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Friday, 3 February 2023

Ms Anna Collyer
Chair
Australian Energy Market Commission
Level 15
60 Castlereagh Street
SYDNEY NSW 2000

Lodged online: www.aemc.gov.au

Dear Ms Collyer

Submission to AEMC draft rule determination on efficient reactive current access standards for inverter-based resources

Transgrid welcomes the opportunity to provide feedback on the Australian Energy Market Commission's (**AEMC**) draft rule for efficient reactive current access standards for inverter-based resources (**IBR**).

As the jurisdictional planner, operator and manager of the transmission network in NSW and the ACT, Transgrid supports reforms that will enable both energy and system security services to be provided to consumers at the lowest possible cost. To achieve this aim and remain consistent with the National Electricity Objective (**NEO**), any amendments to the access standards must be forward-looking. This will ensure the National Electricity Market (**NEM**) is able to withstand a range of current and forecast operating scenarios. Furthermore, having access standards that consider a range of operating scenarios will promote efficient connections and investments within the NEM.

Transgrid supports the intentions of the AEMC's draft rule to facilitate a clear and balanced connection process that can be delivered within a timely and reasonable timeframe. However, there are several issues we believe warrant further consideration. Our primary concerns are further outlined in the attached submission.

Transgrid looks forward to continuing to work with the AEMC to develop flexible and relevant access standards for inverter-based resources that reflect current and forecasted operating scenarios.

If you or your staff require any further information or clarification on this submission, please contact Malithi Gunawardana, Manager Network Connections at Malithi.Gunawardana@transgrid.com.au.

Yours sincerely



Marie Jordan
Executive General Manager, Network

Efficient reactive current access standards for inverter-based resources

Transgrid submission to the AEMC's draft rule determination

Summary

Transgrid welcomes the Australian Energy Market Commission's (**AEMC**) draft rule and supports reforms which promote greater efficiency in the connection requirements of inverter-based resources (**IBR**). In general, Transgrid supports the draft determination as a meaningful amendment to the Minimum Access Standards (**MAS**) for clause S5.2.5.5. Transgrid also supports the underlying theme of the draft rule to enable flexibility and facilitate expert engineering knowledge to the connection process.

Transgrid welcomes the introduction of a reactive current commencement requirement along with an increase in the reactive current rise time. This will help provide clearer guidance to proponents that a response which is fast to commence, stable and adequately controlled is preferable.

As outlined by the AEMC in the draft determination, the settling time requirement is not a robust measurement as to the adequacy of the reactive current response. Transgrid agrees with this justification and supports its removal from the MAS.

Transgrid also supports the amendment to the active power recovery requirement, as it acknowledges that there may be an accompanying frequency disturbance which the plant must respond to accordingly and that the clearance of a fault does not guarantee that the voltage at the connection point has recovered and stabilised.

Transgrid believes further consideration is needed for the following issues:

1. Divergence with the automatic access standards
2. Definition of maximum continuous current
3. Minimum reactive current capability requirement of 0% or lower
4. Voltage thresholds for commencement of a response.

These issues are discussed in the following section.

Transgrid views on specific issues identified in the AEMC draft rule

Divergence with the automatic access standards

The AEMC outlines several considerations discussed between generators and Network Service Providers (**NSP**) during negotiations.

Transgrid believes that the final determination should provide further clarity on how a negotiation would consider the different approaches to requirements between the existing Automatic Access Standards (**AAS**) and the proposed MAS.

Definition of maximum continuous current

The AEMC has proposed that the maximum continuous current be defined in the Rules by basing it on the rated apparent power of the generating system and connection point normal voltage.

Transgrid agrees with the proposal to define the maximum continuous current in the Rules. Though, there is ambiguity as to how this definition would be applicable if clause S5.2.5.5(u)(2) is utilised, and the reactive current response is measured at a location other than the connection point. For example, if the reactive current contribution is measured at generating unit terminals, then the proposed definition of maximum continuous current in the draft rule may not be appropriate.

It is therefore recommended that there be a provision in the Rules for the definition to be altered, with agreement between the connection applicant, Australian Energy Market Operator (**AEMO**) and the NSP. Furthermore, the maximum continuous current definition should be recorded in the performance standards.

Minimum reactive current capability requirement of 0% or lower

The AEMC has outlined in the draft determination that for some connecting plant, the current minimum requirement of 2%/ current injection is too high. This can be due to a multitude of design factors, including the technology, balance of plant, network location, etc. The draft rule has set the MAS for reactive current injection to 0%/ or a lower percent or percentages as agreed between AEMO and the NSP.

Transgrid notes the following issues with the existing rules:

- There is no flexibility for AEMO and the NSPs to agree to a lower standard.
- Generating systems have had to tune their plant to comply under the most onerous operating conditions, in some instances, additional dynamic reactive plant has been required.
- There can be a trade-off between the speed of the response, stability requirements and the level of current injection capacity.
- This trade-off isn't sufficiently accounted for by the restrictive requirements of the existing MAS.

In Transgrid's experience, most plant can achieve the existing requirement of 2%/ current response at the connection point under typical and reasonable operating conditions. In most cases, only the onerous operation conditions cause compliance issues. It is important that reasonable attempts be made to harness the latent capability of the generating system under typical operating conditions to help support the network in an efficient manner. Lowering the requirement to 0%/ for all connecting plant under all conditions may diminish the importance of harnessing that latent capability. Transgrid believes that having a requirement greater than 'do no harm' will better facilitate the use of this latent capability and thus more effectively promote efficient investment in the network and better achieve the outcomes of the NEO.

Therefore, rather than prescribing a 'do no harm' requirement for all generating systems, Transgrid believes that it is more appropriate that the MAS retains a non-zero reactive current response requirement measured at the connection point, unless the NSP and AEMO agree that a lower level is appropriate. This would better utilise the latent capability of the generating system.

Allowing for flexibility to accept lower performance standards for onerous operating conditions, whilst still requiring a higher level of performance under more typical and reasonable operating conditions, would be a more beneficial outcome for the network. This would encourage the generating systems to ensure that sufficient endeavours have been taken to properly tune the plant, whilst taking into account a range of operating conditions (not only the most onerous) to best harness the latent capability of the generating system.

Whilst the negotiating framework in the current rules is intended to put the onus on connecting applicants to start negotiations at or near the AAS level, this is not often seen in practice. Therefore, relying on this framework alone is likely not going to be sufficient to encourage generating systems to effectively tune their

plant to harness this latent capability in the first instance. Transgrid believes that the proposed 0%/0% requirement poses a risk to prolonging the negotiating process by inadvertently setting a low expectation of acceptable performance.

Further to compliance issues, the existing requirement for current injection is too high, but rather than the additional requirements under which the response must be delivered were too onerous and too restrictive. The relaxation of the rise time requirement and removal of the settling time requirement is likely to provide sufficient flexibility in allowing generating systems to meet a non-zero requirement, even under onerous operating conditions.

In addition, the draft rule proposes that “a lower percentage or percentages” can be agreed to by AEMO and the NSP. We would encourage the AEMC to outline its intention for allowing for multiple lower percentages to be agreed to.

Voltage thresholds for commencement of a response

The AEMC highlights that the existing requirements for a response to commence within a certain voltage range is restrictive to certain technologies and control strategies.

Transgrid agrees with the AEMC as the proposed rule addresses the deficiency by altering the requirement to be that the reactive current response must have commenced before the connection point voltage has dropped below 80% or increased above 120% of normal voltage. Transgrid agrees with this approach as it facilitates different control strategies which are not dependent on a fixed voltage threshold.

The proposed rule, however, does not allow for these thresholds to be altered with agreement between AEMO and the NSP. Flexibility to widen the voltage threshold at which the reactive current response commences can facilitate an appropriate trade-off between:

- a stronger reactive current injection from non-Fault Ride Through (**FRT**) control strategies; and
- a faster rise time of the FRT-like control strategies.

In Transgrid’s experience, the non-FRT control strategies (such as inverter-level voltage control) can offer stronger, yet slower, reactive current injection compared to FRT control during shallow faults. Under the proposed rule, AEMO and the NSP can agree to longer rise and commencement times to facilitate these non-FRT and potentially preferable control strategies for shallow faults below 80% of normal voltage. However, such performance standards might not adequately capture the response for larger disturbances to which the plant may exhibit a faster response.

For example, a generating system might exhibit a reactive current rise time longer than 80 ms for connection point voltages down to 78% but less than 40 ms for disturbances below 78%. The proposed rule would require that the longer rise time be recorded in the performance standards for connection point voltages below 80% of normal voltage. The more preferable outcome would be that the voltage threshold for the performance standard can be lowered (to 78% in this example) such that the faster rise time is adequately reflected.

Therefore, Transgrid proposes that these voltage thresholds can be widened, with agreement between AEMO and the NSP. This would allow non-FRT control strategies for shallow faults whilst still recording adequate performance standards for FRT responses below an agreed threshold (similarly for over-voltages). Providing the flexibility for these thresholds to be negotiated aligns with the flexibility provided in other proposed rule changes as well as in the existing rules.