6 June 2022

Australian Energy Market Operator

Lodged via email: planning@aemo.com.au

Dear Sir/Madam,

Re: Amendments to AEMO instruments for Efficient Management of System Strength Rule – Issues Paper

ElectraNet welcomes the opportunity to comment on the proposed amendments to the system strength instruments in response to the AEMC's rule change with respect to the Efficient Management of System Strength in 2021.

ElectraNet request consideration is given to the following:

1. Minimum fault level requirements need to take into account:
    a. Existing inverter-based Resources (IBR) subject to any existing or forecasted operational constraints and limitations;
    b. Forecast new IBR (noting that regional generation output is limited by operational demand and interconnector transfer capacity) and modifications to existing IBR (associated with asset replacement);
    c. Protection system requirements to ensure secure operation of the power system;
    d. Single power system prior outage conditions. There is an ongoing requirement for planned outages to support replacement, refurbishment and maintenance activities and the ability to secure these outages when needed is central to the provision of a safe, reliable and secure power system;
    e. Historical required fault level to support the secure operation of power system for the already connected parties;
    f. Local regional characteristics. For instance in South Australia, the minimum fault level cannot be any lower than the combined contributions from the ElectraNet transmission connected synchronous condensers and interconnectors.
2. The tolerable level of DER shake-off for efficient planning and operation of the power system;
3. Fit-for-purpose modelling of DER in relation to planning of fault level obligations for system strength services;
4. Modelling of IBR for PSS/E fault level assessments must utilise models or fault calculation methodologies which are supported by OEM advice and field verification where possible;
5. The proposed methodology for Preliminary Assessments relies on the use of a Single Machine Infinite Bus (SMIB) PSCAD model to assess the minimum short circuit ratio (SCR) withstand capability of a proposed facility. This minimum SCR capability is then used to determine the general system strength impact (SSQ) that forms part of the calculation of system strength charges.

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ElectraNet notes that this process brings forward the requirement for PSCAD models to be available at the time of Connection Enquiry rather than at the time of Connection Application as was the case prior to this Rule change. The existing experience that proponents have typically not yet selected an OEM at the time of Connection Enquiry and the extensive efforts required by the Proponent, NSP and AEMO to test and accept PSCAD models is important to recognise here. It is understood that one objective of the rule change was to reduce the reliance on detailed assessments and thereby reduce the duration of the connection process. It is not clear that the requirement for PSCAD models at the enquiry stage will assist in this objective.

The limitations of SMIB type analysis are also important to note, since interactions between nearby plant are not captured by this approach and so the outcomes cannot capture all aspects of plant stability or system strength impact. Since the rule requires that a simplified isolated model be used, consideration of engineering safety margins in assessing SCR withstand capability would appear sensible.

Additionally, and as noted in AEMO's Issues Paper, the plant SCR capability determined at this stage will be dependent on inverter/control system settings. It is important to recognise that the SCR withstand capability of a plant and other key performance criteria to be determined during Generator Performance Standard negotiation are often inversely related (i.e. low SCR withstand capability is generally difficult to achieve in combination with high speed control system and inverter response). Since this SCR capability will subsequently be used to assess the SSQ and therefore impacts on the system strength charge, ElectraNet notes that this is likely to encourage detuning of controls and subsequently reduced GPS performance levels.

6. When undertaking Full Assessments, ElectraNet considers that the criteria applied to determine whether a project is classified as a committed project should be the formal acceptance of a project's Generator Performance Standards, and successful completion of the project's Full Assessment or Stability Assessment as applicable. At this stage, the models and performance obligations of a particular project are assessed, documented and accepted, and the project is at a sufficiently advanced stage to support inclusion in studies assessing other proposals. Future network augmentations should be included once they achieve sufficient funding certainty from NSPs (e.g. completed a RIT-T or, for smaller projects, are endorsed by the respective NSP). Emphasis should be placed on the relative timing of network augmentations and the likely date of connection for customer connection projects when considering the inclusion of future network augmentations.

7. Regarding the scope of a Stability Assessment, ElectraNet notes that careful consideration is important in defining the key system nodes at which system voltages are monitored for the assessment. As a minimum, it is considered that the following locations should be included for the monitoring of voltage performance: the Point of Connection for the connecting plant, all regional system strength nodes, locations of key system dynamic reactive support devices, interconnector nodes and nodes at which significant IBR connections are located. Additionally, ElectraNet considers that the real and reactive power flow on major intra-regional and inter-regional transfer paths should be examined, and the aggregated regional IBR real power response should be monitored in order to detect plant disconnection and LVRT retriggering type issues in the wider system.

   Disturbances should include key contingency events (credible as well as those specified in existing customer GPS and those in the proposed GPS for the new connection) and switching of key network elements (reactive plant, lines, transformers) to examine stability for smaller disturbances.

The dispatch of other IBR in the studies needs to be carefully considered to ensure that the assessment covers sufficiently broad system operating scenarios (noting that the dispatch of IBR will vary with time of day and season).

In situations where the connecting NSP is not the System Strength Service Provider (SSSP) (e.g. a DNSP connection), it is suggested that the SSSP also be consulted on the results of the stability assessment. The SSSP is clearly required to be involved due to the need to assess whether the System Strength Services plans can be adjusted to mitigate issues or if the generator is required to bring other remediation. This is implied as necessary by the AEMO flow chart but not clearly discussed in the current AEMO proposed approach.

8. The proposed calculation approach for System Strength Locational Factor (SSLF) uses the additional fault level required at the System Strength Node (SSN) to restore Available Fault Level at the Applicant's point of connection as the basis for establishing the locational cost of providing System Strength Services. ElectraNet notes that this approach results in locational factors that increase rapidly and to unreasonable levels for locations only two to three busses away from the SSN. This is because of the non-linear nature of fault currents in the network. The following table provides SSLFs calculated using the proposed approach for the SA system at Davenport 275 kV and for locations up to four buses away. ElectraNet considers that SSLFs of this size are unreasonable. It is suggested that an alternative approach (for example, assessing network impedance relative to the SSN) to utilising fault current is considered as the basis for SSLF calculations.

Location	System Strength Locational Factor (SSLF) (Applying proposed fault level based approach)
Davenport 275kV (SSN)	1.00
Cultana 275kV (one bus away)	2.65
Cultana 132kV (two busses away)	9.13
Yadnarie 132kV (four busses away)	317

ElectraNet appreciates the opportunity to comment on these important aspects of the Amendments to AEMO instruments for Efficient Management of System Strength Rule, and we look forward to engaging further on the issues raised in this submission. Should you have any queries, please contact Jock Baker in the first instance on (08) 8404 7304.

Yours sincerely,

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Manager Network Development