GOVERNMENT OF WESTERN AUSTRALIA

Department of Energy and Economic Diversification

Energy Policy WA

Power System Security and Reliability Standards Review

Information Paper

Technical Requirements for grid-following and grid-forming inverter-based technologies and SWIS System Strength framework

20 August 2026

Contents

Abbreviations

Term	Definition
AEMO	Australian Energy Market Operator
DEED	Department of Energy and Economic Diversification
ESM Rules	Electricity System and Market Rules
ESOO	Electricity Statement of Opportunities
ESR	Electric Storage Resources
FPCG	Forecast and Planning Coordination Group
GFL	Grid-following inverter
GFM	Grid-forming inverter
IBR	Inverter-based resource
NCESS	Non-Co-optimised Essential System Services
NEM	National Electricity Market
NER	National Electricity Rules
PSSR	Power System Security and Reliability
SCR	Short-Circuit Ratio
SWIS	South West Interconnected System
TSP	Transmission System Plan
WEM	Wholesale Electricity Market
WOSP	Whole of System Plan

1. Summary of review outcomes

The Department of Energy and Economic Diversification (DEED), in consultation with the Australian Energy Market Operator (AEMO) and Western Power as well as a dedicated Working Group established by the Market Advisory Committee, has been progressing reforms through the Power System Security and Reliability (PSSR) Standards Review.

The review was initiated in response to the increasing penetration of inverter-based resources (IBRs) within the South West Interconnected System (SWIS), the retirement of synchronous generation, and the resulting need to ensure the technical and regulatory framework remains fit for purpose during the energy transition.

As part of the review process, DEED published a Consultation Paper in June 2025, followed by a Western Power Technical Paper in December 2025. Together, these papers proposed regulatory reforms intended to:

- reduce barriers to connection for emerging technologies by clarifying grid-forming (GFM) inverter technical requirements and refining performance standards to better recognise the capabilities and operational characteristics of modern IBRs; and
- establish a coordinated system strength framework for the SWIS, including clear roles, responsibilities and processes for identifying and addressing current and forecast system strength shortfalls.

This Information Paper provides the review outcomes related to the above proposals. The review outcomes have been informed by stakeholder submissions, ongoing technical engagement with industry participants, consideration of interstate and international frameworks, and further analysis undertaken by DEED, AEMO and Western Power.

Tables 1 and 2 below outline the review outcomes and supporting rationale for proposals 12-16 outlined in the June 2025 Paper and proposal 6-11 in the December 2025 Paper.

The tables are intended to provide:

- a concise description of each review outcome;
- the policy and technical rationale supporting the outcome; and
- an overview of how the proposed reforms collectively support secure and efficient integration of IBRs within the SWIS.

In general:

- Table 1 focuses on reforms to technical standards and performance requirements for IBRs, including GFM technologies; and
- Table 2 focuses on reforms relating to system strength planning, forecasting and procurement frameworks.

An Exposure Draft of Electricity System and Market (ESM) Amending Rules to implement these review outcomes is being published separately for consultation.

2. Review outcomes and rationale

2.1. Technical Requirements and Access Standards for grid-following and grid-forming inverter-based resources

Table 1 outlines the revised Technical Requirements for grid-following (GFL) and grid-forming (GFM) inverter-based resources (IBRs) connecting as Large Energy Producing Systems (>10 MVA) in the SWIS.

To facilitate the review outcomes described in Table 1 below, new terminology will be applied as follows:

- 'Automatic Access Standard' (previously 'Ideal Generator Performance Standard');
- 'Minimum Access Standard' (previously 'Minimum Generator Performance Standard'), and
- 'Negotiated Access Standard' (previously 'Negotiated Generator Performance Standard'),

while retaining 'Generator Performance Standard' as the umbrella term for the approved and registered performance standard.

These amendments support the transition of Existing Transmission Connected Generating Systems to the new arrangements by aligning the terminology, which will cover a broader range of technologies and capabilities. The new terminology is also aligned with that applied in the National Electricity Market (NEM) to create consistency across jurisdictions.

Table 1 Review outcomes and rationale: Technical Requirements and Access Standards for GFL and GFM IBRs

Review Outcome	Rationale
1. Grid-Forming Capability definition	
The ESM Rules will introduce a new definition for 'Grid-Forming Capability': ***Grid-Forming Capability:*** *The capability of a Generating Unit or Generating System, as applicable, to:* *(a) behave as a controlled voltage source behind an effective impedance; and*	GFM inverter-based technology is rapidly evolving. The definition of Grid-Forming Capability is intended to provide guidance on when a Generating Unit or Generating System (as relevant) should be assessed against GFM-specific technical requirements, while providing greater clarity to parties seeking to connect.

Review Outcome	Rationale
(b) *autonomously deliver a stable sub-cycle response to rapid changes in voltage magnitude, frequency, and phase angle, within its current and energy limits,* *such that the relevant Generating Unit or Generating System does not primarily rely on an externally measured voltage phase angle or frequency reference to determine its response.* The ESM Rules will introduce a new definition for 'Grid-Following Capability': ***Grid-Following Capability:*** *The capability of a Generating Unit or Generating System, as applicable, that does not have Grid-Forming Capability.*	The definition focuses on the behaviour of the equipment at the system interface, based on the common characteristics currently observed across GFM technologies. The review outcome has been refined in response to stakeholder feedback that 'controllable impedance' should not be explicitly prescribed as an attribute, to avoid excluding future implementations that achieve equivalent terminal behavior through other means. Accordingly, the term "controllable impedance" has been replaced with "effective impedance" to improve clarity and flexibility. This approach avoids prescribing internal design or implementation choices, while preserving the required terminal behaviour and performance outcome at the agreed Measurement Location.
2. Withstand Short Circuit Ratio (SCR)	
2.1 – Withstand SCR	
New Part A12.9A is inserted in the ESM Rules to specify the Minimum and Automatic Access Standards and Technical Requirements for Asynchronous Generating Systems or Generating Units with respect to 'Withstand Short Circuit Ratio'. The ESM Rules will introduce a new definition for 'Short Circuit Ratio' and to support its operation, a new definition for 'Maximum Apparent Power'. ***Short Circuit Ratio (SCR):*** *The ratio of the three-phase fault level (MVA) at the Connection Point, calculated excluding the contribution of all Asynchronous Generating Systems, to the Maximum Apparent Power (MVA) of the relevant Asynchronous Generating System.* ***Maximum Apparent Power:*** *The maximum Apparent Power level that a Generating Unit or Generating System, as applicable, can inject or withdraw, including as calculated from the Generator Performance Chart provided under Part A12.3.* New definitions for 'Withstand Short Circuit Ratio' and 'Adequately Controlled' (see outcome 4.4 below) are also introduced and the existing definition for 'Continuous Uninterrupted Operation' is amended (see Review Outcome 2.3 below).	This review outcome has been revised to adopt a single Minimum Access Standard for Withstand Short Circuit Ratio of ≤3 for both GFM and GFL IBRs. This approach avoids favouring one technology pathway over another, while ensuring all IBRs contribute appropriately to system security. DEED considers that a SCR of ≤3 is an appropriate and achievable minimum threshold for the SWIS. This threshold is consistent with AEMO's 2025 WEM Electricity Statement of Opportunities (ESOO), which indicates that several locations within the SWIS are expected to operate below an SCR 3.0, and in some cases below 2.0. The ≤3 threshold is also aligned with requirements in the National Electricity Market (NEM). Setting a more stringent minimum requirement would likely require additional equipment, such as synchronous condensers, or prevent connection at otherwise viable locations. The SCR settings, including any Automatic Access Standard, will be revisited as the SWIS system strength framework matures and greater clarity is established regarding its application and requirements.

Review Outcome	Rationale
Withstand Short Circuit Ratio: *The lowest Short Circuit Ratio at the Measurement Location at which an Asynchronous Generating Unit or Generating System, as applicable, is demonstrated to be Adequately Controlled, while remaining in Continuous Uninterrupted Operation, for the purposes of the withstand SCR assessment under Part A12.9A.* The existing definition for 'Measurement Location' is amended to provide further details to identify the mechanism for determining an alternative 'Measurement Location': ***Measurement Location**: The Connection Point, or another measurement location agreed by AEMO and the Network Operator, as specified for the relevant Technical Requirement. The process for agreeing an alternate measurement location is documented in the guidelines published by the Network Operator under clause 3A.4.4.* A Minimum Access Standard for Withstand SCR of ≤3 will apply to both GFL and GFM IBRs. The Automatic Access Standard is the same as the Minimum Access Standard at this stage. There are no Negotiation Criteria for Withstand SCR.	The assessment for 'Withstand Short Circuit Ratio' is only intended to apply for the application of Part A12.9A, and not more generally as part of System Strength reporting. It is noted, in relation to the definition of "Measurement Location", that the content of the guideline will be transitioned to a WEM Procedure, subject to the applicable consultation process.
2.2 – Settings used to demonstrate Withstand SCR	
The ESM Rules will include a requirement that, unless otherwise agreed with AEMO and the Network Operator, the control settings used to demonstrate Withstand SCR must not differ from the control settings used to demonstrate compliance with other Technical Requirements.	The ESM Rules will retain the principle that settings used to demonstrate compliance should, by default, be the same settings used in operation. The PSSR Standards Review will consider whether, and in what circumstances, a framework for approved 'alternative' settings should be introduced." As part of further work undertaken by the PSSR Standards Review, consideration will be given to arrangements for enabling changes, if determined necessary by Western Power, to control settings if a single set of settings is impractical due to a particularly wide system strength operating envelope. For example, Western Power may have to, at some point, require 'alternative' settings that depart from the original compliance settings, to

Review Outcome	Rationale
	accommodate coordinated changes to control settings and/or changes to control settings for a single facility, if such action is warranted by localised system strength conditions. If 'alternative' settings are approved by the Western Power, these will be required to be appropriately documented with governance through the GPS framework and supported by requirements around monitoring and testing.
2.3 – SCR boundaries when the Generating System or Generating Unit is expected to remain stable	
The ESM Rules will amend the existing definition for Continuous Uninterrupted Operation, as follows: ***Continuous Uninterrupted Operation****: In respect of a Generating System or operating Generating Unit within a Transmission Connected Generating System that is operating immediately prior to a ~~power system~~ ~~d~~Disturbance, means:* *(a) not disconnecting from the SWIS except ~~in accordance with~~as required or permitted under its Registered Generator Performance Standard;* *(b) during the ~~d~~Disturbance, contributing active and reactive current or Active Power and Reactive Power as required or permitted by its Registered Generator Performance Standard;* *(c) after clearance of any electrical fault that caused the ~~d~~D*isturbance*, only ~~substantially~~ varying its Active Power and Reactive Power as required or permitted by its Registered Generator Performance Standard; and* *(d) not exacerbating or prolonging the ~~d~~D*isturbance *or causing a subsequent ~~d~~D*isturbance *for other connected Equipment, except as required or permitted by its Registered Generator Performance Standard,* *with all essential auxiliary and reactive Equipment remaining in service and accounting for, where applicable:* *(e) inherent or programmed responses, in accordance*	The 'Withstand Short Circuit Ratio' should define the minimum system strength condition for which 'Continuous Uninterrupted Operation' must be demonstrated. This provides a clear and practical boundary for compliance, avoiding an open-ended obligation to maintain operation at arbitrarily low SCR conditions beyond those assessed through the connection process. It clarifies that 'Continuous Uninterrupted Operation' is not required where the actual system impedance at the connection point exceeds the nominated withstand system impedance, and this would not, in itself, constitute non-compliance. This approach provides greater certainty for connection applicants and Original Equipment Manufacturers (OEMs) when undertaking compliance studies, model validation, and operational performance assessments. Consistent with the National Electricity Rules (NER), the requirement is framed in terms of system impedance rather than SCR or fault level metrics. The Network Operator is best placed to advise on the expected range of network conditions, while responsibility for tuning inverter-based Generating Systems to satisfy applicable performance requirements remains with the proponents and OEMs. A new definition for 'Disturbance' is also introduced to clarify the meaning of 'disturbance' and support the operation of 'Continuous Uninterrupted Operation' and other defined terms under Appendix 12. In relation to the definition of "Disturbance", it is noted that, for the purposes of this definition, "large disturbance" and "small disturbance" are to be incorporated as definitions into the ESM Rules.

Review Outcome	Rationale
with good electricity industry practice, opposing RoCoF or opposing voltage phase angle jumps; and *(f) responses consistent with the operation of the Generating Unit or Generating System, as applicable, in accordance with Part A12.6.* The ESM Rules will introduce a new definition for 'Disturbance': ***Disturbance:*** *Any large disturbance or small disturbance as described in the Technical Rules.* The ESM Rules will specify that GFL and GFM IBRs are not required to maintain 'Continuous Uninterrupted Operation' if the network operating conditions result in the system impedance increasing beyond the level agreed with AEMO and the Network Operator.	
3. Contingency response requirements	
3.1 – Voltage phase angle jump during the fault	
New Part 12.9B is inserted into the ESM Rules to introduce a requirement for Asynchronous Generating Systems with GFM or GFL capability to be 'Adequately Controlled' and remain in 'Continuous Uninterrupted Operation' for changes in phase angle caused by the occurrence and clearance of balanced and unbalanced faults, provided the positive sequence phase-angle change does not exceed the Minimum Access Standard (refer to review outcome 3.2).	The requirement is consistent with IEEE Std 2800 and appropriately expresses the fault ride-through obligation as it applies to phase angle events. This is not an additional requirement on top of fault ride-through obligations. Rather, it ensures consistency between voltage-magnitude and phase-angle requirements during faults.
3.2 – Voltage phase angle jump response	
The ESM Rules will require: • a Minimum Access Standard for GFL IBRs to be 'Adequately Controlled' and remain in 'Continuous Uninterrupted Operation' for a positive-sequence phase angle jump of ±25°;	DEED considers it prudent to establish a Minimum Access Standard to assess the capability of inverter-based Generating Systems to withstand phase angle jumps. Explicit withstand and opposition requirements provide clear expectations regarding the behaviour of both GFL and GFM technologies during severe disturbances, while avoiding unnecessary costs.

Review Outcome	Rationale
• a Minimum Access Standard for GFM IBRs: ○ to be 'Adequately Controlled' and remain in 'Continuous Uninterrupted Operation' for a positive-sequence phase angle jump of ±25°; and ○ to initiate a response to oppose the positive-sequence phase angle jump within 20 milliseconds (ms). • detailed testing and assessment arrangements to be specified in a WEM Procedure. The Automatic Access Standard is the same as the Minimum Access Standard at this stage. There are no Negotiation Criteria for Voltage Phase Angle Jump.	The proposed 25° phase angle jump withstand capability is consistent with international practice, including IEEE Std 2800-2022, and reflects the demonstrated capability of modern IBRs. The requirement is intended to reduce nuisance tripping from vector shift protection and support continued operation during credible disturbances. For GFM technologies, there is an additional expectation that the inverter actively opposes the phase angle jump to support restoration of the system voltage angle. The requirement for response initiation within one cycle (≤20 ms) is intended to define the fast voltage angle support capability characteristic of GFM operation. This is a response initiation requirement only, and not a requirement to fully suppress the disturbance within one cycle. Phase angle jump performance is distinct from fault ride-through performance, as it relates to maintaining stability and voltage angle coherence during rapid phase-angle disturbances. Absent these capabilities, the Network Operator and AEMO would likely need to rely more heavily on synchronous machines and additional system strength and inertia services, increasing overall system costs.
4. Active and reactive current response during and after contingencies	
4.1 – Reactive current commencement time during contingencies	
The ESM Rules will introduce a new definition for 'Commencement Time' to replace the concept of 'Settling Time', to provide (as appropriate) an alternative means of measuring performance while meeting the policy intent: ***Commencement Time**: In relation to a voltage Disturbance, the time measured from the commencement of the voltage deviation until the first clearly identifiable point at which the reactive current response begins to act in a direction that opposes the voltage deviation, based on the relevant fundamental frequency reactive current component.* The definition applies to the Minimum and Automatic Access Standards for both GFL and GFM IBRs.	The introduction of a commencement time concept is intended to incentivise a prompt reactive current response, while also providing a clear indication that the response has actually been initiated. The review outcome also seeks to avoid unintended consequences associated with overly prescriptive rise or settling time requirements. For example, an excessively fast rise or settling time may contribute to instability under low system strength conditions and may adversely affect system damping. The approach also aligns with the NER framework, which already includes a commencement time requirement in the minimum access standard and,

Review Outcome	Rationale
	more recently, in the AEMC's draft determination for the automatic access standard.
The ESM Rules will be amended to modify the reactive current commencement time requirements as follows: For GFL IBRs: • Minimum Access Standard: Commencement Time of ≤ 40 ms; and • Automatic Access Standard: Commencement Time of ≤ 20 ms; For GFM IBRs: • Minimum Access Standard: Commencement Time of ≤ 30 ms; and • Automatic Access Standard: the same as the Minimum Access Standard at this stage. The default Measurement Location for assessing Commencement Time remains the Connection Point, unless another Measurement Location is agreed with AEMO and the Network Operator. The Commencement Time and Rise Time for a given requirement must be measured at the same Measurement Location.	The review outcome seeks to optimise the response characteristics of both GFL and GFM IBRs by defining appropriate commencement times to support voltage recovery during contingency events while maintaining system stability and inverter performance. For this purpose, Commencement Time measures the time from the start of the voltage deviation to the first clearly identifiable point at which the reactive current response begins to act in a direction that opposes the voltage deviation, based on the relevant fundamental frequency reactive current component. This means the requirement is directed at the initiation of the response, rather than the time taken to achieve the full reactive current response. For GFL IBRs, the adopted thresholds of ≤40 ms for the Minimum Access Standard and ≤20 ms for the Automatic Access Standard preserve the intended distinction between minimum and above-minimum GFL performance. For GFM IBRs, the adopted threshold of ≤30 ms for the Minimum Access Standard reflects stakeholder feedback and implementation discussions, and the Automatic Access Standard is the same as the Minimum Access Standard at this stage. In response to stakeholder concerns that a 20 ms commencement time for GFM IBRs may be overly onerous and difficult to measure and validate in practice, the requirement was revised to ≤30 ms. While a 20 ms threshold may remain technically achievable, the revised value better reflects practical limitations in demonstrating sub-cycle initiation using currently available monitoring and modelling approaches, while still maintaining a clear distinction between GFL and GFM performance expectations. The default Measurement Location for assessing Commencement Time remains the Connection Point, unless another Measurement Location is agreed with AEMO and the Network Operator under the Appendix 12 framework. To support consistency in assessment, the Commencement Time and Rise Time for a given requirement must be measured at the same Measurement Location.

Review Outcome	Rationale
4.2 – Reactive current rise time during contingencies	
The ESM Rules will be amended to specify reactive current rise-time requirements for GFL and GFM IBRs as follows: For GFL IBRs: • Minimum Access Standard: the reactive current response must have a Rise Time of no greater than 80 ms; and • Automatic Access Standard: the reactive current response must have a Rise Time of no greater than 40 ms. For GFM IBRs: • Minimum Access Standard: the reactive current response must have a Rise Time of no greater than 80 ms; and • Automatic Access Standard: the same as the Minimum Access Standard at this stage. Assessment is to be undertaken at the Connection Point by default, unless another Measurement Location is agreed with AEMO and the Network Operator. Where provided for under the ESM Rules, a longer Rise Time may apply if agreed by AEMO and the Network Operator and recorded in the relevant Generator Performance Standard.	Reactive current rise time is a key factor in voltage support during faults and applies to both GFL and GFM technologies. The proposal retains an explicit reactive current rise-time obligation for IBRs, while clarifying that assessment is to be undertaken at the connection point by default, while permitting measurement at the unit terminals if agreed by AEMO and the Network Operator. While exact clearance times vary by location and protection configuration, primary protection operating times on the SWIS transmission network are typically in the range of 80–120 ms. The ≤80 ms threshold is aligned with the NEM framework requirements for GFL reactive current rise time and is considered an established minimum benchmark.
4.3 – Negative-sequence control during contingencies	
The ESM Rules will be amended to introduce technical criteria requiring the following Minimum and Automatic Access Standards: • For GFL IBRs, inject negative sequence current dependent on negative sequence voltage that leads the negative sequence voltage by nominally 90°, with a tolerance of approximately ±10°.	The current provision in clause A12.9.1.6(c) of the ESM Rules is difficult to interpret and implement in practice, resulting in inconsistent application, protracted technical debate, and uncertainty for proponents, OEMs, the Network Operator and AEMO. The requirement is framed around specifying the relevant negative-sequence current response during unbalanced faults, including the phase relationship

Review Outcome	Rationale
• No GFM-specific Minimum or Automatic Access Standard for negative-sequence current response will apply at this stage. • Both GFL and GFM IBRs will be required to follow a defined prioritisation between positive- and negative-sequence current components when current limits are reached.	between negative-sequence current and negative-sequence voltage and the treatment of current allocation when current limits are reached. Clarifying the negative-sequence control requirement therefore supports system security, and efficient project delivery in the SWIS. It supports protection system performance, healthy-phase voltage management and more consistent access standard assessment outcomes. The same broad technical principles that underpin IEEE Std 2800-2022 are reflected without relying on a direct reference to that standard. Instead, the relevant negative-sequence requirements are specified directly in the ESM Rules so that the adopted requirements are clear, accessible and enforceable, while avoiding uncertainty as to which aspects of the standard are adopted, modified or excluded. The review outcome does not seek to standardise GFM negative-sequence behaviour at this stage, recognising that such behaviour remains highly dependent on controls design and requires further development before a prescriptive standard can be appropriately defined.
4.4 – Definition of Adequately Controlled	
Introduce a new definition in the ESM Rules for ‘Adequately Controlled’ as follows: ***Adequately Controlled:*** *The response of an Asynchronous Generating Unit or Asynchronous Generating System, as applicable, to temporary over-voltage or temporary under-voltage achieves the agreed level of reactive current injection or absorption within the duration of the relevant Disturbance, considering:* *(a) expected positive and negative sequence reactive current response;* *(b) expected active current response; and* *(c) stable control when operating at and transitioning into and out of limits,* *and does not cause or exacerbate:*	The term ‘Adequately Controlled’ is considered a more appropriate and practical concept for IBRs than ’Adequately Damped’ and is broadly consistent with the approach adopted in the NER.

Review Outcome	Rationale
(d) over-voltages, exceeding levels and durations agreed under Part A12.8; *(e) under-voltages, below levels and durations agreed under Part A12.8; and* *(f) voltage transients or oscillations that could adversely affect the ability of other Equipment to remain in operation during the Disturbance.* The existing definition of 'Adequately Damped' is also amended to make it clear that its application applies only to Synchronous Generating Systems, Synchronous Generating Units and the power system as a whole (see outcome 6 below).	
4.5 – Behavior at current limitation during contingencies	
The ESM Rules will require that GFL and GFM IBRs, when operating above maximum continuous current limits, must: • comply with all withstand requirements set out in other technical requirements, including steady-state frequency deviations, voltage and frequency rate of change, phase angle change and SCR; • provide expected positive and negative sequence reactive current response and expected active current response corresponding to the total current level it is operating at; • maintain stable control when operating at, and transitioning into and out of, current limits; and • not cause or exacerbate adverse impacts on network capability, power system security, system strength, quality of supply, or inter-regional power transfer capability.	This requirement clarifies the expected behaviour of GFL and GFM IBRs once current limits are reached. The outcome avoids both unstable or poorly controlled behaviour and any implied obligation for the IBR to operate as an ideal voltage source under all conditions. The requirements strike a practical balance by focusing on maintaining stability and avoiding degradation of system security within the realistic operating limits of the GFL or GFM control. This clarification reduces the scope for open-ended negotiation during connection processes and provides clear guidance regarding expected facility behaviour under these conditions.

Review Outcome	Rationale
4.6 – Frequency of current injection during contingencies	
The ESM Rules will be amended to add a new Common Requirement for GFM and GFL IBRs that, during faults, active and reactive current injection from the Generating System and each of its Asynchronous Generating Units must have a fundamental frequency component that is the same as the fundamental frequency of the terminal voltage.	Experience in the NEM and internationally has shown that, under network faults exacerbated by low system strength conditions, inverter controls can produce oscillatory current at sub-synchronous or inter-harmonic frequencies, for example between 5–40 Hz. If not appropriately controlled, these components can excite sub-synchronous resonances and control-driven modes in nearby Generating Units or Network elements, degrading damping and, in extreme cases, driving otherwise stable facilities into unstable behaviour. The requirement is intended to prevent significant non-fundamental current components that could destabilise the wider system. This review outcome provides a practical safeguard consistent with IEEE Std 2800 and confidence that IBRs will not introduce destabilising low-frequency interactions into the network. The requirement also supports consistent modelling and compliance assessment, while reducing ambiguity regarding acceptable fault behaviour.
4.7 – Fast Opposition of voltage magnitude changes	
The ESM Rules are amended to include a Minimum Access Standard requiring GFM IBRs to be capable of reducing its sensitivity to voltage magnitude changes within 20 ms following a disturbance.	The requirement captures a core characteristic of GFM IBRs - the ability to rapidly oppose changes in voltage magnitude at the Connection Point following a disturbance. This is a distinct performance requirement addressing a different aspect of disturbance response to other access standards. The requirement: • clarifies the distinction between GFL and GFM pathways for access studies; • ensures the initiation of a GFM response within a sub-cycle timeframe rather than implicitly relying on synchronous machines; and

Review Outcome	Rationale
	• supports secure operation in a weak, inverter-dominated system region by aligning expected dynamic performance with system planning assumptions. Compliance with the requirement can be managed through the existing compliance framework under Chapter 3A of the ESM Rules, including GPS, Generator Monitoring Plans, compliance reporting obligations and Rectification Plans.
4.8 – Fault ride-through activation thresholds	
Introduce a new definition for 'End of Disturbance' as follows: **End of the Disturbance:** *Following a Disturbance, the time at which the RMS magnitude of the voltage at the Connection Point recovers to within 90% and 110% of the nominal voltage and remains within this range for at least 20 ms.* For the Minimum Access Standard applying to GFL and GFM IBRs, amend the ESM Rules to: • replace the under-voltage range with a fixed value of 80%; and • replace the over-voltage range with a fixed value of 120%. For the Automatic Generator Performance Standard applying to GFL IBRs, amend the ESM Rules to: • replace the under-voltage range with a fixed value of 85%; and • replace the over-voltage range with a fixed value of 115%. Specify that, in each case, the Generating System may commence a response before the specified threshold is reached (otherwise the response must commence when the threshold is reached).	The activation thresholds define the latest acceptable trigger point for the required reactive current response for the Minimum Access Standard, while retaining flexibility for faster or more sophisticated behaviour to be recognised under the Automatic Access Standards or Negotiated Access Standards. For the GFM IBRs, the threshold does not mandate a discrete internal fault ride-through threshold setting. A well-designed GFM inverter operating as a voltage source would generally produce a sub-cycle response before voltage reaches the 80% threshold. Using 80% and 120% positive-sequence voltage as the activation thresholds: • provides a consistent trigger for connection studies and performance assessment; • reduces the risk that system security continues to rely predominantly on synchronous machines due to weaker or more variable GFM performance assumptions; and • supports predictable and timely voltage support during disturbances in a weak, inverter-dominated SWIS region.
4.9 – Use of total current during contingencies	
Introduce a new definition for 'Total Current' in the ESM Rules as follows: **Total Current:** *Total Current: The root mean square magnitude of the fundamental-frequency current injected or absorbed by a Generating System*	DEED considers that using 'Total Current' as the reference quantity during contingencies better reflects the actual operational characteristics and short-term capability of IBRs.

Review Outcome	Rationale
or Generating Unit, as applicable, at the Measurement Location, determined as the root-sum-square of the active and reactive current components of both positive-sequence and negative-sequence current, including any overload capability (if available). Total Current excludes zero-sequence current, harmonic, inter-harmonic, direct current offset and switching-*frequency components of semiconducting devices, unless expressly stated otherwise* Introduce a new Common Requirement establishing total current as the reference quantity during contingencies for both GFL and GFM IBRs. The requirement will clarify that Total Current includes the active and reactive current contributions of a Generating System or Generating Unit and, where applicable, its positive- and negative-sequence current components, subject to existing thermal capability and current limitation framework.	This approach ensures that the existing overcurrent capability built into modern GFL and GFM inverter technologies can be fully utilised during faults, without requiring additional equipment or design changes. The requirement also provides a simple and technology-neutral measure of fault support. Rather than introducing new technical obligations, the review outcome makes more effective use of capabilities already available within modern inverter technologies.

Review Outcome	Rationale
4.10 – Active power recovery following contingencies	
The ESM Rules will be amended to: • replace the term 'after clearance of the fault' with the newly defined concept of 'End of the Disturbance' (see outcome 4.8 above) in respect of both GFL and GFM IBRs; and introduce: For GFL IBRs: • Minimum Access Standard: the Generating System must return to at least 95% of its pre-disturbance Active Power output within a period agreed by AEMO and the Network Operator after the End of the Disturbance; and • Automatic Access Standard: the Generating System must return to at least 95% of its pre-disturbance Active Power output within 100 ms after the End of the Disturbance. For GFM IBRs: • Minimum Access Standard: the Generating System must return to at least 95% of its pre-disturbance Active Power output within a period agreed by AEMO and the Network Operator after the End of the Disturbance; and • No Automatic Access Standard is proposed at this stage.	The defined concept of "End of the Disturbance" provides a clearer and more consistent reference point for measuring active power recovery following a contingency event. It ensures that recovery obligations commence only once voltage at the Connection Point has recovered to a stable range, rather than immediately upon fault clearance, which may occur before the system voltage has fully recovered, particularly under low system strength conditions. For GFL IBRs, the retained Automatic Access Standard of 100 ms preserves the existing higher-tier performance expectation for rapid active power restoration. The Minimum Access Standard for GFL, and the Minimum Access Standard for GFM, continue to require return to at least 95% of pre-disturbance Active Power output within a period agreed by AEMO and the Network Operator, reflecting the need for a practical and proportionate recovery requirement that can account for connection-point and plant-specific conditions. No separate Automatic Access Standard is proposed for GFM IBRs at this stage (i.e. the Automatic Access Standard is equivalent to the Minimum Access Standard for GFL/GFM). This is consistent with the broader interim approach adopted for the current GFM framework, under which the Minimum Access Standard is being clarified first, while higher-tier GFM requirements are deferred pending further development and experience.
4.11 – Reactive current sustainment time during contingencies	
The ESM Rules are to implement the concept of sustainment time without specifically implementing a new definition for this.	Due to stakeholder concerns on prescribing a fixed value, it was previously proposed to create a new definition for Sustainment Time to specify that GFL and GFM IBRs must 'substantially maintain' the required reactive current response until the 'End of the Disturbance'. The revised review outcome implements the concept of sustainment time without specifically relying on such a definition. Note that while the Technical Requirements will require response to be maintained, for the purposes of assessment and testing of this Technical

Review Outcome	Rationale
	Requirement clarity is to be provided in the GPS Guideline (consistent with current practice). The content of the guideline will be transitioned to a WEM Procedure, subject to the applicable consultation process. It is intended that the amended Technical Requirement, working together with the GPS Guideline (content to be transferred to a WEM Procedure), will ensure that IBRs do not reduce their reactive current response to the extent that voltage support is materially withdrawn during the disturbance, which could adversely affect voltage stability and protection system performance. This approach is broadly consistent with the NER concept of "substantially maintain", while retaining flexibility for AEMO and the Network Operator to agree alternative profiles or tighter requirements when justified by local conditions.
4.12 – Reactive current injection ratio during contingencies	
The ESM Rules will be amended to apply a Minimum Access Standard for GFL and GFM IBRs of 0% reactive current injection per 1% reduction in positive-sequence voltage (which is a reduction on the existing Minimum Generator Performance Standard of 2% reactive current injection per 1% voltage drop that applies to Asynchronous Generating Systems).	The review outcome seeks alignment with the corresponding NER framework introduced in 2023 and recognises that reactive current response requirements should be capable of being tailored to the specific needs of the relevant connection point. The 0% Minimum Access Standard does not prevent a higher reactive current injection or absorption response from being agreed and recorded in the relevant Generator Performance Standard where justified by connection point conditions or system security requirements. The approach is intended to ensure that sufficient reactive current injection or absorption capability can be provided during contingency events to support voltage recovery, while avoiding unnecessarily prescriptive response ratios that may not be appropriate across all system conditions.
4.13 – Long duration faults	
The ESM Rules will be amended to apply a Minimum Access Standard fault duration of 450 ms for GFM and GFL IBRs (which is a reduction of the existing Minimum Generator Performance Standard fault duration of 2 seconds). The term 'Adequately Damped' (see outcome 6 below) is replaced with 'Adequately Controlled' (see outcome 4.4 above), where relevant.	Sustaining a fault response for 2 seconds or longer may not be technically achievable for all IBRs and could contribute to facility instability. At the same time, long duration faults may occur within the network, during which facilities are still expected to remain connected and stable.

Review Outcome	Rationale
	Accordingly, the outcome lowers the duration for which the response must be sustained, and maintained near constant, to 450 ms, reflecting the longest circuit breaker failure time within the transmission network.
5. Disturbance ride-through, oscillations and stability	
5.1 – Disturbance ride-through for multiple disturbances	
The ESM Rules are amended to improve clarity regarding disturbance ride through obligations for multiple disturbances under Part A12.9 by: • providing greater clarity regarding the circumstances of Disturbances, during which in any combination, a Generating System and each of its operating Generating Units must remain in Continuous Uninterrupted Operation; • enabling a Negotiated Access Standard to specify the required response of a Generating System for each combination of power system disturbances or conditions specified in Appendix 12, which should be as close to Continuous Uninterrupted Operation as is reasonably practicable; and • leveraging the new defined terms 'Disturbance' and 'End of the Disturbance'. Detailed criteria regarding 'Disturbance' sequencing will be specified in a WEM Procedure.	Providing greater clarity regarding the circumstances under which continuous uninterrupted operation must be maintained will assist all parties involved in the connection process. The outcome is broadly consistent with the NER framework and is intended to provide AEMO and the Network Operator with a clearer understanding of facility limitations for use in operational and planning studies. The approach is also intended to facilitate more efficient compliance assessment and reduce uncertainty for connection applicants. The negotiated pathway for more complex disturbance combinations is consistent with the broader performance-based framework adopted under the ESM Rules.
6. Damping of power system oscillations	
The ESM Rules will be amended to improve clarity regarding Voltage and Reactive Power Control under Part A12.4 by: • leveraging the newly defined term 'Adequately Controlled'; • removing references to the undefined term "critical modes"; • clarifying that instability arising from control interactions within IBRs can affect the SWIS power system more broadly, rather than only other equipment connected at the same connection point.	Avoiding degradation of power system oscillation damping is a fundamental characteristic of GFM controls under both Australian and international frameworks. The term 'Adequately Controlled' is considered a more appropriate and practical concept for IBRs than 'Adequately Damped'. The term "critical modes" originated for predominantly synchronous power systems characterised by a relatively small number of well-defined inter-area oscillatory modes.

Review Outcome	Rationale
• introducing a new Minimum Access Standard for GFM IBRs requiring that the Generating System must have Equipment capabilities and Control Systems sufficient to ensure that: ○ operation of the Generating System does not degrade the damping of power system oscillations and must be Adequately Controlled; and ○ operation of the Generating System does not cause instability or poorly damped oscillations that would adversely affect the SWIS power system or other Equipment connected to the SWIS. AEMO and the Network Operator will specify the applicable oscillation frequency range consistent with the bandwidth of the relevant control systems (see also the detail provided below). Unless sufficient evidence is provided regarding actual converter-control bandwidth, an upper frequency limit of 100 Hz will apply. The ESM Rules will introduce an amended definition for 'Adequately Damped': **Adequately Damped***: The response of a Generating Unit, Generating System or power system, as applicable, following an oscillation triggered by any Disturbance must conform to the following criteria:* *(a) the damping ratio of the oscillation must be at least 0.1;* *(b) the halving time of any oscillation is not to exceed 5 seconds; and* *(c) allow other Generating Systems or Generating Units, as applicable to maintain Continuous Uninterrupted Operation.* The ESM Rules will introduce a new definition for 'Control System Bandwidth': **Control System Bandwidth:** *For a relevant Control System, the upper frequency limit, expressed as an absolute frequency in Hertz, up to which the closed-loop Control System can provide its intended response for the applicable Technical Requirement at the relevant operating point. This limit is assessed by considering the response of the Control System to time-varying changes, in a relevant command or input signal, or a measured quantity used by the Control System, or a Disturbance. For the avoidance of doubt,*	In inverter dominated systems, oscillations are more commonly control-driven, can occur across a broader frequency range, and may involve numerous localised or facility-specific modes. As a result, identifying "critical modes" is inherently subjective and difficult to robustly demonstrate through simulation. For IBRs, and particularly GFM technologies, relevant risks arise from higher-frequency control-driven instability and adverse interactions between inverter control systems, which are not adequately captured by the current drafting. Framing the requirement around oscillation-neutral behaviour, rather than imposing a full synchronous-machine-style damping obligation, allows compliant behaviour to be achieved through appropriate control-system design and tuning without imposing disproportionate costs. The outcome is also intended to reduce the need for additional network-level damping or system strength measures and to minimise the risk of adverse control interactions between GFM and GFL IBRs. As part of the changes, to improve clarity regarding the application of the terms Adequately Controlled and Adequately Damped, the definitions have been explicitly specified. A new definition for Control System Bandwidth will also be introduced in the ESR Rules to assist with the interpretation of the Minimum Access Standard for Voltage and Reactive Power Control.

Review Outcome	Rationale
Control System Bandwidth is not the power system fundamental frequency, switching frequency components of semiconducting devices, sampling frequency, communication update rate, measurement filter cut-off frequency, or harmonic frequency.	
7. Partial load rejection	
The ESM Rules will be amended to clarify the treatment of partial load rejection by: • amending the definition of Continuous Uninterrupted Operation to recognise beneficial programmed or inherent responses, including: ○ active power responses opposing phase-angle jumps; and ○ primary frequency and inertial responses opposing frequency changes; and • amending the relevant active power and frequency-response provisions so that such beneficial responses are not treated as non-compliance where they occur in accordance with good electricity industry practice; and • clarifying in Part A12.10 that the disturbance ride-through requirements for partial load rejection apply to Synchronous Generating Systems, while the broader beneficial-response for IBRs is addressed through the amended definition of Continuous Uninterrupted Operation and related Generator Performance Standard clauses.	The amendments recognise that certain facility responses during 'Disturbances' may provide broader benefits to overall power system performance. These responses include active power responses that oppose voltage phase-angle jumps, as well as primary frequency and inertial responses that oppose frequency deviations. The current framework does not clearly accommodate such behaviour and may inadvertently discourage the provision of beneficial system responses. The review outcome will, therefore, amend the definition of 'Continuous Uninterrupted Operation' and the relevant Generator Performance Standard clauses to explicitly permit inherent or programmed responses to voltage phase-angle and frequency disturbances, including inertial response. The amendments also remove an unnecessary impediment to the connection of GFM inverter technologies, recognising that inertial response in GFM technologies is commonly implemented through programmed control functions rather than purely inherent physical behaviour. The approach is expected to simplify and streamline the connection process for GFM IBRs.
8. Instability detection mechanism	
The ESM Rules will be amended to introduce a requirement for GFL IBRs to include an instability detection mechanism. The mechanism must be capable of detecting sustained oscillatory behaviour of the facility and initiating a controlled and proportionate response.	The instability detection mechanism will address a genuine system security risk. GFL IBRs can exhibit sustained oscillatory behaviour which, if not detected and managed, may propagate more broadly through the network. The mechanism is intended to reduce the risk of converter-driven and sub-synchronous oscillations as IBR penetration increases and synchronous generation declines.

Review Outcome	Rationale
	The outcome also provides AEMO and the Network Operator with a practical mechanism to identify and contain unstable behaviour before it propagates more broadly through the power system. At the same time, the requirement provides developers and OEMs with a clearer and more objective requirement against which facilities can be designed and assessed.

2.2. SWIS System Strength framework

Table 2 outlines the review outcomes and supporting rationale to establish a System Strength framework for the SWIS, including clear roles and responsibilities to address forecast system strength shortfalls.

Table 2 Review outcomes and rationale: SWIS System Strength framework

Review Outcome	Rationale
9 – Revised System Strength definition	
The ESM Rules will be amended to introduce a 'System Strength' definition that is revised from the earlier definition proposed in the PSSR Standards Review Consultation Paper of 19 June 2025 as follows: ***System Strength**: Is a measure of the ability of the power system at a given location to maintain stable voltage magnitude, voltage angle, and waveform quality following Disturbances such as those caused by a sudden change in Load or an Energy Producing System, the switching of a Network element, tapping of transformers and other types of faults.*	The revised definition of System Strength better captures both the locational nature of system strength and the need to consider behaviour during both steady state operation and disturbance conditions. The revised drafting also provides greater clarity regarding the type of events and operating conditions relevant to the assessment of system strength.
10 – Coordinating assumptions and inputs for forecasting	
To support a coordinated approach to forecasting inputs and assumptions, a collaborative process will be established between the Coordinator of Energy (Coordinator), AEMO and Western Power through a Forecast and Planning Coordination Group (see review outcome 11). General coordination requirements will be included in the ESM Rules to support effective collaboration between the relevant parties.	Forecasting activities underpin application of many PSSR standards, and the assumptions and inputs adopted through the forecasting and planning process can materially affect both PSSR outcomes and consumer costs. For the end-to-end PSSR standard to operate effectively, forecasting inputs and assumptions must be coordinated, and sufficiently consistent across relevant parties. DEED considers that this approach will support a more flexible and adaptive approach to forecasting and planning activities, while improving collaboration and coordination between the responsible entities. The outcome is also intended to improve consistency, transparency and confidence in forecasting assumptions used to support PSSR related planning and investment decisions.

Review Outcome	Rationale
11 – A future fleet outlook for use in fault level assessments	
A Forecast and Planning Coordination Group (FPCG) will be established comprising representatives from AEMO, the Coordinator and Western Power to align forecasting and planning approaches and methodologies (see review outcome 10). The FPCG will develop the modelling framework, including methodology, modelling approach, inputs, assumptions and scenarios, used to determine an expected 10-year Energy Producing Systems, Electric Storage Resources (ESR) and Load capacity outlook (Fleet forecast). The Coordinator will publish a forecast of the 'fleet outlook' annually.	DEED considers it necessary that the Coordinator, AEMO and Western Power align their forecasting approach and use this to develop a 10-year 'fleet forecast' on an annual basis. The outcome has been refined to include Loads in the fleet outlook. This approach is intended to provide the FPCG with the information required to improve consistency across planning functions and activities, and undertake fault level forecasting activities.
12 – Maintaining minimum fault levels required for network protection	
The FPCG will be required to develop the modelling framework, including methodology, modelling approach, inputs, assumptions and scenarios, used by AEMO to identify System Strength Shortfalls through the System Strength Report. AEMO will publish the agreed forecast outcomes every two years in a System Strength Report. The report will include: • minimum fault level and short circuit ratio requirements at each Transmission Node; and • minimum fault level assessments and short circuit ratio screening identifying forecast System Strength Shortfalls. If the 'fleet outlook' or system conditions change materially but do not warrant a full reassessment, subject to the agreement of the FPCG, AEMO will publish a streamlined update to the System Strength Report in the intervening year.	Forecasting and managing system strength issues is becoming increasingly important to maintain a secure and reliable power system. Providing transparency in the methodology and calculations used to calculate minimum fault level requirements at each Transmission Node, and associated shortfalls, will provide greater confidence to industry that investments made to address system strength shortfalls are prudent and efficient. The initial proposal required Western Power to undertake forecasting activities relating to System Strength Shortfall(s), including: • development and publication of a methodology for calculating minimum fault level requirements at each Transmission Node; and • comparison of minimum fault level requirements against expected fault levels. DEED received feedback from AEMO that separation of the forecasting functions from procurement functions is prudent.

Review Outcome	Rationale
Western Power will be required to alleviate any forecast System Strength Shortfalls through either: • network reinforcement; or • procurement of non-network solutions through competitive NCESS procurement processes, as appropriate.	DEED also received feedback from Western Power that AEMO is better placed to undertake fault level forecasting activities, with input provided by Western Power. The approach has therefore been refined to reflect stakeholder feedback, with coordination of the forecasting framework to be undertaken by the FPCG and with AEMO publishing the agreed forecast outcomes in a System Strength Report every two years. A full assessment may not be necessary every year, particularly where there are no material changes in system conditions, network configuration, or generation mix. A bi-annual publication requirement of the System Strength Report provides regular transparency and provides informed investment signals to market participants by periodically reassessing system strength needs. Allowing streamlined updates in the intervening year, if necessary, ensures resources are used efficiently and avoids unnecessary regulatory burden, while continuing to provide an accurate reflection of prevailing system strength requirements. DEED considers that the revised framework will improve identification of existing and forecast System Strength Shortfalls, while the existing NCESS framework remains the most appropriate mechanism for competitive procurement and cost allocation associated with alleviating those shortfalls. Separate to this Information Paper, DEED is consulting with stakeholders on options for a regulatory incentives framework to minimise system strength shortfalls. This will ensure that costs are allocated to causers (i.e. IBRs) where appropriate, minimising projected system strength shortfalls and the overall cost of solutions which need to be centrally procured by Western Power.
13 – A centralised planning/investment function for system strength	
The FPCG, using the agreed modelling framework, will be required to forecast any System Strength Shortfall likely to emerge due to: • forecast connection of IBRs; and/or • the retirement of synchronous generators.	Significant investment in network infrastructure will be required to unlock capacity for new generation and ESR facilities. Similarly, investment in system strength services will be required to support secure integration of IBR resources. Given current lead times for technology such as synchronous condensers, a purely ‘connect and manage’ approach under which

Review Outcome	Rationale
The ESM Rules will be amended to introduce the following definition of 'System Strength Shortfall': *A System Strength Shortfall is identified at a Transmission Node if an assessment under has determined that at least one of the following is present:* *(a) the minimum three phase fault level falls below the minimum fault level required for network protection operation (shortfall in the effective level of System Strength); or* *(b) the stable voltage waveform cannot be maintained for the level and type of the forecast inverter-based resources for the relevant year at the relevant Transmission Node (shortfall in the sufficient level of System Strength):* *i. in steady state conditions; and/or* *ii. following any Credible Contingency Event.* AEMO will publish the agreed forecast outcomes every two years in a System Strength Report. If the 'fleet outlook' or system conditions change materially but do not warrant a full reassessment, subject to the agreement of the FPCG, AEMO will publish a streamlined update to the System Strength Report in the intervening year. Western Power will be required to take steps to procure services capable of alleviating identified shortfalls through competitive mechanisms using the NCESS framework.	issues are addressed only once facilities seek to connect, may materially limit the range of available solutions. DEED considers that a centralised framework requiring proactive investment to maintain sufficient system strength for forecast connection of IBRs will provide greater planning certainty for both the Network Operator and connection applicants The framework is also intended to: • support timely and efficient connection of IBRs; • avoid reliance on individual participants to deliver system strength solutions; • help unlock lower-cost generation and ESR technologies that may otherwise face barriers to connections; and • support a more holistic, lowest whole of system cost approach to system strength management. The initial proposal did not include a definition of System Strength Shortfall. DEED considers that a clear definition is necessary to identify system strength issues and support procurement of appropriate remedial solutions. The definition of System Strength Shortfall provides greater clarity on how shortfalls are identified and assessed, while recognising the two outcomes of the assessment framework: • minimum fault level requirements; and • sufficient system strength to maintain stable voltage waveforms for forecast IBR connections. Currently, Western Power is not required to make proactive investments in System Strength to support forecast connection of IBRs. Instead, System Strength issues are generally addressed through individual connection processes. The Review identified a need for a more centralised planning function capable of addressing system strength issues proactively and at a system-wide level. DEED considers the NCESS framework remains the most suitable mechanism to competitively procure system strength services and allocate associated costs.

Review Outcome	Rationale
	DEED also recognises the importance of minimising the forecast system strength shortfalls before they emerge, rather than relying solely on centralised proactive procurement once gaps become apparent. Accordingly, an appropriately designed incentive framework will be important to support achievement of the State Electricity Objective while maintaining investment confidence and system security throughout the energy transition. Separately to this Information Paper, DEED is consulting with stakeholders on options for a regulatory incentives framework to minimise projected system strength shortfalls and reduce the cost of any procurement of solutions by Western Power.

3. Review process and outcomes

3.1. Background

On 19 June 2025, as part of the PSSR Standards Review, DEED published a Consultation Paper outlining proposals for:

- differentiated technical standards for GFM and GFL IBRs to provide clearer guidance to proponents and ensure the operational benefits of GFM capability are realised as uptake of IBRs increases (proposals 6-11); and
- establishment of a System Strength framework to clarify and allocate roles and responsibilities between the AEMO, Western Power and the Coordinator for maintaining system strength, including arrangements for centralised procurement to address forecast system strength shortfalls (proposals 12-16).

Stakeholder submissions broadly supported the objectives of improving system security and providing greater clarity for IBRs in the SWIS. Key themes raised during consultation included:

- the need for clearer roles and responsibilities relating to system strength;
- support for technology-neutral and outcomes-based technical standards;
- implementation practicality;
- flexibility in facility tuning; and
- alignment with developments in the National Electricity Market (NEM).

Following publication of the Consultation Paper, AEMO (in the NEM) published a Grid-forming Technology Access Standards Technical Requirements Review Approach Paper. In response, DEED requested that Western Power, in consultation with AEMO, review and, where necessary, revise the proposals to support efficient connection of IBRs and, where practical, align with developments in the NEM.

Western Power subsequently published revised technical requirements for GFM and GFL in a Consultation Paper in December 2025. The revised requirements responded to stakeholder feedback while retaining certain differentiated requirements necessary to deliver the intended system benefits of GFM capability.

Between February and June 2026, DEED conducted a series of workshops with AEMO and Western Power to assess stakeholder feedback on the Western Power Consultation Paper. These workshops considered the merits, implementation considerations and system security implications associated with stakeholder submissions.

In parallel, DEED also considered stakeholder submissions relating to the proposed SWIS System Strength framework.

Specific consideration of stakeholder submissions is provided in Appendices A and B.

3.2. Overview of review outcomes

Technical Requirements for GFL and GFM inverter-based resources

The final review outcomes refine some of the technical requirements while retaining flexibility within an outcomes-based framework. Overall, the approach seeks to improve clarity and system security outcomes while maintaining a proportionate and technology-neutral approach, where practical.

Key outcomes include:

- a revised behaviour-based definition for GFM Capability, replacing ‘controllable impedance’ with ‘effective impedance’ to provide greater clarity regarding when a facility should be assessed as meeting GFM-specific Technical Requirements;
- adoption of a unified Minimum Access Standard of withstand SCR ≤3 for both GFL and GFM IBRs;
- retaining requirements that settings used to demonstrate compliance should, by default, be the same settings used in operation;
- clarified voltage phase-angle jump response requirements, and the specific thresholds and response expectations;
- clarified active and reactive current behaviour during and after contingencies, including definitions relating to commencement time, rise time, adequately controlled behaviour, operation at current limitation and the use of total current rather than maximum continuous current;
- requirements for disturbance ride-through across multiple disturbances in quick succession, including conditions for continuous uninterrupted operation and for providing a sufficient response after the ’end of the disturbance’;
- commencement time requirements for reactive current injection of ≤30 ms for GFM IBRs;
- requirements relating to damping of power system oscillations for GFM technologies, including a Minimum Access Standard that the Generating System must not degrade damping of power system oscillations and must be Adequately Controlled;
- amendments relating to partial load rejection and the revised definition of continuous uninterrupted operation; and
- introduction of an instability detection mechanism, aligned with the NER to support the detection and management of inverter-based instability within agreed performance standards.

Table 1 in this paper outlines the review outcomes and supporting rationale for these.

SWIS System Strength framework

The final positions refine and clarify elements of the System Strength framework, including roles and responsibilities and the timing of certain forecasting activities.

Overall, the approach seeks to support system security and reliability outcomes while improving investment certainty.

Key outcomes include:

- a revised (from that proposed in the PSSR Review Consultation Paper of 19 June 2025) System Strength definition to better capture locational considerations, and the need to reflect both steady state operation and disturbance conditions;
- a definition of a System Strength Shortfall to provide greater clarity regarding how shortfalls are identified and measured;
- establishment of a Forecast and Planning Coordination Group (FPCG) to improve consistency of forecasting and planning inputs and assumptions across the Coordinator of Energy, Western Power and AEMO;
- requiring the FPCG to develop the modelling framework, including methodology, modelling approach, inputs, assumptions and scenarios, to:
    - develop a 10-year Energy Producing Systems capacity and demand outlook on an annual basis; and
    - identify System Strength Shortfalls, to be published by AEMO in a System Strength Report,
- requiring the Network Operator to contribute to, assist and provide the FPCG with any information, including data, models and analysis, reasonably required by it and to enable AEMO to develop and publish a System Strength Report;
- requiring the Network Operator to alleviate a forecast of residual System Strength Shortfalls through network reinforcement or the procurement of non-network solutions or services through the NCESS framework;
- requiring that, when the Network Operator submits a request to the Coordinator to determine whether to trigger a NCESS procurement process, the request should be made as early as reasonably practicable, having regard to the nature of the forecast System Strength Shortfall and the time likely to be required for the proposed non-network solution to be procured, funded developed and delivered; and
- a requirement for AEMO, a Network Operator and the Coordinator to take the Fleet Forecast, determined by the FPCG, into account when developing the Long Term Projected Assessment of System Adequacy, Transmission System Plan and Whole of System Plan.

Table 2 in this paper outlines the review outcomes and supporting rationale for these.

3.3. The need for further measures

Separately to this Information Paper, DEED is consulting with stakeholders on additional, targeted measures to complement the above review outcomes through the PSSR Standards Review – Consultation Paper System Strength regulatory incentives framework and Technical Standards for hybrid systems.

In particular:

- additional measures, including an appropriate regulatory incentives framework, are required to minimise forecast system strength shortfalls and reduce costs to consumers, so the centralised procurement can address only any residual shortfalls.
- proponents seeking to connect facilities that combine GFM and GFL inverter technologies (hybrid facilities) require guidance on the applicable technical requirements.
- electromagnetic transient (EMT) models for existing facilities will become increasingly important for the accuracy of AEMO and the Network Operator modelling activities, which would require the relevant participants to provide these models.
- as more IBRs connect to the system, the need for changes to control settings, across a broader range of circumstances than existing mechanisms were designed to address, is increasing as an essential operational tool for maintaining power system stability and performance

Appendix A. Responses to stakeholder submissions

The submission period on proposals 6-11 in the Western Power Consultation Paper closed on 13 February 2026. The Consultation Paper received 11 public submissions, which are published of DEED's website. A summary of stakeholder submissions and Western Power's responses is provided in the table below.

Submission	Comment	Western Power response
Definitions and system strength capability		
New proposal in the 2025 December Western Power Consultation Paper – Grid-forming Capability definition *A GFM facility is an IBR that behaves as a controlled voltage source behind a controllable impedance and autonomously delivers a stable sub-cycle response to rapid changes in voltage magnitude, frequency, and phase angle, within its current and energy limits.*		
L&K Engineering **SMA Australia** **Tesla**	Limited direct comment. L&K sought a more technology-neutral definition and cautioned against locking in a specific implementation approach. SMA suggested phasor-based language may better express GFM behaviour.	Modified. Western Power will retain a behaviour-based definition but refine the wording by replacing **"controllable impedance"** with **"effective impedance"** to avoid prescribing internal implementation while preserving the intended terminal behaviour. Any further refinement can be considered through future guidance.
Consultation Paper Proposal 6.1 – Withstand SCR capability Withstand SCR performance standards: Minimum Generator Performance Standard of withstand SCR 2.0 (GFM) and 3.0 (GFL). Automatic Generator Performance Standard of withstand SCR 1.2 for GFM, with no Automatic Generator Performance Standard for GFL.		
Atmos Renewables **Collgar Renewables** **L&K Engineering** **Mint Renewables** **Neoen** **Nomad Energy** **OffGrid WA** **Smart Energy Council** **Synergy**	This was one of the main areas of stakeholder concern. Several stakeholders argued that fixed SCR thresholds are overly prescriptive or simplistic, and that a higher GFL MAS should apply in strong parts of the network. Others raised technology-neutrality and incentive concerns for GFM.	Modified/deferredd Western Power will adopt **a unified Minimum Generator Performance Standard of SCR <=3 for both GFL and GFM**. Automatic Generator Performance Standard levels for both technologies will be deferred pending further development of the WA system strength framework. Requests to increase the GFL MAS above this level are not accepted.

Submission	Comment	Western Power response
Consultation Paper Proposal 6.3 – Settings used to demonstrate withstand SCR General requirement for GFM and GFL inverter-based technologies: Require settings used to demonstrate withstand SCR not differ from settings required for other Technical Requirements unless agreed with AEMO and Network Operator.		
Atmos Renewables **L&K Engineering** **Mint Renewables** **Neoen** **Smart Energy Council** **Synergy**	Stakeholders were concerned that requiring one setting set across all conditions could lead to sub-optimal tuning at stronger sites, particularly where there is a wide spread between site SCR and the withstand SCR requirement. Several submissions sought flexibility and a clearer exception process.	Modified. Western Power will retain the principle that the **settings used to demonstrate compliance should, by default, be the same settings used in operation**. As part of further work undertaken by the PSSR Standards Review, consideration will be given to arrangements for enabling changes, if determined necessary by Western Power, to control settings where a single set of settings is impractical due to a particularly wide system strength operating envelope.
Contingency response requirements		
Consultation Paper Proposals 7 – Voltage phase angle jump Proposal 7.1 – GFL ±25° phase angle jump withstand (Minimum Generator Performance Standard) Proposal 7.2 – GFM ±25° withstand + fast opposition with response initiation ≤20 ms (Minimum Generator Performance Standard) Proposal 7.3 – Remain in operation for phase angle changes during faults (within positive-sequence criterion)		
Atmos Renewables **L&K Engineering** **Mint Renewables** **Neoen** **Nomad Energy** **Smart Energy Council**	Stakeholders questioned whether explicit phase-angle requirements duplicate fault ride-through obligations and whether the GFM 20 ms response requirement is too prescriptive. Some suggested vector shift protection settings could be a more practical alternative.	Retained/clarified. Western Power will retain the revised proposal: **±25° withstand for GFL, ±25° withstand plus response initiation within 20 ms for GFM**, and the requirement to remain in operation during fault-related phase angle changes within the criterion. Western Power considers phase angle response to be a distinct requirement, not a duplication of FRT. Guidance can clarify how “response initiation” is assessed and evidenced.

Submission	Comment	Western Power response
Consultation Paper Proposal 8.1 – Reactive current commencement time during contingencies **GFL** Minimum Generator Performance Standard: ≤ 40 ms Automatic Generator Performance Standard: ≤ 20 ms **GFM** Minimum Generator Performance Standard: ≤ 20 ms Automatic Generator Performance Standard: not proposed at this stage		
Atmos Renewables **Neoen** **Nomad Energy**	Some stakeholders considered fixed commencement times too prescriptive and preferred site-specific flexibility.	Modified. Western Power will modify the proposed Minimum Generator Performance Standard values of **40 ms for GFL** and **30 ms for GFM**. These are considered appropriate and consistent with the intended distinction between GFL and GFM capability. Default assessment at the connection point; inverter-terminal assessment may be considered where justified.
Consultation Paper Proposal 8.2 – Reactive current rise time during contingencies **GFL** Minimum Generator Performance Standard: ≤ 80 ms Automatic Generator Performance Standard: ≤ 40 ms **GFM** Minimum Generator Performance Standard: ≤ 80 ms Automatic Generator Performance Standard: not proposed at this stage		
Atmos Renewables **Mint Renewables** **Neoen** **Noman Energy**	Stakeholders generally sought flexibility and cautioned against fixed rise-time requirements where network conditions vary materially.	**Retained / Clarified.** Western Power will retain an **80 ms MAS for both GFL and GFM**, while clarifying that a longer rise time may be agreed where appropriate. Negotiated flexibility to be reflected in rule drafting.

Submission	Comment	Western Power response
Consultation Paper Proposal 8.3 – Negative-sequence control during contingencies **GFL** Minimum Generator Performance Standard: negative sequence current leading negative sequence voltage by about 90°, with clear prioritisation **GFM** Minimum Generator Performance Standard or Automatic Generator Performance Standard are not proposed at this stage (GFM negative sequence behaviour left to future work).		
Mint Renewables **Synergy**	Stakeholders generally supported aligning GFL requirements with established practice but cautioned against prematurely imposing equivalent requirements on GFM technologies	**Retained / Deferred.** Western Power will retain the **GFL requirement**, aligned with IEEE 2800-style intent, and **defer any GFM requirement** for future consideration.
Consultation Paper Proposal 8.4 – Fast opposition of voltage magnitudede changes **GFL** Not applicable **GFM** Minimum Generator Performance Standard**:** reduce the sensitivity of voltage magnitude to a given change in current within 20 ms after the disturbance, compared to when the facility was not connected.		
Atmos Renewables **Neoen** **Synergy**	Some stakeholders questioned whether this adds anything beyond existing reactive current and phase-angle related requirements.	Retained. Western Power will retain the proposal on the basis that opposition of voltage magnitude changes is a **distinct performance requirement** and addresses a separate dimension of disturbance behaviour.
Consultation Paper Proposal 8.5 – Fault ride-through activation thresholds **GFL** Minimum Generator Performance Standard**:** 80% and 120% Automatic Generator Performance Standard: 85% and 115% **GFM** Minimum Generator Performance Standard**:** 80% and 120%		
Neoen	Stakeholders raised concerns about fixed thresholds, particularly for GFM technologies that may not rely on a discrete internal FRT trigger.	**Retained / Clarified** Western Power will retain the proposed **80% / 120% thresholds**. Western Power's position is that this does not require a discrete internal GFM threshold setting, and that the under-voltage threshold is a relaxation from existing WEM settings.

Submission	Comment	Western Power response
		Rule drafting will clarify that the requirement is outcomes-based and does not prescribe internal control architecture.
Consultation Paper Proposal 8.6 – Use of total current during contingencies **GFM and GFL** Minimum Generator Performance Standard: total current will replace the maximum continuous current.		
Atmos Renewables **Neoen**	This proposal was generally supported. Some stakeholders suggested the concept could be incorporated by refining existing drafting rather than introducing a separate requirement.	Retained. Western Power will retain **use of total current** as the reference approach during contingencies, as it better reflects inverter behaviour and available short-term capability. Drafting can be refined, but no policy change is proposed.
Consultation Paper Proposal 8.7 – Active power recovery following contingencies **GFL** Minimum Generator Performance Standard: within a period of time agreed by AEMO and the Network Operator Automatic Generator Performance Standard: ≤ 100 ms **GFM** Minimum Generator Performance Standard: within a period of time agreed by AEMO and the Network Operator Automatic Generator Performance Standard: not pursued at this stage		
N/A	This issue attracted little substantive comment. No major alternative position was advanced.	Western Power will retain the proposal unchanged.
Consultation Paper Proposal 8.8 – Reactive current sustainment time during contingencies **GFL and GFM:** General requirement: The facility must substantially maintain the response required under subparagraph (1) until the end of the disturbance, or until another point agreed with the Network Operator and AEMO (consistent with the NER).		
L&K Engineering **Mint Renewable** **Neoen**	Stakeholders supported moving away from the earlier fixed tolerance approach, but some sought greater clarity around how sustainment should be interpreted.	**Modified / Clarified** Western Power's final position reflects the change already made in the revised proposal: the earlier **±2% fixed tolerance is removed and replaced** with a more flexible, NER-aligned formulation based on substantially maintaining the response.

Submission	Comment	Western Power response
		Project-specific reductions, where justified, can be addressed through negotiated pathways and guidance.
Consultation Paper Proposal 8.9 – Long duration faults **GFL** Minimum Generator Performance Standard: Reduce 2 seconds to 450 ms; replace adequately damped with adequately controlled Automatic Generator Performance Standard: not applicable **GFM** Minimum Generator Performance Standard: same as GFL Automatic Generator Performance Standard: not applicable		
N/A	This issue attracted little substantive stakeholder concern.	Western Power will retain the proposal unchanged.
Disturbance ride-through, oscillations and stability		
Consultationn Paper Proposal 9 – Disturbance ride-through for multiple disturbances GFL and GFM facilities must maintain continuous uninterrupted operation through sequences of multiple disturbances, subject to defined disturbance sequencing criteria.		
Atmos Renewables **Mint Renewables**	Broadly supported. The main feedback sought clearer drafting around sequencing of disturbances and how the end of a disturbance should be identified.	Retained/clarified. Western Power will retain the proposal. No substantive policy change is required. Drafting and procedures can clarify disturbance sequencing concepts.
Consultation Paper Proposal 10 – Damping of power system oscillations **GFL** No direct requirement, except the new definition of “adequately controlled”. **GFM** Minimum Generator Performance Standard: “oscillation neutral” in 0.1–100 Hz band Automatic Generator Performance Standard: not applicable		
Atmos Renewables **Collgar Renewables** **Mint Renewables** **Smart Energy Council** **Tesla**	Stakeholders generally supported an outcomes-based, “do no harm” approach, while cautioning against overly prescriptive assumptions or fixed frequency-based obligations.	Retained. Western Power will retain the **oscillation-neutral formulation**. The final position is that facilities should not degrade damping or introduce new instability, without prescribing internal control design.

Submission	Comment	Western Power response
		Any detailed implementation or study expectations can be addressed through guidance.
Consultation Paper Proposal 11 – Partial load rejection Modify the definition of continuous uninterrupted operation and clause A12.6.1.5 of the ESM Rules to recognise beneficial responses: active power opposing phase-angle jumps and primary frequency/inertial response opposing frequency changes.		
Atmos Renewables **Mint Renewables**	Stakeholders that addressed this issue were supportive. The clarification was seen as useful in removing ambiguity where beneficial inertial or active power responses occur during partial load rejection events.	Western Power will retain the proposal as drafted.
New proposal in the 2025 December Western Power Consultation Paper – Instability detection mechanism **GFL** Consistent with NER S5.2.5.10 (post NER version 234) **GFM** Not proposed at this stage		
Mint Renewables **Neoen** **SMA Australia** **Tesla** **Synergy**	Stakeholders generally supported the intent, but raised concerns about implementation maturity, false positives, attribution, device classification, cost and funding, and how far the requirement might extend.	Western Power will **retain the requirement for GFL facilities**. Western Power considers the system security risk sufficiently material to justify retaining the obligation, while recognising that implementation detail must be developed carefully. Detailed technical expectations, acceptable response types and practical implementation arrangements to be developed through guidelines.

Appendix B. Responses to stakeholder submissions

The submission period for the Consultation Paper on proposals 12-16 closed on 7 August 2025. DEED received 18 public submissions which are published on DEED's website. A summary of stakeholder submissions and DEED's responses is provided in the table below.

Submission	Comment	DEED Response
Consultation Paper Proposal 12 The following definition of system strength will be implemented in the ESM Rules: • System Strength: Relates to the ability of the power system to resist changes to the voltage waveform in a particular location, both during steady state operation and following a disturbance, including, but not limited to, a sudden change in a Load or an Energy Producing System, the switching of a Network element, tapping of transformers and faults		
APA Group	APA Group supports this Proposal.	Noted.
Chambers of Minerals and Energy of WA (CME)	CME supports this Proposal.	Noted.
Shell Energy	Shell Energy does not support this Proposal. Shell considers that the definition of System Strength in the NEM has resulted in the confusion of several distinct technical issues and often sub-optimal, poorly targeted and non-economic responses to emerging technical issues. Precise established electrical engineering concepts (e.g. fault level of x MVA, inertia as y MWs/MVA etc.) already exist and are quantifiable. Shell Energy considers using this more precise terminology is more appropriate for developing effective technical solutions.	The ESM Rules already define System Strength. This Proposal seeks to amend this existing definition to account for locational considerations and the need to capture steady state operating and disturbances. DEED considers that the proposed revised definition of System Strength acknowledges this dynamic. Further, the PSSR Standards Review did not identify a sufficient need at this time to deviate from the current approach of defining System Strength with respect to voltage waveform.
SMA	SMA considers that the reference to "voltage waveform" is a bit nebulous and could be interpreted in various ways. The definition would be strengthened by reference to the maintenance of the angle of the voltage waveform.	The PSSR Standards Review did not identify a sufficient need at this time to deviate from the current approach of defining System Strength with respect to voltage waveform.

Submission	Comment	DEED Response
Synergy	Synergy supports this Proposal.	Noted.
Tesla	Tesla supports this Proposal.	Noted.
Western Power	Western Power supports the proposed definition and acknowledges that it leaves scope to define precise measures to address system strength issues under specific Technical Requirements. However, Western Power proposes that consideration is given to replacing “steady state operation” with “normal operation”.	Noted. The PSSR Standards Technical Working Group discussed and preferred “steady state operation” to “normal operation”. Further, the terminology “steady-state” is already used within the ESM Rules in the following definitions: • **Power System Stability**: Means when the SWIS will return to an acceptable steady-state operating condition following a disturbance. • **Stable**: Means when the SWIS will return to an acceptable steady-state operating condition following a disturbance.

Consultation Paper Proposal 13 AEMO, DEED and the Network Operator to align on a forecasting approach, in consultation with interested stakeholders through public consultation. This approach should include the methodology, inputs, assumptions, and scenarios necessary for the determination of an expected 10-year generation and ESR capacity outlook on an annual basis. This fleet forecast should reflect capacity (i.e. MW), technologies (e.g. gas/wind/solar) and broad locations (e.g. regions).		
AEMO	AEMO strongly supports a future fleet outlook for use in fault assessments, and notes that it should interact and be aligned with the coordinated assumptions and inputs process outlined under Proposal 16. AEMO also supports the consultation aspect of the proposal. AEMO notes that determining the future fleet outlook requires more than just alignment on a common set of assumptions. Ideally, it should consider what the optimal mix of technologies is, and where a facility should be	Noted. DEED agrees that separation of the forecasting exercise from procurement is prudent. The Review Outcome now considers that the FPCG (see proposal 16) should assume the role for identifying System Strength Shortfalls, while the Network Operator will be required and responsible for alleviating any residual forecast system strength shortfalls through appropriate network reinforcements or the procurement of non-network solutions or services (through the NCESS framework).

Submission	Comment	DEED Response
	located, under a particular scenario based on an agreed set of consistent input assumptions. AEMO recommends that roles and responsibilities for determining the optimal fleet mix should be clearly defined at the detailed design phase. AEMO also recommends that consideration should be given to separating the entity responsible for setting generation assumptions for the determination of system strength requirements from the entity responsible for providing the service.	
APA Group	APA Group supports the alignment on forecasting approach assuming this relates only to inputs required for fault level assessments. APA Group considers the need for alignment on other forecasting assumptions, inputs, and approaches is unclear.	Noted. Please refer to responses to Proposal 16 for the intended approach for other forecasting inputs/assumptions.
Chambers of Minerals and Energy of WA (CME)	CME supports a single, aligned forecasting approach to assist the Network Operator to forecast and maintain minimum fault levels for network protection, and strongly agrees with the need for robust public consultation. CME seeks clarity on which organisation is ultimately responsible and accountable for finalising and publishing the forecasts, and whether it will impact the current ESOO process.	Noted. The FPCG will agree and publish relevant forecasts. The proposals do not alter existing forecasting responsibilities but aim to improve collaboration and alignment of input and assumptions across planning instruments, to improve consistency. Once the relevant forecasts have been agreed and published, there will be a requirement for AEMO, the Network Operator and the Coordinator to take the Fleet Forecast into account when developing the Long Term Projected Assessment of System Adequacy, Transmission System Plan and Whole of System Plan.
Collgar Renewables	Collgar Renewables supports this Proposals. Collgar Renewables strongly believes that there should be clear and enforceable obligations on one or both parties	Noted. The revised review outcome 12 addresses the requirements for the FCPG to identify shortfalls of system strength and for the Network Operator to be responsible for alleviating any residual forecast system strength shortfalls through appropriate network reinforcements or the

Submission	Comment	DEED Response
	(AEMO /Network Operator) to maintain minimum levels of system strength across the SWIS. Collgar Renewables supports a location-based fleet outlook and urges it to be used to inform immediate investment planning.	procurement of non-network solutions or services (through the NCESS framework).
SMA	SMA supports the proposed forecasting approach and recommends targeted industry consultation with inverter original equipment manufacturers (OEMs) like SMA.	Noted.
Synergy	Synergy is broadly supportive of this Proposal and provides the following suggested refinements to the proposed forecasting approach. • The methodology used is transparent; • There are clear and measurable metrics to quantify system strength; • Technology neutrality is maintained, ensuring that definitions can be applied fairly across synchronous and asynchronous technologies; and • There is integration of existing standards and other frameworks (e.g. System Strength Impact Assessment Guidelines) where possible.	Noted.
Tesla	Tesla seeks further clarification on the link between fault level and network congestion.	The future fleet outlook can also have a broader use, for example in analysing the impact of network curtailment on market outcomes. E.g. the fleet forecast can support dispatch studies to identify curtailment due to system strength and PSSR constraints caused by high concentrations of IBR, or otherwise, in a particular part of the network.
WA Expert Consumer Panel (WA ECP)	The WA ECP members support the intent of aligning the forecasting approach between AEMO, DEED and the Network Operator as proposed.	Noted. Please refer to responses to Proposal 16 for the intended approach for other forecasting inputs/assumptions.

Submission	Comment	DEED Response
	This should recognise the different needs of each party with regard to the purpose of their forecast/s, and that they use different sources of input or support in preparing their forecasts.	
Western Power	Western Power supports this Proposal and agrees that developing a coordinated 10-year fleet outlook is critical for forecasting fault levels and anticipating system strength challenges across the SWIS. Western Power recommends that a general obligation to develop the system strength forecasting methodology be assigned to the party with overarching accountability for system security—rather than prescribing discrete responsibilities in the ESM Rules.	Noted. DEED notes the revised review outcome to clarify the roles of the Coordinator, AEMO and Western Power for identifying system strength shortfalls.

Stakeholder	Stakeholder Feedback	DEED's Response
Consultation Paper Proposal 14 The Network Operator will be required to: 14.1. develop and publish a methodology for calculating minimum fault level requirements at each transmission node; 14.2. compare the minimum fault level requirements with the expected fault level at each node as part of the Transmission System Plan (TSP) each year, using the fleet outlook and the demand forecast, as part of the System Strength calculation; and 14.3. resolve any forecast shortfalls through network reinforcement or non-network solutions (e.g. competitive NCESS procurement), as necessary.		
AEMO	AEMO supports the intent of this proposal but suggests clarification that the Network Operator will be required to publish the results of the minimum fault level requirements for each Transmission Node, as part of the Transmission System Plan. AEMO recommends that there are provisions in the detailed design to enable appropriate information sharing between AEMO and the Network Operator, to support operability of the framework.	DEED notes the revised review outcome and agrees that the results of the minimum fault level requirements for each Transmission Node should be published. DEED agrees that appropriate information sharing provisions are important to support the operability of the framework and clarifications have been included in the draft Amending Rules.
APA Group	APA Group supports this Proposal as the minimum fault levels are essential for protection scheme operation and network stability and reliability. The Network Operator is best placed to determine the minimum base line, monitor fault levels at nodes and then resolve any shortfalls.	Noted.
Chambers of Minerals and Energy WA (CME)	CME supports this Proposal and notes that the Consultation Paper identified that there is currently no mechanism to address system strength issues that emerge post-connection.	Noted. Review outcome 12 is intended to resolve this existing limitation.
Collgar Renewables	Collgar Renewables supports the intent of this Proposal. However, Collgar Renewables recommends that the objective be broadened to explicitly include the stable operation of existing inverter-based resources (IBR), not just network protection.	Noted. The Network Operator has an existing obligation to meet network technical requirements, including adequacy of protection systems. The review did not identify the need to

Stakeholder	Stakeholder Feedback	DEED's Response
	Further, Collgar Renewables recommends that further obligations are placed on the Network Operator to upgrade or replace protection schemes that are not compatible with operation under low short-circuit ratio (SCR) or weak system conditions. This will ensure that protection systems remain effective and do not compromise system security as system strength declines further. Collgar Renewables also recommends that fault level shortfalls be published and updated annually to clearly identify where transmission or system strength investment is immediately required to unlock renewable generation.	extend these obligations or requirements for the Network Operator. DEED notes the revised review outcome and the requirement for AEMO to publish every two years the results of the minimum fault level requirements for each Transmission Node in the System Strength Report. This reporting cycle balances the need for timely visibility of emerging system strength risks across the SWIS, enabling early operational measures and application of the regulatory incentive framework (proposed in Consultation Paper), while providing sufficient time to assess outcomes and commence timely procurement or any necessary mitigation measures.
Neoen	Neoen suggests separating the requirements for System Strength and minimum Fault Level required for network protection.	DEED notes that Proposals 12 and 15 recognise the broader nature of System Strength. This proposal specifically focuses on minimum fault levels.
Perth Energy	Perth Energy raises concerns regarding the timing of Western Power investment to address shortfalls and whether this occurs reactively to connections or optimised over several years. Perth Energy considers that clearer guidance could be provided to investors to develop and maintain a plant balance that better supports the Government's objectives.	The existing NCESS framework will be used to procure non-network solutions or services to address residual system strength shortfalls. The proposed Amending Rules include a requirement to clarify that this should occur with enough lead time to alleviate a System Strength Shortfall before it is forecast to materialise. The fleet forecast and system strength shortfalls will be required to be published, providing clear investment signals to existing participants and proponents of new facilities.
Shell Energy	Shell Energy supports this Proposal and notes that the minimum fault level has an impact on power quality, reactive power management, and control system stability. Accordingly, Shell Energy suggests that the minimum	DEED agrees with this suggestion.

Stakeholder	Stakeholder Feedback	DEED's Response
	expected fault level should be tracked and tabulated in a similar manner to the way maximum fault levels are.	
SMA	SMA considers that the Proposal is a reasonable starting point. However, it's unclear from the Proposal regarding the funding mechanism for the Non-Co-optimised Essential System Services (NCESS) procurement and whether it is intended to be funded by the consumer, the taxpayer or through another mechanism. SMA notes that in the NEM, there is a mechanism for shared grid stability services to be funded by the generators that consume system strength. This is implemented using a System Strength Charge for new connections by generators that will consumer system strength.	Noted. Under the ESM Rules, the costs of the Network Operator's NCESS contracts, will be recovered through its network tariffs. This will result in system strength costs being shared with all network users, including generators and retailers. DEED recognises the importance of minimising the forecast system strength shortfalls before they arise, rather than relying solely on centralised proactive procurement once shortfalls become apparent. An appropriately designed incentive framework will therefore be critical to ensure the State Electricity Objective is achieved, while maintaining investment confidence and system security throughout the energy transition. To address this, separately to this Information Paper, DEED is consulting with stakeholders on potential regulatory incentives to reduce the forecast system strength shortfalls, reducing the need for procurement and the costs to consumers.
Smart Energy Council (SEC)	The SEC strongly supports DEED's intent to: • Establish a centralised system strength procurement and investment planning function (via NCESS) • Allow for synthetic inertia providers to participate in RoCoF and system strength frameworks The SEC recommends that prioritisation should be given to the flexibility and modularity in the future system strength framework to reduce reliance on synchronous condensers and enable BESS-led services.	Noted.

Stakeholder	Stakeholder Feedback	DEED's Response
Synergy	Synergy agrees with the proposed approach at a high level but suggests that the following matters require detailed consideration as part of the progression of this Proposal: • Should there be coordination required between the Network Operator, AEMO and DEED in implementation of this approach, there must be a clear and transparent division of responsibilities between these entities. • A mechanism should be implemented to allow stakeholders to query or request clarity from the Network Operator on the methodology and calculation of fault levels at transmission nodes, especially in circumstances of low inertia. • The whole of system cost impact must be considered, and cost benefit analysis should be a requirement as part of any procurement initiatives to address forecast shortfalls. • Clarity should be provided on the cost allocation approach for each project undertaking network reinforcement or the non-network solutions. Sufficient prior notice should be provided to impacted stakeholders.	Noted. DEED and agrees that the delineation of responsibilities between parties is important. The revised review outcome requires that the methodology and calculation of fault levels at transmission nodes is made transparent to stakeholders. The existing NCESS framework will be used to procure services required to alleviate forecast system strength shortfalls. Under the ESM Rules, the costs of Network Operator's NCESS contracts will be recovered through its network tariffs. This will result in system strength costs being shared with all network users, including generators and retailers. Separately to this Information Paper, DEED is consulting with stakeholders on potential regulatory incentives to reduce the likelihood of forecast system strength shortfalls, reducing the need for procurement and the costs to consumers.
Tesla	See feedback provided as per Proposal 13.	Noted.
Western Power	Western Power supports the proposal to maintain minimum fault levels across the SWIS to safeguard network protection and ensure the stable operation of inverter-based resources (IBRs). While acknowledging that transparent forecasting of system strength shortfalls is essential, Western Power recommends that responsibility for forecasting and declaring minimum fault level shortfalls, particularly to support stable IBR operation, be assigned to AEMO. Western Power will continue to provide AEMO with the minimum fault level	DEED notes the revised review outcomes regarding roles and responsibilities for forecasting shortfalls of system strength to address Western Power feedback.

Stakeholder	Stakeholder Feedback	DEED's Response
	requirements necessary for the effective operation of network protection systems. To support AEMO in fulfilling this responsibility, Independent Power Producers (IPPs) should be obligated under the ESM Rules to notify AEMO of the minimum fault levels required for the proper functioning of their protection equipment.	

Stakeholder	Stakeholder Feedback	DEED's Response
Consultation Paper Proposal 15 15.1. The Network Operator will be required to forecast shortfalls in system strength required to host the expected portfolio of inverter-based resources on the system, and to take steps to procure services that can address these shortfalls through competitive mechanisms (using the NCESS framework).		
AEMO	AEMO supports the proposal for a centralised planning function for system strength – to incentivise new connections.	Noted.
APA Group	APA Group supports the Network Operator being required to forecast shortfalls in system strength and the procurement of services to address these shortfalls through competitive mechanisms.	Noted.
Chambers of Minerals and Energy WA (CME)	CME agrees that the Network Operator needs to be proactive in investing and maintaining system strength to address any forecast shortfalls required to host new inverter-based resources. The use of competitive mechanisms to ensure efficient cost is also welcome.	Noted.
Collgar Renewables	Collgar Renewables strongly supports a centralised and forward-looking approach.	Noted.
Shell Energy	Shell Energy considers the use of "system strength" as an umbrella metric is not suitable for designing power systems. Shell Energy believes it is more appropriate to consider	DEED considers that while specific technical requirements and local system conditions must be considered when identifying solutions, these requirements are often driven by underlying

Stakeholder	Stakeholder Feedback	DEED's Response
	individual specific requirements and design the most cost-effective solution going forward.	system strength limitations. Addressing individual issues in isolation risks overlooking broader system impacts and may not result in an efficient whole-of-system outcome. The proposed framework is intended to identify and manage system strength needs at a system level, while allowing a range of network and non-network solutions to be assessed and implemented. This approach supports coordinated planning, provides greater certainty for proponents, and helps to ensure that solutions are delivered in a manner that maintains system security while minimising overall costs to consumers.
SMA	SMA supports the proposal for a centralised system of investment to ensure system strength to meet an expected fleet of IBR.	Noted.
Synergy	Synergy agrees that the Network Operator should be obliged to forecast for shortfalls in system strength and to make this information publicly available. Synergy agrees that a proactive approach is needed to ensure that system strength is maintained in the SWIS. However, Synergy considers that NCESS should not be the sole solution for system strength concerns. Synergy also suggests the following items are considered: • The chosen mechanism must be transparent, with stakeholder engagement and consultation throughout the process (covering forecasting methodology, assumptions, modelling results, and outcomes). • The principles of economic efficiency and transparency should be integral to decisions on future investments into system strength for the SWIS.	Noted. DEED agrees that NCESS procurement should not be the sole solution for system strength concerns. To address this, DEED is consulting with stakeholders on potential regulatory incentives to reduce the likelihood of forecast system strength shortfalls, reducing the need for procurement and the costs to consumers. DEED considers that the NCESS framework is the most suitable mechanism for competitively procure and allocate costs related to system services to alleviate residual forecast system strength shortfalls.

Stakeholder	Stakeholder Feedback	DEED's Response
	• Market Participants will require clarity on how the cost of these services are expected to be allocated, and the cost allocation methodology must be consulted appropriately.	
Tesla	Tesla supports DEED's consideration of centralised framework to provide planning certainty for both the Network Operator and proponents seeking connection, as well as to enable efficient levels of investment. Tesla notes that there is an opportunity to design the system strength framework to support efficient procurement by reflecting on challenges with the timeframes associated with regulatory investment tests (i.e. RIT-T or NFIT) and notes that, in some instances, these processes can favour certain solutions over others.	Noted. DEED considers that the NCESS framework remains the most suitable mechanism to competitively procure system strength services and allocate associated costs. DEED notes the review outcome that requires the Network Operator, when it considers an NCESS procurement process may be required, to submit a request to the Coordinator as early as reasonably practicable for a determination on whether the procurement process should be triggered. DEED also recognises the importance of minimising the forecast system strength shortfalls before they emerge, rather than relying solely on centralised proactive procurement once gaps become apparent. Separately to this Information Paper, DEED is consulting with stakeholders on options for a regulatory incentives framework to minimise system strength shortfalls and reduce the cost of any procurement of solutions by Western Power.
WA Expert Consumer Panel	ECP members consider this proposal to be reasonable, providing that good practice evaluation of options occurs to ensure that system strength enhancements are only made where there is a sufficient level of certainty that the expected fleet will eventuate in a region, requiring the additional system strength.	Noted.
Western Power	Western Power supports the Proposal in principle. To enable effective implementation of this framework, Western Power highlights the need for clear delineation of	Noted.

Stakeholder	Stakeholder Feedback	DEED's Response
	accountabilities between forecasting, investment triggering, and delivery. Western Power recommends that AEMO assumes the role of central planner for system strength, as this would ensure independence, consistency with broader system strength responsibilities, and alignment with NEM arrangements. Western Power will continue to be responsible for conducting system strength impact assessments triggered by customer connection processes and assist in the facilitation of the mitigations due to the connection of new participants and their facilities to the SWIS.	DEED notes the revised review outcomes regarding roles and responsibilities for identifying forecasted shortfalls in system strength to address Western Power feedback.

Stakeholder	Stakeholder Feedback	DEED's Response
Consultation Paper Proposal 16 To achieve a coordinated approach to forecasting inputs and assumptions, a collaborative process between the parties responsible for forecasting (DEED, AEMO and the Network Operator) should be established, with general rules included in the ESM Rules to guide the parties towards effective collaboration.		
AEMO	AEMO strongly supports the proposal to coordinate the approach to forecasting inputs and assumptions. This will utilise existing planning arrangements (Whole of System Plan (WOSP), ESOO and the TSP) and improve the limited integration currently required by the ESM Rules and other instruments. In addition, AEMO considers that the proposed framework should consider the following aspects: • leveraging the Multi-Sector Modelling (MSM) and Inputs, Assumptions and Scenarios Report (IASR) could provide a useful starting point for aligning inputs and assumptions. These processes currently inform the analysis undertaken by AEMO in the NEM and WEM for the ESOOs and could potentially support Western Power's network planning processes. However, there will need to be flexibility in how uncertainty is treated in each process and in different time periods. For example, to ensure reliability outcomes, the ESOO will undertake forecasting of future generation on the basis of committed resources whereas ensuring suitable system strength outcomes will require a forecast of the likely future fleet. • consideration could be given to uplifting the capabilities of the WOSP and its related processes. If it provided more frequent guidance the outputs (potentially including an Optimal Development Path) could inform the annual planning processes for the TSP, ESOO and relevant components of the GSOO, and facilitate	Noted. DEED considers that the option of a prescribed register will likely introduce unnecessary rigidity and an increased administrative burden with limited additional benefit relative to a less formal but still collaborative approach. DEED acknowledges that confidentiality restrictions and formalising the approach for data transfer/access will necessitate appropriate consideration. The review outcome includes high-level provisions regarding information sharing, with the details to be considered by the Forecast Planning and Coordination Group as part of the development of the terms of reference.

Stakeholder	Stakeholder Feedback	DEED's Response
	requirements for the SWIS. The MSM and IASR processes could also be used to inform the timing and development of the WOSP. • the collaborative process under this proposal will still need to result in some form of a data repository or public data set, as this will be fundamental to coordinating inputs and assumptions and promoting reproducibility. The design of the framework therefore needs to resolve existing concerns that some data required to enable effective integrated planning is likely to be confidential or not currently shared with AEMO. • the framework needs to ensure that confidentiality requirements around data do not prevent requisite analysis and modelling by AEMO. For example, access to specific data will be essential to determine the remedies for a system strength issue at a specific location, e.g. through changes to a Facility (re-tuning), during the connection process or post-connection, or through a constraint on the Facility. Access to data will also be essential to determine the extent to which these solutions offer longer-term remediations or are temporary fixes. To some degree, information could be aggregated to protect confidentiality without foregoing transparency, but this is not always possible.	
APA Group	APA Group supports, as per Proposal 13, the alignment on forecasting approach assuming this relates only to inputs required for fault level assessments. APA Group considers that the need for alignment on other forecasting assumptions, inputs, and approaches is unclear. The objectives and purposes of forecasts developed for different documents (e.g. PASA, TSP, and WOSP) often differ and may warrant the use of varying assumptions,	Noted. This proposal is intended to ensure a considered approach is taken between the Coordinator, AEMO and the Network Operator when choosing inputs and assumptions to be used across the various forecasting exercises. This will ensure that consistency in approach is taken when appropriate to do so.

Stakeholder	Stakeholder Feedback	DEED's Response
	particularly where forecasts are testing system boundaries rather than aiming to reflect a most likely development scenario.	Once these inputs/assumptions have been considered, the intention is for the forecasts to continue to be developed by the existing responsible entity as per existing process.
Chambers of Minerals and Energy WA (CME)	CME supports this Proposal, with further comments under Proposal 13.	Noted.
Collgar Renewables	Collgar Renewables supports this Proposal.	Noted.
Shell Energy	Shell Energy support the intent of this Proposal. However, Shell Energy considers that while common and verifiable inputs should be shared, each party should retain the freedom to develop independent forecasts, allowing for a more realistic and useful range of outcomes for planning processes.	This proposal is intended to ensure a considered approach is taken between the Coordinator, AEMO and the Network Operator when considering what inputs and assumptions should be used across the various forecasting exercises. This will ensure that consistency in approach is taken when appropriate to do so. Once these inputs/assumptions have been agreed, the intention is for the forecasts to continue to be developed by the existing responsible entity as per existing process.
SMA	SMA supports this Proposal.	Noted.
Synergy	Synergy supports this Proposal.	Noted.
WA Expert Consumer Panel	ECP members support this Proposal, noting the comments on forecasting under proposal 13. ECP members note that this proposal appears to reflect a broader policy direction. It is important to ensure that incorporating it into the ESM Rules does not make cooperation becoming cumbersome	Noted.
Western Power	Western Power supports this Proposal.	Noted.