

# Draft System Strength Requirements Methodology (SSRM)

Public webinar, 11 August 2022



We acknowledge the Traditional Owners of country throughout Australia and recognise their continuing connection to land, waters and culture.

**We pay respect to their Elders past, present and emerging.**

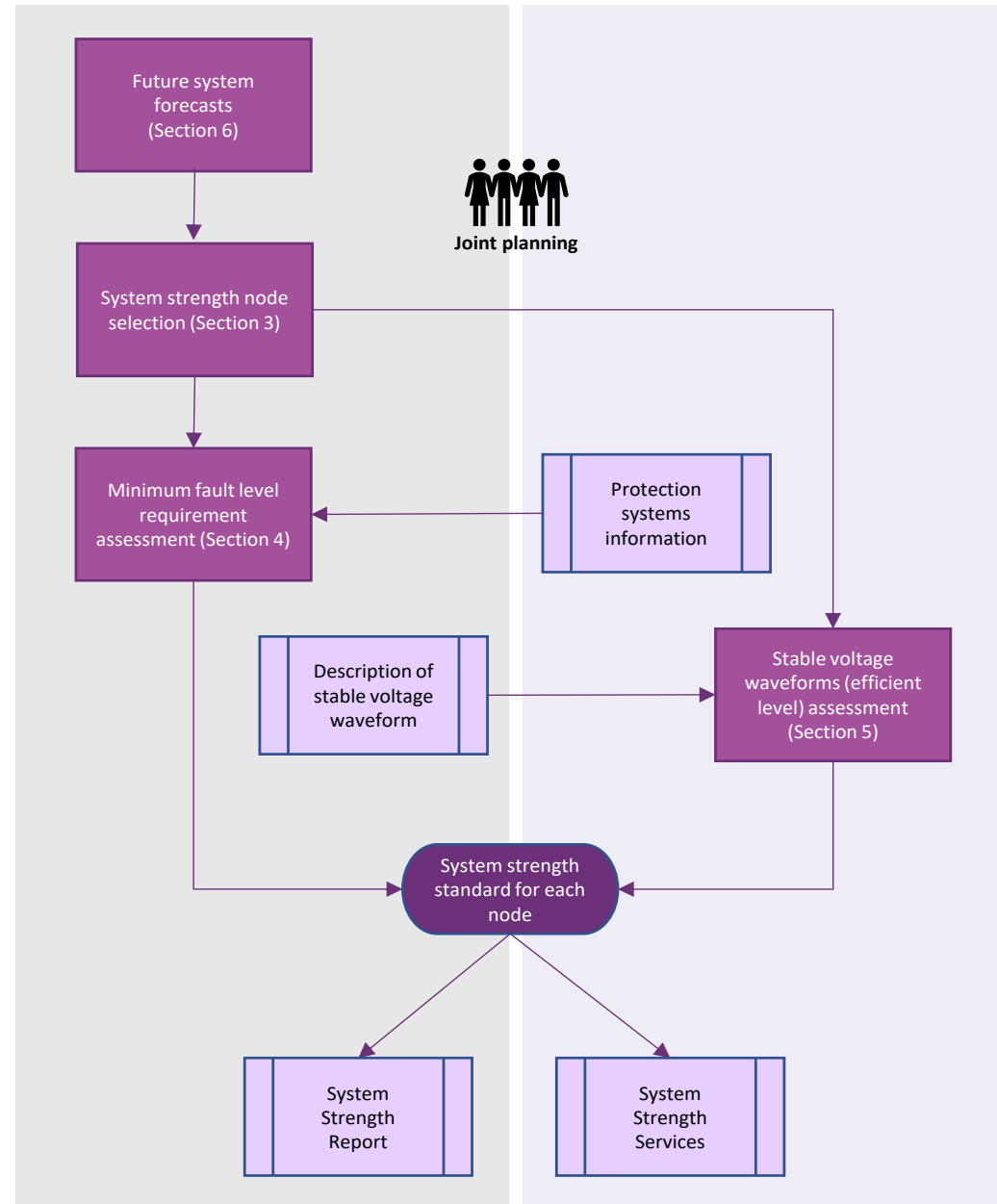
# Context for this consultation

- In October 2021, the Australian Energy Market Commission (AEMC) released its final determination and rule on the efficient management of system strength on the power system.
- AEMO commenced consultation on 26 April 2022. For the SSRM, the following issues were considered:
  - determining minimum fault level requirements
  - criteria for stable voltage waveforms ('efficient' level of system strength)
  - forecasting inverter-based resource (IBR) connections and behaviour of synchronous machines
  - selection of system strength nodes, and
  - planning for critical outages.
- Consequential updates for the Power System Stability Guidelines (PSSG) are also being considered.
- The System Strength Impact Assessment Guidelines are now being progressed under a separate consultation from the SSRM.

# AEMO's approach to the SSRM has evolved based on feedback

- AEMO will take a consultative approach to setting the system strength requirements.
- Inverter-based resource forecasts for the efficient level of system strength will typically be consistent with the Integrated System Plan.
- Minimum fault level requirements must be set to ensure power system security, protection system operation and voltage control equipment performance.
- The annual system strength report will identify critical planned outages that system strength service providers must incorporate into their system strength planning.
- System strength nodes will be selected within system strength service providers' networks.
- AEMO does not intend to include synchronism of distributed energy resources in the calculation of minimum fault level requirements.
- Different modelling techniques will be used for different time horizons.
- A description of stable voltage waveforms is provided.
- AEMO's Engineering Framework includes a priority action to collaborate with industry on a voluntary specification for grid-forming inverters.

# Overview of draft SSRM



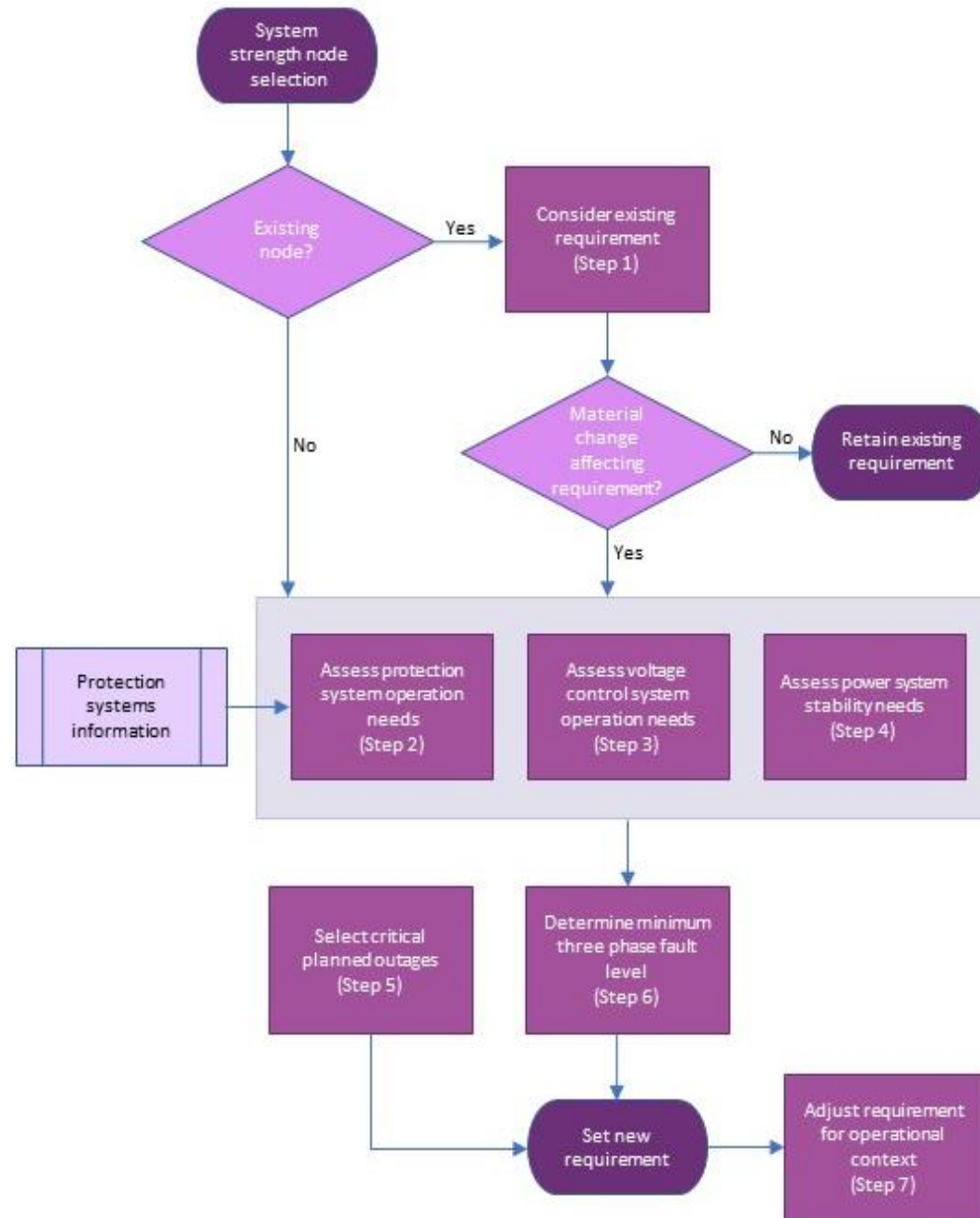
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# System strength node selection

- A system strength node is a physical location on the transmission network of a system strength service provider, at which AEMO must determine system strength requirements and apply those requirements for power system security purposes. The nodes will also be used for the application of system strength locational factors and system strength charges.
- AEMO will apply engineering, market and policy judgement to select an appropriate set of system strength nodes for each region. This will consider general principles for factors affecting overall node selection, as well as a set of criteria to inform individual node selection.

General principles	Criteria
<ul style="list-style-type: none"> <li>- Reasonable representation of overall system strength requirements</li> <li>- Declared within the transmission network of a system strength service provider</li> <li>- Practicable number of nodes per region</li> <li>- Have regard to where system strength provision is expected to be most efficient</li> <li>- Can be selected from future transmission network projects</li> </ul>	<ul style="list-style-type: none"> <li>- Projected inverter-based resources connections</li> <li>- Projected change in synchronous machine operation</li> <li>- Existing and future HVDC equipment operation</li> <li>- Other power system stability issues</li> </ul>

# Minimum fault level assessment process



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# Description of stable voltage waveforms

- The positive-sequence RMS voltage magnitude at a connection point does not violate the limits in the operational guides for the relevant network.
- Change in the voltage phase angle at a connection point does not exceed 45 electrical degrees following any credible contingency event or protected event.
- The three-phase instantaneous voltage waveforms at a connection point are close to 50 Hz, for pre- and post-contingent conditions, with voltage waveform distortion within acceptable levels.
- Any undamped steady-state RMS voltage oscillations anywhere in the power system should not exceed an acceptable planning and connection threshold as agreed with AEMO.



# Future system forecasts

- AEMO will in general apply the ‘most likely’ scenario from the most recently published Integrated System Plan (ISP) (either draft or final) at the time AEMO is determining the system strength requirements each year.
- AEMO will use ISP capacity modelling outputs for the selected scenario as inputs to the assessment of the minimum and efficient levels of system strength for each system strength node, and may conduct sensitivities for the latter part of the 10-year horizon based on a number of ISP scenario results.
- AEMO will forecast the location of the new inverter-based resources relative to an ISP Renewable Energy Zone an ISP sub-region of the National Electricity Market, and will map these to an appropriate system strength node, without accounting for capacity factors or any coincidence factors.
- Network (or non-network) augmentation projects identified as committed, anticipated or actionable in the ISP within the 10-year outlook period will be included in the assessment. In addition, network augmentations that would be required to feasibly connect the forecast amount of inverter-based resources, will be included when AEMO is conducting system strength standard assessments.
- AEMO may depart from ISP future system forecasts when preparing the system strength standards, in cases where updated market modelling is available (for example from the ESOO), where a material market, policy or technology change has occurred but has not led to an ISP Update.

# Next steps

- AEMO welcomes feedback from stakeholders on the draft SSRM, draft PSSG and draft determination by 19 August 2022.
- Some guiding consultation questions are provided in the draft determination:
  - Does the draft SSRM support the proactive provision of system strength services in the NEM? If yes, why? If no, why not?
  - Has AEMO appropriately incorporated feedback provided in submissions? If not, has AEMO adequately explained its reasoning for not incorporating feedback?
  - Should one annual System Strength Report be used to consult on revisions to system strength nodes, assumptions, thresholds and planning margins to be used in the next assessment?
  - Do stakeholders have specific views on appropriate values for assumptions, thresholds and margins which are referenced in the draft SSRM and which will be subject to annual feedback through the publication of the System Strength Report? These include:
    - Do you have any further recommendations for enhancing the SSRM?
- A copy of the draft SSRM, draft PSSG and draft determination are available via <https://aemo.com.au/consultations/current-and-closed-consultations/ssrmiag>.
- AEMO intends to publish the final SSRM and final PSSG by the end of September 2022.



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