

AEMO review of technical requirements for connection

Update Report (Part 1)

Revised recommendations
stakeholder forum

3:00-4:30pm (AEST) 9 August 2023



Important notes

- The information presented today does not cover all AEMO's positions and recommendations in this Review, and presentations may contain errors or inconsistencies. Please refer to AEMO's published reports for definitive information and for submission purposes: <https://aemo.com.au/en/consultations/current-and-closed-consultations/aemo-review-of-technical-requirements-for-connection>.
- This stakeholder forum will be recorded by AEMO for the purposes of its consultation. AEMO may make the recording available to stakeholders who have not been able to attend the session live.
- **By attending the forum, you consent to AEMO recording the forum and using the record for these purposes.**
- **No other recording of the meeting is permitted.**

Agenda

Item	Issue	Timing
1	Introduction & context a) Forum objectives & participation b) Regulatory context & current status	10 mins
2	Draft Recommendations (including Q & A) a) NER Sch. 5.2 - Conditions for connection of Generators b) NER Sch. 5.3a - Conditions for connection of Market Network Services c) NER Chapter 5 structural amendments	50 mins 10 mins 15 mins
3	Next steps	5 mins

Forum purpose & participation

Stakeholder forum objectives

To provide:

1. **Context:** Current status of the Review and consultation
2. **Recommendations:** Overview of revised recommendations made by the Update Report (Part 1)
3. **Q&A:** Opportunity for stakeholders to raise questions or issues regarding the revised recommendations.

Consultation submissions can be sent to:

contact.connections@aemo.com.au

Get in touch with the Project Team throughout the Review via AEMO's Contact Connections email address.

Participation and engagement today

- AEMO welcomes questions on the issues presented
- Questions and issues can be raised in the Teams chat window
- Attendees are encouraged to “Like” other questions
 - Responses will be prioritised on this basis
- Discussion will be focussed on higher level issues rather than detailed technical discussion
- We may not be able to address all queries or issues today. In this event we:
 - Encourage you to provide feedback on our revised recommendations via the stakeholder engagement process which is now open
 - Get in touch with the Project Team with any questions that you need resolved in order to make your submission.

Regulatory context

NER 5.2.6A requirements

AEMO must:

- at least once every 5 years, review some or all technical requirements for connection in NER Schedules 5.2 (Generators), 5.3 (Loads) and 5.3a (Market Network Service Providers)
- assess whether technical requirements should be amended, having regard to:
 - (1) the National Electricity Objective
 - (2) the need to achieve and maintain power system security;
 - (3) changes in power system conditions
 - (4) changes in technology and capabilities of facilities and plant.
- AEMO must publish an Approach Paper, a Draft Report and a Final Report, and submit any Rule Change request to the AEMC thereafter.

Fast track Rule change potential

- AEMO has undertaken a number of measures to support a potential fast-track process
- AEMO will consider whether to request the AEMC to consider the 'fast track' rule change process, for final recommendations
- Extent of fast track rules proposal to be determined once outcomes of consultation are assessed.

Current status

Scope

Draft recommendations

Revised recommendations

Final recommendations



12 Oct 2022

Approach Paper publication



3 Mar & 4 Apr 2023

Draft Report publication



26 Jul & late Aug 2023

Update Report & Draft Rules publication



Oct - Nov 2023

Final Report publication



Nov - Dec 2023

Rule change proposal(s)

20 Apr & 23 May 2023
Consultation closure

23 Aug & late Sep 2023
Consultation closure

Refine scope and preferred solutions in consultation with stakeholders

Review feedback, refine recommendations & draft Rules

Review feedback, refine recommendations & finalise Rules

Participate in Technical Focus Groups

Review Draft Report

Participate in stakeholder consultation as required

Review Draft Rules

Participate in stakeholder consultation as required



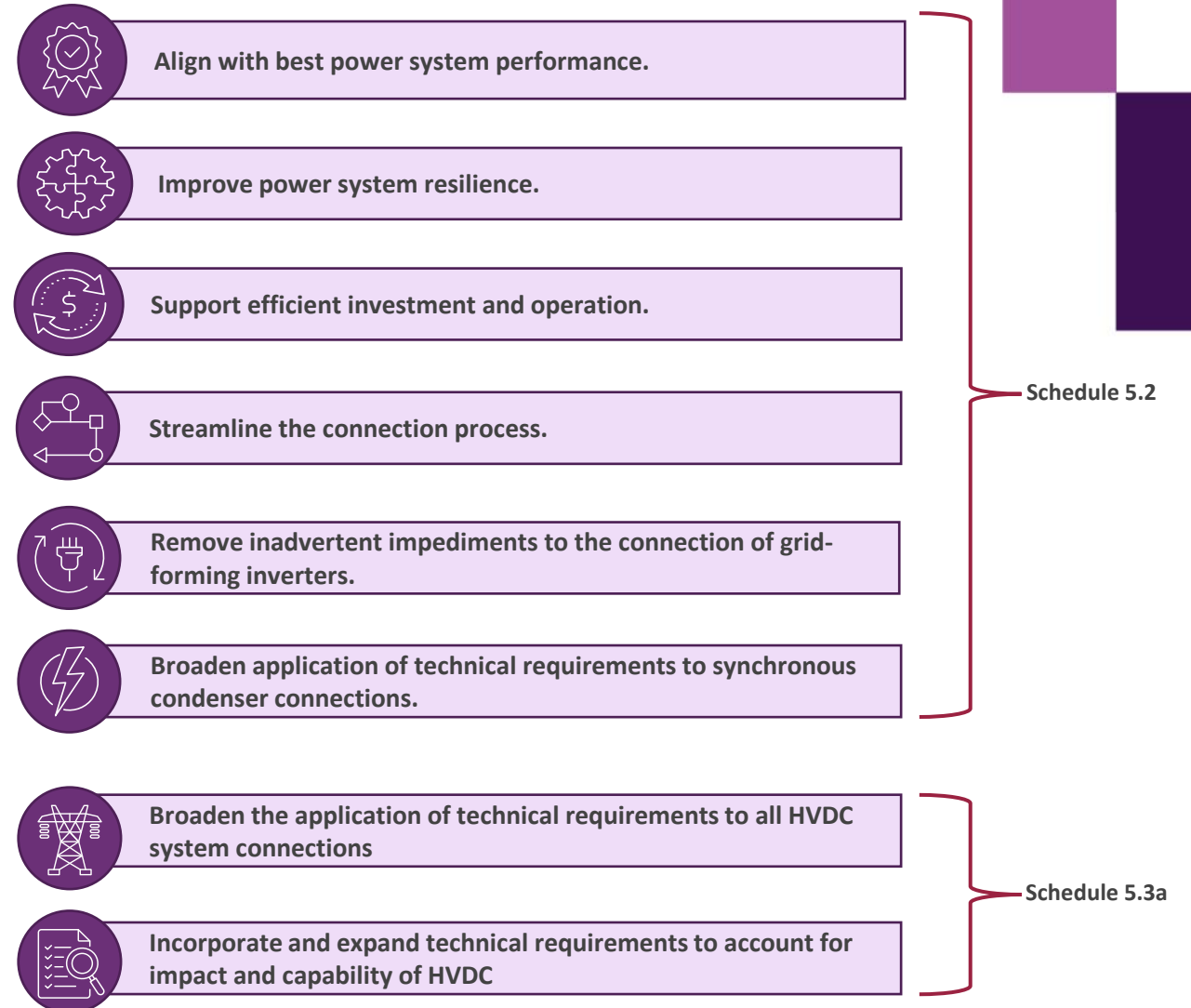
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Activity	Update Report (Part 1) key dates	Update Report (Part 2) key dates
Update Report published	26 July 2023	Late August 2023
Update Report consultation closes	23 August 2023	Late September 2023
Final Report released	October 2023	October – November 2023
AEMC formally notified	November 2023 (indicative)	November 2023 (indicative)

Revised recommendations at a glance

Schedule and clause	Issues
Schedule 5.2 Conditions for Connection of Generators	34
S5.2.1 – Outline of requirements	1
S5.2.5.1 – Reactive power capability	3
S5.2.5.1, S5.2.5.5, S5.2.5.7, S5.2.5.8	1
S5.2.5.2 – Quality of electricity generated	1
S5.2.5.4 – Generating system response to voltage disturbances	3
S5.2.5.5 – Generating system response to disturbances following contingency events	12
S5.2.5.7 – Partial load rejection	2
S5.2.5.8 – Protection of generating systems from power system disturbances	3
S5.2.5.10 – Protection to trip plant for unstable operation	1
S5.2.5.13 – Voltage and reactive power control	6
Ch 10 definition – CUO	1
Schedule 5.3a Conditions for connection of Market Network Services	8
S5.3a.1a – Introduction to the schedule	1
S5.3a.4 – Monitoring and control requirements	1
S5.3a.8 – Reactive power capability	1
S5.3a.13 – Market network service response to disturbances in the power system	3
New clause	2
Multiple schedules	2
S5.2.5.2, S5.2.5.6, S5.2.5.10, S5.3.7, S5.1.5	1
S5.2.5.2, S5.2.5.6, S5.3.8, S5.3a.11, S5.1.6	1
Total issues with recommendations	44

High level objectives



NER Schedule 5.2 recommendations

Conditions for Connection of Generators

Please enter your questions in the webinar chat.

Please “Like” other stakeholder’s questions to prioritise issues addressed in the chat



Streamline the connection process.



Align with best power system performance.

S5.2.5.4 Overvoltages >130%

- Recommendation developed following stakeholder feedback on Draft Report:
 - Amend S5.2.5.4(a) to
 - “at least”
 - Peak voltage at least 184% of *nominal voltage*
 - Considering the waveforms and durations contemplated in IEC 60071-1 for switching surges and lightning impulse
 - Add S5.1.4(a1) to require NSP to design its network and undertake insulation coordination so that switching of *network* elements does not cause *connected plant* to experience **switching surges** of the type contemplated in IEC 60071-1 for voltages **above those described in S5.1a.4 of the system standards** (the power frequency overvoltage curves)
 - Extend NER 5.7.2(a) to allow a Registered Participant who has reason to believe that equipment owned or operated by a Registered Participant with whom it has a connection agreement to request testing **or assessment** of the relevant equipment.
 - If there is a problem with surges on the Schedule 5.2 system, and there is reason to believe it is from the NSP’s network, then the Generator/IRP can assessment to determine if the network is causing the surge



Streamline the connection process.

S5.2.5.5 Form of Multiple Ride Through Requirement

- Draft report proposed MAS that includes declaration of specific limitations and a test suite.
 - MAS proposal received strong support
 - Stakeholders liked the test suite (as it was a limited set) but some NSPs wanted more targeted assessments.
- Revised recommendation, based on feedback:
 - Retained the proposed MAS – declaration of specific limitations
 - Schedule 5.2 Participant may request advice from the NSP on combinations of *contingency* events (within the boundaries described in the MFRT AAS & MAS), likely to be onerous
 - NSP may not request additional studies unless it has reasonable grounds to believe that the plant may have a specific limitation not adequately disclosed.
 - Aims to target the most onerous conditions considering the connection location
 - Also aims to limit to only the useful and necessary assessments
 - Balances NSP rights and Schedule 5.2 Participant rights.



Align with best power system performance.

S5.2.5.10 Requirements for response to instability

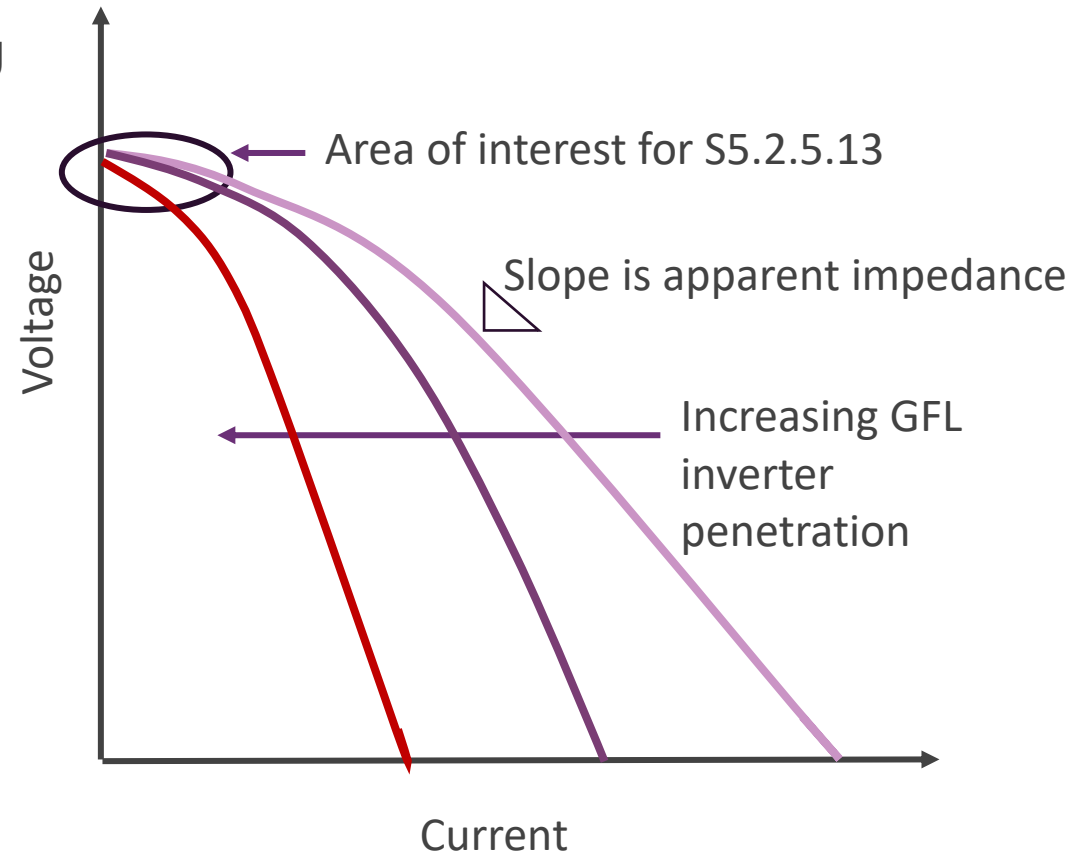
- Substantial feedback on this clause, with two key issues:
 - Protection operation based on oscillation without knowing if the plant was the cause could cause unnecessary tripping of plant
 - Concerns about the technology maturity for protection systems/ other systems to identify if the plant is causing the oscillation.
- Revised recommendation, based on feedback:
 - AAS requires protection system and a detection system but:
 - On detection of instability execute a **hierarchy of automated actions** based on **configurable enablement and trigger conditions, thresholds and timeframes** to be agreed with the NSP and AEMO, where
 - actions to disconnect the plant may only be taken where plant is **contributing to the instability** and
 - actions are executed promptly on meeting the applicable trigger conditions through a **protection system or other automated system**.
 - MAS requires, where the plant can **change voltage at its connection point by more than 1%**, a **detection system and a process to manage instability promptly on detection**, in a manner agreed with AEMO and NSP.
- Other requirements – refer to detail in the draft NER amendments.



Align with best power system performance.

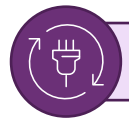
S5.2.5.13 Voltage control –specifying the conditions for tuning

- Received feedback around test results not matching modelled response (particularly reactive risetime)
- In workshops also discussed that fault level was not really the right measure to describe system conditions for S5.2.5.13
- In the drafting, introduced apparent system impedance as a measure.
 - Plan to do some simulations to confirm efficacy of this approach





Support efficient investment and operation.



Remove inadvertent impediments to the connection of grid-forming inverters.

Continuous uninterrupted operation

Issue	Feedback	Response
Request to amend S5.2.5.4 requirements for CUO in 90 -110% range from workshops.	Stakeholder consultation feedback supported the 10% range, but some stakeholder disagreement on methodology.	Incorporated in Draft Report Addressed in Rules drafting - Focused on performance outcomes rather than methodology.
AEMO proposed to incorporate frequency response, inertial response, phase jump response explicitly in CUO or related clauses.	Supported by stakeholders.	Addressed in Rules drafting in CUO definition.
CUO definition is focused on fault ride through, not other types of disturbances	Transgrid identified this issue in feedback to the Approach paper.	Addressed in Rules drafting - Make definition broader to cover all types of disturbances.

CUO – detail of implementation

- For S5.2.5.4 – focus rule change on outcomes and leave methodology to a guideline. In 90-110% range:
 - For variations of up to 10% of connection point voltage,
 - No variation in active power except for transient response, losses, energy source availability and any other factors that the NSP & AEMO agree are reasonable in the circumstances
 - No reduction in reactive power capability of the operating productions units below the minimum amounts to be absorbed or supplied (as applicable considering the voltage change) under the performance standard established under S5.2.5.1
 - > 10% step – allow for temporary reduction of active power output and temporary reduction in reactive power capability corrected by tap-changing transformer action.

- In CUO definition – for frequency, inertial and phase jump responses:
 - ... accounting for, where applicable:
 - Inherent or programmed response in accordance with good electricity industry practice, opposing rate of change of frequency (inertial response) or opposing phase angle jumps; and
 - Response consistent with the operation of the plant in accordance with clause 4.4.1(c1) (primary frequency response)

Q&A time

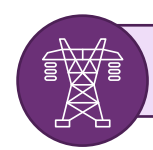
Please enter your questions in the Teams chat.
Please “Like” other questions to prioritise responses.

NER Schedule 5.3a recommendations

Conditions for Connection of Market Network Services

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Broaden the application of technical requirements to all HVDC system connections



Incorporate and expand technical requirements to appropriately account for the impact and capability of HVDC



NER S5.3a (Market Network Services) recommendations

Schedule and clause	Issues
Schedule 5.3a	8
S5.3a.1a Introduction to the schedule	1
S5.3a.4 Align remote inverter stability monitoring and protection	1
S5.3a.8 Reactive power capability with S5.2.5.1	1
S5.3a.13 Align frequency disturbance capability with NER S5.2.5.3	1
S5.3a.13 Align voltage disturbance capability with NER S5.2.5.4	1
S5.3a.14 Align multiple fault ride through capability with NER S5.2.5.5	1
New clause: Align voltage control with NER S5.2.5.13 for generators	1
New clause: Align active power control NER S5.2.5.14 for generators	1

Recommendations – key points

- Amend S5.3a.1a such that it applies to all HVDC system connections (not just to MNSPs), including flexibility for application to an offshore wind facility.
- Exclude TNSP-owned HVDC systems from the requirements of NER Schedule 5.1, whose purpose is to:
 - define the operation and planning of the NSP transmission and distribution networks, including system stability
 - enforcing power quality standards for other network users
 - facilitate generation and customer connections
- Align ride relevant access standards with equivalent access standards for generators.

Q&A time

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Please “Like” other stakeholder’s questions to prioritise issues addressed in the Q&A

Structural amendment recommendations

NER Chapter 5 structural amendments

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NER Chapter 5 structural amendments

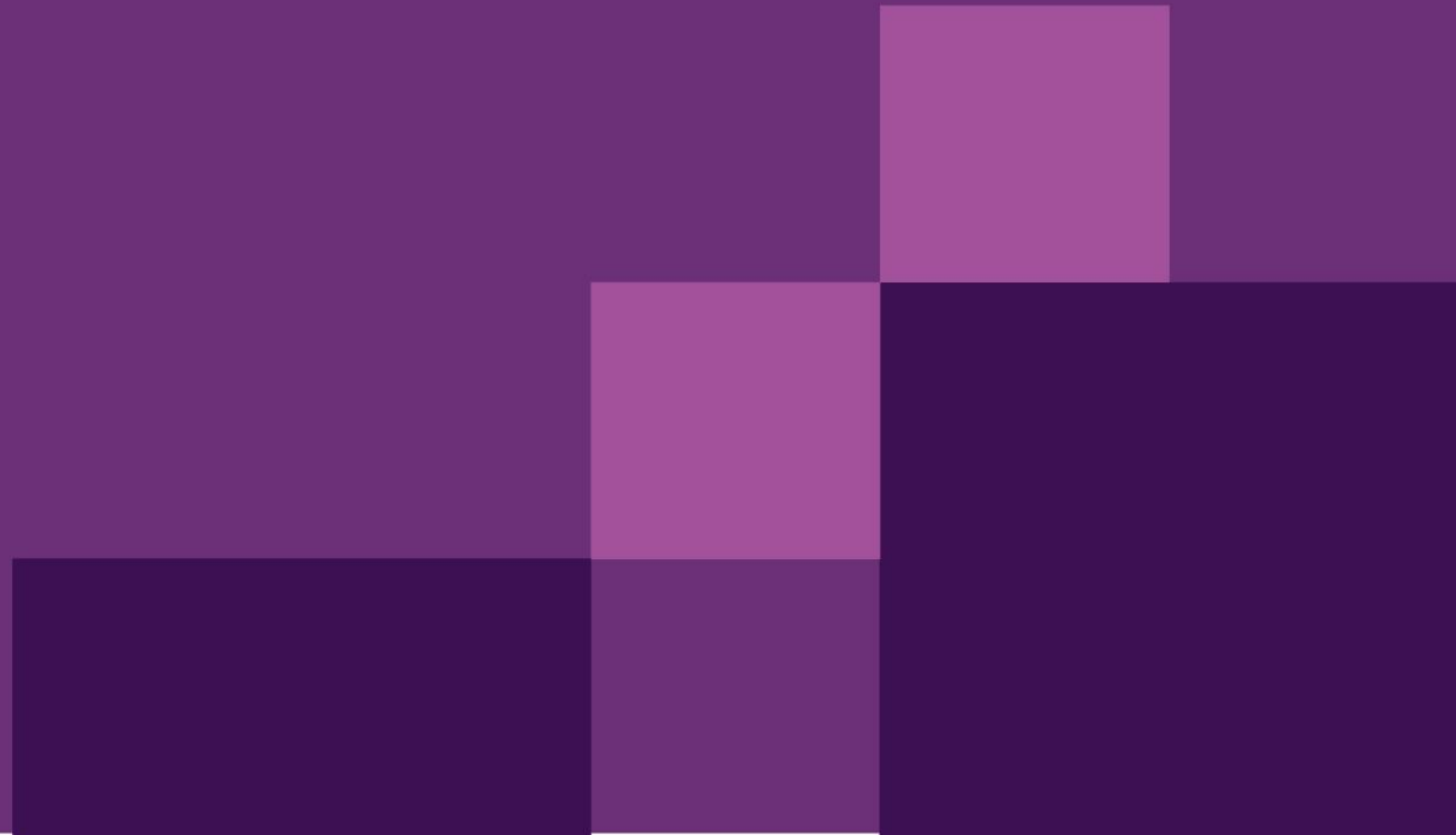
Element	Proposed approach
Define the plant	<ul style="list-style-type: none"> • Schedule 5.2 plant: production systems (generating systems, IRS plant associated with production units only), synchronous condensers both standalone and part of a production system • Schedule 5.3 plant: loads, including loads within an IRS • Schedule 5.3a plant: HVDC networks. • For schedules 5.2 and 5.3, plant is only captured if it is: above the AEMO advisory threshold, the connection applicant is or will be a registered participant, connecting to transmission, or NSP considers there will be material impact on other network users.
Define a Schedule 5.2/5.3/5.3a Participant	<ul style="list-style-type: none"> • Define a Schedule 5.2/5.3/5.3a Participant as the person who will own, operate or control the corresponding plant. • Tie the technical obligations to the person who will enter into the connection agreement (not necessarily the registered participant who could be an intermediary), or an NSP who operates the plant within its own network. • Modify the process for determination and documentation of performance standards for an NSP's own equipment.
Define AEMO advisory role in relation to the negotiation of access standards	<ul style="list-style-type: none"> • 30 MW/30 MVA nameplate rating is recommended for all schedules. • For plant that does not meet the relevant threshold, the schedules may still apply (i.e. the person will be a Schedule Participant) if there will be a registered participant or the NSP considers there to be an impact on other network users, but AEMO will not be involved and the 5.3.4A process (where applicable) will proceed as if all AEMO functions were removed.
Chapter 5A connections	<ul style="list-style-type: none"> • Where connection applicants using the Chapter 5A connection framework are nevertheless Schedule 5.2/5.3 Participants, those schedules will still apply. We recommend explicitly allowing NSPs not to apply all of the standards in an applicable schedule – only those that are reasonably necessary to minimise the impact of the plant on other network users.
Registration of performance standards	<ul style="list-style-type: none"> • AEMO will only register performance standards (for compliance purposes) for registered participants (including NSPs), but will still receive a copy of all performance standards for which it does have an advisory role. • Performance standards for non-registered participants are enforceable by the NSP through the connection agreement.
Threshold criteria for AEMO advice	<ul style="list-style-type: none"> • The same threshold criteria for AEMO advice would apply to technical requirements associated with plant alterations (5.3.9 and 5.3.12).

Q&A time

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Next steps



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For more information visit

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