Power System Security and Reliability (PSSR) Standards Review

Smart Energy Council Submission

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Table of contents

Executive Summary

The Smart Energy Council (SEC) welcomes the opportunity to provide further input into the Power System Security and Reliability (PSSR) Standards Review.

As the national peak body representing clean energy investors, battery developers and hybrid project proponents operating in the SWIS, we strongly support the objective of strengthening system security in an increasingly inverter-dominated grid.

However, if one of the fundamental policy objectives of this Review is to accelerate the deployment of grid-forming inverter-based resources (GFM IBRs) across the SWIS, we are concerned that the current proposals (as drafted), are unlikely to achieve that outcome.

In summary, the proposed framework:

1. Does not include any structural incentive mechanism to drive uptake of GFM capability over grid-following (GFL);[1]

2. Introduces several prescriptive technical requirements that may constrain optimal plant tuning and reduce system-wide performance;[2]

3. Risks increasing project CAPEX and compliance burden, ultimately raising consumer energy costs;[3]

4. Encourages compliance-based model tuning rather than optimisation based on actual local network characteristics; and

[1] Energy Policy WA, **Power System Security and Reliability (PSSR) Standards Review – Consultation Paper** (Consultation Paper, 19 June 2025) sets out the proposed reform framework for consolidating and updating technical standards for the SWIS, including revised technical requirements for grid-forming (GFM) and grid-following (GFL) inverters, but does not itself establish any market or regulatory incentive mechanism that prioritises GFM uptake over GFL technology, see Energy Policy WA, *Power System Security and Reliability (PSSR) Standards Review – Consultation Paper* (Consultation Paper, 19 June 2025) https://www.wa.gov.au/system/files/2025-06/pssr_standards_review_consultation_paper_0.pdf

[2] The Consultation Paper includes a range of detailed technical requirements *(including specified SCR thresholds, phase angle response criteria, and damping bandwidth settings)*, that, if framed prescriptively, may constrain optimal tuning of inverter controls and inhibit delivery of system-wide performance outcomes, see ibid.

[3] The PSSR Consultation Paper proposes a number of detailed technical and compliance requirements. Stakeholders within the SEC and externally, have expressed concern that these requirements could increase the complexity and cost of project delivery, with associated compliance burden that could ultimately contribute to higher consumer energy costs, this is evidenced in Chamber of Minerals and Energy of Western Australia, *Submission on Power System Security and Reliability (PSSR) Standards Review Consultation Paper* (Submission, 7 August 2025) 1–2 (observing concern about rising electricity costs in the SWIS and the prospect of *additional* cost increases due to regulatory settings) https://www.wa.gov.au/system/files/2025-08/chamber_of_minerals_energy_wa_cme_submission_pssr_standards_review_consultation_paper.pdf

5. May unintentionally entrench reliance on centralised synchronous assets rather than distributed inverter-based system strength.[4]

The SEC recommends a recalibration toward a performance-based, technology-neutral, cost-efficient framework that explicitly supports distributed grid-forming capability.

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1. Structural Incentives for Grid-Forming Capability

The Core Policy Question

If the SWIS is transitioning toward high penetrations of inverter-based generation, then:

> ***How will this framework materially increase the penetration of grid-forming capability by 2030?***

While the Review acknowledges the security benefits of GFM,[5] it does not create an economic or regulatory signal that makes GFM the preferred investment pathway.

Unlike the NEM, where market design and service access have supported voluntary GFM uptake, the SWIS currently lacks clear value signals.

Risk

Absent a structural incentive:

- Developers will pursue lowest-cost compliance.
- GFL will remain dominant.
- System strength will continue to rely on mechanical synchronous assets.
- Distributed inertia capability will be under-deployed.

[4] In the absence of explicit incentives for distributed grid-forming capability, system strength requirements are more likely to be met through centrally procured synchronous assets, including synchronous condensers, rather than through embedded inverter-based solutions.
[5] *including system strength, inertia, damping and voltage stability*

Recommendation

- Introduce targeted procurement or financial mechanisms to support GFM deployment in weak grid areas.
- Enable synthetic inertia participation in RoCoF and related services.
- Explicitly recognise GFM as a preferred non-network solution within centralised planning.
- Reduce compliance friction for projects adopting GFM capability.

Without these measures, the reforms are unlikely to materially shift technology choice.

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2. Prescriptive Technical Requirements and Performance Trade-Offs

SEC members have raised consistent concerns regarding overly prescriptive technical requirements, including:

- Withstand SCR thresholds
- Voltage phase angle jump response times (e.g. 20ms suppression)
- Current injection frequency requirements
- Prescribed prioritisation of positive/negative sequence currents
- Fixed oscillation damping bandwidth (e.g. up to 300 Hz)

While we support clear minimum security standards, overly prescriptive internal control requirements risk:

1. Constraining innovation across OEM control architectures;
2. Forcing sub-optimal tuning for unrealistic worst-case conditions;

3. Degrading inertial and frequency response performance in normal operating conditions;

4. Creating unnecessary divergence from established NER S5.2 principles.

For example, members have highlighted that:

- Plants are typically tuned to reflect actual site SCR conditions (often >5).
- Requiring tuning for artificially low SCR scenarios (e.g. SCR 1.2) can reduce inertial performance.
- A 20ms phase angle suppression requirement may force plants to effectively dial down inertia delivery.
- Grid-forming inverters inherently manage negative sequence currents; prescriptive hierarchies may interfere with designed behaviour.
- GFM inverters provide active damping at lower frequencies (~10 Hz) and passive damping at higher frequencies; imposing universal damping requirements to 300 Hz misunderstands inverter control bandwidth.

Recommendation

- Shift from prescriptive control mandates to performance-based outcomes.
- Align technical settings with demonstrated real-world GFM behaviour and NER S5.2 frameworks where appropriate.
- Remove fixed oscillation frequency bands and instead require demonstration of adequate system stability.
- Avoid prescribing internal current prioritisation where outcome-based verification suffices.

Ideally, the focus should be on:

Measurable system outcomes *(not internal control architecture)*.

3. Tuning for Compliance vs Tuning for Real Grid Conditions

Several members have expressed concern that the proposals may incentivise projects to tune IBR models to meet GPS compliance thresholds rather than to optimise for actual system conditions.

Where there is a significant difference between:

- Minimum anticipated SCR at site, and
- Hypothetical withstand SCR requirements,

forcing tuning to the lower value can:

- Reduce frequency support,
- Limit active power transfer,
- Degrade system-wide performance.

This creates a compliance-optimised fleet rather than a performance-optimised fleet.

Recommendation

Allow flexibility in control system tuning where:

- Actual site SCR materially exceeds minimum withstand thresholds; and
- Demonstrated performance outcomes meet system security objectives.

Possible approaches have been suggested:

- Defining a "significant SCR difference" threshold;
- Allowing simulation-based demonstration pathways;
- Permitting islanded-mode performance demonstration where appropriate.

4. Hybrid Systems and Point of Compliance

SEC members developing hybrid projects (e.g. wind + BESS) have raised concerns that current drafting may not adequately reflect:

- The distinct operational roles of the primary generator and the GFM-capable BESS;
- The need for flexibility in assessing compliance at component level.

Recommendation

- **Clarify that hybrid performance requirements should reflect the characteristics of the primary generator.**
- Maintain flexibility in point-of-compliance arrangements.
- Ensure hybrid systems are not penalised where GFM functionality is provided by a sub-component (e.g. BESS).

5. GPS Registration and Process Efficiency

Industry experience indicates that:

- The interaction between GPS registration and evolving technical standards is often duplicative.
- Multi-year registration delays have occurred.
- Modifying a registered plant (e.g. upgrading firmware from GFL to GFM) can require full re-registration.

This creates a structural disincentive to enhance plant capability.

Recommendation

- Harmonise GPS and PSSR requirements to avoid duplication.
- Establish a streamlined re-registration pathway for capability upgrades.
- Allow firmware-based GFL to GFM upgrades without full re-registration where system impact is beneficial.

Reducing administrative friction is one of the lowest-cost levers available to improve system security outcomes.

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6. System Strength Planning and Centralised Procurement

The SEC strongly supports:

- The establishment of a centralised system strength planning and procurement framework;
- Consideration of non-network solutions;
- Recognition of synthetic inertia within future service design.

However, ideally planning design should avoid:

- Structural bias toward synchronous condensers;
- Over-reliance on high-cost mechanical solutions where distributed GFM capability can provide equivalent or superior outcomes.

Distributed, modular battery systems:

- Offer higher availability,

- Avoid single-point mechanical failure risk,
- Can provide both inertia and system strength concurrently.

Recommendation

- Ensure procurement frameworks are technology-neutral.
- Explicitly assess distributed GFM solutions as first-order options.
- Enable synthetic inertia to participate in RoCoF services.

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7. Cost Impacts and Consumer Outcomes

The SEC emphasises that technical standards must balance:

- Security,
- Feasibility,
- Cost efficiency.

Increased compliance burden, prescriptive settings and hardware over-specification will increase:

- CAPEX,
- Financing risk,
- Ultimately wholesale energy costs.

Over-engineering the system beyond what is necessary to achieve secure operation risks imposing unnecessary costs on consumers.

Economic efficiency should remain a core design principle of the PSSR framework.

Conclusion

The SEC supports the intent of the PSSR Review and recognises the importance of strengthening system security in the SWIS.

However, to ensure the reforms achieve their stated objectives, we recommend that Energy Policy WA:

- Introduce structural incentives for grid-forming capability;
- Shift toward performance-based technical requirements;
- Allow flexibility in control tuning based on real site conditions;
- Streamline GPS and upgrade processes;
- Design system strength procurement frameworks that favour efficient, distributed solutions;
- Maintain cost-efficiency as a central policy objective.

With appropriate calibration, WA has the opportunity to design one of the most forward-looking inverter-dominated system frameworks in Australia.

The SEC remains available to support technical workshops and facilitate detailed member input to ensure the final standards deliver secure, efficient and investable outcomes.