ENGINEERS
AUSTRALIA

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Daniel Fracalossi
Principal Engineer – Grid Performance & Integration
AEMO
gpsrr@aemo.com.au

Dear Daniel

Re: 2026 General Power System Risk Review Approach Paper

As Australia's national body for engineering, Engineers Australia is the voice and champion of our 140,000-plus members. We provide them with the resources, connections, and growth they need to do ethical, competent and high-value work in our communities. A mission-based, not-for-profit professional association, Engineers Australia is constituted by Royal Charter to advance the science and practice of engineering for the benefit of the community.

Thank you for the opportunity to provide comments on the 2026 General Power System Risk Review (GPSRR) Approach Paper. Our input considers insights from Australia's National Climate Risk Assessment (2025), which provides a useful evidence base on the growing interdependencies between climate, energy, and national security systems. That report highlights the increasing likelihood of concurrent and cascading events affecting essential services and vulnerable communities, reinforcing the need for a holistic approach to risk management and system resilience.

1. **What are stakeholder views on the proposed priority risks and the associated approach and methodology for assessment in the 2026 GPSRR?**

Priority Risk 1 – Emerging risks associated with increasing large load connections

Multiple generator or storage facilities could be severely affected by a common disturbance/failure, such as:

- far-reaching/cascading power outages
- electric generator and/or storage failures/outages
- external events
- internal system events
- energy supply limitations

This risk could be reframed as:

a) High concentration of voltage-sensitive large loads poses a risk that disturbances may lead to the simultaneous disconnection of multiple large loads, resulting in significant frequency and voltage excursions. If not accounted for, these events may exceed the capacity of existing FCAS, potentially triggering over-frequency generator shedding (OFGS) or other cascading failures under extreme scenarios.
b) Cascading failures from external interruptions. Fires, storms, ice/snow, floods, cyclones, tornadoes, civil disturbances, and sabotage could occur simultaneously on multiple facilities across the network. If not planned for, these events may not only result in catastrophic interruption to supply but also stretch the resourcing required to reinstate supply.

Multiple generator or storage facilities could be severely affected by a common disturbance/failure. These events are often covered by insurance, but in the case of a critical energy supply with a significant impact, assurance could be more beneficial than just the cost of reinstatement. Alternatively, some consumers may want to cover this sort of interruption with their own backup supply and should understand the potential for a far-reaching/cascading power outage due to:

- an external event
- an internal system event
- energy supply limitations

In Table 2, Risk 1 overview, Potential solutions - we suggest you add:

In considering the concept of accommodating large loads, due analysis should be given to restricting the size of loads and storage to a manageable size so that the effect of losing a load or supply is not too large to risk a cascade effect. Bigger loads should not come at the expense of network reliability and system resilience.

Priority Risk 3 – Large non-credible generation contingency events

The potential solution above could also reduce the consequences of Priority Risk 3.

2. **Are there any other current and emerging system operator risks that may lead to cascading failure or major supply disruptions that should be included for discussion in the 2026 GPSRR?**

As mentioned above, cascading failures and common mode failures have emerged with increasing frequency. The following systemic and business continuity risks merit consideration within the GPSRR scope:

- Continuity of essential services: Power outages affecting hospitals, water utilities, and communications infrastructure during heat or flood events.
- Vulnerable populations: Disproportionate exposure of elderly, remote, and Indigenous communities to prolonged energy loss.
- National security and defence interdependencies: Electricity supply disruptions affecting critical defence, logistics, and emergency response functions.
- Cyber-physical dependencies: Increasing reliance on digital control systems and aggregators introduces common-mode failure and cybersecurity risk.
- Global and domestic supply-chain fragility: Equipment, materials, and workforce shortages during extended climate events may impede restoration.

Addressing these within the GPSRR would align with the National Climate Risk Assessment's conclusion that energy reliability and national resilience are inseparable.

3. **Are there any suggested improvements regarding the risk assessment methodology?**

Assigning a risk likelihood is potentially misleading. It is important to consider these risks in the context of "vulnerability." Any event that results in widespread disruption and/or loss must have a plan to mitigate the consequences, irrespective of how likely it is to occur. i.e. It is not acceptable to "live" with the consequences if it were to occur. These cannot be rationalised away.

A vulnerability scale could be based on the important deliverables and how much of the system would be involved. The mitigations would then be focused on reducing the impact rather than just the frequency of occurrence.

The GPSRR provides a useful technical foundation, but its risk assessment process could be improved by embedding a formal risk management framework aligned with AS/ISO 31000, ISO 21500 (Portfolio Management), and ISO 55000 (Asset Management). This would allow AEMO and the government to:

- Strengthen the risk appetite statement for national energy security and community resilience, articulating tolerances for interruption and socio-economic disruption.

- Establish consistent risk criteria across consequence domains (safety, environmental, service continuity, social, reputational, and intergenerational).
- Introduce a tiered escalation process. Linking portfolio, program, and project risks to ensure transparency and effective prioritisation.
- Integrate business continuity principles so that critical service dependencies (health, emergency response, telecommunications, aged care, water) are assessed alongside technical reliability.

The National Climate Risk Assessment notes that compounding hazards, such as simultaneous heatwaves, bushfires, and network outages, can result in cascading failures across systems. This increases the potential for disruption to essential services, which warrants explicit inclusion in the GPSRR's risk framework and scenario planning.

4. **What are stakeholder views regarding the proposed modelling approach for the priority risks for assessment in the 2026 GPSRR?**

In complicated systems, Monitoring Data enables the potential to 'Respond', which then enables 'Learning', which allows the potential to 'Anticipate' things that can go wrong.

Although further modelling is a prudent step to take, it is important not to lose sight of the need to deal with the exposures (Vulnerabilities). Action should not be delayed when events may continue to overtake real-time preparedness.

Additionally, as the system expands rapidly and external events increase in frequency, the planned modelling may have its utility superseded and come after the critical point when action is or was required.

Monitoring data is important. However, the amount of data available and proposed to be collected is sizable, numerous and multidisciplinary. This potentially makes the task beyond merely complicated. To do a credible function of analysis, humans will most likely need the support of Artificial Intelligence tools. This is largely uncharted territory and may take persistence and time to complete. Action on threats should be based on best available information rather than trying to be "too perfect" with justification via modelling.

One area that needs urgent consideration is the "standards" that are employed regarding natural events like storms. Taking an informed, pragmatic approach may serve AEMO and society better than being thorough. There is always an "Efficiency Thoroughness Trade Off (ETTO)". The optimum point is a risk judgment call based on vulnerability and not just likelihood. The magnitude and frequency of these events are outstripping those allowed for in standards. Design standards should be considered in proportion to the reliability required.

Two additional categories that may help the categorisation of these risks are "Common Mode failure" and "Cascading failures." Definitions of both should be prepared as an element of the GPSRR process.

Prioritisation based upon the ability to be successful is dangerous in itself. The risks that leave the system vulnerable should be clearly presented to decision makers. If the solutions are unattractive by any measure, the minister needs to be part of the decision. It is not an engineering decision alone; it is a societal decision. The societal disruption should be included in the cost of the risk (Vulnerability). More explicit prioritisation of actions would provide greater clarity.

Reducing impact by separating the national system into segments to reduce knock-on effects is a principle that could be employed now.

As the energy system becomes more decentralised, there is also an opportunity to move to more sophisticated thinking and to rate the reliability of supply along with the cost of that reliability and supply. This would enable the opportunity for AEMO to highlight that there are benefits as well as risks associated with loads and generators. These can be quantified, and a user pays approach can be designed that balances cost with service. This could also help build energy centres that match the reliability of service required.

Opportunities may emerge. For example, it may be beneficial for small and remote energy users to have small, dedicated supplies generated locally, independent of the national grid, thus avoiding the cost of

extending the distribution network where it would prove to be unreliable anyway. If this cannot be done now, then the potential consequences should be described and communicated.

To help bridge the gap between the technical, operational, industrial, political and societal understanding of this complicated national system, additional tools could be considered to support communication and understanding. These tools would also support the technical discussions and consultation processes. Examples include:

- Layers of Protection Analysis (LOPA) - Consideration should be given to using LOPA to present the elements that achieve reliability (risk reduction) in the generation, storage and distribution (GS&D) utilities.
- Threat Barrier Diagram (TBD) is a graphical tool that can be used to illustrate where control/protection measures reduce particular risks to the GS&D utilities. The diagram would then enable further detailed discussion and innovation of options that are likely to fill gaps that then become more obvious or emerge. Emergence of issues is in the nature of complex systems, and it is better to have them emerge in a constructive workshop rather than in a "surprise" real-life situation.
- Bow Tie Diagrams (BTD) - can evolve from TBDs prepared in the workshops, to illustrate to government or investors where and what the required funding is attempting to achieve by way of risk reduction and improved performance. BTDs are designed to support the communication of detailed information in a refined and clear picture.
- Fault Tree Analysis (FTA) - can be employed to analyse quantitatively how the risk of failure events is reduced by proposed or existing interventions.
- Outcome Analysis (Event Analysis) can be used to quantify (estimate) the probability of particular identified unwanted outcomes, which enables clear comparison.

When FTA and Event Analysis are combined, they enable objective comparison of alternative opportunities for risk reduction or reliability improvement and system resilience.

Further work should be done to determine the adequacy and utility of the parameters proposed for future projections. The time scale for data collection may not relate to the period of interest and looking forward five or six years with any accuracy is problematic in the current environment. Imagination may serve AEMO better in this instance.

5. **What are stakeholders' views regarding the proposed risk cost assessment methodology to be applied in the 2026 GPSRR?**

The proposed risk cost assessment is acceptable, provided the outcomes are only used for comparison purposes and not used absolutely in decision-making. It is valid to use a criterion to compare initiatives to advise on priority, but it is not suitable for determining whether a project is a viable intervention.

More sophisticated methods are required for an absolute but pragmatic decision. Some of these methods and tools are described briefly above.

Integrating technical decisions with financial decisions is a complex task. As mentioned previously, it may be time to consider this problem on a 'local' or 'region-by-region' basis. Some regions will be more reliable than others. Costs in some regions will be less efficient than in others. Reliability requirements will vary from region to region.

If these elements are managed utilising the objective tools that are available to us, it could be beneficial to develop a "BIG Picture Vision" of centres of high reliability and centres of low cost. This would enable industries that require low-cost electricity, but where reliability of supply is not critical, to flourish in areas that match their electricity supply profile. On the other extreme, this would enable industries where reliability is critical to be located where reliability has evolved to be higher, but at a higher cost.

The current formula: Risk Cost = L × T × VCR × Pc × Pe is a practical starting point for quantifying economic loss from non-supply. However, it omits the human, social, and systemic dimensions of resilience. To address this, AEMO could consider broadening the approach to better capture:

- Life-safety considerations: Introduce a Value of Statistical Life (VSL) or equivalent parameter to capture mortality and morbidity risks arising from service loss during extreme weather or emergency conditions.
- Compounding and concurrent risks: Modify the restoration term (T) using concurrency multipliers to reflect delays caused by simultaneous events—a key finding of the National Climate Risk Assessment.
- Intergenerational and societal perspectives: Apply discount-rate sensitivity testing (for example 4%, 2%, 0%) to evaluate the long-term value of resilience investments against short-term economic efficiency.
- The move towards a multi-criteria model: Extend the assessment with Societal Impact Weightings (safety, environment, reputation) consistent with ISO 31000 Annex A, to support transparent trade-offs between financial, ethical, and safety outcomes.

An enhanced expression could take the form of something like:

Total Risk Value = (L × T × VCR) + (VSL × Expected Fatalities) + (Σ Societal Impact Weightings × Likelihood)

This approach better reflects the total value at risk, encompassing both measurable economic loss and qualitative human and societal impacts.

6. **Does the proposed consultation approach meet stakeholder expectations and do stakeholders have any suggestions on how AEMO could best engage with industry on the development of the 2026 GPSRR?**

AEMO could consider conducting face-to-face workshops to discuss particular items in more detail. This would enhance the ability of AEMO to innovate some novel and practical actions that would effectively reduce or manage the risks of concern. This approach would assist in getting more broad-based input to policy decisions.

The additional tools presented under consultation question 4 would support the discussions in these technical face-to-face workshops.

Additional Recommendations for Consideration:

- Adopt a joint AEMO–Government Risk Appetite Statement incorporating safety, environmental, and economic dimensions.
- Apply assurance gates at portfolio, program, and project levels (aligned with ISO 21500 and ISO 55000) to ensure that GPSRR outputs inform strategic investment decisions.
- Integrate climate and security scenarios into the modelling framework to reflect concurrent and compounding hazards.
- Recognise transformational adaptation, including distributed and islanded systems, as valid mitigation pathways where conventional redundancy may be insufficient.
- Enhance transparency and traceability between GPSRR risk assessments, portfolio risk registers, and decision-making processes.

Yours sincerely

Jenny Mitchell
General Manager Policy and Advocacy