



Friday, 3 February 2023

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

Submitted online: www.aemc.gov.au

Re: ERC0272 and ERC0329 | Efficient reactive current access standards for inverter-based resources | Submission on Draft Determination

Dear Ms Collyer,

GridWise Energy Solutions (GridWise) welcomes the opportunity to respond to the AEMC's draft determination on the two rule change requests, one from a consortium of wind turbine original equipment manufacturers (OEMs) and the other from Renewable Energy Revolution (RER) Pty Ltd. Both proposals seek to address the standards specifying the reactive current fault-response required of connecting plant better to reflect the location-specific needs of the power system.

Established in 2018, GridWise provides power system engineering solutions and services to the utility-scale renewables, electricity networks, and distributed energy sectors. We have undertaken power system modelling and analysis of over 3 GW of wind, solar and battery energy storage projects across the NEM during various stages of the project lifecycle, from early-stage feasibility to connection studies and commissioning / R2 model validation.

In March 2021, GridWise facilitated the formulation and drafting of a rule change proposal Reactive current response to disturbances (clause S5.2.5.5) (AEMC reference ERC0329) on behalf of the proponents GE International Inc, Vestas Australia, Siemens Gamesa Renewable Energy and Goldwind Australia. The rule change request proposes amendments to the requirements of clause S5.2.5.5 of the National Electricity Rules to enable the more efficient connection of renewable generators and avoid unnecessary costs, project uncertainty and resultant delays caused by the current requirements.

The successful implementation of revised standards is in the interest of all market participants as it will provide projects with better technical and process certainty. The AEMC's preferred rule, as proposed in the draft determination, is a step forward in this direction. It will result in better project outcomes while improving overall power system security.

However, there are certain aspects of the preferred rule that we wish to highlight for the AEMC's consideration in its final determination. We believe that our proposed changes will improve clarity

M 1300 521 143
E contact@gridwiseenergy.com

gridwiseenergy.com

Level 21/459 Collins St
Melbourne VIC 3000





in assessing connection applications and facilitate consistency for ongoing compliance assessment¹.

Reactive current contribution during contingency conditions

We welcome the minimum access standard requirements changes for a more flexible negotiation process. Our recent project experiences show that assessing reactive current contributions is one of the more complicated power system studies and involves evaluating hundreds of plant operating scenarios. It is common that out of all the scenarios assessed, a few do not meet the applicable criteria. Tuning plant models for these ‘off-normal’ conditions is a time-consuming and complicated exercise and, in our view, counter-productive to overall project outcomes.

The draft rule allows discretion from AEMO and the Network Service Provider to agree to a lower percentage or percentages for such off-normal scenarios. This will significantly improve the assessment of connection applications, streamline the overall process and prevent additional project costs.

We note that the draft rule does not alter clause S5.2.5.5(u)(2), which allows the reactive current contribution to be measured at a location other than the connection point (including within the relevant generating system) where agreed with AEMO and the NSP. From a power system control perspective, assessment at the generating unit terminals is the most logical as this is the point at which the control is applied. However, significant non-linearities are introduced by the plant’s internal network, and the connection point may be at a significant physical and electrical distance from the unit terminals.

Commencement of generating system response

We support the changes to the low- and high-voltage trigger thresholds, which are fixed in the preferred rule and not provided as a range. However, we note that the draft rule mandates the low voltage threshold to be at least 80% of normal voltage and the high voltage threshold to be at most 120% of normal voltage.

The current minimum access standard under clause S5.2.5.5(o)(1) allowed the threshold ranges to be varied with the agreement of the Network Service Provider and AEMO. We propose that this flexibility may benefit some projects and that the ability to vary the threshold by agreement be reinstated.

Unclear terms

As the AEMC is aware, having good technical clarity around terms defined in the NER is important to have a streamlined connections process. We welcome the addition of the newly defined term "maximum continuous current" and further clarity around the definition of "continuous, uninterrupted operation". We have three additional suggestions for the AEMC’s consideration in the final rule.

¹ The issues raised here and responses to AEMC’s consultation paper are by GridWise alone. The rule change proponents (wind turbine OEMs) may have similar or differing views.





1. The definition for “maximum continuous current” be qualified as the current at the connection point corresponding to the apparent power required by *the lower of the generating system’s performance standard under NER clause S5.2.5.1, at the normal voltage and the automatic access standard*. We believe that, should the generating system be able to produce apparent power greater than the automatic access standard for clause S5.2.5.1, this should not be the basis for maximum continuous current.
2. The draft rule clause S5.2.5.5(o)(4) states that the reactive current response must be adequately controlled. “Adequately controlled” is not a defined NER term. We propose that the sub-clause S5.2.5.5(o)(4) be omitted.
3. Similarly, the term “excessive voltage rise” is not defined in NER Chapter 10. We suggest that the system standards be referred to instead.

Transition arrangements

The draft determination notes that under the transition arrangements, all connections will be assessed under the existing reactive current minimum access standard for up to 10 weeks after publication of the final rule.

We believe that many connection applications currently under assessment may benefit if this is modified such that they are assessed under the new final rule based on mutual agreement from all parties (including the Connection Applicant, NSP and AEMO). We understand that the requisite modelling is already being performed as part of the connection studies and that there will be no significant adjustments to how NSP and AEMO undertake their due diligence work. This will help projects avoid unnecessary costs, project uncertainty and resultant delays.

Information asymmetry and implications on the negotiations process

Under NER clause 5.3.4A, the Connection Applicant must provide reasons and evidence to the NSP and AEMO as to why, in the reasonable opinion of the Connection Applicant, the proposed negotiated access standard is appropriate and does not adversely affect power system security or the quality of supply for other Network Users.

In the case of some technical studies, such negotiations are objective and based on commonly available information, e.g., thermal ratings of transmission lines and minimum fault levels of system strength nodes. However, in our experience, negotiations around reactive current contribution from generating systems can become subjective primarily due to the information asymmetry that exists between the Connection Applicant and the NSP. In most cases, the Connection Applicant can’t be knowledgeable about the system security impacts of a reduced reactive current contribution. Likewise, the NSP has to form a subjective view of how much contribution is required from a particular generating system. This can create delays in negotiating the generator performance standards.

Another complication is that wide-area PSCAD models are essential to accurately validate individual plant performance for reactive current contribution. However, as per the current connections process, in most instances, the NSP undertakes the wide-area PSCAD studies only after the Connection Applicant submits the connection application. Therefore, such wide-area





PSCAD models are not available to the Connection Applicant while undertaking plant tuning or selecting the electrical balance of plant.

Whilst we recognise that connection process reform is forthcoming, this issue has not been explicitly addressed as part of the preferred rule. There may be better places to address process-related issues than the NER. However, note that the final rule should not limit the tuning of control setting parameters in line with first principles and the power system security requirements of the connecting network.

If you require any further information or clarification, please get in touch with me at Aditya.upadhye@gridwiseenergy.com.

Yours sincerely,

A handwritten signature in black ink, appearing to read "Aditya Upadhye".

Aditya Upadhye
Director – GridWise Energy Solutions

M 1300 521 143
E contact@gridwiseenergy.com

gridwiseenergy.com

Level 21/459 Collins St
Melbourne VIC 3000

