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Onboarding and Connections team
Australian Energy Market Operator

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Essential Energy submission – Proposed Guideline for NER S5.2.5.10

Essential Energy welcomes the opportunity to provide a submission to the Australian Energy Market Operator (AEMO) on its initial summary guide for clause S5.2.5.10 in the National Electricity Rules (NER). We support the intention to develop a guideline to establish a consistent understanding and approach for the technical requirements for asynchronous generating systems and reactive plant.

The following three sections cover our responses to specific feedback sought by AEMO.

1. Opportunities and/or challenges of the access standard requirements

Opportunity: Implementing a protection system which detects if a generating system causes or contributes to an undamped oscillation in the grid. This will eliminate the need to perform stability assessments by the proponent, network service provider (NSP) and AEMO, and could save significant time and resources while reducing the risk of instability in the network.

Challenge: Faulty or incorrect operation of AEMO's proposed protection system could significantly increase risks to network stability. For example, it could lead to a mass generation trip for generating systems in close vicinity and cause a mismatch between generation and demand.

Challenge: The AEMO proposed protection system would require frequent updates as the network (in close vicinity of the system) is modified or a new connection established. Such frequent updates could cause significant costs and resource constraints for AEMO, NSPs and the proponent.

Challenge: Clarity on the responsibilities and obligations of the various parties around design, development, and operation of the AEMO proposed protection system. Any ambiguity could lead to legal challenges in addition to operational or network risks.

Challenge: Essential Energy is not aware of any commercially available products with the capability to detect a generating system that causes or contributes to an undamped oscillation. This is mainly due to the fact that the dynamic conditions under which the power grid operates makes it almost impossible to detect the cause of instability using a general algorithm.

2. Clarity of the access standard requirements

Essential Energy supports clarification of the S5.2.5.10 access standard requirements, as long as it does not limit the definition of 'unstable operations' based on commonly occurring conditions that are considered unstable. Defining unstable operations exhaustively would raise the possibility of excluding some conditions that should be identified as unstable operations, and could inadvertently result in generating systems being non-compliant with S5.2.5.10. A guideline that outlines examples of commonly occurring conditions that are considered unstable, and provide an assessment approach, would enable clarity while minimizing risks.

3. The approach to a suitable protection system with AEMO

Prior to commissioning a generating system, Essential Energy proposes to continue utilising system-specific modelling to detect unstable operating conditions and tune the generating system based on modelling outputs. If an unstable operation cannot be detected through modelling for a specific system, it might be difficult for a general algorithm to detect it in real-time or generate accurate or helpful outputs.

Other issues for consideration by AEMO

a) The technical note specifies that the voltage should be measured at the point of connection, however, reactive power has been referred to the entire generating system without specifying an exact location within that system. Generally, all meters calculate the reactive power phase angle based on the measured voltages and current as a product of V and I. If the reactive power is being measured at the point of connection, comparing the phase angle of the reactive power and voltage is not practical as they cannot be captured at the same time, considering the delay in multiplying V and I. If the reactive power is being measured at the generating unit's terminal, the time delay to communicate would invalidate the comparison.

b) The provided methodology appears to be limited to specific types of disturbances to tune the algorithm, because of the limitation, extensive assessment is required to reach a comprehensive design for the detection algorithm. Being dependent on certain types of disturbances can invalidate the algorithm as the network characteristics change continuously and the behaviour of the network will not remain constant after a disturbance.

c) It is unclear how an oscillatory disturbance can be identified from non-oscillatory disturbances as most of the two phase to ground faults, are oscillatory during the fault. If the proposed protection system disconnects the generator during the fault, it may cause non-compliance with S5.2.5.5.

d) Considering the dynamic characteristics of the network, the algorithm design needs to consider impacts of connections to be established in the near future. This could add significant costs and complexities for both the NSP and the proponent.

e) It is outlined that AEMO and NSPs are facing challenges to determine which generating systems are causing and/or contributing to the oscillations. If NSPs and AEMO cannot detect the generator that is causing the oscillation using the currently captured data, how will an online system detect the oscillation? Is there an assumption of different data or improved data quality in the future?

If you have any questions in relation to this submission, please contact Mary-Clare Crowley, Acting Head of Regulatory Affairs via mary-clare.crowley@essentialenergy.com.au or (02) 6588 6773.

Yours sincerely,

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