

Amendments to AEMO instruments for Efficient Management of System Strength Rule



Issues Paper

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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.

AEMO Competition Law - Meeting Protocol

AEMO is committed to complying with all applicable laws, including the Competition and Consumer Act 2010 (CCA). In any dealings with AEMO regarding proposed reforms or other initiatives, all participants agree to adhere to the CCA at all times and to comply with this Protocol. Participants must arrange for their representatives to be briefed on competition law risks and obligations.

Participants in AEMO discussions **must**:

- Ensure that discussions are limited to the matters contemplated by the agenda for the discussion
- Make independent and unilateral decisions about their commercial positions and approach in relation to the matters under discussion with AEMO
- Immediately and clearly raise an objection with AEMO or the Chair of the meeting if a matter is discussed that the participant is concerned may give rise to competition law risks or a breach of this Protocol

Participants in AEMO meetings **must not** discuss or agree on the following topics:

- Which customers they will supply or market to
- The price or other terms at which Participants will supply
- Bids or tenders, including the nature of a bid that a Participant intends to make or whether the Participant will participate in the bid
- Which suppliers Participants will acquire from (or the price or other terms on which they acquire goods or services)
- Refusing to supply a person or company access to any products, services or inputs they require

Under no circumstances must Participants share Competitively Sensitive Information. Competitively Sensitive Information means confidential information relating to a Participant which if disclosed to a competitor could affect its current or future commercial strategies, such as pricing information, customer terms and conditions, supply terms and conditions, sales, marketing or procurement strategies, product development, margins, costs, capacity or production planning.

AEMO Forum and Meeting Expectations

This charter explains expectations regarding participation and behaviour in the Australian Energy Market Operator (AEMO)'s stakeholder forums.

Meeting Expectations

All participants will:

- Respect the diversity of the group.
- Speak one at a time – refrain from interrupting others.
- Share the oxygen – ensure that all attendees who wish to have an opportunity to speak are afforded a chance to do so.
- Maintain a respectful stance towards all participants.
- Listen to others' points of view and try to understand others' interests.
- Share information openly, promptly, and respectfully.
- If requested to do so, hold questions to the end of each presentation.
- Remain flexible and open-minded, and actively listen and participate in meetings.
- Abide by COVID-Safe workplace guidelines, if attending a meeting on AEMO's premises.

Roles and Responsibilities

Forum stakeholders agree to:

- Be specific and fact-based in their feedback on a specific workstream or emerging issue;
- Review and provide feedback on papers and reports;
- Relay information to their colleagues or constituents after each meeting and gather information/feedback from their colleagues or constituents, as practicable, before each meeting;
- Maintain a focus on solutions or outcomes that benefit all energy consumers.

AEMO agrees to:

- Provide technical expertise in a manner that is considerate of the audience and their level of expertise;
- Assist participants in understanding issues enough to represent their views;
- Provide all participants the opportunity to voice their views.

Agenda

1. Background, timing and key issues
2. Amendments to System Strength Requirements Methodology
3. Amendments to System Strength Impact Assessment Guidelines
4. Amendments to Power System Stability Guidelines

These slides provide information about AEMO's issues paper released to consult on amendments to AEMO instruments for the 'Efficient management of system strength' final rule determination. These are for background information purposes only. AEMO has made reasonable efforts to ensure the quality of the information but cannot guarantee that the information and assumptions are accurate, complete or appropriate for your circumstances. Anyone proposing to use the information in these slides should independently verify its accuracy, completeness and suitability for purpose, and obtain independent and specific advice from appropriate experts.

Accordingly, to the maximum extent permitted by law, AEMO and its officers, employees and consultants involved in the preparation of this document:

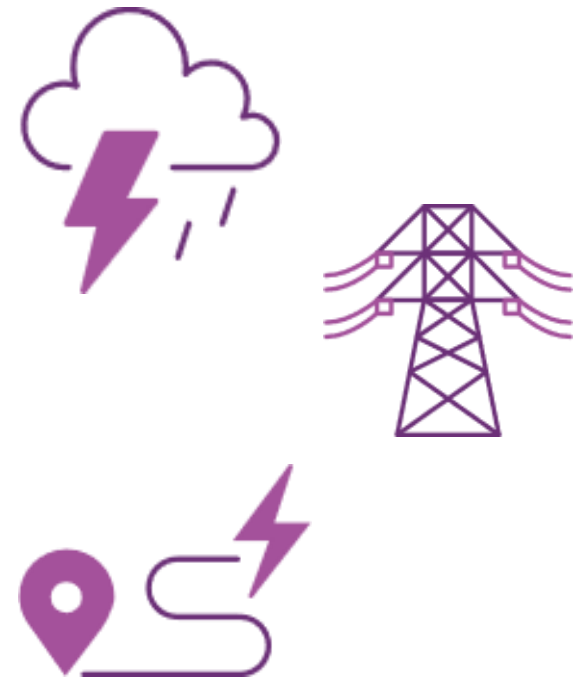
- make no representation or warranty, express or implied, as to the currency, accuracy, reliability or completeness of the information in this document; and
- are not liable (whether by reason of negligence or otherwise) for any statements or representations in this document, or any omissions from it, for any use or reliance on the information in it.

Background, timing and key issues

What is system strength?

System strength is the ability of the power system to maintain and control the voltage waveform at any given location in the power system, both during steady state operation and following a disturbance.

System strength can partly be represented by the amount of electrical current available when there is a disturbance on the system – fault current, measured in megavolt amperes (MVA) – but other electrical parameters are also important.



Key changes in the new framework

- From 1 December 2022, new power system standard comprising:
 - A minimum fault level requirement for power system security (MVA).
 - Requirement for stable voltage waveforms at connection points to host AEMO's forecast levels of new inverter-based resources like solar and wind.
- The System Strength Service Provider must plan to meet the standard from 2 December 2025.
- New minimum access standards for generators, loads and market network service providers from 15 March 2023.
- Revised system strength connection options with a new system strength charging mechanism commencing 15 March 2023.

AEMO's system strength instruments to be amended

System Strength Requirements Methodology

- Overview of system strength nodes and declaration process
- How AEMO will forecast new connections
- Modelling and analysis AEMO will use to determine nodes and minimum three phase fault levels at the nodes
- Description of stable voltage waveforms
- Matters to be considered in setting minimum fault level requirements

System Strength Impact Assessment Guidelines

- Methodology for network service providers to use when conducting preliminary and full system strength impact assessments
- Define and provide guidance about calculation of available fault levels and system strength locational factor
- Short circuit ratio assessment methodology and guidance on short circuit ratio minimum access standard compliance
- Criteria for classification of inverter-based load and large inverter-based resources
- Guidance for network service providers on methodology to verify plant stability

Power System Stability Guidelines

- Include a definition of system strength.
- Extend the application of the guidelines to market network service providers and registered customers to which the new system strength framework applies
(These are 'consequential changes' only.)

Key milestones for consultation

Key date	Milestone
21 October 2021	Final AEMC determination made on rule changes to the system strength framework.
26 April 2022	Issues Paper released by AEMO to consult on changes to system strength instruments and incorporate the rule change, via https://aemo.com.au/consultations/current-and-closed-consultations/ssrmiag .
1 June 2022 (TBC)	Submissions due on Issues Paper, to planning@aemo.com.au .
30 June 2022 (TBC)	Draft report to be published, including draft System Strength Requirements Methodology, System Strength Impact Assessment Guidelines, and Power System Stability Guidelines (SSRM, SSIAG and PSSG).
21 July 2022 (TBC)	Submissions due on draft report and draft SSRM, SSIAG and PSSG.
1 September 2022 (TBC)	Final report to be published, including final SSRM, SSIAG and PSSG.

System Strength Requirements Methodology



Minimum fault level requirements

Under the new system strength standard, AEMO set minimum three phase fault level requirements for each system strength node.

AEMO: needs to meet its power system security responsibilities in operational timeframes based on these minimum requirements.

System Strength Service Providers: need to plan their networks and deliver services to meet these requirements in full.

Key issues:

- Overarching approach for determining minimum fault level requirements. Use current minimum level fault level requirements as a starting point.
- Use flexible modelling approach for stable power system operation after a credible contingency event or protected event.

- Treatment of IBR when assessing minimum fault level requirements where after Amending Rule effected, IBR accounted for under the efficient level.
- Protection system operation requiring regular review.
- Options to assess voltage control system operation.
- Maintaining synchronism of distributed energy resources (DER).
- Application of minimum fault level requirements in an operational context.

For more information, see Section 3.1 of the Issues Paper

Criteria for stable voltage waveform

- Description of stable voltage waveforms.
 - Proposing a post-fault and no-disturbance description rather than a during-fault description.
- Assessment of stable voltage waveforms in the future.
 - Using EMT models to study network stability beyond ~2 to 3 years can become increasingly imprecise. Options:
 - Apply generic EMT models as 'stand-in' for plant not committed.
 - Available fault level calculation, RMS-based proxy study method.
 - Simplified switching studies testing voltage robustness.

For more information, see Section 3.2
of the Issues Paper

Modelling future IBR and synchronous machine

- To forecast system strength requirements over a 10-year horizon, AEMO uses a number of inputs from the ISP and the ESOO. The Issues Paper considers the items below and what assumptions are needed:
- Quantity, type and location of new generation and generation retirement.
- IBR projections used to determine the system strength requirements.
- Technical capability of future plant.
- Future network development

For more information, see Section 3.3
of the Issues Paper

Locating system strength nodes

- System strength nodes should be selected at points most suitable for maintaining minimum fault levels and stability of voltage waveform level of system strength.
- More system strength may be required closer to connecting IBR.
- Proposed system strength node criteria:
 - Power system to remain stable.
 - Protection/plant settings.
 - Voltage control devices.
 - IBR resources.
- AEMO has not proposed to create a system strength node at every transmission busbar, to ensure practicality of assessment and monitoring of nodes. In this consultation AEMO is seeking other alternative assessment processes.
- The SSNL is linked to the calculation of System Strength Locational Factors in the SSIAG.

For more information, see Section 3.4
of the Issues Paper

Planning for critical outages

- AEMO proposes a “critical” planned outage to be “one which would substantively prevent sufficient strength from being available to meet power system needs, at sufficient scale and/or duration to justify inclusion in the system strength standard”.
- Thresholds for this could be included in the SSRM:
 - Outages of the elements of major inter- or intra-connectors in the NEM.
 - Outages of network elements considered to be High Impact Outages.
 - Outages of elements connecting major generation or system strength sources centres to the remainder of a region.
 - Outages that remove key reactive plant from service.
 - A threshold for which the duration of an outage is considered impactful.

For more information, see Section 3.5
of the Issues Paper

System Strength Impact Assessment Guidelines



General system strength impact

- The Amending Rule introduces the concept of ‘general system strength impact’, which requires assessment of both the adverse system strength impact of the proposed connection and any additional reduction in the AFL at the relevant connection point.
- The change from ‘adverse’ to ‘general’ system strength impact means that the SSIAG must be updated to include an assessment of the relevant plant’s contribution to any reduction in the AFL.
- AEMO is considering whether a material threshold should be defined for the system strength impact assessment.

For more information, see Section 4.2
of the Issues Paper

Preliminary assessment of system strength impact 4.6.6(b)(1A)

- The new clause requires the Preliminary Assessment to be carried out using the SMIB model.
- Key considerations for SCR capability assessments using SMIB models are:
 - An EMT-type (PSCAD™/EMTDC™) SMIB model is required for this assessment.
 - Plant SCR capability will be dependent on the inverter/control system settings, technology and its limitations.
 - SMIB network representation and its limitations.
 - Aggregation methodology of the reticulation system.

For more information, see Section 4.3
of the Issues Paper

Methodology for full assessments of system strength impact

- The Full Assessment is carried out if the Preliminary Assessment indicates the relevant connection or alteration would have an adverse system strength impact.
- Key Issues:
 - Timing of Full Assessment: AEMO proposes to confirm when electromagnetic transient modelling should be completed prior to demonstration and acceptance of access standards.
 - Definition of committed projects: AEMO is proposing changes to the definition.

Methodology for stability assessment

- Under the Amending Rule, for Applicants who elect to pay the system strength charge, the Connecting NSP will need to carry out a Stability Assessment using a methodology to be set out in the SSIAG. The Stability Assessment methodology is a new requirement.
- AEMO is considering options for the:
 - Scope of stability assessment.
 - Timing of stability assessment.
 - Consultation with AEMO.
 - Consequence of plant instability.

For more information, see Section 4.5
of the Issues Paper

Calculation of system strength locational factor and available fault level

- The Amending Rule requires the SSIAG to include the methodology for Connecting NSPs when calculating an SSLF.
- This must be representative of impedance between connection point and applicable system strength node (SSN) and must use Available Fault Level (AFL) as basis for the methodology.
- SSIAG must provide guidance where SSLF is not able to be determined or would be “manifestly excessive”.
- Key issue: SSLF calculation methodology (SSLF ratio of additional fault level at SSN required to restore available fault level at Applicant’s point of connection; connections sharing same point as SSN, the ratio will be unity)
- The SSIAG must include a definition of AFLs at SSNs, including for the purposes of forecasts under clause 5.20C.3(f)(3) and for the calculation of the SSLF for a connection point.

For more information, see Section 4.6 and 4.7 of the Issues Paper

Guidance on compliance with minimum access standards

- The Amending Rule introduces SCR minimum access standards for IBR, including asynchronous generating units, inverter based loads, and market network service facilities.
- For high SCR connections (e.g. 6 and higher) it is plausible that the SCR may change over time as system conditions change.
- At this stage, AEMO is not proposing that NSPs undertake unnecessary assessments at SCR of 3 for the original connection when this is not applicable. If the need arises to demonstrate compliance at SCR of 3 at a later point in time, this can be dealt with via change processes already established in the NER.
- AEMO will need to implement the new access standards for asynchronous generation, IBL and market network service facilities from the rule change.

For more information, see Section 4.8
of the Issues Paper

Power System Stability Guidelines

Changes to the Power System Stability Guidelines

- AEMO is making changes to the Power System Stability Guidelines.
- The PSSG were originally consulted on in 2011-12 and published on 25 May 2012.
- The current PSSG pre-date any NER changes referencing system strength.
- AEMO must update the PSSG to define system strength in a similar manner to the other types of stability and ensure consistency with the new system strength framework.

For more information, see Section 5
of the Issues Paper



- Issues Paper can be found at <https://aemo.com.au/consultations/current-and-closed-consultations/ssrmiag>
- Feedback is welcomed by 5pm (AEST) 1 June 2022 to planning@aemo.com.au



For more information visit

aemo.com.au