



**GridWise Energy Solutions Pty Ltd**  
L21, 459 Collins Street, Melbourne  
Victoria 3000 Australia

ABN: 75 625 132 550

W: <https://gridwiseenergy.com/>

Thursday, 23 June 2022

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

Submitted online: [www.aemc.gov.au](http://www.aemc.gov.au)

**Re: ERC0272 and ERC0329 | Efficient reactive current access standards for inverter-based resources**

Dear Ms Collyer,

GridWise Energy Solutions (GridWise) welcomes the opportunity to respond to the AEMC's consultation paper 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 better technical and process certainty to projects. Therefore, we urge the AEMC to consider the following elements in preparing a draft rule<sup>1</sup>.

**Standards that are based on sound power system fundamentals, provide overall market benefit and are conducive to integrating current and future technologies**

The generator performance standard for reactive current contribution needs to cater to diverse scenarios that include fault types (balanced, unbalanced), fault severity, location relative to the connecting plant, and the characteristics of the connecting network and neighbouring generators.

A "one size fits all approach" can result in sub-optimal project outcomes and may cause unintended system security consequences. For example, a high level of reactive current contribution for a deep fault (close to 0 p.u voltage at PoC) in a strong grid may not benefit the network at all but may cause control system coordination challenges with neighbouring plants for other scenarios. Similarly, most faults in the power system are unbalanced, but high "k-factors" tuned for balanced fault scenarios may cause unacceptably high voltages on non-faulted phases resulting in safety and reliability concerns.

As the AEMC rightly points out in its consultation paper, the technologies connecting to the NEM are evolving rapidly. Therefore, the updated standards should consider the wide range of issues related to integrating these newer technologies. For example, this may be for large-scale inverter-based loads like electrolysers, newer inverter technologies (e.g., grid forming) or offshore wind projects that are likely to have an extensive internal transmission and reticulation network.

The rule change proposal by the wind turbine OEMs<sup>2</sup> attempts to simplify existing requirements in a way that allows both NSPs and project proponents more flexibility in negotiating a performance standard that balances power system security requirements and generator technology considerations.

**Rule settings on reactive current response coordinated with other industry reforms**

There have been some significant regulatory and policy reform initiatives in the recent past, even since the submission of the rule change proposal by the wind turbine OEMs.

For example, the supply side requirements in the 'Efficient management of system strength on the power system' rule change will require system strength services to be supplied through a TNSP-led procurement of system strength. As noted in the wind turbine OEMs rule change proposal<sup>3</sup>, the current requirements on reactive current contribution may result in duplicative investments in front of and behind the meter, not only possibly resulting in stranded assets but may also cause complex coordination challenges.

The Energy Corporation of NSW recently consulted with the industry on the draft technical standards applicable for generator connections within the Central West Orana Renewable Energy Zone (REZ). Future REZs may undertake a similar process and have different technical requirements (more or less restrictive than the NER

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<sup>1</sup> 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.

<sup>2</sup> Rule change request from GE International Inc, Goldwind Australia, Siemens Gamesa Renewable energy, Vestas Australia on 11 March 2021: Reactive current response to disturbances (clause S5.2.5.5).

<sup>3</sup> Ibid.

standards) based on their unique characteristics and objectives. Therefore, the final NER minimum access standard on reactive current contribution should not unintentionally result in situations where two geographically close generators (one inside a REZ and one outside) have diverging requirements. We believe that a better way to manage this is by having a larger negotiating bandwidth within the NER, as the wind turbine OEM proposed in their rule change proposal.

### **Reducing information asymmetry and other issues with the connections process as identified in the CRI roadmap**

The Connection Reform Initiative (CRI), led by AEMO and the Clean Energy Council, published a reform roadmap<sup>4</sup> in December 2021. The CRI reform area 1.1 explicitly identifies lowering select Minimum Access Standards to allow NSPs to better reflect network performance and system needs at connection location as one of its priorities. The roadmap recommends a more flexible approach for AEMO, NSPs, proponents, and OEMs to agree on performance standards whilst minimising process uncertainty and system risks. This recommendation aligns well with the high-level objectives of ERC0329.

The roadmap also identifies issues related to information asymmetry, particularly regarding the availability of PSCAD models for proponent use. As stated in the rule change proposal by the wind turbine OEMs, the 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 submission of the connection application.

Whilst we recognise that connection process reform is forthcoming, the revised NER standards 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 feel free to contact me at [Aditya.upadhye@gridwiseenergy.com](mailto:Aditya.upadhye@gridwiseenergy.com).

Yours sincerely,

A handwritten signature in black ink, appearing to read "Aditya Upadhye", with a small flourish at the end.

Aditya Upadhye  
Director – GridWise Energy Solutions

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<sup>4</sup> <https://www.cleanenergycouncil.org.au/advocacy-initiatives/energy-transformation/connections-reform-initiative>