



Amendments to AEMO instruments for Efficient Management of System Strength Rule

Joint response to The Australian
Energy Market Operator

16 September 2022



Part of Energy Queensland

Amendments to AEMO instruments for Efficient Management of System Strength

ABOUT ERGON ENERGY

Ergon Energy Corporation Limited (Ergon Energy) is part of Energy Queensland and manages an electricity distribution network which supplies electricity to more than 740,000 customers. Our vast operating area covers over one million square kilometres – around 97% of the state of Queensland – from the expanding coastal and rural population centres to the remote communities of outback Queensland and the Torres Strait.

Our electricity network consists of approximately 160,000 kilometres of powerlines and one million power poles, along with associated infrastructure such as major substations and power transformers.

We also own and operate 33 stand-alone power stations that provide supply to isolated communities across Queensland which are not connected to the main electricity grid.

ABOUT ENERGEX

Energex Limited (Energex) is part of Energy Queensland and manages an electricity distribution network delivering world-class energy products and services to one of Australia's fastest growing communities – the South-East Queensland region.

We have been supplying electricity to Queenslanders for more than 100 years and today provide distribution services to almost 1.4 million domestic and business connections, delivering electricity to a population base of around 3.4 million people via 52,000km of overhead and underground network.

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1 INTRODUCTION

Ergon Energy Corporation Limited (Ergon Energy) and Energex Limited (Energex), operating as distribution network service providers (DNSPs) in Queensland, welcome the opportunity to provide comments to the Australian Energy Market Operator (AEMO) on their consultation on the *Amendments to AEMO instruments for Efficient Management of System Strength Rule – Issues Paper* (Issues Paper).

Ergon Energy and Energex continue to accommodate large numbers of registered generators. We have a total of 27 large-scale inverter-based generators currently committed and connected with a capacity of 1.5GW and more than 600MW of further projects going through the application process. As such, it is essential that distribution-connected generation is not inherently disadvantaged by the updated System Strength Impact Assessment Guidelines.

We are supportive of a more collaborative approach to system strength planning with the AEMO and are pleased to have our business represented on the AEMO Networks System Strength Working Group. We note that system strength requirements and impacts for small-scale distributed energy resources (DER) are not yet fully understood. As such, this will be an emerging area of research in coming years which could necessitate further changes to system strength requirements.

Ergon Energy and Energex have provided comments to the questions raised in the Issues Paper in the following section.

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2 TABLE OF DETAILED COMMENTS

| Consultation Paper Feedback Question | Ergon Energy and Energex response |
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| Issue 1 – System Strength Requirements Methodology | |
| 1. Do stakeholders have alternative suggestions for the approach to determining minimum fault level requirements? | Ergon Energy and Energex support the proposed approach. |
| 2. Do stakeholders have any alternative suggestions for the approach to assessment of projected minimum fault level requirements over the next decade? If so, please elaborate on techniques, requirements to implement, and potential benefits over simpler approaches. | We suggest the forecast minimum fault level should only consider existing and committed generation, existing and committed loads, committed network augmentation and confirmed decommitments. These base assumptions are sufficient to extend electromagnetic transient (EMT) modelling for the 10-year forecast period. Alternative suggested methods have not provided a reliable indication of system strength needs to date. |
| 3. In the context of clause S5.1a.9 f the Amending Rule, what are stakeholders' views on the inclusion or exclusion of existing and forecast IBR in the assumptions for determining minimum fault level requirements? | Ergon Energy and Energex support the inclusion of committed IBR. However, forecast IBR should not be included for determining minimum fault level requirements, and should only be included in the planning process for maintaining the stable voltage waveform criteria. |
| 4. What are stakeholders' views on how protection equipment requirements for | We suggest Network Service Providers (NSPs) should determine the minimum fault level requirements of their protection systems so these can be considered in the determination of minimum fault level requirements. |

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| Consultation Paper Feedback Question | Ergon Energy and Energex response |
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| <p>minimum fault level can be assessed, both now and for the coming decade?</p> | |
| <p>5. What are stakeholders' views on the future of protection scheme design and operation as the Australian power system transforms?</p> | <p>Ergon Energy and Energex note NSPs are currently working through this complex topic.</p> |
| <p>6. How could AEMO enhance the proposed approach to incorporating protection scheme operation into the minimum fault level requirements?</p> | <p>Ergon Energy and Energex are currently working through this issue and suggest future working groups or discussions may present a suitable pathway forward.</p> |
| <p>7. Are there alternatives to the allowable voltage step change limit, according to the NER S5.1a.5, proposed by AEMO for testing that the minimum fault level requirements facilitate reactive control equipment operation?</p> | <p>Ergon Energy and Energex currently use 5% as the voltage step change limit and this is assessed after any dynamic voltage control equipment has responded.</p> |
| <p>8. Do stakeholder hold different views on how best to incorporate the impact of new technologies on reactive control equipment operation.</p> | <p>Ergon Energy and Energex have no comments.</p> |

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| Consultation Paper Feedback Question | Ergon Energy and Energex response |
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| <p>9. Where should planning responsibility for synchronism of distributed DER lie – in the minimum fault level requirements of the system strength standards, the stable voltage waveform requirement of the system strength standard, or elsewhere in transmission and distribution network service providers' planning functions?</p> | <p>It is our view that this responsibility should lie within the distribution network service provider's (DNSP's) planning functions. DNSPs are already engaging with significant technologies, volumes and magnitudes of DER within the context of the network for which the DNSP is responsible. Each DNSP has some similarities, but there is also some uniqueness for which the DNSP is best placed to be accountable and responsible.</p> |
| <p>10. Do stakeholders have specific proposals for how to assess how distributed PV impacts available fault levels considering their sparsity, uncertainty and visibility?</p> | <p>Ergon Energy and Energex are not aware of any extensive research or detailed investigation into the system strength requirements of small-scale inverter-based renewable generation (where small-scale in this context is less than 5MW). For this reason, we do not have a suggestion for an assessment methodology and identify this as an area for future research. Ergon Energy and Energex intend to initiate investigations to understand the system strength requirements of small-scale inverter-based generation within their distribution networks, particularly in high penetration and/or low system strength areas.</p> |
| <p>11. What other issues need to be taken into account when considering the application of the minimum fault level requirements in an operational context?</p> | <p>Ergon Energy and Energex have no comments.</p> |
| <p>12. Do stakeholders consider the proposed description for stable voltage waveforms to be comprehensive? Are there any recommended additions or</p> | <p>We believe the description is sufficient for its purpose.</p> |

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| Consultation Paper Feedback Question | Ergon Energy and Energex response |
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| deletions? If so, why? | |
| 13.To what degree should the SSRM indicate assessment processes that SSSPs may apply when assessing delivery of stable voltage waveforms for IBR connections and operation over the 10-year horizon? | Ergon Energy and Energex believe the determination of the assessment process should largely be left to the SSSPs, as they are responsible for planning and delivering sufficient system strength to meet the stable voltage waveform criteria. |
| 14.What do stakeholders consider to be the pros and cons of the three proposed options for assessing future voltage waveform stability? Should any other options be considered? If so, what options? | <p>Option 1. In our experience, EMT studies are the only way to sufficiently assess system strength. As such, this is our preferred option.</p> <p>Option 2. Our experience with the Available Fault Level (AFL) methodology as part of the Preliminary Impact Assessment (PIA) process suggests this method is a poor indicator of system strengths gaps. The PIA has often indicated a negative AFL but, once the projects have reached the Full Impact Assessment (FIA) stage with EMT assessment, there has been no evidence of system strength shortfalls.</p> <p>Option 3. While this option is very similar to Option 2, it is assessed in a different way and it is not evident that it provides any advantage over Option 2. As Option 2 is already being applied by NSPs in PIAs, it is preferred over Option 3.</p> |
| 15.Given the multitude of possible approaches, does AEMO have a role in providing guidance through the SSRM to encourage consistency between SSSPs where appropriate? | We suggest that SSRM should provide high level direction, for example, that EMT modelling should be used, but the specific details should be left to the SSSPs. |
| 16.Under what conditions, if any, do stakeholders consider that AEMO should deviate from the ISP's 'most likely scenario' for the purposes of the | Ergon Energy and Energy have no comments. |

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| Consultation Paper Feedback Question | Ergon Energy and Energex response |
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| system strength requirements? | |
| 17. What locational detail should AEMO provide for new generation – a REZ level or a specific network bus? | Ergon Energy and Energex suggest as much locational detail as possible should be provided. |
| 18. What (if any) additional detail for new connections should be set out in the SSRM, in addition to the location and total megawatts (MW)? | We suggest the technology types should also be provided. For example, synchronous, grid following, grid forming. |
| 19. Do stakeholders have specific suggestions for how potential new loads should be incorporated in the forecast? | As transmission network service providers (TNSPs) have well established processes for forecasting demand, we suggest these be incorporated. |
| 20. Do stakeholders have specific suggestions for how DNSP-connected generation plant could be incorporated, given that the ISP predominantly considers transmission-connected plant? | Ergon Energy and Energex suggest DNSPs could provide information regarding projects which are currently active for the earlier years of the forecast. |
| 21. Is this equation-based approach for projecting the level and type of IBR for setting the system strength requirements appropriate? If not, what alternatives should be | We note the equation does not include a term for the forecast Inverter Based Loads and suggest this be considered. |

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| Consultation Paper Feedback Question | Ergon Energy and Energex response |
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| considered, and why? | |
| 22. Do stakeholders have specific alternatives to suggest in response to AEMO's proposed approach to projecting technical capability of future plant? If so, what alternatives should be considered? | While more sophisticated technology may be utilised in the future, it is our experience that proponents will generally choose the least costly technology. Therefore, advancements which are not mandatory should not be relied upon in determining requirements. |
| 23. Is including only committed and anticipated network augmentation projects suitable for forecasting system strength requirements? | Ergon Energy and Energex have no comments. |
| 24. Are there any other sources of information on network augmentations which need to be considered? | We believe that significant distribution projects could be shared via joint planning if pertinent to system strength. |
| 25. Do you consider that the proposed selection criteria will allow for an appropriate set of system strength nodes to be selected? If not, please provide specific alternatives or additions. | As system strength nodes cannot be located in distribution networks, we suggest it may be more appropriate to locate a system strength node at or near all TNSP/DNSP connection points in order to facilitate efficient connection of generation into the distribution network. This is particularly applicable to the Queensland network, which has extensive sub-transmission networks remote from the transmission network and numerous registered inverter-based generators currently connected with more proponents anticipated to apply for connection. |
| 26. AEMO has not proposed to create a system strength note at every transmission busbar, to ensure practicality | Ergon Energy and Energex have no comments. |

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| Consultation Paper Feedback Question | Ergon Energy and Energex response |
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| <p>of assessment and monitoring of nodes. What do you think represents an appropriate balance between accuracy and practicality? If you do not agree with AEMO's proposal, please propose specific alternative assessment processes.</p> | |
| <p>27. Are there specific changes that should be considered to the AEMO approach to what a 'critical' planned outage should be, and the potential thresholds for those outages? If so, please note alternatives.</p> | <p>Ergon Energy and Energex have no comments.</p> |
| <p>28. Do you have a view on whether criteria for critical planned outages should be specified in the SSSRM, versus a case-by-case assessment each year?</p> | <p>Ergon Energy and Energex have no comments.</p> |
| <p>Issue 2 – System Strength Impact Assessment Guidelines</p> | |
| <p>29. Should a material threshold be defined for the purpose of general system strength impact assessment? If so, what should those thresholds be and why (for IBL, load types, individual or cumulative, as well</p> | <p>We do not consider that a materiality threshold is required as we understand that the proposal is that generators will remediate as required according to any adverse system strength impacts identified in the FIA.</p> |

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| Consultation Paper Feedback Question | Ergon Energy and Energex response |
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| as generators including LIBR, connected into transmission and distribution networks)? | |
| 30. Are there any other issues relevant to the general system strength impact that AEMO ought to take into account? | Ergon Energy and Energex have no comments. |
| 31. Should there be an engineering safety margin applied to the SCR withstand capability calculation considering limitations associated with SIMB based evaluation? | Ergon Energy and Energex believe it would be prudent to include a safety margin to the SCR withstand capability. |
| 32. Are there any other issues relevant to the Preliminary Assessment methodology that AEMO ought to take into account? | <p>It is not clear how the single machine infinite bus (SMIB) assessment can practically be done at the PIA stage.</p> <p>In our experience, key project decisions such as selecting the Original Equipment Manufacturer have not been made nor has any level of generating system design been done. This makes it unlikely for there to be a model available for the SMIB assessment and therefore generic models are most likely to be used at this stage. This was raised in our submission to ERC0300.¹</p> <p>Accordingly, the assessment will need to be repeated at Application stage to confirm the Preliminary Assessment, and this will need to be allowed for in the process.</p> |
| 33. What criteria should be applied to determine whether a project is classified as a committed project for Full | <p>We believe the current definition of <i>committed project</i> should be maintained. For example, 5.3.4a achieved with an agreed PSCAD model and Connection Agreement has been executed.</p> <p>It is not clear why AEMO is proposing to remove the requirement of the Connection Offer being accepted. If the intention is to allow 'batching' of</p> |

¹ <https://www.aemc.gov.au/sites/default/files/documents/ergon-energex.pdf>

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| Consultation Paper Feedback Question | Ergon Energy and Energex response |
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| Assessment purposes? Why? | similarly progressed projects, it is considered there is already the allowance for this with 5.4.5 of the existing System Strength Impact Assessment Guidelines. |
| 34.How and when is it appropriate to include future network augmentations (new transmission upgrades, configuration changes, considered projects, system strength remediation upgrades etc.) into the Full Assessment? Why? | <p>We suggest future augmentations be included once they have achieved financial approval (committed).</p> <p>Through Joint Planning the TNSP/DNSP can decide how to treat projects which have not yet reached the committed stage.</p> |
| 35.Are there any other issues relevant to the Full Assessment methodology that AEMO ought to take into account? | Ergon Energy and Energex have no comment. |
| 36.Is the proposed scope of a Stability Assessment appropriate? | In practice the Stability Assessment and Compliance Assessment will use the same set of study results. Furthermore, post fault instability can be a result of the generator not meeting its performance standards, so this should not automatically be attributed to insufficient system strength. As such, it is unclear from a technical perspective why AEMO proposes to separate Compliance Assessment from the Stability Assessment. |
| 37.Are there any studies, contingencies, and evaluations that should, or should not, be part of a Stability Assessment? Why? | Ergon Energy and Energex believe a comprehensive set of S5.2.5.5 studies and some key S5.2.5.13 studies should be included. These are required for Compliance Assessment, confirming there are no adverse control interactions and assessment of sufficient system strength. |
| 38.What study assumptions could be recommended to ensure there is no 'free rider' situation for (system strength services) non-paying Applicants? | We suggest the study should be run starting with the minimum fault level case, i.e., exclude forecast SSSP services. |

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| Consultation Paper Feedback Question | Ergon Energy and Energex response |
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| 39. Are there any other issues relevant to the Stability Assessment methodology that AEMO ought to take into account? | Ergon Energy and Energex recommend including high-level guidelines regarding the minimum scope of network which should be modelled in the study. For example, full National Electricity Market, the region in question or a sub region. |
| 40. Are there any other issues relevant to the calculation of SSLF that AEMO ought to take into account? | We consider the Applicant to be best placed to determine whether the SSLF is excessive. For example, they can complete the cost-benefit assessment of paying the charge versus bringing their own system strength or improving plant fault level requirements. |
| 41. What is the preferred methodology and pre-fault condition assumption for calculation of short circuit currents? Why? | We suggest the methodology should look at the worst case post contingency network configuration when determining the AFL. |
| 42. Are there any other issues relevant to the calculation of AFL that AEMO ought to take into account? | Ergon Energy and Energex have no comments. |
| 43. For (high SCR) connections where SCR may change over time, what would be a sensible process to trigger the need for GPS assessment or confirmation of compliance at SCR of 3.0? | Ergon Energy and Energex suggest a GPS reassessment should occur whenever the fault level drops below the level at which the plant was designed and tuned to operate. This should also be triggered if an FIA or Stability Assessment identifies an issue with plant tuning. |
| 44. Are there any other issues AEMO should take into account when considering compliance of affected plant? | Ergon Energy and Energex have no comments. |

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| Consultation Paper Feedback Question | | Ergon Energy and Energex response | |
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| Issue 3 – Power System Stability Guidelines | | | |
| 45. Is it necessary to include the definition of system strength in the PSSG? | | Ergon Energy and Energex have no comments. | |
| 46. Are there any other areas in the PSSG that need to be updated for system strength? | | Ergon Energy and Energex have no comments. | |
| 47. Is there any other section of the PSSG that needs to be updated or reviewed? | | Compliance with S5.2.5.10 requires further clarity, particularly for asynchronous generators. It is understood AEMO has already commenced work on producing a guideline to this effect and suggest efficiency could be gained by combining the two documents. | |