, thereby enabling PWC to account for forecasted generation into its forward dispatch). As solar does not behave like gas, the dispatch needs to be tailored in order to maximise the performance of both. Tetris suggests creating a new category (that does not need to be called “semi-scheduled”), that requires a forecast within a minimum and maximum bound.

Part 3: Supplementary Paper #2: C-FCAS

Tetris acknowledges the additional clarifications provided and understand the need for all generators to provide C-FCAS (lower) whilst T-Gen provides C-FCAS (raise) until market start.

Part 4: Additional Considerations

4.1 Timely Resolution and Stability

Tetris appreciates that the Generator Performance Standards consultation is complex and involves numerous stakeholders. We applaud the prompt and thorough consultation process to date; however,



we encourage PWC to finalise the consultation and advise of the interim recommendations as soon as possible. Tetris is targeting to commence construction of the Batchelor and Manton Solar Farms at the start of the dry season in 2019, and clarity on the GPS criteria is required for the pending investment.

Following on from this, Tetris requests that once the GPS is agreed, that the requirements do not change, allowing the investors an element of stability.

If you have any questions, please contact Frank Boland, Director.

Regards,

A handwritten signature in black ink, appearing to read "FJB", with a stylized flourish at the end.

Frank Boland

Director, Tetris Energy