A2791663

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Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235

Attention: Dominic Adams

Dear Dominic

REF: ERC0222
AEMO Rule Change Proposal - Generator Technical Performance Standards

Powerlink appreciates the opportunity to provide input to the Australian Energy Market Commission's (AEMC's) Consultation Paper on the Australian Energy Market Operator's (AEMO's) Rule Change proposal.

Powerlink agrees with the overall intent of AEMO's proposal, which is to ensure the security and integrity of the power system. Powerlink also supports and refers the AEMC to the matters raised in Energy Networks Australia's submission on this matter. The remainder of this submission puts forward the following positions:

- that the AEMC must consider the impact of different generation technologies connecting to the power system and the mechanisms which will allow AEMO and TNSPs to facilitate such connections while delivering the functionality required for planning and operating the power system in a reliable and secure manner, both now and into the future, while also achieving cost effective and efficient outcomes for consumers;
- that given the difference in costs of meeting standards at the time of investment versus retrospectively, the onus of proof could reasonably be placed on generators or proponents as to why they cannot or should not be required to meet the automatic access standards;
- that there would be merit in achieving a consistent, national approach where practical to provide procedural fairness and greater investment certainty; and
- that administratively appropriate transitional arrangements be put in place that are clear and transparent, are fair to all parties concerned and provide a high degree of predictability in the process to promote certainty in investment decision making.

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To assist the AEMC in its considerations, Powerlink has also provided a response on various matters of detail sought in the Consultation Paper. These are largely addressed in the attachments.

AEMO's Proposal

AEMO's Rule change request seeks to change or introduce a number of the access standards for connecting generators in the National Electricity Market (NEM). These include standards in relation to voltage control and reactive power, disturbance ride through, system strength, active power control, frequency control and remote monitoring and control. In addition, AEMO proposes to amend the process for negotiating performance standards.

Fundamentally, AEMO is of the view that the current access standard settings in the Rules and the negotiating framework to set performance standards are not sufficient to ensure the ongoing security of an evolving power system. AEMO's concern relates to both the connection applications currently before them and those expected to be made in the near future.

Overarching Issues

Powerlink supports AEMO's intention to ensure the security of the power system and quality of electricity supply. Powerlink agrees that the regulatory framework should be designed to support efficient and effective investment in the NEM, including to satisfy customer demands, with arrangements that also deliver ongoing power system security, reliability and operability at the lowest long run cost. Powerlink recognises that there may be differences between short and long run costs that the AEMC will need to balance.

Technology and the Future

A broader issue that needs to be considered is that different technologies exhibit different characteristics and these can have different implications for the security of the power system. This is further complicated when analysing the power system impact of a potential connection in isolation versus as part of a sequence of connections. The need to manage uncertainty associated with the future power system requirements is also a concern, as what may be required to facilitate connection now may be very different to that over the life of the plant as other inputs to the power system change.

Powerlink considers that this longer-term requirement should inform the negotiating framework. In particular, Powerlink agrees with AEMO's proposal that, on balance, the onus of proof could reasonably be placed on generators/proponents as to why they cannot meet the automatic access standards, rather than on why more than the minimum standards is required for the current and future power system operation.

The current Rules relating to generator technical standards lends itself to a focus on the technical capability at the connection point. In assessing connection applications the potential impacts of a connection more broadly in the power system increasingly needs to be considered. More recently, this includes the need to take account of displacement of synchronous generation, which can impact the operability and stability of the network.

Powerlink considers that the primary objective of the negotiating framework should be to ensure the maintenance of system security at the lowest cost over the long run.

In reaching a view on AEMO's Rule change proposal, the AEMC will need to balance the up-front economic considerations for individual proponents against the potential cost of retrofitting or alternative arrangements to deliver overall security of the power system.

National Consistency

It is understood that AEMO seeks to maintain a NEM-wide, technology-neutral approach to establishing connections and considers that the long-term interests of consumers will be best served with a consistent national framework[1].

Powerlink agrees that there is merit in achieving a consistent, national approach where practical so that proponents who may seek to connect in a number of jurisdictions understand the framework and face the same process.

Transitional Arrangements

AEMO has proposed transitional arrangements for application of the AEMC's Final Rule tied to the date of 11 August 2017, being the date that AEMO submitted its Rule change request. Specifically, that:

- the amending Rule apply to all connection applications where the performance standards have not been finalised by that date; and
- the minimum access standards apply to any performance standards agreed after that date that are below the level of the *new* minimum access standard. For each affected performance standard, the connecting generator, NSP and AEMO (where relevant), would need to renegotiate a new performance standard.

For practical reasons, AEMO's proposal for retroactive application is not consistent with best regulatory practice. Powerlink would support transitional arrangements that provide sufficient notice to allow all parties to transition to the new arrangements. In establishing any such arrangements, the AEMC should ensure that the requirements are clear and transparent, are fair to all parties concerned and provide a high degree of predictability in the process.

Powerlink is conscious of the current large number of generation enquiries to connect in Queensland and across the NEM generally. As such it would be prudent to move to the proposed standards in a timely manner so that the long term benefits to customers can be realised through the large number of generators currently wanting to connect.

Queensland Experience

Powerlink is experiencing a significant growth in the volume of variable renewable electricity generators seeking to connect to the power system in the short to medium term.

Similar to the experience of network service providers in a number of other States, some connection applicants have sought to negotiate reduced access standards, particularly in relation to reactive capacity and voltage control. Powerlink's

[1] AEMC Consultation Paper, p37.

experience is that some generation proponents have tended to focus on maximising active power production from a given plant/component rating with a starting point in negotiation to offer no voltage support at high active power output.

Powerlink considers that the provision of reactive power capability and voltage control functions should be a mandatory requirement for all generators.

Conclusion

Powerlink is generally supportive of AEMO's proposed amendments to the National Electricity Rules (NER). Powerlink agrees that the existing technical standards no longer adequately take account of the capabilities of asynchronous generators and that the technical requirements must be reviewed to ensure that new generation delivers the functionality required to plan and operate the future power system in a secure, reliable and efficient manner.

Further supporting detail and comments on areas of the proposed Rule change that may require further consideration and/or clarification is given in Attachment A and B respectively.

If you have any questions in relation to this submission, please contact Jennifer Harris.

Yours sincerely

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Attachment A – Supporting Detail

S5.2.5.1 Reactive power capability and S5.2.5.13 Voltage and reactive power control

AEMO's proposed rule change for the negotiating framework and for S5.2.5.1 provides a framework to efficiently deliver the voltage support and control services required for the current and future operation of the power system.

When operating at lower active power output, due to prevailing weather conditions, intermittent renewable generators have inherent reactive power and voltage control capability. To preserve this capability at high active power output represents an incremental up-front cost.

The alternative is for additional investment in discrete plant (quite often dynamic reactive plant - SVC/Statcom) to maintain system security during these periods, resulting in increased costs to customers.

For areas of the power system where there is a proliferation of PV solar farms, gaps in voltage control may still emerge as the demand and network power transfers transition to an evening peak. From a local perspective there may be merit in considering solutions which increase PV capability (Q at night).

S5.2.5.11 and S5.2.5.14 Frequency and Active power control

The proposed rule change asks for capability only. Such capability would preserve the opportunity for these plants to participate in future ancillary markets (Frequency Control Ancillary Services (FCAS), Fast Frequency Response (FFR)). Without such a capability, as synchronous plants are displaced during periods of high variable renewable generation output, the fleet of plant capable of providing these services reduce with a likely increase in cost for these services. In addition, the increasing penetration of intermittent renewable energy sources will likely increase the need for frequency regulation/control services.

The provision of this control system capability would represent only an incremental up-front cost.

It would be materially more expensive to retrofit this capability in the future.

S5.2.5.15 System Strength

The standard must also be set at an appropriate level. If the standard is too low then additional costs will pass to new proponents looking to connect if the performance of "inferior" plant is impacted under the "do no harm" requirements from the AEMC's recent system-security related rule change Final Determination on Managing Power System Fault Levels (System Strength).

There also needs to be more clarity on how the system strength is defined. The proposed rule change defines that the connecting plant can operate down to a short circuit ratio (SCR) of 3. However, current equipment standards might suggest a lower value closer to 2 is robust.

Specifying a lower value may need to be considered on a case by case basis. For example, it is possible that the connection point could be electrically remote from the HV terminals of the connection transformer. Such uncertainties would support adopting the higher value of 3. Perhaps the SCR could be defined at the HV terminals of the connection transformer; allowing a lower value to specified.

There also needs to be a consideration of reactance/resistance (X/R) when defining the minimum system strength.

However it is defined, there needs to be consistency across all jurisdictions (e.g. ESCOSA specifies the SCR at the equipment terminals).

S5.2.5.7 Partial Load Rejection

The addition of the Partial Load Rejection performance standard for asynchronous generators should result in improved system resilience.

5.3.9 Procedure to be followed by a Generator proposing to alter a generating system

Powerlink agrees with the inclusion of S5.2.5.7 (partial load rejection) for a change to voltage control systems. Load rejections initiate a disturbance impacting both system frequency and voltage. As such, this clause belongs with the voltage/excitation system changes equally with governor changes.

Equally S5.2.5.10 (Protection to trip plant for unstable operation) should also be considered for changes to the protection system.

Attachment B – Requires further consideration and/or clarification

High Voltage Withstand

The proposed AEMO rule change is to update the high power frequency voltage withstand curve in the system standard, S5.1a.4. As currently drafted, Figure S5.1a.1 applies for credible contingency events. As supporting evidence for this rule change, AEMO noted that these current levels and duration can be exceeded during extreme operational outcomes such as following fast acting load shedding schemes and protected events; that is, events not currently classified as credible contingency events.

Powerlink agrees that higher voltage withstand capability would result in a more resilient power system and subsequently higher levels of reliability. However, changing the system standard could pose the following issues:

- incompatibility with the tapping range of some transformers
- review of network equipment capability and co-ordination with over voltage protection settings and
- capability and settings of customer equipment.

An approach that addresses these issues but still delivers a more resilient power would be to implement the new High Power Frequency Voltage Withstand Curve as a Generator Performance Standard in S5.2.5.4.

S5.2.5.4 Generating system response to voltage disturbances

AEMO clarified that the revised minimum access standard in clause S5.2.5.4 and definition of continuous uninterrupted operation (CUO) is intended to apply within the normal operating range (90 – 110 % of normal voltage). However, as defined in the negotiated access standard (S5.2.5.4) the plant must be capable of CUO for the range of voltages specified in the automatic access standard unless there is agreement (between AEMO and NSP) that the total reduction of generation in the power system as a result of any voltage excursion within levels specified by the automatic access standard, would not exceed 100 MW.

Based on the proposed definition of CUO this appears to be in conflict and also less than the minimum access standard. At worse, this ambiguity needs to be addressed.

S5.2.5.5 Generating system response to disturbances following contingency events

S5.2.5.5 (b) (1) and (c)(1) - Compliance assessment methodology needs to be defined. 15 events within 5 minutes is one event every 20 seconds. This is within the reclaim time of Powerlink's auto reclose (typically set at 30 sec). Therefore, if this was simulated realistically then multiple circuits would lock-out after successive events. This would have severe consequences for the angular stability of synchronous plant and stability (system strength) of asynchronous plant. Clarification should be provided as to whether this is just a theoretical exercise where faults are applied and removed without tripping circuits.

S5.2.5.5 (c)(2)(i)(A) - Compliance assessment methodology needs to be defined. For synchronous plant the capacitive current injection reduces during the fault. It is assumed that compliance is to be assessed for the duration of the disturbance.

For recent synchronous generator compliance assessments this minimum (just prior to fault clearance) injection has been assessed as < 2%. Note that this was assessed at the point of connection and (i)(ii) of the **general requirements** now specifies assessment at the generator terminals. Such assessment would result in a higher % injection but this has not been quantified.

S5.2.5.5 (c)(2)(iii) - Minimum access standard for active power recovery is specified as 1 sec. If the negotiation principles are to start with the automatic access standards then it is acceptable to consider on a case by case basis the materiality, due to location on the grid and size of plant, of exceeding this time. Therefore, suggest wording be changed to, "1 second or as otherwise agreed by AEMO and the NSP".

S5.2.5.5 (2) - references fault types in subparagraphs (1)(ii) and (iii) but (1)(iii) has been deleted.

S5.2.5.13 Voltage and reactive power control

S5.2.5.13 (2A)(iii) – suggest wording be changed to, "allows the voltage ~~setpoint~~ to be continuously controllable in the range of at least 95% to 105% of normal voltage at the connection point or agreed location on the power system, without reliance on a tap-changing transformer".

S5.2.5.13 (b)(3)(vii)(C) and (d)(4)(iii)(B) - When stepping into a limiting device (e.g. UEL OEL) it is not reasonable to place performance requirements on the settling time for voltage. This is no longer a controlled variable and system variations may take it outside bounds.

S5.2.5.13 (b)(1)(i) and (ii) – "Adequately damped" is defined depending on the frequency of oscillation of the generating unit against any other generating units. This is in reference to "speed" modes. For other modes the criteria is one of no degradation, but restricted to modes that are "critical". The rules are silent on what constitutes a "critical" mode. Ambiguity should be removed as it has for the minimum access standard where it is specified that operation of the generating unit does not degrade:

(A) any mode of oscillation that is within 0.3 nepers per second of being unstable, by more than 0.01 nepers per second; and
(B) any other mode of oscillation to within 0.29 nepers per second of being unstable.;.

S5.2.5.13 (g) – suggest wording be changed to, ".....Remote control equipment to change the set point and mode of regulation (**including droop setting**) must be provided.