

08 November 2017

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Chief Executive  
Australian Energy Market Commission  
PO Box A2449  
Sydney South NSW 1235

Attention: Mr. Dominic Adams

### **Generator Technical Performance Standards – Consultation Paper (19 September 2017) (ERC0222)**

Energy Networks Australia (ENA) welcomes the opportunity to make a submission to the Australian Energy Market Commission's (AEMC) Generator Technical Performance Standards rule change Consultation Paper.

Twenty-five electricity and gas network companies are members of Energy Networks Australia, providing governments, policy-makers and the community with a single point of reference for major energy network issues in Australia. This submission responds to the questions put forward in the Consultation Paper. We wish to emphasise the following key points:

- » Changes to the existing negotiating framework which place the onus of proof on generators/proponents to justify why they cannot meet automatic access standards is likely to achieve the best overall performance capability and operability of the integrated system at lowest cost.
- » The AEMC should consider the customer impacts of Rule changes, which place potential (investment) obligations, liabilities, and costs on Network Service Providers (NSPs) for reactive support. This is especially the case, where the associated services were previously provided at minimal or zero cost and provide clear benefits to generators. Current regulatory arrangements mean that network costs and risks for these obligations are ultimately borne by customers, as generators do not currently pay either Distribution or Transmission use of System charges.
- » Potential Connection Applicants should expect similar approaches and processes across the National Electricity Market (NEM). At the same time, it is important that the AEMC take into account legislation and relevant Codes in each jurisdiction to ensure that there are no conflicts or inadvertent outcomes from applying any consequential rule change to each jurisdiction.

- » Energy Networks Australia supports the introduction of a system strength performance standard<sup>1</sup> and looks forward to further clarity as to how the standard will be measured and assesses whether the standards relate to generator performance standards and/or network (planning-related) standards.

Other related issues that need to be considered are the capacity and compatibility of networks and customers settings, and the equipment to implement the new High Voltage Withstand Curve.

- » Energy Networks Australia members appreciate AEMO's October 2017 Supplementary Material document (at pages 7 and 8) that endeavours to clarify its intention to refer to operating in the 90% to 110% normal voltage band to address the highlighted **Continuous Uninterrupted Operation (CUO)** drafting error re NER S5.2.5.4. However, further consideration needs to be given as to how such a revised definition may affect existing Connection Agreements between TNSPs and DNSPs on a Quality of Supply NER Clause S5.2.5.6 basis.

### Distribution Level issues

It is important for the AEMC to consider the extent to which proposed changes will (or should) apply to Virtual Power Plants (VPP's) and/or a collection of smaller-sized generating units.

Virtual Power Plants are an aggregated collection of small generation systems, generally Low Voltage (LV) connected (under AS4777) and geographically dispersed, but controlled in aggregate to mimic a larger power station (e.g. > 5MW). With the on-going proliferation of small scale solar, there is strong potential for a large uptake of VPPs in the next few years.

The challenge will be that each system is likely to be measuring different connection point conditions, particularly during disturbances, so overall control would likely have to be referenced to some aggregated upstream system node.

The AEMC will need to consider how AS4777 requirements, primarily aimed at Low Voltage power quality management, interact with NER requirements (both existing and proposed). For example, it is not clear whether the NER requirements a VPP that is sized > 5MW would take precedence over local distributor AS4777 requirements for Low Voltage Power Quality management.

### Additional Technical and Operational issues

Some key messages and specific responses to the Consultation Paper questions for the AEMC's consideration are provided in Attachment # 1. However, Energy Networks Australia notes the following additional issues that need to be considered in developing any rule changes:

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<sup>1</sup> This should be set, taking into account the "do no harm" requirements from the AEMC's recent system-security related Final Determination on Managing Power System Fault Levels (System Strength).

- » Addressing overvoltage including the scope for breaching AS61000 (power quality flicker and short-term overvoltage) as well as voltage rise issues. In Victoria, it is understood that the generation system shall not impose a voltage issue on the installation at the network point of supply outside the limits specified by Clause 1.6.2(c) - AS 60038;
- » Treatment of embedded generation;
- » In respect of inverters, the need for a 'sanity check' against the relevant IEC standard equivalents of Australian Standard 4777;
- » How AEMO's Power System Data Communications Standard may apply at various potential asynchronous sites at the approximately 5MW level in member networks (including an economic justification of this treatment);
- » The need to reference AS standard 61000.3.13 where the AEMC and/or AEMO detail how to undertake Voltage Unbalance Allocations for new connections; and
- » That NER Clause S5.2.5.6 is likely to be a key issue in any second phase, or next review of Generator Technical Performance Standards.

Noting the importance of this issue for the NEM's future, a number of member businesses will be lodging separate submissions to focus on issues specific to their business including experiences and interaction with existing National Electricity Rules (NER) arrangements and other jurisdictional instruments.

Energy Networks Australia and its members welcome and encourage further AEMC engagement (e.g. workshops or meetings) on these and other member-raised issues as it develops its thinking towards its Draft Determination in the early part of 2018.

Given the on-going volume of connection applications at both transmission and distribution levels, industry and NEM regulatory institutions need to endeavour to expedite the process (including an educative element) noting the AEMC will not be making a retrospective rule.

Should you have any additional queries, please contact Norman Jip, Energy Network Australia's Senior Program Manager – Transmission on (02) 6272 1521 or [njip@energynetworks.com.au](mailto:njip@energynetworks.com.au)

Yours sincerely



Andrew Dillon

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## Attachment 1 - Responses to Selected Consultation Paper Questions

### Question 1 - Assessment framework

*Do you agree with the Commission's proposed approach to assessing whether the rule change request will, or is likely to, contribute to the achievement of the national electricity objective? If not, how should it be assessed?*

Energy Network Australia broadly agrees with the proposed assessment framework. This includes maintaining system security at lowest costs to consumers; appropriate allocation of costs and risks, regulatory certainty and flexibility, as well as being technology neutral.

It is critical that the AEMC give higher weighting/additional priority to addressing system security issues, which are key drivers for this rule change and should bring about long-term benefits for consumers.

### Question 2 - Role of Access Standards

*(a) Do the current generator access standards require changes to help maintain power system security?*

*(b) Would making changes to generator access standards represent the lowest cost approach to maintaining system security relative to other options?*

*(c) Will mandating certain capabilities in generator access standards enable and support the establishment of ancillary services in future?*

Generator access standards need to be updated to address the transforming generation mix in the National Electricity Market (NEM). This is particularly the case since the Standards were last reviewed a decade ago, and to address concerns outlined through the Consultation Paper on specific technical aspects and capabilities.

The existing performance standards were generally drafted with synchronous plant in mind and then additional requirements/modifications were gradually made for non-synchronous plant. It is expected that the future system will be dominated by non-synchronous generation and therefore a review is warranted.

Generator Performance Standards form a small but important part of a broader reform of system security frameworks. None of these changes should be considered in isolation. Improvements to Generating Performance Standards and related processes need to factor in integrated system planning to achieve a more balanced overall approach without an excessive burden on new generation.

***Reactive power and voltage control*** - at lower active power output, due to prevailing weather conditions, variable renewable energy generators have inherent reactive power and voltage control capability. To preserve this capability at high active power output represents an incremental cost only.

The alternative is clearly a worse option for consumers - Network Service Providers (NSPs) to invest in discrete plant (quite often dynamic reactive plant - Static Var Compensators/Statcom) to maintain system security during these periods.

The provision of reactive power capability that allows participation in voltage support functions should be a mandatory requirement for all generators.

***Active power control and frequency control*** -The proposed rule change asks for capability only. Such an additional control system capability must also, *at worst* represent an incremental cost. It preserves the opportunity for these plants to participate in future ancillary services markets (e.g. Frequency Control Ancillary Services (FCAS), and Fast Frequency Response (FFR)). Without such a capability, when synchronous plants are displaced, 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 Variable Renewable Energy will likely increase the future need for frequency regulation/control services.

Generally, it is considered that the incremental increase in costs related to increased generator performance standards is deemed prudent relative to the contribution these standards are likely to make to maintaining system security and efficiently providing these services into the future.

Therefore, mandating certain capabilities in generator access standards would enable and support the establishment of ancillary services in the future. It is generally considered materially more expensive to retrofit additional capability to plant that was not initially designed with such requirements at the time of installation. Without such requirements, participation in any future ancillary services could be limited.

#### Question 3 - Proposed changes to generator access standards

For each of AEMO's technical recommendations set out in Appendix B:

*(a) Do you agree with AEMO's analysis of the issue in relation to the proposed change to the access standard?*

Energy Networks Australia broadly agrees with AEMO's analysis. The discussion on an evolving generation mix, lessons from the South Australia 'system black' event of 28 September 2016, alignment with overseas practices and taking advantage of modern technologies' higher levels of performance appear appropriate.

We also note that the 2017 Essential Services Commission of South Australia's (ESCOSA) requirements have been in place in SA for several months and a number of projects have now been assessed against these. At this stage, these arrangements do not appear to present a material barrier to projects or investments progressing in that jurisdiction.

#### **For S5.2.5.4**

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.

Energy Networks Australia 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 impact:

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

One approach to address these issues but still deliver a more resilient power system would involve implementing the new High Power Frequency Voltage Withstand Curve as a Generator Performance Standard in S5.2.5.4.

#### **For S5.2.5.5**

The Minimum access standard for active power recovery is specified as 1 second. If, the negotiation principles are to start with the automatic access standards then it may be acceptable to consider on a case-by-case basis the materiality, due to the location on the grid and size of plant, of exceeding this time. Therefore, Energy Network Australia suggests the wording be changed to "1 second or as otherwise agreed by AEMO and NSP".

#### **Question 4 - System strength access standard**

- (a) Do you agree with AEMO's analysis of the issue related to system strength?*
- (b) Would the proposed changes address these issues, particularly in light of the Commission's Managing system fault levels rule change final determination? If not, what alternative solutions are there?*
- (c) Would the proposed changes relating to system strength represent an unnecessary barrier to entry, having regard to the costs imposed by the change and the technical capabilities of different technologies?*

Energy Networks Australia agrees that a system strength performance standard should be introduced. This should also be set at an appropriate standard, particularly given the "do no harm" rule change outcomes and requirements. If the standard is too low then additional costs will need to be borne by new proponents looking to connect if the performance of "inferior" plant is impacted.

There also needs to be more clarity on how system strength is defined. The proposed rule change defines that the connecting plant can operate down to a 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 X/R when defining the minimum system strength. This may need to be considered on a case-by-case basis.

We note that the specifics of this requirement is different from the ESCOSA requirements (ESCOSA specified at the equipment terminals and refers to an X/R ratio, whilst the proposed new rule is at the connection point) and that consistency is important. One of these jurisdictional requirements should ideally be amended to ensure consistency.

AEMO's proposal sets out a minimum capability generating plant is required to meet and; from our recent experience, this is not an unreasonable requirement.

At this early stage, we observe that the more stringent requirements recommended by AEMO and agreed to ESCOSA in August 2017 as part of ESCOSA's recent [Inquiry into the licensing arrangements for generators in South Australia](#) has not seen a consequential massive reduction or cessation of connection inquiries.

Question 5 - Proposed changes to generator access standards.

*For each of AEMO's technical recommendations set out in Appendix B:*

*(a) Do you agree with AEMO's analysis of the issue in relation to the proposed change to the access standard?*

Energy Networks Australia agrees with AEMO seeking this capability to be built in to the connecting plant - AEMO is not mandating participation. The reasonableness of this request is underpinned by the incremental costs of this capability. If additional costs are real then this may lead to over-investment. However, these costs should be more than compensated by the downward pressure on future FCAS costs. That is, mandated active power control capability will increase competition in FCAS markets, and therefore reduce the cost of these FCAS services over time.

We note that the proposal is consistent with the principles of ESCOSA's requirements.

Question 6 - Reduction in system size thresholds

*(a) Do you agree with AEMO's view that standards should not consider generating system size in their application appropriate? If not, what alternatives are there?*

*(b) Would the proposed changes to the thresholds for certain generator access standards represent an unnecessary barrier to entry, having regard to the costs imposed by the change and the technical capabilities of different technologies?*

As far as possible a consistent approach should be applied. As distribution businesses are acutely aware this is impacting generator applicants of < 30 MW. This approach appears consistent with the intent contained in the AEMC's recent Final Determination on AEMO's Generating System Model Guidelines rule change consultation.

The growing trend of generating system projects less than 30 MW, when considered in aggregate, can have a material impact on the power system. This leads to asking what assessment criteria could be used as a filter (e.g. an effective SCR) such that unreasonable costs are not imposed?

In South Australia, ESCOSA requirements apply to generating systems below the 30MW limit currently referenced in the NER. There is also experience with developers proposing systems that fall just below the threshold of size as specified in the NER that, when summated across a number of projects in close proximity, could result in a material impact on security if plant capability is not appropriate.

We also note that the AEMO registration guideline for generators requires registration down to 5MW for batteries due to their unique characteristics and support that a minimum system size threshold should be considered. However, in doing so, we caution that the AEMC take into account existing member business objectives, obligations and the intent in existing jurisdictional Codes and legislation, e.g. the Victorian Electricity Distribution Code.

An issue that needs further AEMC thought is how this GTPS rule change at lower voltages will impact upon the growing need for co-optimisation of the operation of the distribution network with Distributed Energy Resources, i.e. a future Distribution System Operator (DSO) role and the adoption of specific DSO accountabilities.

(b) If advised early enough, connection proponents should seek as much detail from manufacturers as possible noting these prospective requirements.

#### Question 7 - Definition of continuous uninterrupted operation (CUO)

*(a) Do you think the current definition of continuous uninterrupted operation raises issues for maintaining power system security?*

*(b) Would the proposed change to the definition of continuous uninterrupted operation address the issues raised by AEMO? If not, what alternatives are there, for example what materiality thresholds should apply?*

*(c) Would the proposed change to the definition of continuous uninterrupted operation represent an unnecessary barrier to entry, having regard to the costs imposed by the change and the technical capabilities of different technologies?*

Energy Networks Australia members appreciate AEMO's October 2017 Supplementary Material document (at pages 7 and 8) that endeavours to clarify its intention to refer to operating in the 90% to 110% normal voltage band to address the highlighted **Continuous Uninterrupted Operation (CUO)** drafting error re NER S5.2.5.4. We understand the AEMC's objective is to be consistent with the Essential Service Commission of South Australia's (ESCOSA's) approach.

Members agree with the AEMC's intent. If there is no reduction in Power and Quality from pre to post contingency, this results in no incremental impact on the duration or severity of the disturbance.

The definition drives a definite plant capability that is greater than otherwise required. Without this MW output, plant and neighbouring plants subjected to the same voltage disturbance will reduce output. This may increase FCAS requirements with its own incremental costs.

Given that S5.2.5.5 is added, the inclusion of "during the disturbance" is not problematic as NER clause S5.2.5.5 anticipates a transient reduction in power with acceptable active power recovery times defined.



Nevertheless, there remains room for further stakeholder discussion to derive a satisfactory definition acceptable to industry. For example, a further consideration is how such a revised definition may impact upon existing Connection Agreements between TNSPs and DNSPs on a Quality of Supply NER Clause S5.2.5.6 basis. We understand that NER Clause S5.2.5.6 is likely to be a key issue in any second phase, or next review of Generator Technical Performance Standards.

**Question 8 - Negotiated access standard requirements under specific clauses**

*(a) Do you agree with AEMO's analysis of the issues in relation to negotiated access standard requirements?*

*(b) Would the proposed changes address the issues raised by AEMO? If not, what alternatives are there?*

AEMO has attempted to clarify the continuous uninterrupted operation requirements, which is similar with the ESCOSA requirements.

In relation to S5.2.5.4 (Response to voltage disturbances) - the negotiated access standard allows AEMO and the NSP to consider a total reduction of generation in the power system because of any voltage excursion within levels specified by the automatic standard up to 100 MW. This seems at odds with the definition of CUO that is also specified for the minimum access standard, and interpretation/understanding needs to be appropriately clarified.

**Question 9 - Technical standards relevant to the alteration of generating plant/system**

*(a) Do you agree with AEMO's analysis of the issues related to the technical standards for alteration of generating plants or system?*

*(b) Would the proposed change address the issues identified by AEMO? If not, what alternatives are there?*

Energy Networks Australia agrees with the proposal as it should result in improved security for older plant as they undergo upgrades in the future.

The requirements of S5.2.5.7 (partial load rejection) are not applied to asynchronous generation under the current NER. The proposal will result in improved system resilience by requiring older asynchronous generators to meet the access standards for this clause when they undergo plant upgrades.

Agreeing to such an inclusion of S5.2.5.7 (partial load rejection) for a change to the voltage control system, would align with a change in an excitation control system. Partial load rejection impacts frequency and voltage and in this context this clause should equally belong with the voltage/excitation system changes, as to governor changes.

Equally, S5.2.5.10 (Protection to trip plant for unstable operation) should have been considered for changes to protection system(s).

*Question 10 – Jurisdictional issues and harmonisation*

- (a) How important is a consistent approach to generator access standards across regions?*
- (b) Are AEMO's proposed changes sufficient to manage system security across all areas of the power system so that jurisdictional arrangements (such as ESCOSA's licensing conditions for connecting generators in South Australia) are not required?*
- (c) Are there changes in addition to those proposed by AEMO that stakeholders consider necessary to avoid the need for jurisdictional specific arrangements?*

It is an important objective, so that potential applicants can expect similar approaches and processes from different jurisdictional and/or competing network service providers, as well as from AEMO where it has an advisory and/or planning role for applying NER clauses. Jurisdictional differences in terms of processes need to be kept to a minimum.

The principles behind the proposed Rule change and the 2017 ESCOSA licensing standards are consistent; however, there are some differences in the specifics. It should be a primary objective of this Rule change to ensure consistent generator performance requirements across the NEM and to enable the ESCOSA requirements to eventually fall away and be superseded by the NER in due course. As such, consideration of the differences between the 2017 ESCOSA, the proposed Rule change, and the most appropriate requirements for the overall power system is important.

In the case of Victoria, some concerns have been raised as to the interaction of this rule change and present responsibilities or otherwise for Distribution businesses (e.g. frequency and voltage) under the current Victorian Electricity Distribution Code. Avoiding any unintended consequences by way of new obligations and liabilities for potentially new roles for Victorian DNSPs will be crucial. For convenience, a link to the [Victorian Electricity Distribution Code](#) is provided.

*Question 11 – Issues with the current negotiating framework*

- (a) Do AEMO and NSPs have adequate powers under the NER to require connection applicants to set performance standards at levels that do not negatively impact power system security? Are there other factors that may impact the effectiveness of the negotiating process?*
- (b) How does the negotiating process operate in practice for participants? Is AEMO's view that connection applicants generally aim for the minimum access standards, and negotiate away from that position, an accurate representation of most negotiations?*

The current minimum access standard of S5.2.5.1 does not provide the necessary support for an NSP to negotiate reactive power capability. For example, some Solar Farm proponents push for the minimum in relation to NER S5.2.5.1. The existing CUO assessment methodology is negating this trend now, but not to the extent where the proponent offers Ancillary Services for MVArS.

#### Question 12 - Rationale for a negotiating framework

*(a) Given the changing nature of connections to the power system, does the rationale for a negotiating framework governing the connection process remain appropriate? Do you value the ability to negotiate and why?*

*(b) What are the appropriate respective roles of the automatic, minimum and negotiated access standards?*

The core principles behind the negotiating framework remain valid; however, as noted by both the AEMC and AEMO, that the appropriate setting of the level for automatic and minimum access standards is critical.

The negotiation process should ensure the highest level of system security is maintained. That is, automatic access standards are the benchmark, with lower standards only acceptable if a proposed plant cannot meet the automatic standard (demonstrated and onus on proponent) and the connection of this plant would result in only minor impacts on system performance (and not result in a degradation in system security).

The primary objective of the negotiating framework should be to ensure the maintenance of system security - economic considerations for individual proposals should not be valued above the overall security of the power system as this has a far wider impact on costs across the NEM and to consumers.

#### Question 13 - AEMO's proposed changes to the negotiating framework

*(a) AEMO proposes changing the negotiations so that the onus is on the connection applicant to prove that they cannot practicably meet an automatic access standard. Does this change strike the appropriate balance between security and costs?*

*(c) Would the proposed changes have any unintended adverse consequences for connecting MNSPs or large customers?*

This appears an appropriate objective. A general move toward automatic standard levels would *ceteris paribus* be a net benefit to all stakeholders. We would support 'in-principle' the safe harbour approach proposed by AEMO, *wherever practical*. The 'onus of proof' on applicants also appears to be in line with the AEMC's 'do no harm' approach in its recent Final Determination on the system strength/'power system faults' rule change.

Notwithstanding, Energy Networks Australia cautions that the reversal on the onus of proof proposed makes the negotiation of less than automatic standards a difficult one and a potentially adverse playing field for some generators.

#### Question 14 - Nature of the issues raised

*(a) What are the potential negative impacts on system security that could arise from the connection of new equipment under existing arrangements?*

*(b) What other options may be available to address the issues raised, taking into account the limitations set out in section 6.2.1 below?*

The potential exists given the envisaged volume of connections for a large number of sub-optimal connections that can be deleterious to other generators and parts of the network for system strength and constraint management under existing NER arrangements.

The AEMC already notes (at page 12) that the minimum access standard allows for generators without reactive power capability, voltage control capability, reactive power support to connect. In addition, active power recovery time and partial load rejection requirements (page 15) seem inadequate. To allow such a situation to continue would at a minimum, not address these particular concerns, and more likely, exacerbate these issues from a system security management perspective.

**Question 15 - AEMO's proposed transitional arrangements**

*(a) What is the nature of the system security implications of an immediate transition to a new rule, as against a grandfathered transition?*

It would be reasonable that some transitional period is provided for in changing to new arrangements. The transitional arrangements need to be fair, transparent and predictable. The absence of this is detrimental to investment certainty in the NEM. In any event, the AEMC cannot make a retroactive Rule.

Given the on-going volume of connection applications at both transmission and distribution levels, industry and NEM regulatory institutions need to endeavour to expedite the process (including an educative element). This relates to appropriate expectation setting of such a regime, should the rule change proceed.

A clear indication of a target date for effective commencement and an unambiguous progress milestone (e.g. an agreed GPS where existing arrangements would be continued) would appear crucial to any transition and implementation. However, these processes need to be balanced against the potential increase in risks to security that may occur if even a fraction of the current connection inquiries being processed across the NEM proceeds to full development.