

23 August 2023
Andrea Marinelli
Principal Project Manager – Regulatory Change
Australian Energy Market Operator (AEMO)

Via email: contact.connections@aemo.com.au

Dear Ms Marinelli

Draft recommendations on the review of technical requirements for connection

AusNet welcomes the opportunity to make this submission in response to the Draft Recommendations on the review of technical requirements for connection (the Draft Recommendations).

AusNet is the largest diversified energy network business in Victoria with over \$11 billion of regulated and contracted assets. It owns and operates three core regulated networks: electricity distribution, gas distribution and the state-wide electricity transmission network, as well as a significant portfolio of contracted energy infrastructure. It also owns and operates energy and technical services businesses (which trade under the name "Mondo").

Consistent with previous submissions, AusNet remains broadly supportive of the review and has provided detailed comments within the attached stakeholder feedback template from our perspective as a provider of transmission and distribution services. We also continue to recognise the significant effort by AEMO and industry to tackle this highly complex area of reform.

Having reviewed the full suite of documents provided, there are several critical issues that should be resolved before any NER amendments are considered final. Specifically, we request AEMO:

- **Provide greater evidence and rationale to justify draft NER amendments that represent a significant shift from current practice.** Many of the draft NER amendments proposed fundamentally change requirements for generation seeking connection from current practice. In some cases, these NER amendments appear to deviate from the intent of the original NER clause or draft recommendation without explanation. We have done our best to provide feedback on these areas in the attached, and strongly suggest AEMO consider whether the evidence available justifies a change in current practice.
- **Directly engage with NSPs on recommendations which result in a material shift in our role and responsibilities.** Some of the draft recommendations result in an increase in responsibility for NSPs and/or reduction in responsibility on AEMO. For example, excluding connections below 30 MW from AEMO advisory matters and transferring contingency study responsibilities to NSPs. AusNet requests AEMO engage directly with NSPs to articulate the rationale for these specific draft amendments and discuss their broader implications.

The above comments reflect that a review as complex and extensive as this may require further consideration by industry should AEMO wish to proceed to a fast-track rule change.

We note AusNet is a member of Energy Networks Australia (ENA) and supports that submission. If you have any questions regarding our submission, please contact Jason Jina, Energy Policy Lead by email at jason.jina@ausnetservices.com.au.

Sincerely,



Rod Jones
General Manager, Network Strategy & Planning

AusNet

Attachment: Response to Draft recommendations on the review of technical requirements for connection

Australian Energy Market Operator (AEMO)

Wednesday, 23 August 2023



Update report Stakeholder feedback template:

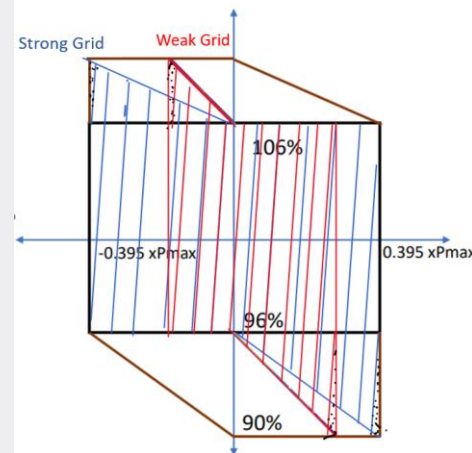
AEMO Review of technical requirements for connection

Stakeholders making a submission on the recommendations set out in the AEMO draft report may use the below template to provide feedback. Please consider the confidentiality disclaimer at the end of this document.

Stakeholder: AusNet

Schedule 5.2 Conditions for Connection of Generators

NER Schedule 5.2 issue	Schedule 5.2 (Generators) – feedback on revised recommendations and relevant draft NER amendments
NER S5.2.1 – Outline of requirements	
Application of Schedule 5.2 based on plant type instead of registration category and extension to synchronous condensers	AusNet supports AEMO’s revised recommendation.
NER S5.2.5.1 – Reactive power capability	
Voltage range for full reactive power requirement	<p>AusNet supports AEMO’s revised recommendation in principle. However, for S5.2.5.1 Negotiated access standard c (3), it is suggested to change to the following wording including the voltage-dependent reactive power requirement:</p> <p>“may include negotiate a limit that describes how the <i>reactive power capability</i> varies as a function of active <i>power level</i> or voltage level due to a design characteristic of the <i>plant</i>”</p> <p>AusNet believes that the efficient voltage-dependent reactive power curve should be as follows, which can form a basis for the Negotiated access standard. It can be provided in the assessment guideline or approach paper setting up as a recommended negotiation principle.</p> <ul style="list-style-type: none"> For a key voltage bus node where the voltage is meant to be tightly controlled, the UQ profile similar to the GB grid code (as mentioned in Bo Yin’s response to the Draft Report) utilises plants’ capability more effectively which takes the high dV/dQ sensitivity into account.



- For the bus nodes that are not remote from system strength nodes on the transmission level and are regularly experiencing bidirectional load flow may require more network voltage control support. Under such circumstances, the wider-band UQ profile (e.g., strong grid in the image above) provides more resilience assuming the Q margin (i.e., away from knee point of QV curve) and stability margin (i.e., away from stability limits) are well maintained.

Treatment of reactive power capability considering temperature derating

For weaker systems, Voltage sensitivity to Q and sometimes P (i.e., cross coupling effects) are prone to be high. Therefore, extension of Q (i.e., prioritization of derating P) would not enhance the network's voltage stability. Hence, it is not a preferable option. For a distribution network where SCR is typically low, which tends to have the characteristics of weak grid connection, therefore, the reactive power proportional to active power accounting for any temperature derating is more preferred.

On the other hand, in grid conditions where voltage sensitivity to Q (i.e., dV/dQ) is less pronounced and grid bus angle is not sensitive to P (i.e., $d\delta/dP$ is low), prioritizing derating of P (i.e., option 3) becomes more favourable.

There is not one fits all 'balanced right' approach. AusNet proposes to leave selection of option 1 or 3 up to the relevant NSP's discretion considering network regulation needs and plant limitations. The expectation can be communicated at the connection enquiry stage or as early as practical.

Compensation of reactive power when units are out of service

AusNet agrees with AEMO's revised recommendation to introduce reasonable impact threshold.

AusNet supports the initially proposed 0.5% threshold to minimize the impacts on network voltage regulation. Nevertheless, proponents could argue for the adoption of a 3% voltage variation tolerance for transmission and 5% for distribution to maintain consistency with S5.2.5.12 voltage variation assessment criteria.

S5.2.5.7, S5.2.5.8, S5.2.5.13

Simplifying small connections

- AusNet supports AEMO's revised recommendation on S5.2.5.7, S5.2.5.8 and S5.2.5.13 for smaller connections.
- AusNet disagrees with the recommendation to exclude AEMO's advisory matters on connections less than 30 MW. This is a significant change from current practice and no justification has been provided as to how this recommendation was reached. Additionally, AEMO's position in this matter contradicts discussions between NSPs and other parts of AEMO which have been considering AEMO becoming further involved in setting performance standards for sub-5 MW connections.
- AusNet requests AEMO share its analysis assessing the merits of excluding AEMO's advisory matters on connections less than 30 MW, compared to the status quo. This should include responding to valid questions and concerns raised by Energy Queensland and AusNet during their first-round response to the review's draft report, which were left unanswered.

NER S5.2.5.2 – Quality of electricity generated

NER Schedule 5.2 issue		Schedule 5.2 (Generators) – feedback on revised recommendations and relevant draft NER amendments	
Reference to plant standard		AusNet supports AEMO's revised recommendation.	
NER S5.2.5.4 – Generating system response to voltage disturbances			
Overvoltage requirements for medium voltage and lower connections		AusNet supports AEMO's revised recommendation.	
Requirements for overvoltages above 130%		In AEMO's revised recommendation, it is aimed to clarify the power frequency root mean square voltages outlined in S5.2.5.4(a)(2) to (8) and (b)(1) to (5). However, this crucial clarification has not been addressed in the draft NER amendments.	
Clarification of continuous uninterrupted operation (CUO) in the range 90% to 110% of normal voltage		AusNet notes voltage variations greater than 10% within the range 90% to 110% of nominal voltage, temporary active power output reduction and temporary reduction in reactive power capability, corrected by tap-changing transformer action is acceptable when assessing CUO performance. However, the response time of OLTC in transmission and distribution can differ significantly. In distribution networks, the response time of OLTC can be as high as 1 to 2 minutes, which may not be genuinely classified as a temporary response. To ensure a more precise definition of temporary response, AusNet suggests specifying the acceptable response time limits (e.g., 7.5s) rather than accepting performance to be corrected by OLTC.	
NER S5.2.5.5 – Generating system response to disturbances following contingency events			
Definition of end of a disturbance for multiple fault ride through		AusNet believes that end of a disturbance for MFRT should be the first instance where voltage at point of connection reaches a level between 90% and 110% of the normal point of connection voltage. This approach differs from AEMO's draft recommendation, where end of a disturbance means voltage return within the range 90 to 110% of normal voltage at the connection point for at least 20ms. Implementing this proposed change would eliminate any ambiguity related to performance expectations, particularly in scenarios involving multiple voltage fluctuations within and outside the specified range.	
Form of multiple fault ride through clause		AusNet supports AEMO's revised recommendation concerning NSPs developing extra connection-specific non-credible contingencies events that align with historical faults. Nonetheless, AusNet extends an invitation to AEMO to provide clarity regarding the specific criteria that qualify as "reasonable grounds" for an NSP to identify an inadequately disclosed limitation. Furthermore, AusNet holds the perspective that defining a baseline common suite of tests encompassing the MFRT requirements under the AAS and MAS would significantly enhance the value of AEMO's initiative. The evidence can be provided in the form of type testing or a hardware in the loop (HIL) report.	
Number of faults with 200 ms between them		AusNet supports AEMO's revised recommendation.	
Reduction of fault level below minimum level for which the plant has been tuned.		AusNet supports AEMO's revised recommendation on recording the range of fault levels for tuning be advised by the NSP and recorded, in the RUG. However, to carve out the CUO for MFRT in AAS and MAS may not be consistent with the objective on streamlining the connection process. Given the rapid change occurring in the power system, to maintain the CUO for MFRT beyond N-1 and extending it to at least N-1-1, thereby accommodating crucial planned, remains a paramount consideration due to the magnitude of concurrent projects being executed on the network.	
Active power recovery after a fault		AusNet supports AEMO's revised recommendation on amending the MAS to include reference to clause 4.4.2(c1) for primary frequency response (PFR) where S5.2.5.11 has been referenced regarding a frequency disturbance and include frequency response in the AAS. However, AusNet suggests allowing active power recovery should start at the first instance when voltage reaches a level to between 90% and 110% of point of connection normal voltage, instead of that voltage return stably into that range.	
Rise time and settling time for reactive current injection		AusNet supports the draft recommendation on omitting the settling time requirement in AAS, which is further supported by changing the tuning objective to "adequately controlled" instead of "adequately damped". However, AusNet still has concerns that without some general criteria being defined in the AAS around damping, there may be protracted negotiations or the potential for degraded performance being deemed acceptable.	
Commencement of reactive current injection		AusNet supports AEMO's revised recommendation	
Clarity on reactive current injection volume and location and consideration of unbalanced voltages		AusNet supports AEMO's revised recommendation on requiring the control strategy to minimise voltage deviation on each phase from pre disturbance levels, for unbalanced faults. AusNet would like to stress that the negative sequence current control should not be overly prescriptive due to the X/R ratio being dictated by angle of the fault impedance. To have a constant negative sequence current injection objective might not be aligned with the objective of maximizing post fault voltage stability.	

NER Schedule 5.2 issue		Schedule 5.2 (Generators) – feedback on revised recommendations and relevant draft NER amendments	
Metallic conducting path		As per the previous AusNet submission, AusNet's view is that this wording served a purpose, and that rather than omission entirely, an appropriate, clearer substitute should be included.	
Reclassified contingency events		AusNet notes AEMO's response and suggests that if there are undocumented principles in use, that they should be formalised so that parties have clear and fair expectations of future compliance and changes.	
NER S5.2.5.7 – Partial load rejection			
Application of minimum generation to energy storage systems		AusNet supports AEMO's revised recommendation	
Clarification of meaning of CUO for NER S5.2.5.7		AusNet supports AEMO's revised recommendation	
NER S5.2.5.8 – Protection of generating systems from power system disturbances			
Emergency over-frequency response		AusNet supports AEMO's revised recommendation	
NER S5.2.5.10 – Protection to trip plant for unstable operation			
Requirements for stability protection on asynchronous generating systems		AusNet supports AEMO's revised recommendation	
NER S5.2.5.13 – Voltage and reactive power control			
Voltage control at unit level and slow setpoint change		AusNet supports AEMO's revised recommendation	
Realignment of performance requirements to optimise power system performance over expected fault level (system impedance) range – Voltage control		Considering the rapid transformations occurring within the National Electricity Market, AusNet acknowledges the intention on the introduction of a connection point-dependent performance index (i.e., dV/dQ and dV/dP) is to improve representation of network characteristics. While AusNet embraces the concept of capturing potential cross coupling effect of the grid, we also recognise the potential burden it could place on Network Service Providers. The practicality of calculating the minimum, maximum, and typical values of apparent system impedance, while factoring in generator dispatching patterns when setting up the study cases, raises questions. As a result, AusNet is of the opinion that the challenges presented by this change initiative outweigh the benefits it offers. This perspective contradicts the primary objective of this rule change, which seeks to streamline the connection process by eliminating obstacles that are not aligned with the Net Zero target.	
Materiality threshold on settling time error band and voltage settling time for reactive power and power factor setpoints		AusNet supports AEMO's revised recommendation	
Clarification of when multiple modes of operation are required		AusNet supports AEMO's revised recommendation	
Impact of a generating system on power system oscillation modes		AusNet supports AEMO's revised recommendation	
Definition – continuous uninterrupted operation			
Recognition of frequency response mode, inertial response and active power response to an angle jump		AusNet supports AEMO's revised recommendation	




Confidentiality disclaimer

Under clause 5.2.6A(d)(2), AEMO is required to publish all submissions received about this Review on its website. Please identify any part of your submission that is confidential, which you do not wish to be published. Please note that if material identified as confidential cannot be shared and validated with other interested persons, then it may be accorded less weight in AEMO's decision-making process than published material. AEMO prefers those submissions be forwarded in electronic format.

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