



Submission on Consultation Paper Generator Technical Performance Standards

7 November 2017

1 This Submission

This Submission from Tilt Renewables is in relation to the “Generator Technical Performance Standards Rule Change”, proposed by AEMO. In assessing the proposed Rule Change, Tilt Renewables has considered AEMO’s rule change request (11/8/2017), AEMC’s pre-reading document for the industry workshop held on 12 October 2017, AEMO’s supplementary material (10/2017) and the AEMC’s Consultation Paper.

The document is structured around the AEMC’s pre-reading document for the industry workshop. That document collects all the crucial changes in a cross-linked, relevant order and Tilt Renewables is of the opinion that its response would be most coherent in following that structure.

Tilt Renewables is a developer and owner of renewable generators within the NEM, New Zealand and in Western Australia.

2 General Comments

Tilt Renewables supports the intention of ensuring the long term stability and security of the power system. Tilt Renewables does note that the required stability and security must be achieved whilst also considering the NEO. Tilt Renewables also supports AEMO’s concept of a NEM-wide, technology neutral approach.

AEMO has stated that the technical requirements are “no longer adequate to account for the capabilities of asynchronous generation”. Tilt Renewables is of the understanding that the technical requirements are in place to ensure adequate capabilities are in place to support the power system, not simply to represent the capability of the generators being installed. The proposed rule change must be considered in terms of what is required for the power system, not how the generation fleet can be gold-plated as that would be contrary to the NEO.

3 Process Issues

3.1 Negotiation of Performance Standards

The Automatic Access Standards (AAS) are written such that any generator that meets each one, irrespective of location, would not cause the NSP or AEMO to be unable to meet their obligations under the system standards, the quality of supply requirements and the Rules.

The Minimum Access Standards (MAS) are written such that a generator that meets each one might, assuming the most favourable location in the NEM, not cause the NSP or AEMO to be unable to meet their obligations under the system standards, the quality of supply requirements and the Rules. Any standard lower than the MAS will prevent the NSP and AEMO from meeting their obligations even at the most favourable location on the network and is unacceptable.

The Negotiated Access Standards (NAS) are conceptualised such that a generator that does not meet the AAS can offer a capability that still allows the NSP and AEMO to meet their obligations under the system standards, the quality of supply requirements and the Rules without requiring either cost-prohibitive or technically unachievable requirements of the generators.

The concept of AAS, NAS and MAS allows for different technologies (with different capabilities) to successfully locate in different areas of the network that have different requirements for system security.



Tilt Renewables would prefer that the negotiation of access standards was a collaborative, technical negotiation rather than an adversarial negotiation. Tilt Renewables, however, accepts AEMO's statement that some proponents are proposing MAS regardless of the needs of the power system and can understand that AEMO may feel such proposals lead to an adversarial approach.

Tilt Renewables does not agree with AEMO's statement that generators starting negotiations from the minimum access standards may "...lead to the connection of generating systems with inferior performance than is actually required"¹. AEMO and the NSP are responsible for ensuring system strength and are required to not accept an unacceptable set of proposed Generator Performance Standards (GPS). Tilt Renewables expects that inferior performance would be avoided by such a refusal to accept.

Ensuring the proposed GPS are acceptable requires good engineering on the part of the Connection Applicant, NSP and AEMO. Tilt Renewables does not think that the concept of a safe harbour should replace good engineering as that may result in a gold-plated fleet of generators being installed, failing the NEO.

Not having access to all the system models and tools that AEMO has means that proposed generators need to be conservative in the performance standards they offer to AEMO. Basing proposed GPS on a limited suite of models leaves proponents open to a level of risk. That risk can be mitigated by proposing GPS that may be slightly lower than the theoretical maximum. If system security is not negatively impacted, that should be accepted.

The specific wording in the proposed rule change would require each performance standard to be "...as close as practicable" to the AAS. Tilt Renewables has concerns that such wording would introduce significant uncertainty in the application of the NER. The practicality of overcoming some shortcomings may appear reasonable to AEMO yet uneconomic for a Connection Applicant. Tilt Renewables questions how "as close as practicable" would be measured.

Instead, Tilt Renewables recommends that emphasis should be placed on 5.3.4A(b)(2) and 5.3.4A(b)(3) when AEMO responds to proposed GPS. If the proposals are demonstrated to not meet those requirements (for security and quality) then the Connection Applicant would need to re-assess their proposal.

Tilt Renewables suggests changing AEMO's proposed rule 5.3.4A(c1) to require, when seeking a NAS, the Connection Applicant to "...provide with that proposal evidence (to AEMO's and the Network Service Provider's reasonable satisfaction) that there is no system security and no power quality degradation associated with not meeting the Automatic Access Standard", avoiding the "as close as practicable" wording yet ensuring a level of engineering is performed.

3.2 Transitional Arrangements

AEMO in section 1.7 of its Rule Change Request asked that the new technical requirements be applied from the date of the Request. Tilt Renewables opposes this in the strongest possible terms. It is not practical to work to technical requirements that are not yet finalised and this rule change request should not halt the development of the grid prior to its ratification. The Commission should allow a reasonable time following ratification of the new requirements for their implementation.

AEMO stated that its intention was to base the rule change request on the ESCOSA requirements and that proponents should therefore be ready to implement the new requirements. The development of the ESCOSA requirements did not follow the Rule Change Process required under the NER greatly reducing the influence that Participants could have on those requirements. It is not reasonable to expect that the

¹ AEMO Rule Change Request, Page 20



technical requirements be immediately implemented. This formal rule change request is the first time that appropriate debate on those rules has been possible.

Tilt Renewables requests that the transition to the new technical requirements be controlled to prevent unacceptable costs being worn by participants currently negotiating connections. Tilt Renewables has projects nearing GPS negotiation and financial close at this time. A sudden change in the required connection standards (let alone a retrospective change) would require re-work and delays. To properly conduct the studies that guide the development of the proposed GPS takes around two months at a cost to developers of approximately \$80k. There is additional work in pulling the information together and finalising the Connection Application and receiving an offer to connect. Tilt Renewables therefore requests that the new technical requirements only apply to projects that have not made a substantially complete Connection Application within 6 months after the new rules are made. This will allow sufficient time for any Connection Applications that are on-foot to be completed without impacting project timing and economics.

Tilt Renewables has assessed the impact of a two-month delay on a 360 MW wind farm project and determined that the NPV would reduce by 8% reduction. Being forced to re-start performance standards assessment could cause such a delay and significantly impact the project viability.

4 Specific Proposals Regarding Access Standards

Tilt Renewables notes that its comments on the access standards that follow are all dependent on the negotiation of Access Standards being undertaken to ensure no detriment to system security and quality. If the principal selected for the negotiation of access standards is that the GPS must be as close as practicable to the AAS then the comments below would need to be re-assessed to ensure sufficient conservatism is allowed for to mitigate the risk of over-promising and under-delivering due to the limited system models available to Connection Applicants.

5 Voltage Control and Reactive Requirements

5.1 S5.2.5.1 – Reactive Capability

It seems reasonable to Tilt Renewables that the minimum requirement for reactive capability is that level that enables the guaranteed control capability under S5.2.5.13.

5.2 S5.2.5.13 – Voltage and Reactive Control

(a) Voltage Regulation

Tilt Renewables notes, as raised by DigSilent at the industry workshop held on 12 October 2017, that the connection to a stronger part of the network, compared to a weaker part, would require a greater amount of reactive support to achieve the same level of voltage control. At the same time, connection to a stronger part of the network requires less contribution from each connected generator as the voltage is already well supported. Adding significant amounts of reactive support to enable voltage control to $\pm 2\%$ may result in significant reactive plant being added to the system in a location that does not require it. That would be contrary to the NEO.

In such situations, Tilt Renewables would suggest that a NAS based on rules similar to the existing NER that allow for power factor control (instead of voltage control) would be more appropriate. They would not degrade system security or power quality and would achieve the NEO whilst being consistent with



AEMO's responsibilities under NER clause 4.5.1(f)(3). Should the power system change in the future, then AEMO should undertake its responsibilities under NER clause 4.5.1(f)(1), and (2) to maintain the voltages at that time.

The requirement for every generator to have voltage control (not just power factor control) with the ability for AEMO to remotely change the control mode could be acceptable, however the amount of voltage control available for such generators should be limited by the amount of reactive capability required to achieve the power factor control required for current system security levels.

(b) Settling Time

Tilt Renewables is generally accepting of the need for controlled settling of control systems. It would need to defer to the manufacturers to understand whether the MAS proposed is likely to be achievable for modern generators. Tilt Renewables acknowledges AEMO's intention to ensure a damped voltage response across the system.

6 Reactive Current Injection During Disturbances

Tilt Renewables defers to manufacturers to comment on the ability of modern generators to achieve the requirements proposed by AEMO.

Tilt Renewables does note that for a generator that it is constructing at this time (using relatively modern, full converter, asynchronous wind turbines) that there is a limit such that when the voltage drops below 20% of nominal at the generator terminals, the ability to inject additional reactive current drops away. The wording currently being considered for that Performance Standard is similar to the following:

“For *voltages* below 20% at the *generating unit* terminals, reactive current injection may reduce to zero. The *generating unit* will not absorb reactive current during the application of the fault”

The MAS proposed by AEMO would not allow for such flexibility. Tilt Renewables understands that AEMO requires the system to be adequately supported during faults but questions whether modern inverter connected generation can be expected to meet even the MAS. Again, Tilt Renewables is of the opinion that the MAS should allow for supporting the system security and power quality rather than simply requiring an arbitrary standard to be met by generators.

7 System Strength

Tilt Renewables defers to manufacturers to comment on the ability of modern generators to achieve operation at very low short circuit ratios (SCR). Tilt Renewables notes that on-site testing of this requirement would be challenging. Generally, proof of this capability would be from manufacturer tests and data sheets as the actual fault level at any time is not measurable (unless a fault is applied) so the measurement of SCR cannot be made. Estimates of the SCR can be made but in strong regions of the network it may be that the SCR never drops low enough to perform the test.

8 Continuous Uninterrupted Operation

Based on the revised definition in AEMO's supplementary material, Tilt Renewables has the following comments:

- (a) appears acceptable
- (b) appears acceptable

- (c) requires some wording allowing recovery of active power and reactive power following a disturbance. Following clearance of the fault, the system will be in a state where the active power and reactive power output of any generator, synchronous or asynchronous, will not yet have recovered. Clause S5.2.5.5 allows for active power to return to 95% of pre-fault levels between 100 ms (AAS) and 1000 mw (MAS). It also describes, generally, the mechanism of recovery from fault that would allow for recovery of reactive power.
 - Explicit reference to S5.2.5.5 must be made in this part (c) of the definition to allow for the real, physical response of generators to system events.

9 High Voltage Ride Through

Tilt Renewables recommends against adopting the new diagram proposed by AEMO to be implemented as Figure S5.1a.1 in the NER.

Through the changes being proposed in this Generator Technical Standards Rule Change Request, AEMO is seeking to improve system security, including the improvement of voltage control of generators and therefore voltage control through the system. The improved voltage control will minimise the risk of voltages exceeding the existing Figure S5.1a.1.

Tilt Renewables notes that S5.1a of the NER develops system standards that (S5.1a.1):

- (a) are necessary or desirable for the safe and reliable operation of the facilities of Registered Participants;
- (b) are necessary or desirable for the safe and reliable operation of equipment;
- (c) could be reasonably considered good electricity industry practice; and
- (d) seek to avoid the imposition of undue costs on the industry or Registered Participants.

Changing Figure S5.1a.1 worsens the system making it less likely to provide for the safe and reliable operation of connected facilities. The existing Figure S5.1a.1 has been considered good electricity industry practice and should continue to be so considered.

Tilt Renewables understands that it cannot rely on system standards (such as Figure S5.1a.1) being fully complied with. To allow for Figure S5.1a.1 not being complied with, generators have protection systems that disconnect them from the system for extreme voltages.

As voltage is a local phenomenon, it is expected that the number of generators that would trip for an over-voltage event would be limited. In particular, if there are many generators in the vicinity, their voltage control systems would tend to work together to control the voltage, again limiting the number of units that trip off.

Tilt Renewables recommends that AEMO must use its reasonable endeavours to maintain voltage conditions throughout the power system so that the power system remains in a satisfactory operating state, as per 4.5.1(e) of the NER, using the powers granted to it under 4.5.1(f). Changing the system standards is shifting the goal posts rather than providing improved system control, security and reliability and that would be contrary to the intent of this rule change.

10 Multiple Low Voltage Disturbance Ride-Through

Tilt Renewables defers to equipment suppliers to comment on the ability of their units (either synchronous or asynchronous) to ride through events as proposed.

11 ROCOF Withstand

Tilt Renewables defers to equipment suppliers to comment on the ability of their units (either synchronous or asynchronous) to ride through events as proposed.

12 Active Power Recovery

Tilt Renewables defers to equipment suppliers to comment on the ability of their units (either synchronous or asynchronous) to ride through events as proposed.

13 Frequency Response Mode

This appears generally acceptable to Tilt Renewables, assuming that a sensible approach is taken to negotiating the NAS rather than assuming that the AAS will be required.

14 AGC

Tilt Renewables is comfortable with the requirement for new generators to be ready to receive and respond to AGC signals.

Tilt Renewables suggests that a reciprocal rule be introduced that requires AEMO to guarantee a connection to the AGC on request from any new or existing generator. The AGC signal must be of equal fidelity and accuracy as the EMMS data that AEMO presently uses to dispatch most new generators. The EMMS and the AGC must present the same data such that either can be used with confidence by the generator.

15 Active Power Ramp Rate

This appears generally acceptable to Tilt Renewables.

16 Remote Monitoring and Control

This appears generally acceptable to Tilt Renewables. Again, Tilt Renewables would appreciate a reciprocal rule requiring AEMO to guarantee a connection to the AGC on request from any new and existing generator.