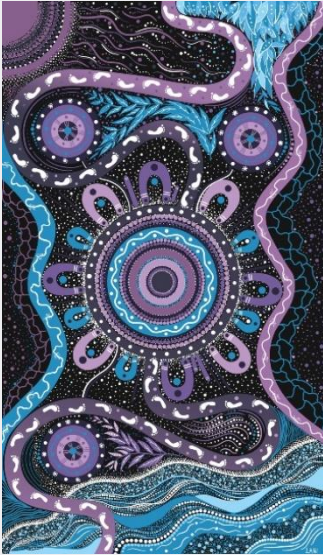


2025 GPSRR Final Consultation Report

July 2025





We acknowledge the Traditional Custodians of the land, seas and waters across Australia. We honour the wisdom of Aboriginal and Torres Strait Islander Elders past and present and embrace future generations.

We acknowledge that, wherever we work, we do so on Aboriginal and Torres Strait Islander lands. We pay respect to the world's oldest continuing culture and First Nations peoples' deep and continuing connection to Country; and hope that our work can benefit both people and Country.

'Journey of unity: AEMO's Reconciliation Path' by Lani Balzan

AEMO Group is proud to have launched its first [Reconciliation Action Plan](#) in May 2024. 'Journey of unity: AEMO's Reconciliation Path' was created by Wiradjuri artist Lani Balzan to visually narrate our ongoing journey towards reconciliation - a collaborative endeavour that honours First Nations cultures, fosters mutual understanding, and paves the way for a brighter, more inclusive future.

Important notice

Purpose

AEMO has prepared this document to report on the consultation completed on its draft report for the 2025 General Power System Risk Review under clause 5.20A.2(c) of the National Electricity Rules.

Disclaimer

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Abbreviations

Abbreviation	Term	Abbreviation	Term
AEMO	Australian Energy Market Operator	NEM	National Electricity Market
BESS	battery energy storage system	NER	National Electricity Rules
CB	circuit breaker	NSP	Network Service Provider
CER	consumer energy resources	PFR	primary frequency response
DNSP	distribution network service provider	PV	photovoltaic
FCAS	frequency control ancillary service	RAS	remedial action scheme
GPSRR	General Power System Risk Review	REZ	renewable energy zone
GW	gigawatt	SRAS	system restart ancillary service
IBR	inverter-based resources	SVC	static var compensator
ISP	<i>Integrated System Plan</i>	TNSP	transmission network service provider
MSL	minimum system load	UFLS	under frequency load shedding

1 Introduction

At the completion of its annual general power system risk review (GPSRR), AEMO publishes a draft report under National Electricity Rules (NER) 5.20A.2(c), on which it invites submissions from stakeholders.

AEMO published its Draft 2025 GPSRR report on 10 June 2025 and invited submissions from all interested persons. AEMO also invited stakeholders to an industry briefing on the Draft 2025 GPSRR report on 20 June 2025.

The closing date for submissions was 1 July 2025. In response to the consultation, AEMO received submissions from ACEN Australia and Tesla Motors Australia. Relevant feedback and questions from those submissions have been published on AEMO's website.

AEMO appreciates engagement and contributions from all the participating stakeholders for finalising the 2025 GPSRR report.

AEMO published its final 2025 GPSRR report in July 2025¹. The final report incorporates changes based on AEMO's consideration of feedback received, as well as further review by AEMO on the GPSRR analysis.

The following sections include summaries of the stakeholder feedback received on the draft report and AEMO's responses (where relevant), with a description of the changes made to the final 2025 GPSRR report in response to AEMO's consideration of submissions.

¹ See <https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/system-operations/general-power-system-risk-review>.

2 Consultation feedback and responses

This section sets out AEMO's responses to feedback raised in the submissions received on the draft report and relevant points raised at the industry briefing.

2.1 Draft 2025 GPSRR report feedback

AEMO sought submissions on the Draft 2025 GPSRR report during a public consultation between 10 June 2025 and 1 July 2025. AEMO received written submissions from ACEN Australia and Tesla Motors Australia, which can be found on AEMO's website².

On 20 June 2025, AEMO held a session with all interested parties, at which attendees were invited to ask questions and provide any feedback in relation to the 2025 GPSRR.

The following sections include summaries of the comments and questions from the session, with AEMO's responses, where relevant.

AEMO thanks all stakeholders who engaged with the 2025 GPSRR for their contributions in shaping the review and finalising this report.

2.1.1 Summary of ACEN Australia's submission

In its submission on the draft 2025 GPSRR, ACEN Australia:

- Agreed with the priority risks outlined by AEMO's Draft 2025 GPSRR report and strongly supported in-depth work and consultation on the management of non-credible contingencies throughout the energy transition.
- Noted that the current security framework is focused primarily on managing credible contingencies and further consideration should be given to the management of non-credible contingencies.
- Highlighted that renewable energy zones (REZs) may result in increased non-credible contingency risk where large amounts of generation are connected to the main grid via one or two long transmission lines.
- Discussed the implications of contingency management on REZ curtailment, highlighting the impacts that curtailment can have on developers and investors in renewable generation.
- Provided its experience in the Central West Orana REZ and suggested that other methods of contingency management outside of curtailment could support increased utilisation of transmission infrastructure.
- Suggested reconsidering the definition of credible contingencies and the required volumes of frequency control ancillary services (FCAS), and recommended that these ideas be decoupled from the concept of the largest single generator.
- Commented that the use of localised FCAS could be used as one method to manage contingency sizes. This would potentially allow for larger contingency sizes, greater utilisation of transmission assets, and more efficient network development.

² See <https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/system-operations/general-power-system-risk-review>.

- Noted that while regional procurement of FCAS may result in initially higher FCAS costs, over time this would decrease and have the potential to deliver net benefits when considering the avoided network costs of raised contingency limits.
- Indicated that, according to its analysis, despite significant increases in the volume of contingency FCAS procurement, the average raise and lower FCAS prices have remained stable or declined over the last five years. ACEN Australia suggested that increased reliance on FCAS will not necessarily lead to increased prices and may be negligible compared to potential savings in network infrastructure costs.

2.1.2 AEMO response to ACEN Australia's submission

AEMO appreciates ACEN Australia's support of the priority risks set out in the Draft 2025 GPSRR report as well as further investigation of the management of non-credible contingencies. As detailed in the Draft 2025 GPSRR report, the energy transition may result in increasing non-credible contingency sizes that are difficult to manage using the existing tools and frameworks. As per the recommendations in the 2025 GPSRR, AEMO intends to further investigate the management of contingencies through additional studies and analysis and will consult with industry on the outcomes.

AEMO notes ACEN Australia's suggestions on the consideration of localised FCAS as a contingency management measure. This will be considered as part of the review, in addition to other options such as non-credible contingency size limits, remedial action schemes (RASs), and proactive reclassification for weather events. Analysis will be undertaken to determine which of these options, if any, are most suitable for management of contingencies into the future.

2.1.3 Summary of Tesla Motors Australia's submission

In its submission on the draft 2025 GPSRR, Tesla Motors Australia:

- Supported AEMO's modelling and findings regarding inverter-based resource (IBR) response to remote frequency events. Tesla Motors Australia also agreed with AEMO's proposed review of the increasing risks of non-credible contingencies and emphasised the benefits of dispersed system strength and inertia procurement from battery energy storage systems (BESS).
- Agreed with the results from AEMO's studies on frequency droop settings, and noted that mandating limits on frequency droop to 4% may have material impacts on future investments.
- Encouraged the investigation of incentives for damping and voltage support services provided by BESS, welcomed the exploration of broadening system restart ancillary service (SRAS) providers to include grid-forming batteries, and suggested longer contract durations for SRAS may be appealing to BESS developers.
- Did not support using directions to manage minimum system load (MSL) risks, preferring the use of Type 1 Transitional Services procurement. Tesla Motors Australia supported the Clean Energy Council's rule change request to create a new market ancillary service for MSL reserves as a longer-term solution.
- Challenged some of AEMO's assumptions on fault level requirements for protection and voltage control systems, saying that the operation of capacitor banks, reactors and static var compensators (SVCs) is not necessarily related to the fault level.

- Encouraged the consideration of small-signal stability challenges in the National Electricity Market (NEM), particularly those introduced through synchronous condensers.
- Did not support additional control schemes for BESS active power ramping, and sought clarification on unintended operation.
- Acknowledged the need for greater visibility of participant systems for consumer energy resources (CER).
- Supported the need for greater scrutiny on synchronous machines close to retirement and sought clarification on primary frequency response (PFR) testing.
- Recommended that inverter limit violations apply to grid-following inverters only.

2.1.4 AEMO response to Tesla Motors Australia's submission

AEMO welcomes Tesla Motors Australia's support for the content included in the Draft 2025 GPSRR as mentioned in its submission. AEMO notes that Tesla Motors Australia supports the modelling and findings on the IBR response to remote frequency events, and its proposed review of the increasing risks associated with non-credible contingency events. In addition, Tesla Motors Australia supports consideration of small signal stability challenges in the NEM and concerns around the limited visibility of participant systems for CER.

AEMO has also acknowledged the benefits that BESS can provide to the NEM as outlined in Tesla Motors Australia's submission, such as damping, voltage support, SRAS and MSL reserves. As with all technologies, cost benefit analysis will be used to determine the best risk mitigation methods for specific scenarios.

Regarding Tesla Motors Australia's comments on the operation of capacitor banks, reactors and SVCs in relation to fault levels, AEMO would like to clarify that the 2025 GPSRR refers to insufficient fault levels resulting in the inability to maintain stable operation of voltage control equipment. This includes capacitor banks, reactors and dynamic equipment that may not comply with the voltage step change limits outlined in the applicable Australian Standard (AS/NZS 61000.3.7:2001) if system strength is reduced.

AEMO maintains that consideration of additional control schemes for BESS active power ramping is warranted. While BESS provide many benefits to the NEM with their fast active power response, they also pose additional risk if unexpected operation occurs. This could manifest through control system maloperation with BESS ramping from maximum to minimum active power limits at sub-cycle timeframes. While this is not expected to be a common occurrence, risk mitigation measures must be considered to prevent significant consequences if it were to occur.

Regarding PFR testing, AEMO clarifies that PFR is not always tested during the hold-point testing process, particularly for original equipment manufacturers (OEMs) that are experiencing challenges in providing PFR. If PFR is not demonstrated during commissioning, this introduces risks that it will not be implemented after commissioning. AEMO is actively engaging with participants to improve PFR implementation.

AEMO acknowledges Tesla Motors Australia's comments regarding inverter limits for grid-forming and grid-following inverters. Any inverter limits are imposed for system security reasons and these will consider the control methodology of any plant involved in the limits. AEMO cannot guarantee that grid-forming inverters will not be limited in some instances, but acknowledges that where grid-forming inverters can support the power system, it is less likely that constraints will be required.

2.2 Industry briefing session

AEMO thanks attendees of the industry briefing session for their engagement and feedback on the Draft 2025 GPSRR. Below is a summary of questions related to the approach paper at the session, and AEMO's responses.

Questions	AEMO responses
The 2024 GPSRR identified more specific risks (e.g. circuit breaker (CB) failure in Latrobe Valley, non-credible loss of Humelink). Is there a reason the priority risks this time around are much more general in nature?	AEMO intended the 2025 GPSRR to take a more strategic review of risks across the network, including considering higher level risks and focus on case studies where required. This approach was taken based on feedback received on previous GPSRRs and aimed to make the document more accessible for a wider audience.
How was it concluded that BESS was going to be concentrated in South Australia for the IBR response to remote frequency events studies?	In 2024, South Australia had the highest concentration of BESS in the NEM, and ElectraNet identified the potential for the Heywood Interconnector instability in studies that focused on the response of South Australian BESS. The concern was that the connection of more BESS in South Australia might exacerbate this issue and lead to cascading failure of the network. AEMO selected this risk for further study, including consideration of future BESS across all regions. AEMO's results demonstrated that if BESS are geographically dispersed across all NEM regions, the risk of instability is reduced.
What kind of settings were used for BESS in simulations, such as for the South Australian BESS and NEM BESS scenarios? The settings can significantly change the outcome, particularly the damping performance of inter-area modes depending on whether grid forming or grid following controls were assumed.	BESS were assumed to have grid-following converter controls except for facilities with grid-forming capability captured in dynamic models provided to AEMO. This was considered to be a conservative approach, as using grid-following models was more likely to result in instability. Due to this, it is expected that the performance of BESS in practice will at least match or exceed the performance in the simulation results.
Has AEMO considered the impact of having too much inertia from synchronous condensers in SA?	This was not a focus area for the 2025 GPSRR. Parties are welcome to submit risks for consideration in the 2026 GPSRR if they could lead to cascading failure or major supply disruptions.
What is the forecast load in 2050? If rooftop photovoltaic (PV) generation is forecasted to be 75 GW, then there is the potential for significant negative demands on sunny days in some regions. Has this scenario been considered?	The GPSRR only has a mandate to look five years into the future, and the reference to 75 gigawatts (GW) was indicating the extent of the rapid uptake of rooftop photovoltaics (PV) in the NEM. AEMO's <i>Integrated System Plan</i> (ISP) looks further into the future and considers these scenarios from a planning perspective. Once these scenarios become plausible in the operational timeframe, they may be considered by the GPSRR if the risks have not already been appropriately mitigated.
Did AEMO consider using grid forming BESS to mitigate minimum system load risks? This would be able to charge and provide system strength during periods of low demand, so that demand does not need to be artificially increased.	AEMO has considered the benefits that BESS provide in addressing minimum system load risks. BESS will have a role in mitigating MSL risks, but will be one part of a range of mitigation measures. Currently it is seen that BESS will charge early in the morning and will not be available to charge at times of peak MSL risk. This may change into the future with any proposed changes in market incentives and the uptake of more BESS.
What is the role of transmission network service providers (TNSPs) with emergency backstop? Is it more like coordinating with multiple distribution network service providers (DNSPs), or will they have their own procedure?	In emergency situations, AEMO may instruct TNSPs to restore demand within a region. This may involve enacting their emergency backstop mechanism. If this occurs, the TNSPs will have their own procedures related to emergency backstop and will liaise with the DNSPs to enact the backstop.
Did AEMO consider reverse power flow from distribution to transmission? If this is likely to occur in the future, then transformers should also be reviewed.	Reverse power flows from distribution to transmission does occur already and has been considered for its impacts on under-frequency load shedding (UFLS), transformer tap ranges, protection settings and a range of other factors. This is not currently considered in the 2025 GPSRR. It is a risk that predominantly sits with the NSPs, and it has not yet been identified through consultation as a priority risk that may result in cascading failure or major supply disruptions.
Has the GPSRR team given thought to if/how the GPSRR will feed into future AEMO Transition Plans? There's a lot of good crossover between the two documents about managing the future power system, so there might be value in bringing them closer together somehow	AEMO is considering how AEMO's documents can complement each other while still fulfilling their own defined roles and responsibilities. The GPSRR team is actively working with other AEMO teams to continue improving the alignment between AEMO's other planning documents while maintaining the GPSRR's distinct operational focus.

3 Summary of changes

Considering the consultation feedback that AEMO has received in written submissions, the industry briefing session, presentations and further AEMO review, AEMO has made a number of updates to the 2025 GPSRR report. These changes have been made as new information has become available, through review of the work required to complete the GPSRR, and for clarification purposes.

In summary, significant changes are:

- Updated executive summary section for MSL, to provide further context and emphasise the need to implement actions related to emergency backstop and the AS/NZS 4777.2:2020 inverter requirements standard.
- Reordering of the priority risks in the executive summary and relevant report sections. The order of risks is now:
 - Minimum system load.
 - Unexpected operation and interaction of protection systems and control schemes.
 - Increasing risks of non-credible contingencies.
 - IBR response to remote frequency events.
- Refinement of the recommendation in relation to the increasing risks of non-credible contingencies, clarifying that further studies will be progressed first to further demonstrate the risk and compare the benefits of the proposed solutions.
- Added section on integrating price-responsive resources (Section 1.3.6).
- Removed all references that were specific to the draft report, consultation period or requests for submissions.