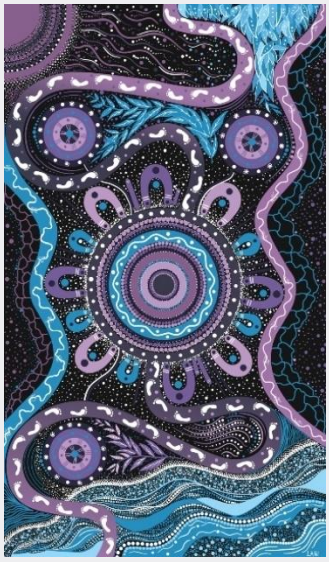
Inverter Management System (Inverter Dispatch)

15 May 2026

High Level Implementation Assessment (FINAL)



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

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

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

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

Important notice

Purpose

AEMO has prepared this document to provide information about the implementation design of the *Inverter Management System (Inverter Dispatch) project*.

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Version control

Version	Release date	Changes
0.1	19 December 2025	Initial version for stakeholder feedback
0.2	15 May 2026	Final version incorporating stakeholder feedback and with additional details on project delivery

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Definitions

This document uses many terms that have meanings defined in the National Electricity Rules (NER). The NER meanings are adopted unless otherwise specified. AEMO's industry terminology web page at https://aemo.com.au/learn/industry-terminology complements this table.

Term	Definition
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AGC	Automatic Generation Control
BESS	battery energy storage system/s
CIG	Constraint Implementation Guidelines
DUID	dispatchable unit identifier
EMS	Energy Management System
EMMS	Electricity Market Management System
EWCF	Electricity Wholesale Consultative Forum
FCAS	frequency control ancillary services
GFL	grid-following
GFM	grid-forming
GPS	Generator Performance Standards
HLIA	High-Level Implementation Assessment
HV	high voltage
IBR	inverter-based resource/s
ICCP	Inter Control Centre Protocol (link)
IGF	Intermittent Generator Forum
IMS	Inverter Management System/s
MSUG	Market Systems User Group
MW	megawatt/s
NEM	National Electricity Market
NEM DB	National Electricity Market Database
NEMDE	National Electricity Market Dispatch Engine
NER	National Electricity Rules
NSP	network service provider
OEM	original equipment manufacturer
PD/Pre-Processing	Pre-dispatch, also known as 'Pre-Processing', feeds into 'NEMDE'
PEC	Project EnergyConnect
PFR	primary frequency response
PFRR	Primary Frequency Response Requirements
Post-Processing	Process after 'NEMDE'
PV	photovoltaic
RTO	Real Time Operations (AEMO)
SCADA	Supervisory Control and Data Acquisition
NSP	transmission network service provider

1 Introduction to Inverter Management System ('Inverter Dispatch') initiative

1.1 Overview of Inverter Management System (Inverter Dispatch)

Background

The National Electricity Market (NEM) is in a period of renewal and transition, with significant change in the generation mix. Retiring synchronous generators are being replaced by a pipeline predominantly made up of inverter-based resources (IBR), such as wind turbines, solar and batteries, including a large amount of distributed solar and batteries. Irrespective, the technical requirements, and critical importance, of power system security are enduring.

Maintaining power system security is a core function of AEMO's, and the need for action by AEMO (in the operational timeframe) is informed by limits advice received from network service providers (NSPs), which can include the need for inverter management and a limit on the number of inverters online under certain power system conditions[1].

Limits advice from NSPs are translated into constraints in AEMO's control room systems, which alert controllers if there are too many inverters online for the prevailing power system conditions. To carry out its critical mandatory obligations under the National Electricity Rules (NER), AEMO's control room must manually phone multiple affected IBR and request a reduction in the number of inverters online to return the power system to a secure operating state within 30 minutes. In response, IBR operators need to take actions to reduce the number of inverters online, under time pressure.

Problem

AEMO considers that the existing manual approach is not sustainable for either IBR operators or AEMO, particularly with the current and expected growth and penetration of large-scale IBR. The existing use of manual processes to contact participants and, if necessary, the escalation to the network service provider (NSP) for disconnection under NER 4.8.9 are disruptive to participants, resource-intensive for AEMO, and create ongoing risks to the secure operations of the power system. More specifically, the current approach has:

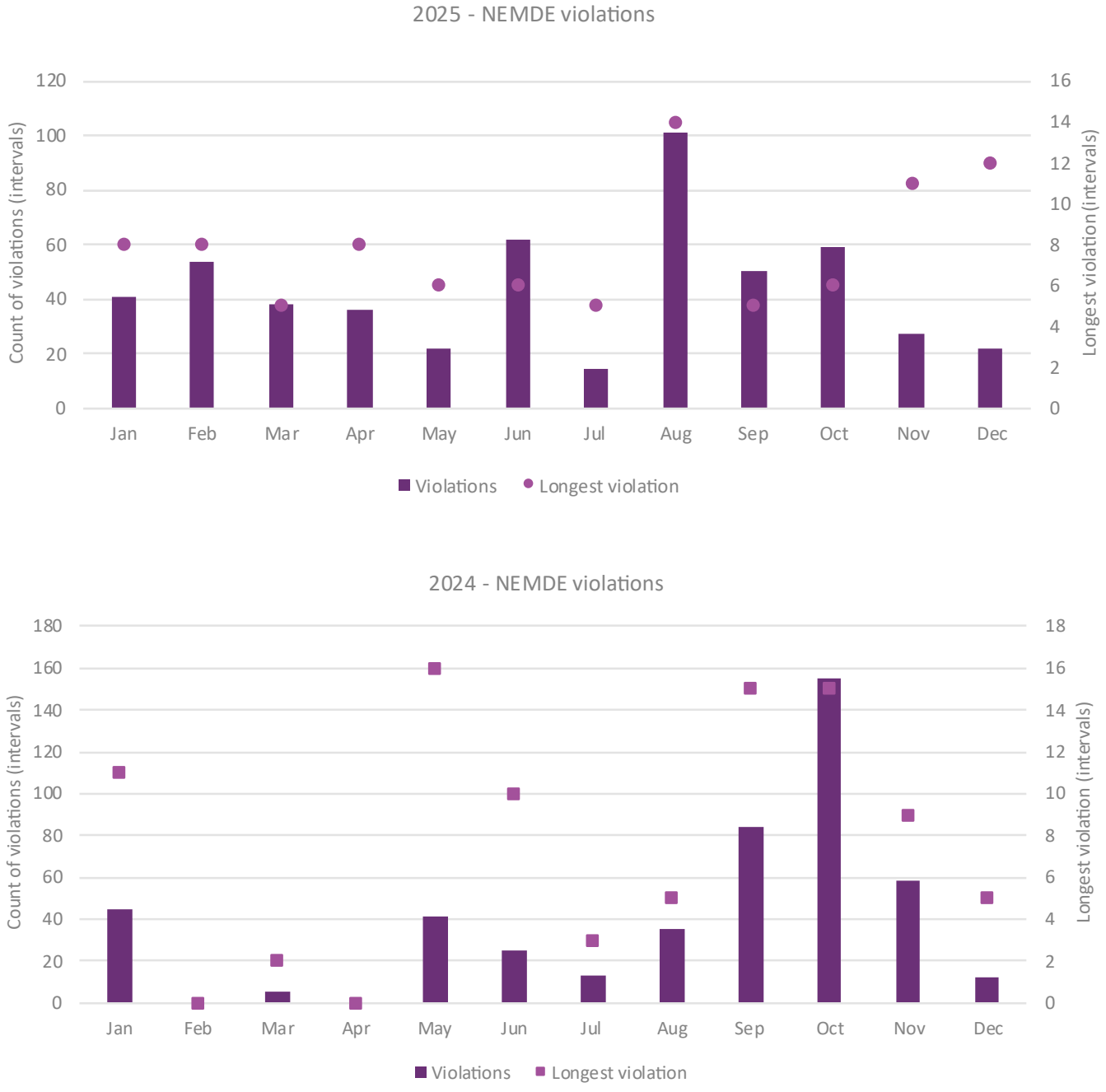
- presented AEMO with difficulties in achieving its core obligation of maintaining a secure power system, and impacted AEMO's ability to return the power system to a secure operating state when managing system strength limits,
- contributed to multiple instances of the power system being at risk of not being in a secure operating state for more than 30 minutes (see AEMO webpage on reviewable operating incident reports)[2], and
- drastically increased the volume of manual activity for AEMO and registered participants, due to complex limits advice related to inverter management, an increased number of inverters in the power system, and the requirement for multiple phone calls between AEMO and registered participants.

[1] See https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/system-operations/congestion-information-resource/limits-advice.

[2] At https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-events-and-reports/power-system-operating-incident-reports.

AEMO's analysis in **Figure 1** shows inverter constraints as violating in the NEM Dispatch Engine (NEMDE) for 473 and 526 intervals respectively over 2024 and 2025. This includes instances of maximum consecutive violations of up to 16 intervals.

Figure 1 Number and length of inverter constraint violations in 2025 (top) and 2024 (bottom)



These results demonstrate the significance of the broader issue and the need for a clear and enduring solution. A change in approach is urgently required to ensure inverter management processes are streamlined for both AEMO and participants.

Initiative objectives

The initiative's objectives are to:

- reduce and remove the need for AEMO's Real Time Operations (RTO) controllers to conduct manual phone calls to IBR to manage power system security, and
- provide IBR operators with the ability to automatically receive inverter limits, and the optionality to implement an automated means for responding to those inverter limitations.

To achieve this, the initiative will apply the following key principles:

- implement a solution that leverages existing standard and well-established processes (for example, by using NEMDE and/or constraints), to minimise implementation cost and effort for participants and AEMO,
- seek to reduce the need for participant and/or AEMO manual activity wherever feasible via automation,
- ensure consistency in approach to IBR management across all regions and jurisdictions wherever possible, and
- ensure the initiative is consistent with the NER.

This initiative will help underpin AEMO's ability to navigate the energy transition – securely and efficiently operating the power system today, and the IBR-dominated power system of the future, so the NEM continues to meet the energy needs of households and businesses at least cost, as required by the national electricity objective.

Desired project outcomes/benefits

This project will deliver the following improvements, which directly support AEMO's ability to maintain power system security by reducing AEMO's control room error and top operational risks for IBR:

- ensuring AEMO's NEM control room can determine and communicate inverter limits to market participants earlier and in a streamlined consistent way with minimal manual processes and monitoring,
- helping participants respond to inverter limits promptly, by providing an electronic inverter limit and removing the requirement for phone communications from AEMO (which are often delayed when phone calls to several participants are required), and
- helping AEMO and participants with inverter management for planned outages, as inverter limits will be available in participants' pre-dispatch (P30 and P5) NEM reports, allowing participants to better plan for operational adjustments ahead of time.

1.2 Document background and purpose

This High-Level Implementation Assessment (HLIA) has been produced as the next stage of AEMO's Inverter Dispatch initiative under the NEM Reform Program. It provides a final view on how AEMO will implement the initiative, and outlines the proposed system, process and operational changes and timelines required to implement this project, as well as providing a general assessment of what these changes may mean for affected NEM participants and stakeholders.

This final HLIA is intended to:

- assist and inform affected participants in developing their own implementation timelines and impact assessments,

- enable AEMO and participants to plan for this initiative in the context of the broader implementation roadmap (NEM Reform Implementation Roadmap), specifically looking for bundling opportunities, efficient sequencing and to reduce delivery congestion,
- enable stakeholders to provide input on the early implementation design and timeframes,
- propose key implementation activities and milestones against which progress will be managed and communicated to industry, and
- encourage early adoption by participants who are ready to respond to AEMO's inverter limits in a more streamlined way, and expedite participant preparedness for those that require operational system process changes.

In the case of any inconsistency between the HLIA and the NER, the NER will prevail.

1.3 Key dates

Table 1 HLIA timelines

Activity	Timeline
AEMO to raise item at NEM Reform Electricity Wholesale Consultative Forum (EWCF)	**Tuesday 11 November 2025**
AEMO to engage with affected IBR participants and other relevant stakeholders in one-on-one sessions to introduce project and seek feedback on Inverter Dispatch initiative	**Monday 17 November to Friday 5 December 2025**
AEMO to publish Draft HLIA (v0.1) to industry	**19 December 2025**
AEMO to conduct further one-on-one stakeholder engagement sessions to seek input and feedback on Inverter Dispatch initiative	**January and February 2026**
Stakeholder feedback on Draft HLIA (v0.1) closes	**13 February 2026**
AEMO industry briefing on HLIA (if requested by industry stakeholders)	**24 February 2026**
AEMO Final HLIA (v0.2) published	**15 May 2026**

1.4 HLIA stakeholder feedback

AEMO has presented the proposed Inverter Dispatch initiative at the Electricity Wholesale Consultative Forum (EWCF) and conducted one-on-one engagements with several IBR participants and stakeholders. AEMO will continue consulting with IBR participants and other impacted stakeholders to gather input and feedback on the Inverter Dispatch initiative, and will provide updates at upcoming industry forums where relevant.

This final HLIA discusses stakeholder feedback received in response to the draft HLIA and provides further, more detailed, information on the impacts to AEMO systems and processes, participant impacts, and the project implementation pathway. The final HLIA will only be updated during project implementation if there is material change in the implementation approach – for example, if detailed design reveals elements that affect the industry's or AEMO's readiness. Stakeholders should refer to the Inverter Dispatch initiative webpage and updates provided via AEMO's NEM Reform industry forums for up-to-date implementation information.

1.5 Stakeholder engagement

AEMO intends to keep interested stakeholders up to date on the Inverter Dispatch initiative via the following channels:

- NEM Reform engagement through the regular monthly forums AEMO conducts as part of the NEM Reform Program, including the EWCF, as well as regular forums such as the Intermittent Generator Forum (IGF),
- initiative webpage – https://www.aemo.com.au/initiatives/major-programs/nem-reform-program/nem-reform-program-initiatives/inverter-dispatch, and
- mailbox – NEMReform@aemo.com.au.

1.6 Interim solution deployed on 31 March 2026

Given the urgency of the solution and potential for participants to want to adopt a more streamlined approach early, AEMO has adopted an interim measure, delivering part of the above-described solution early. The interim solution involves providing inverter limits via AEMO's existing Market Systems, Electricity Market Management System (EMMS).

This interim solution was successfully tested in AEMO's Pre-prod environment on 5 March 2026 with selected industry stakeholders currently impacted by constraints requiring inverter limits. The test involved:

- Eight participants, including relevant third party service providers,
- 14 sites / dispatchable unit identifiers (DUIDs) across New South Wales and Victoria, and
- both wind and solar farms.

AEMO also successfully deployed the project interim solution into Production on 31 March 2026, with relevant participants now able to receive inverter limits via EMMS Data Model. Participants are required to upgrade to the latest version of Data Model and subscribe to receive inverter limits in both pre-dispatch and dispatch reports (please refer to EMMS Technical Specification – Data Model v5.6 – November 2025[3]). As listed in Sections 11.19, 20.17 and 22.14 of the Technical Specification, these inverter limits would be issued every five minutes and for dispatch, 5-minute pre-dispatch, and 30-minute pre-dispatch.

AEMO also held a series of one-on-one engagements with affected participants and stakeholders to seek their feedback on the existing manual approach to providing inverter limits via phone call and on AEMO's proposed solutions for streamlining this process using existing Market and SCADA systems. AEMO will continue to work with interested participants to support adoption of the project interim solution, including providing test data in Pre-production, if required, and phone calls to participants in the interim to support the communication of inverter limits sent via EMMS Data Model.

When interested participants are ready to adopt the interim solution in Production, AEMO will rely on them responding to inverter limits sent to them via Market Systems, gradually removing the need for communications via phone call.

Any participants interested in adopting the interim solution are encouraged to reach out to AEMO by email to NEMReform@aemo.com.au.

[3] At https://di-help.docs.public.aemo.com.au/Content/Data_Model/MMS_Data_Model.htm

2 Stakeholder feedback to Draft High Level Impact Assessment

AEMO published its draft HLIA document on 19 December 2025, requesting feedback from industry participants and stakeholders by 13 February 2026.

AEMO would like to thank all stakeholders who took the time to provide a submission and engage with AEMO both through written feedback and one-to-one discussions.

2.1 Summary of stakeholder feedback received

AEMO requested feedback regarding both the new automated inverter management system and the proposed rule change flagged in the draft HLIA to support the system. AEMO consulted with and received feedback from a wide variety of industry stakeholders in the NEM, including:

- market participants,
- owners and operators of IBR,
- third party service and software providers,
- original equipment manufacturers (OEMs), and
- NSPs.

While the submissions provided a range of perspectives and areas of focus, stakeholders generally recognised the need for increased automation and improved clarity in how inverter limits are communicated and managed, acknowledging the current manual approach is labour-intensive and inconsistent, and carries increased risk to power system security.

Broadly stakeholders supported in principle the use of the rule change to ensure clarity and compliance by expressly enabling inverter limits to be included within a dispatch instruction.

Stakeholders also raised several requests for clarification and further detail on the Inverter Dispatch initiative. These themes broadly fell into the following categories and are addressed throughout this final HLIA:

1. **real-time operational requirements for AEMO and participants** – see Section 3.3,
2. **considerations for grid-forming (GFM) battery energy storage systems (BESS) and hybrid plant** – see Section 3.5.
3. **participant compliance obligations** – see Section 6.2,
4. **operational impacts of disconnecting inverters** – see Section 6.3,
5. **proposed rule changes and time required for implementation** – see Section 6.4, and
6. **engagement with third party providers to support inverter limits** – see Section 6.5.

3 Operational processes and considerations for Inverter Dispatch

3.1 In lead up to operational timeframe

This section outlines the existing process for developing limits advice relevant to inverter management which NSPs develop and share with AEMO. AEMO then creates constraint equations reflecting the limits advice and applies these constraints in NEMDE to maintain power system security. This process will remain unchanged by this initiative and is provided for context.

1. NSPs provide limits advice to AEMO to implement in its market and power system operations.
   - In accordance with AEMO's published limits advice guidelines[4], NSPs are required to develop limits advice[5]. This limits advice covers all aspects of power system security reflecting the physical limitations of the power system and its technical envelope for various expected operating conditions. Limits advice generally covers thermal overload, voltage, transient and oscillatory stability, system strength and inverter and turbine limits. It can also reflect control schemes and their impact on the security of the power system.
   - As part of developing this limits advice, NSPs consider and determine which particular IBR may need to be limited under various power system conditions. AEMO expects this assessment would consider whether an IBR is grid-following (GFL) or GFM (if relevant to the NSP), alongside other factors such as available system strength and location of the IBR within the NSP's network.
2. AEMO performs due diligence when limits advice is provided (for any type of power system limit), to verify the limit equation will give a secure outcome[6].
3. AEMO creates constraints required to implement limits advice.
   - These are created in accordance with AEMO's Constraint Formulation Guidelines[7]. Inverter limitations may exist within system normal and/or outage constraints, as determined by NSPs in their limits advice.

3.2 Operational timeframe

AEMO has observed a consistent increase in the frequency of prevailing power system conditions that require limiting the number of inverters connected to the power system to maintain power system security. As described in Section 3.1, the need for inverter management by AEMO is informed by limits advice received from NSPs. This NSP limits advice is translated to network constraints in AEMO's systems that alert AEMO operators when there are too many inverters online for the prevailing power system conditions. When such a constraint violates in the dispatch timeframe, due to too many inverters

[4] At https://www.aemo.com.au/-/media/files/electricity/nem/security_and_reliability/congestion-information/2025/limits-advice-guidelines.pdf.

[5] See https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/system-operations/congestion-information-resource/limits-advice#:~:text=Limit%20advice,22/04/2020.

[6] See Constraint Formulation Guidelines Section 3.2 at https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/system-operations/congestion-information-resource.

[7] At https://www.aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2022/cfg-and-scvpf/final/constraint-formulation-guidelines-v12---final_.pdf.

online, the power system is no longer secure and AEMO must take action in line with its NER obligations to return the power system to a secure operating state as soon as a possible, and in all cases within a maximum of 30 minutes.

Figure 2 below provides an example of the existing inverter management process, compared to the proposed target future process. This example is in the case of a credible contingency, whereby the contingency results in an outage constraint set being invoked in the dispatch and pre-dispatch timeframe. Inverter limits, including constraint equations that reflect them, are invoked within the outage constraint set.

Figure 2 Inverter management current and target future state summary, in a credible contingency scenario

3.3 Real-time operational requirements for AEMO and participants

Inverter limits to be sent during pre-dispatch and dispatch timeframes

Inverter limits will be published in participant NEM reports for both pre-dispatch and dispatch, and are updated every 5 minutes. The values published for a given trading interval are unlikely to change unless network outages or new operating conditions arise. For planned outages, participants will be able to see indicative inverter limits from 30 minutes to up to 40 hours in advance via pre-dispatch reports. The inverter limits visible in pre-dispatch are indicative limits based on AEMO's view of forecast conditions.

Where conditions change between pre-dispatch and dispatch, and result in a change to inverter limits for specific intervals, AEMO will provide updated inverter limits for the relevant intervals in the next pre-dispatch and dispatch run. Participants do not need to respond to any inverter limits in pre-dispatch (as these are indicative only), yet need to respond to inverter limits in dispatch. For any unplanned outages, AEMO requests participants provide a response as soon as possible within a maximum of 15 minutes from receiving inverter limits from AEMO (more details on this below).

AEMO's expected approach for reduction in inverters online

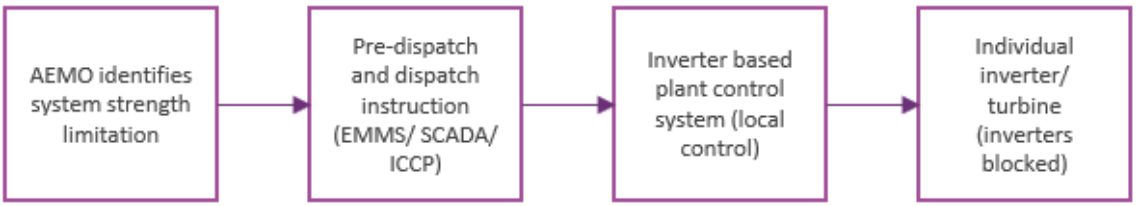
As noted earlier, one of AEMO's core obligations is to maintain power system security and to take action to resecure the power system in response to any contingencies, including where binding constraints are invoked. In discharging these obligations, AEMO may need to send inverter limits to participant DUIDs – this is based on the limits advice from the relevant NSP.

AEMO's Inverter Dispatch initiative will automate the sending of inverter limits from AEMO to IBR with the sending of inverter limits via both:

- EMMS (market data model pathways) for all participants, and
- Supervisory Control and Data Acquisition (SCADA)/Inter Control Centre Protocol (ICCP) for those who prefer operational signalling channels.

Inverter limits will be provided across 5-minute pre-dispatch and 30-minute pre-dispatch horizons to provide plant operators with a forward view of inverter limits, and also in real-time via dispatch reports. Following receipt of inverter limits in dispatch timeframes, participants will be requested to reduce the number of inverters online via remote or local plant control as soon as possible within a maximum of 15 minutes. Integrated alarms, audit logs, and a fallback to manual calls if communication links fail will remain to mitigate operational risk of any failures to send inverter limits.

Figure 3 High-level process for automated communication of inverter limits to participants



AEMO requests participants to respond as soon as possible within a maximum of 15 minutes from receiving inverter limits from AEMO. As noted in **Figure 2**, AEMO expects IBR operators can respond by either automatically or manually reducing the maximum number of inverters online to the inverter limits provided by AEMO. The table below provides an example timeline outlining:

- AEMO's Real Time Operational requirements due to an unplanned outage,
- expected participant actions after receiving inverter limits from AEMO, and
- when AEMO may need to issue a NER 4.8.9 instruction to an NSP to disconnect inverters at relevant plant to resecure the grid within 30 minutes, as per AEMO's Power System Security obligations.

Table 2 Example Real time Operational requirements for AEMO and expected participant actions

Time stamp	Example time (hrs)	Trading Interval ending (hrs)	Action required
T	9:02	9:05	Outage occurs, relevant constraints invoked.
T+5min	9:05	9:10	Relevant participant(s) to receive inverter limits at next dispatch run ('ELEMENT_CAP' field) and requested to respond as soon as possible within 15 minutes (Trading Interval ending 9:20).
T+20min	9:20 - 9:25	9:25	AEMO monitors power system security conditions to see if relevant plants/DUIDs have responded to inverter limits by disconnecting or blocking required number of inverters: A. If yes, no further action required by AEMO (grid will go back to secure operating conditions). B. If no, AEMO may be required to provide instructions under NER 4.8.9 to relevant NSP to curtail required no. of inverters at relevant plants/DUIDs as per NSP limits advice.
T+25min	9:25 - 9:30	9:30	Power system deemed to be insecure for almost 30 minutes. AEMO issues a NER 4.8.9 instruction to NSP to disconnect inverters at relevant plants/DUIDs. NSP disconnects required no. of inverters as per AEMO instructions (that is, opening circuit breakers at relevant plant).
T+30min	9:32	9:35	Grid returns to secure operating conditions within 30 minutes (as per AEMO's Power System Security obligations).

The table below provides example scenarios where a plant with 60 inverters registered for its DUID may receive inverter limits, and AEMO's expected response from the plant operator after receiving inverter limits in dispatch reports for relevant trading intervals.

Table 3 Scenarios of AEMO inverter limits sent to plant/DUID and expected participant action

Scenario #	Registered no. of inverters at DUID	Current no. of inverters online at DUID	AEMO inverter limit applicable to participant DUID	Current no. of inverters online > inverter limit?	Expected action from participant responsible for DUID
1	60	30	30	N	No action required
2	60	30	45	N	No action required (but participant may increase no. of inverters online to 45 if they wish to do so
3	60	30	15	Y	Reduce number of inverters online to 15
4	60	30	0	Y	Reduce number of inverters online to 0
5	60	30	[NULL]	N	No action required
6	60	60	[NULL]	N	No action required

Managing local plant operational constraints and other operational challenges

AEMO can also confirm there is no expectation of instantaneous actions to disconnect inverters, only to reduce the number of inverters online to meet the inverter limit as soon as possible within 15 minutes, noting P/Q should remain within Generator Performance Standards (GPS) requirements. For clarity, AEMO is comfortable with a staged or ramped reduction in inverters (for example from 100% inverters online to 50% of inverters online), taking into account local network voltage and plant operational constraints, as long as the required number of inverters are disconnected or blocked at the DUID as soon as possible within 15 minutes of receiving inverter limits from AEMO.

Adjustments to MW (without blocking or disconnecting inverters) does not prevent IBR from potentially causing power system security issues during periods of low system strength. AEMO requires participants to take action to either block or disconnect inverters to return the grid to secure operating conditions.

AEMO acknowledges the potential operational challenges for some participants, including manual disconnections being difficult within the requested timeframe. AEMO must meet its core power system security obligations, and if there has not been an adequate response from the relevant participant(s), AEMO may need to instruct the relevant NSP under NER 4.8.9 to open the plant circuit breaker if it cannot otherwise return the power system to a secure operating state within 30 minutes.

3.4 Exceptions handling

AEMO anticipates that introduction of this automated process would greatly reduce manual efforts for both AEMO and IBR operators. To maintain visibility of IBR participants' responses to inverter limitations, monitoring capability will be established to compare an IBR's response with any request to reduce the number of inverters online. Monitoring of IBR response to inverter limit requests is planned for delivery as part of this initiative, and uses similar naming to the conformance process for energy dispatch for ease of use by participants, but different trigger thresholds and timing, reflecting AEMO's power system security obligations.

To adhere to the inverter limit provided by AEMO, participants must ensure that the number of inverters online at their plant is at or below the provided limit (by ensuring that any inverters in excess of the provided limit are disconnected or blocked[8]). Participants are expected to adhere to the provided inverter limit as soon as possible. However, if participants do not respond, AEMO may take action by issuing an instruction under NER 4.8.9 to the relevant NSP to disconnect affected IBR via the high voltage (HV) circuit breaker, before the full 30 minutes has elapsed. This is for AEMO to maintain a secure power system within 30 minutes, as per its NER obligations.

AEMO will establish an internal process for inverter conformance, including alarm monitoring and communication to participants, IBR operators and NSPs (if required), in addition to the new inverter limits and conformance signal. Information on the conformance process will be included in Dispatch Procedure SO_OP_3705[9] and communicated in relevant industry forums.

[8] For definitions of these standard terms, see Section 3.3.3 of AEMO published Limits Advice Guidelines, at https://www.aemo.com.au/-/media/files/electricity/nem/security_and_reliability/congestion-information/2025/limits-advice-guidelines.pdf.

[9] At https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Power_System_Ops/Procedures/SO_OP_3705 Dispatch.pdf.

3.5 Considerations for grid-forming BESS and hybrid plant

Inverter limits for grid-forming battery energy storage systems

In response to the Draft HLIA, several stakeholders sought clarity on whether GFM inverters would be treated differently from GFL inverters in the application of inverter limits, noting that imposing caps may restrict the ability to provide expected essential system services. There were also questions on the underlying technical rationale on imposing inverter limits on GFM, with suggestions that if there were no genuine technical need exists to limit the number of GFM inverters online, then they should have blanket exemption.

AEMO has discussed the concerns raised by participants with various NSPs, particularly in relation to the need to apply inverter limits to GFM BESS assets. It was confirmed that NSPs are open to discussions with proponents of IBR, including GFM BESS, and can review specific plant requests regarding inverter limits.

AEMO's constraint equations in NEMDE are based on the limits advice provided by NSPs, which include a cap on the number of inverters online, this is the relevant metric used for system strength limited conditions. AEMO cannot remove the need for inverter limits, because even where inverters are providing 0 MW, they can still cause voltage oscillations if they are connected to the network and not blocked. This also applies to inverters at GFM BESS plant.

From AEMO's engagement and discussions with NSPs, it was also acknowledged that GFM BESS could have a positive impact in mitigating voltage oscillations compared to GFL inverters. However, GFM capability can vary greatly between different equipment manufacturers, particularly in terms of definition and approach to provide such capability, therefore it could not be ruled out that a GFM inverters would not contribute to voltage oscillation. Furthermore, NSPs also indicated that GFM inverters may still need to have limits applied, particularly if there is islanding risk, or if the IBR behaves like a GFL inverter in most respects.

One of the NSPs mentioned that if a plant could perform similarly to a synchronous machine – in terms of inertia, fault level contribution and voltage control, and near-instantaneously match an island load (active and reactive power) to allow a 'bumpless' islanding event – the NSP could then consider whether there would be a to need to apply inverter limits. As noted earlier, NSPs are open to discussions with proponents of existing plant or newly connecting plant about their location, system strength considerations in that part of the network, and whether inverter limits may be applicable to their plant during network outages or constraints in order to maintain power system security.

AEMO encourages proponents to engage directly with their NSP to further explore the above in relation to their individual circumstances. AEMO will be guided by the NSPs' limits advice which will be used to formulate constraint equations which are fed into NEMDE.

Inverter limits for hybrid plant

Similarly, other stakeholders sought clarity on the application of inverter limits to hybrid plants operating under a single DUID, where photovoltaic (PV), BESS, and potentially mixed GFM/GFL inverters are coordinated through a common plant controller. The feedback also recommended AEMO evaluate the stabilising impact of local or neighbouring GFM converters during sudden inverter limit reductions.

In relation to hybrid plants operating under a single DUID, where PV, BESS and potentially mixed GFM and GFL inverters are coordinated via a common plant controller, AEMO can confirm inverter limits are applied at the DUID level. Therefore,

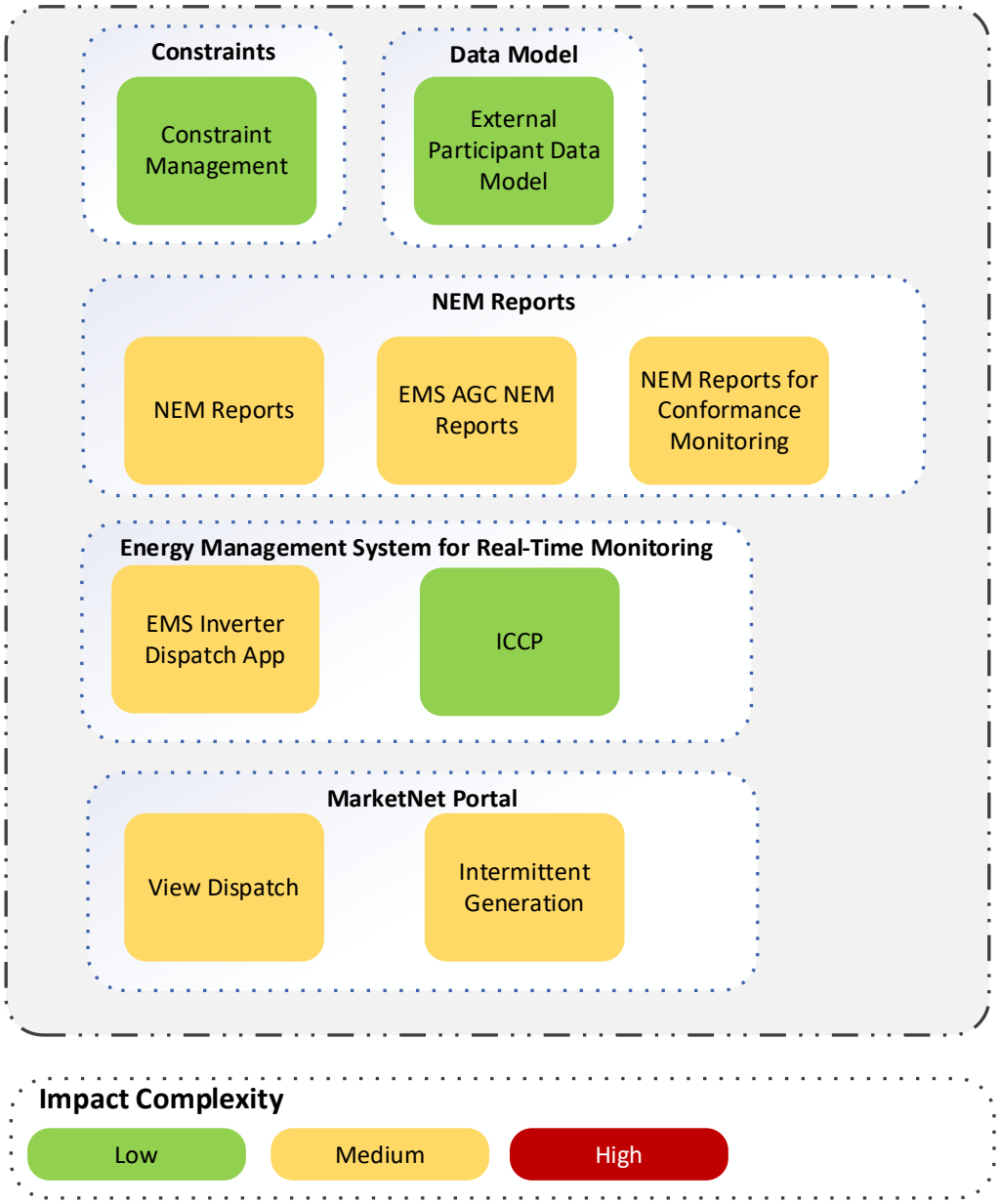
while inverter limits are not applied to individual sites or technology types, proponents can potentially register multiple DUIDs at the same plant if practical to do so, as per AEMO's existing registration guidelines.

Again, AEMO will be guided by the NSPs' limits advice which will be used to formulate constraint equations which are fed into NEMDE.

4 AEMO impacts

The section provides the key impacts to AEMO's processes, systems and interfaces from the Inverter Dispatch initiative.

4.1 Summary of key impact areas



EMS: Energy Management System, AGC: Automatic Generation Control.

4.2 AEMO systems impact

Table 4 summarises key system impacts for the initiative.

Table 4 Summary of AEMO systems impact

System	System description	Impact description	Impact (H, M, L)
EMMS	The Electricity Market Management System (EMMS) is the NEM wholesale system. EMMS provides such system functions as ancillary services, dispatch, market information, NEM reports, offers and submissions, settlements and prudentials, and trading facilities.	Calculation of Inverter Limits based on constraints Right Hand Side (RHS) and writing it back to the National Electricity Market Database (NEM DB).	L
EMS	An Energy Management System (EMS) is a sophisticated software platform designed to monitor, control, and optimise the performance of the electrical power grid in real time. It integrates advanced power system applications to ensure the reliability, efficiency, and stability of electricity supply.	New enhancement into an EMS application for automation of inverter limit communications to participants.	M
ICCP	Network link between NSP and AEMO.	Configuration changes for sending the inverter limits to NSP.	L
NEM Reports	EMMS NEM Reports to provide: • Inverter Cap to the market participants, and • non-conformance warning to the market participant. EMS Automatic Generation Control (AGC) NEM Reports to provide the Inverter Caps to the EMS system	Inclusion of Inverter limits and non-conformance information for NEM reports to be shared with participants.	M
Market Portal	Market Portal is a gateway to information published by AEMO for participants. Participants can login to the portal to access various information relevant for them related to schedule and dispatch.	Inclusion of the inverter limits to be displayed on the market portal for each Dispatch Interval. The participants would be able to see the respective Inverter Limit information after signing in with login credentials.	M

4.3 Impacts on AEMO procedures and guidelines

AEMO assessed the impacts of this initiative to its procedures and/or guidelines. **Table 5** below lists AEMO procedures and guidelines identified, and details of the changes expected.

AEMO will endeavour to provide drafts of changes to stakeholders for information and invite stakeholder feedback where needed.

Further information regarding procedure impacts will be provided at AEMO's NEM Reform EWCF[10].

[10] See https://www.aemo.com.au/consultations/industry-forums-and-working-groups/list-of-industry-forums-and-working-groups/electricity-wholesale-consultative-forum.

Table 5 Details of planned updates to AEMO procedure and guidelines

AEMO procedure or guideline	Details of updates or changes	Indicative dates
Pre-Dispatch Procedure SO_OP_3704	Minor and administrative updates made for Project Interim Solution, changes to introduce the limits on inverter numbers online/available in Unit Specific data. See latest version of SO_OP_3704.[A]	31 March 2026
Dispatch Procedure SO_OP_3705	Minor and administrative updates made for Project Interim Solution, changes to introduce the limits on inverters online/available for semi-scheduled generating units[B] – see latest version of SO_OP_3705.[C]	31 March 2026
	Updates to SO_OP_3705 for Project Final Solution incorporating communication of inverter limits via SCADA and conformance monitoring and alerts to participants	Q1-2027 (indicative)
Constraints Implementation Guidelines (CIG)	Amendments to AEMO's CIG[D] to clarify how inverter limits are implemented via constraints and applied in AEMO's dispatch processes including for Inverter Dispatch.	14 May 2026 published to industry for review and feedback
Primary Frequency Response Requirements (PFRR) document	Updating the existing PFRR document to include in the list of Standing Variations under clause 6.6(h) the number of online inverters, and other minor or administrative updates – see current version of PFRR.[E]	2 Oct 2026: Draft PFRR updates for consultation. 30 Oct 2026: Consultation closes. 18 Dec 2026: Final publication.

A. At https://www.aemo.com.au/-/media/files/electricity/nem/security_and_reliability/power_system_ops/procedures/so_op_3704-predispatch.pdf?la=en.
B. AEMO will also make an additional update to include other IBR such as BESS which can also be subject to binding constraints requiring limits on inverter numbers online/available.
C. At https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Power_System_Ops/Procedures/SO_OP_3705 Dispatch.pdf.
D. At https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/system-operations/congestion-information-resource
E. At https://www.aemo.com.au/-/media/files/initiatives/primary-frequency-response/2024/primary-frequency-response-requirements.pdf?rev=8a84be8f6ec84bfd9c2b84bcefc5e663&sc_lang=en.

AEMO also notes that additional amendments to procedures and other AEMO guidelines, templates or documents, including in **Table 5**, may be required as a result of any proposed rule change in future (see more details of proposed rule change in 6.4).

5 Proposed system solution

As noted above, AEMO control room operators and IBR participants rely on a manual process to manage inverter limits and maintain power system security. This approach contributes to power system risks, operational inefficiencies, communication delays, and limited traceability. The lack of automation and real-time visibility also makes it challenging to enforce inverter constraints and monitor compliance effectively.

This manual burden is a key driver for the implementation of the Inverter Dispatch initiative, to enhance AEMO's ability to maintain and manage power system security, streamline communication, automate provision of inverter limits and provide near real-time monitoring of inverter responses.

In line with the initiative's objectives, AEMO considered several options for inverter management. The proposed solution, using existing SCADA and market systems for sending Inverter Limit requests to market participants via Market Management System and SCADA ICCP systems, was selected for being able to deliver maximum value by:

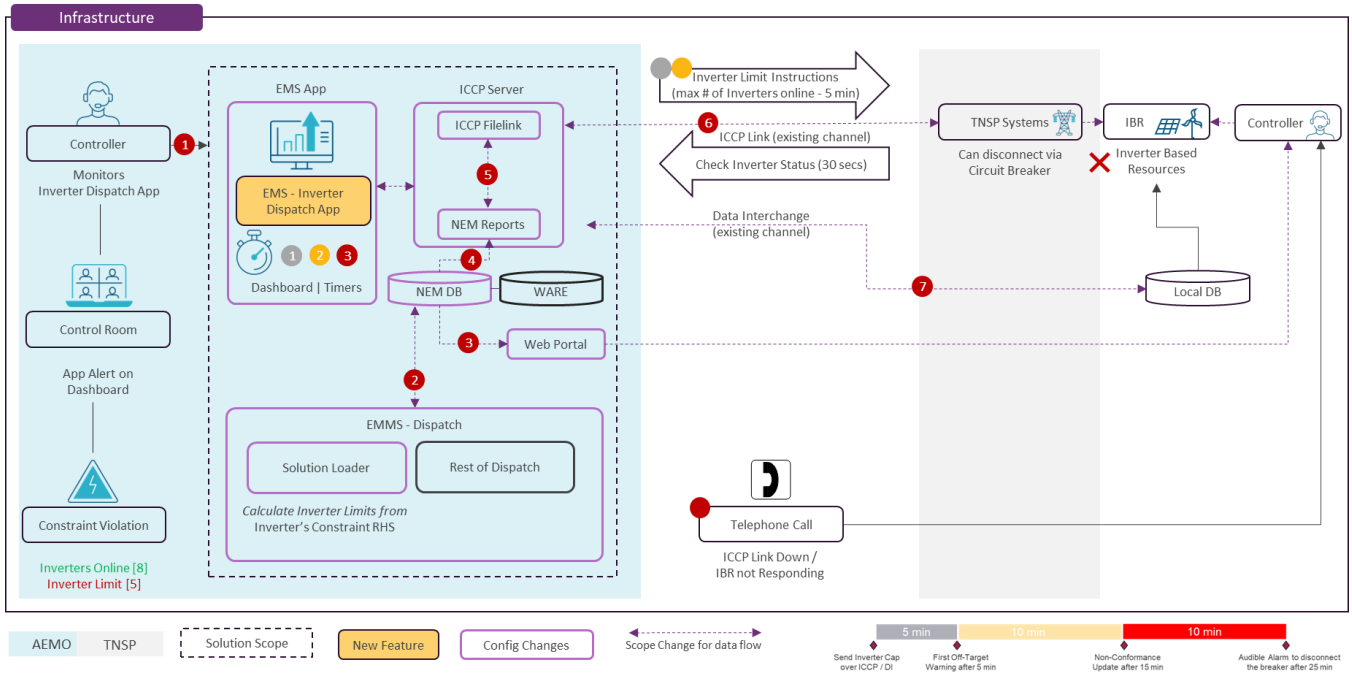
- using proven methodology for solution delivery using existing functional blocks (in constraints and NEMDE) to minimise implementation costs,
- addressing issues and reducing risks related to maintaining AEMO's core obligations, and
- allowing for maximum coverage of the IBR in the NEM.

5.1 Context diagram

Figure 4 below provides a high-level solution of the proposed 'Target State' of the Inverter Management System including process and data flows between AEMO's NEM Control Rooms and IBR and NSP systems.

Table 6 provides a description of each component included in the proposed Inverter Dispatch solution.

Figure 4 High level solution – Inverter Management System using SCADA and market systems



Data flow details

1. AEMO Control Room Operator logging into EMS Inverter Dispatch App for real-time monitoring of the IBRs.
2. Data exchange between NEM DB and EMMS (Solution Loader) for calculating Inverter Limits.
3. Publishing the Inverter Limits to Web Portal/MarketNet portal (can be viewed by participants only after login to their respective page).
4. Extract, format and publish the relevant information from NEM DB into NEM reports.
5. Extracting Inverter Limits from NEM Reports into EMS(ICCP) system.
6. Sending Inverter Limits to TNSP over existing ICCP link.
7. Publish Inverter Limit and conformance status into EMMS NEM Reports to be shared over Data Interchange.

Table 6 Description of solution components

Component name	Component description
EMS – Inverter dispatch app	This new application is proposed to be built to provide AEMO's control room with monitoring capability, for visibility of inverter limits in place via AEMO's EMS, and a conformance monitoring display and alarms based on 'Timers' (see Section 5.1.1 below).
EMMS – Dispatch	The dispatch process will calculate the maximum number of inverters allowed online based on the constraints invoked. Dispatch results are then written back to the NEM DB.
NEM DB and NEM Reports	Data from AEMO's internal database 'NEM DB' is extracted, formatted, and published as structured outputs in NEM Reports, which are made available to market participants and stakeholders via AEMO's reporting platforms. This data is planned to include the maximum number of inverters to be online, as well as conformance monitoring information. Reports are published to the Participant File Server, where they are accessed by participant-side tools for replication into local databases.
Market Portal	The maximum number of inverters to be online, to be published for each DUID via Market Portal for each trading interval.
Data Interchange	Operational data from NEM Reports is extracted and formatted for structured export via the Data Interchange (DI) system and communicated to participants.
SCADA/ICCP Link between AEMO, NSPs and IBR operators	Inverter limits will be transmitted over existing ICCP links via EMS SCADA to NSPs and IBR to support monitoring, control, and coordination for IBR. SCADA signals will operate in the same way as existing MW targets and the Semi-Dispatch cap which are already sent out. This already includes transmission of the number of inverters online 'Inverter status' (from participant to AEMO) and is proposed to also include (if applicable) 'Inverter limits' (from AEMO to participant) on the number of inverters online.
Participant systems	Participant-side tools retrieve and load data, from both the DI and (optionally) ICCP Link into their local databases for operational use.
Telephone call	By exception, telephone calls are used for communication (for example, in the event of non-conformance or if other communication channels are not working).

5.1.1 Conformance system implementation

As set out in Section 3.4, conformance monitoring of IBR response to inverter limits is planned for delivery as part of this initiative, and uses similar naming to the conformance process for energy dispatch for ease of use by participants, but different trigger thresholds and timing, reflecting AEMO's power system security obligations. The inverter limitations are a maximum limit on the number of inverters online, and the conformance process will check that the number of inverters online (provided by existing SCADA signals) is equal to or less than the current applicable limit.

Conformance status will be communicated via NEM Reports, with similar status format to that of energy dispatch[11].

The tables below provide examples of conformance and non-conformance processes, including the notifications to be sent from AEMO to registered participants when inverter limits are in place for a DUID.

Table 7 Example of conformance processing

COUNT	INTERVAL DATETIME	DUID	INVERTERS ONLINE	INVERTER LIMIT	CONFORMANCE STATUS	AEMO ACTION
1	[DATE] 15:05	IBR02	15	10	Off-Target	Send Inverter Limit Notification (ICCP, NEM Reports, Market Portal)
2	[DATE] 15:10	IBR02	10	**10**	Normal	Normal

Table 8 Example of non-conformance processing

COUNT	INTERVAL DATETIME	DUID	INVERTERS ONLINE	INVERTER LIMIT	CONFORMANCE STATUS	AEMO ACTION
1	[DATE] 15:05	IBR01	15	10	Off-Target	Send Inverter Limit Notification (ICCP, NEM Reports, Market Portal)
2	[DATE] 15:10	IBR01	15	10	Off-Target	Send Off Target Warning (NEM Reports)
3	[DATE] 15:15	IBR01	15	10	Off-Target	Send Off Target Warning (NEM Reports)
4	[DATE] 15:20	IBR01	15	10	Non-Conforming	Send Non-Conformance Status (NEM Reports)
5	[DATE] 15:25	IBR01	15	10	Non-Conforming	Disconnect Circuit Breaker (Manual Phone call to NSP)
6	[DATE] 15:30	IBR01	0	**10**	Normal	

[11] At https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Power_System_Ops/Procedures/SO_OP_3705 Dispatch.pdf.

6 Participant impacts

This section focuses on the impacts to external stakeholders from AEMO's proposed Inverter Dispatch solution.

6.1 Impacted external stakeholders

Table 9 Impacted external stakeholders

Participant category	Potential impact description
Participants	• Change in the way the participant receives inverter limits from AEMO. • System changes to electronically receive inverter limits from AEMO. • Process, system, and potentially control system changes may be required to respond to inverter limits. The degree of change will depend on current IBR control system and software system arrangements, and participant decision of degree of automation chosen. • Potential changes with external service providers, for example in the use of third-party vendors for interface between participant and AEMO. • Potential process changes to ensure conformance with inverter limitations.
NSPs	• Change to information NSP receives from AEMO, to include inverter limit SCADA signal over existing ICCP. • Some process and system changes may be required.

6.2 Participant compliance obligations

In this section AEMO clarifies:

- the interaction between inverter limitations and frequency control ancillary services (FCAS) and primary frequency response (PFR) obligations, and
- the interaction between inverter dispatch and participants' ability to meet the full requirements of their registered GPS, for example with regards to reactive power and whether these requirements would scale based on reduced number of inverters online.

6.2.1 Frequency control ancillary services (FCAS) bidding obligations

AEMO recognises that limiting the number of inverters online may impact participants' ability to provide FCAS. If AEMO requests a participant to limit the number of inverters online for a specific DUID, and this results in the participant reducing the number of inverters online at the generating plant and therefore reduced maximum availability for FCAS, then the participant will need to rebid accordingly.

AEMO notes that the NER require participants to ensure bids and offers reflect plant capability, and this includes instances where plant capability is reduced due to responding to inverter limits provided by AEMO. Therefore, where participants respond to a request to reduce the number of inverters online for a specific DUID, or multiple DUIDs at a plant for a specific period, then participants should consider rebidding FCAS capacity for the applicable intervals accordingly.

With suitable warning from AEMO dispatch reports (as well as earlier indicative inverter limits from P30 and P5 pre-dispatch reports), participants will receive inverter limits for the next dispatch run, rather than waiting for a phone call from AEMO.

This means participants can be better placed to ensure appropriate actions including rebidding are undertaken to avoid non-conformance.

AEMO is not in a position to reduce MW in dispatch instructions and FCAS enablement levels based on inverter limits, as dispatch instructions and FCAS enablement levels are determined by NEMDE, based on bids and offers from participants and any relevant constraints. Therefore, it is up to the participant to make the determination on what the reduced FCAS capacity will be from reducing inverters online, and rebid accordingly. Following this, AEMO's dispatch targets to participants would be expected to reflect these rebid quantities from participants.

6.2.2 Primary frequency response (PFR) obligations

As feedback to AEMO's Draft HLIA, stakeholders sought clarification on how AEMO would account for the number of inverters online to determine and calculate a plant's PFR obligations.

For PFR, AEMO considers that units need to be connected and operated in a way that allows PFR to be provided when capable of doing so – this is detailed through AEMO's Primary Frequency Response Requirements (PFRR) document[12]. As outlined in the PFRR, participants need to make reasonable endeavours to meet PFR requirements.

AEMO notes that Section 6.6 of the PFRR provides a list of standing variations, whereby the ability of an Affected Unit to provide PFR will be affected from time to time by one or more factors or causes listed in Section 6.6, in which case the Affected Unit will not be required to provide PFR to the extent that its ability to do so is impacted by the relevant factor or cause. AEMO considers it reasonable for a unit to not provide PFR if it has been issued with an inverter limit effectively rendering it incapable of providing PFR, and AEMO's position is that such a scenario is covered under Section 6.6(h).

AEMO notes Section 6.6(h) of the PFRR includes "to respond to primary energy availability, such as the availability of fuel or stored pressure for thermal generation, wind for wind generation, irradiance for solar generation, head level for hydro generation or number of online coal mills for coal generation".

AEMO acknowledges that this list is not exhaustive and covers few examples. In future PFRR consultations, AEMO will consider including further guidance on inverter management implications on PFRR obligations. As noted in Table 5, AEMO also intends to update the existing PFRR document to include the number of inverters online in the list of Standing Variations under clause 6.6(h), as well as other minor and administrative updates.

6.2.3 Generator Performance Standards (GPS) obligations

AEMO can confirm that reactive power requirements scale down based on reduced number of inverters online, and this is specified in AEMO GPS template Section S5.2.5.1(e1). AEMO understands participants may reduce the number of inverters online due to various operational or commercial reasons, including responding to inverter limits provided by AEMO, and this is addressed in NER S5.2.5.1(e1) which states:

> "With part of the *schedule 5.2 plant* out of service, the *maximum active power* and *reactive power capability* of a *production system* may be reduced in a manner consistent with the topology of the *plant* and the number of the operating *production units*, provided that the *reactive power* performance of any individual *production unit* at its terminals is not lower than its performance when the whole *plant* is in service."

[12] At https://www.aemo.com.au/-/media/files/initiatives/primary-frequency-response/2024/primary-frequency-response-requirements.pdf?rev=8a84be8f6ec84bfd9c2b84bcefc5e663&sc_lang=en.

NER S5.2.5.1(e1) outlines how a plant should operate with fewer units in service, but does not specify any reasons as to why those units are out of service, including whether this is in response to inverter limits from AEMO or inverters being unavailable due to maintenance or other operational requirements. AEMO's GPS template also includes this provision under NER S5.2.5.1(e1), and the template requests participants to provide details of the arrangement in that paragraph.

6.3 Operational impacts of disconnecting inverters

Stakeholder feedback on the Draft HLIA highlighted that both manual disconnection of inverters (where remote control is unavailable) and disconnection by NSPs could pose risks and operational challenges. AEMO acknowledges this and notes that any instructions issued by AEMO to NSPs to disconnect would be used as a last resort measure and only undertaken in accordance with NER 4.8.9.

The current process of managing inverter limits involves AEMO making phone calls to participants of IBR, requesting them to reduce the number of inverters online to at or below the inverter limit based on the relevant NSP's limits advice. As AEMO would certainly prefer participants to take action to reduce inverters online rather than involuntary disconnection by NSPs, this initiative will provide more opportunity for this via:

- indicative inverter limits published in pre-dispatch reports (for any planned outages), and
- inverter limits published in dispatch reports (including in the next dispatch run for any unplanned outages).

This will mean participants receive inverter limits in their dispatch reports at the next trading interval, and can take steps to respond as soon as possible, as opposed to waiting for a phone call from AEMO Control Room which will largely depend on the:

- number of participants required to reduce inverters online, and
- availability of AEMO Control Room resources at the time.

AEMO considers that with the new Inverter Dispatch initiative, there should not be any unannounced disconnection by NSPs, and instead participants will receive indicative invert limits in pre-dispatch reports and 15 minutes window to respond to any unplanned outages requiring a reduction in inverters online.

AEMO can confirm either 'Blocking' or 'Disconnecting' inverters in response to receiving inverter limits from AEMO would be acceptable to AEMO in terms of meeting the requirements to reduce inverter numbers, as noted in the draft HLIA. These terms are defined in Section 3.3.3 of AEMO's published Limits Advice Guidelines[13]. AEMO will also be able to distinguish disconnected/blocked inverters from those inverters online, similar to extreme wind "cut-out" for wind turbines.

Following project delivery in late April 2027, participants will be able to have either 'blocked' or 'disconnected' inverters showing as unavailable inverters to AEMO via SCADA.

AEMO acknowledges there may be existing wind farms and other IBR which were not designed for frequent energisation and de-energisation. The frequency of planned or unplanned outages requiring disconnection of inverters largely depends on the plant's location in the grid and associated system strength in those locations, particularly during unplanned outages leading to binding constraints.

[13] At https://www.aemo.com.au/-/media/files/electricity/nem/security_and_reliability/congestion-information/2025/limits-advice-guidelines.pdf.

Due to the changing nature of the NEM, grid conditions and new rule obligations, there may be more, or fewer, instances of de-energisation and re-energisation required. While this is difficult to be predict, AEMO acknowledges there are locations in the grid where outages and constraints requiring inverter disconnection are happening more often now, although this may be mitigated by new transmission infrastructure such as for Project Energy Connect (PEC) between South Australia and New South Wales.

6.4 Proposed rule changes and time required for implementation

As noted in the Draft HLIA for Inverter Management Systems, AEMO is developing a rule change proposal that will likely propose changes to:

- NER 4.9.2 (Instructions to Scheduled Generators and Semi-Scheduled Generators), and
- NER S5.2.6.1, which sets out the remote monitoring and control requirements for connections.

AEMO's intention is to remove ambiguity from the current process of requesting IBR operators to reduce number of inverters online. By including inverter limits in dispatch instructions, this will provide more clarity to participants regarding their obligation to respond, and combined with the implementation of the Inverter Dispatch system will ensure AEMO is better able to maintain power system security and efficient operations from the growing penetration of IBR.

AEMO has taken into consideration any early feedback received by stakeholders with regards to its proposed rule change, and provides a brief summary of elements of the rule change below.

6.4.1 Clarifying obligations under NER 4.9.2 and 4.9.5

Under NER 4.2.6, AEMO must operate the power system in a secure operating state and, following a contingency, return the system to a secure operating state as soon as practicable and within 30 minutes.

With the implementation of the automated inverter dispatch system, AEMO expects many plants will voluntarily receive and comply with automated inverter signals via Market or SCADA systems. However, without an explicit inverter-limit dispatch instruction in the NER, compliance with inverter limits is voluntary. AEMO is therefore considering proposing amendments to NER 4.9.2 to include inverter limits in dispatch instructions.

NER 4.9.5 prescribes the form and content of a dispatch instruction. AEMO considers that adding the number of inverters online to this list would ensure such an instruction has the same authority, clarity, and compliance expectation as existing outcomes such as MW targets, voltage set points, and reactive power requirements.

6.4.2 Clarify obligations under NER S5.2.6.1

In line with suggestions from stakeholders, AEMO is considering proposing that "number of inverters online" is added as a listed quantity under NER S5.2.6.1(b1), the automatic access standard. This will update the connection requirements such that newly connecting plant will need to possess the capability to:

- monitor telemetered inverter online counts,
- receive inverter counts via EMMS and/or SCADA/ICCP, and
- respond remotely or locally to the dispatch instruction to reduce the number of inverters online.

AEMO understands the majority of existing and newly connecting plant are already providing this information including number of inverters online via SCADA. However, AEMO considers that in establishing explicit capability requirements in NER S5.2.6.1(b1), along with proposed changes to NER 4.9.2 and 4.9.5, would create a direct, formal dispatch pathway for managing the number of inverters online at a specific plant or DUID.

6.4.3 Time required for implementation

Based on feedback from stakeholder sessions, AEMO understands there are varied capabilities of existing plant to receive and comply with inverter limits in dispatch instructions, and acknowledges that not all inverter-based plant currently receive or are likely in the near-term to receive inverter limits due to system security requirements. Based on this, AEMO supports a flexible approach to implementation of the new rules to ensure efficient transition, and recognises an implementation timeframe of greater than 12 months may be appropriate.

AEMO understands there may be a range in costs incurred by participants to comply with inverter limit instructions, particularly for older existing plant which may require substantial modifications to control systems. While AEMO will be automating the sending of inverter limits to participants using existing AEMO market and SCADA systems, AEMO is not proposing to include an obligation on participants to automate their responses (to reduce the number of inverters online), thus providing some flexibility in implementation.

6.5 Engagement with third party providers to support inverter limits

Several stakeholders recommended AEMO engage with third party operators and service providers to discuss the proposed inverter dispatch solution and potential rule changes. This is because many IBR assets are either directly operated by or involve these third parties, including interfacing with AEMO market and SCADA systems.

Stakeholders noted any automation or updates to existing systems and processes would need prior coordination with service providers to assess feasibility and costs, and their direct involvement in testing and deploying any new solutions.

AEMO confirmed providers are able to update software systems and processes to incorporate AEMO's new inverter limit requirements, including receiving and responding to inverter limits sent via EMMS Data Model or SCADA. However, while adding the new inverter limit to applications and data sets is straightforward, including monitoring and providing alerts for actions once an inverter limit is received, the main complexity lies in updating site control systems, especially for older sites.

Service providers advised AEMO that capabilities for automation vary widely across the IBR assets they service – from sites with fully automated SCADA-based responses to sites that still require manual responses to inverter limits from AEMO.

Overall however, third party service and software providers consulted by AEMO confirmed they were able to support a wide range of participants, including being able to:

- automate receipt of inverter limits from AEMO Market or SCADA systems,
- set up trigger alerts for action, and
- send instructions to remote-control centres or on-site teams to take action, and ensure conformance with inverter limits.

6.6 Industry readiness approach

This initiative will adopt a readiness approach that is consistent with AEMO's NEM Reform Readiness Framework (see **Figure 5**).

Figure 5 AEMO's NEM Reform Readiness Framework – to be completed for this initiative

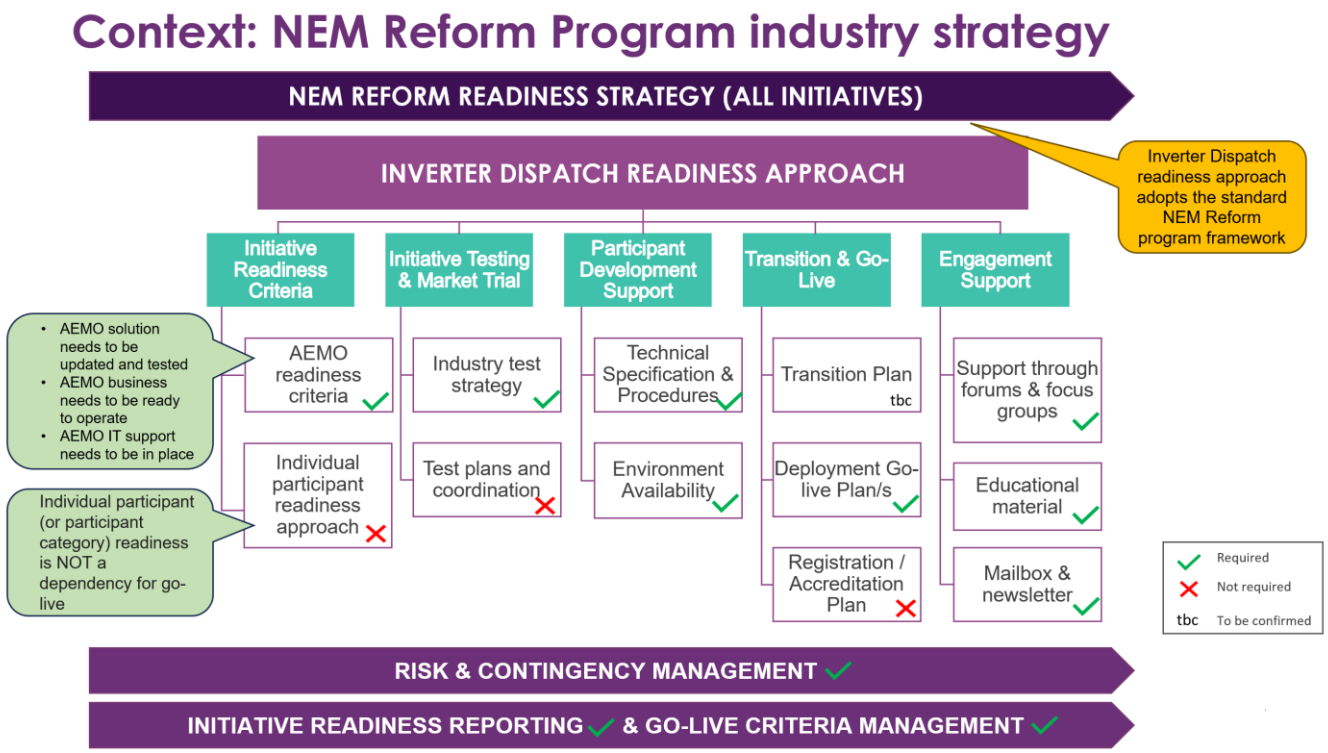


Table 10 Industry readiness approach for Inverter Management Systems – Inverter Dispatch

Readiness area		Industry readiness approach
Initiative readiness criteria	Individual participant readiness approach	Participant readiness is NOT a dependency for go-live. However, AEMO encourages participants to 'opt in' to the automated solution to streamline the process of how inverter limits are communicated and managed and to reduce manual activity to meet compliance obligations.
	AEMO readiness criteria	By go-live date in Q2-2027, AEMO's solution needs to be developed and tested for: • New EMS Inverter Dispatch Application to provide visibility of inverter limits, conformance monitoring and automated communications to Participants, and • EMMS Dispatch and Constraints systems enhancements to calculate maximum number of inverters allowed based on invoked constraints. Inverter Limits and related information to be included in: • Pre-dispatch and Dispatch NEM Reports to IBR (interim solution -data via Data Model v5.6), • Markets Portal screen updates, and • EMS SCADA configuration changes to automate inverter-limit signal from AEMO to NSPs and IBR. Business needs to be ready to operate. IT support needs to be in place.
Industry test	Industry test strategy	AEMO will develop an Industry Test Strategy in collaboration with industry: Draft and final versions expected to be available in Q4 2026. The industry test will run for four weeks in the Preproduction environment during Q1 2027 (likely during February and/or March).
	Test plans and coordination	If required, AEMO will develop an Industry Test Plan in collaboration with participants, for coordinated testing activities.
Participant development support	Procedures	Procedures and guidelines that will be updated, consulted on and published to implement the proposed rule changes. Consultations will begin from May 2026, with draft updates to procedures/guidelines published for stakeholder information and feedback, prior to and final versions of procedures/guidelines being published. Progress of consultation processes will be reported via AEMO's Electricity Wholesale Consultative and Implementation Forum.
	Technical specifications	AEMO will publish technical documentation with sufficient time before industry testing to support participant development. EMMS Technical Specification – initial version expected to be available by 29 May 2026, with a final version published prior to deployment go-live in Q2-2027. **Note: Data Model updates to support IBR were incorporated into DM v5.6 released to Preproduction on 14 October 2025 and Production on 19 November 2025. Participants should ensure they have upgraded to this or later version.** Market Systems User Group (MSUG) sessions available for additional support. Sign up details at https://www.aemo.com.au/energy-systems/market-it-systems/it-change-and-release-management.
	Environment availability	Preproduction will be available to support the industry test. No additional development support environment has been identified.
	IT development support	AEMO will run weekly ITWG Q&A sessions during the Industry Test period to support participants. As required, AEMO will provide industry support via NEM Reform forums, information sessions and focus groups for affected participants. These engagements would be scheduled as the IT design and approach is formalised to support participants development.
Transition and go-live	Transition plan	If required, AEMO will engage with participants to develop a Transition Approach to assist Participants, who 'opt in' to the automated solution, to transition from their current manual or interim process to the new automated solution.
	Go-live plan	An Industry Go-live plan will be developed, in consultation with industry, to confirm detailed deployment and capability availability timeframes in the lead up to rule commencements including: • when data model will be populated with new/changed data and reports available, • when Markets Portal data will be updated from, and

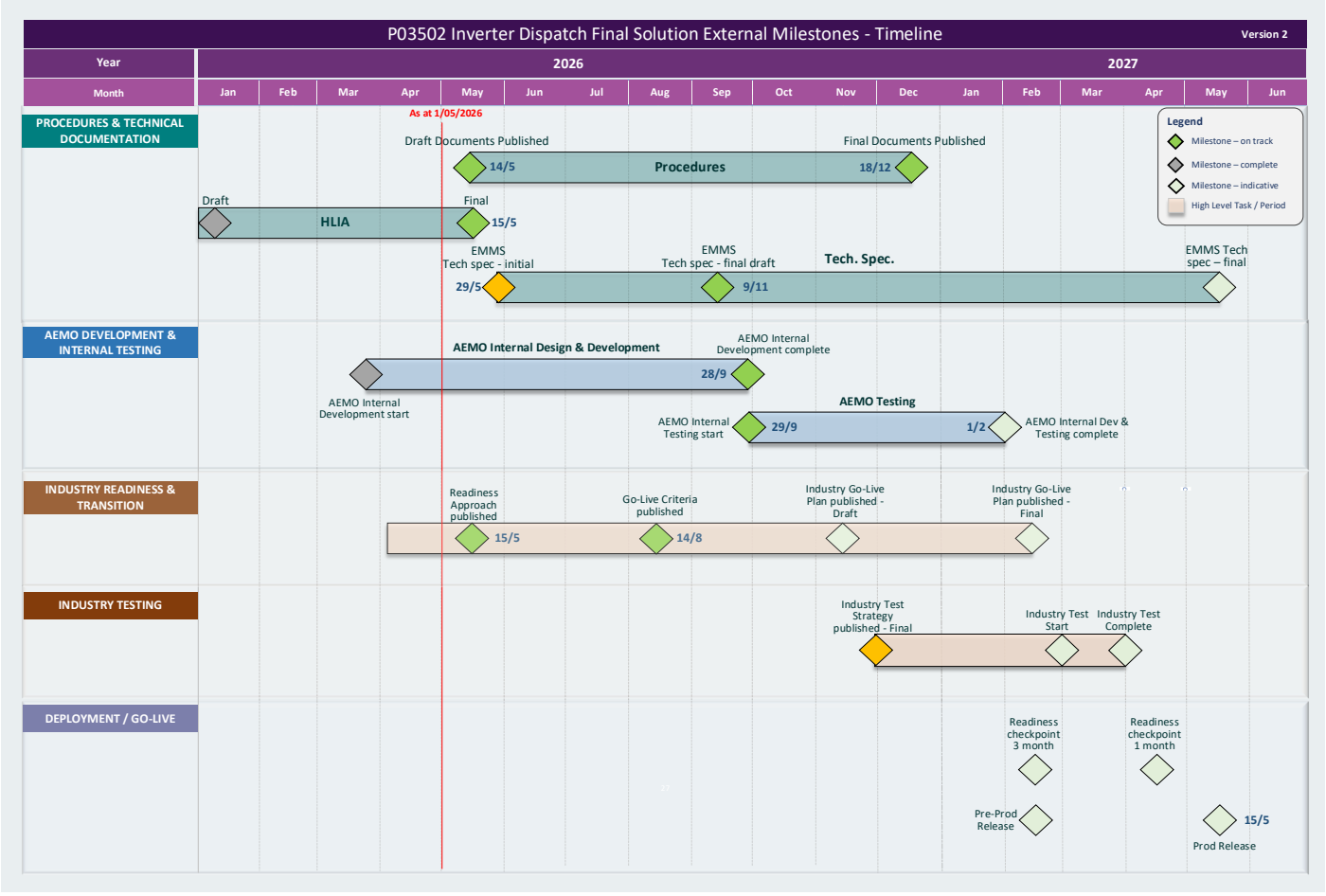
Readiness area		Industry readiness approach
		• when SCADA inverter limit requests with flow. Final plan to be published by end of Q1 2027.
	Registration or accreditation plans	No new registration or accreditation requirements.
Engagement support	Forums and Focus groups	The NEM Reform Program will support affected market participants in each reform phase from implementation design, procedures development, solution delivery and through to industry testing. Support will be provided as required via NEM Reform Program forums, information sessions, focus groups, 1:1s and daily stand-ups including: • Electricity Wholesale Consultative Forum (EWCF) for engagement on procedures • Implementation Forum • Industry Test Working Group Q&A sessions • MSUG for assistance with technical specifications.
	Educational material	AEMO will make available educational material to support awareness, assessment and preparation for affected participants. This material may include guides and factsheets, FAQs and industry presentations. Material will be made available through the project's dedicated webpage.
	Mailbox and newsletter	Participants support provided via monitored mailbox. Regular communications around project milestones.
Initiative readiness reporting	Risk & contingency management	Risk and contingency management will be developed in consultation with industry where it is identified as necessary during implementation, for example, at go-live checkpoints.
	Initiative readiness reporting	Formalised participant readiness reporting required Participants to confirm access and ability to receive enablement instructions. AEMO will report to industry, summary of Industry activities and progress against confirmed L1/L2 industry readiness milestones on a regular basis through NEM Reform forums. AEMO will schedule formal checkpoints against go-live criteria for each initiative, 3 and 1 month prior to go-live, to provide assurance of implementation preparations, allowing time for finalising AEMO's and participants business preparations.
	Go-live criteria management	AEMO will confirm initiative Go-live Criteria with Participants in Q4 2026 to be used for 3-month and 1-month checkpoint evaluation and reporting. AEMO will also take formal checkpoints against go-live criteria to provide assurance of implementation preparations ahead of industry test period and go-live, allowing time for finalising AEMO's and Participants' business preparations: • 3-month Checkpoint – early Q1 2027, and • 1-month Checkpoint – late Q1 2027.

A. At https://www.aemo.com.au/initiatives/major-programs/nem-reform-program/nem-reform-program-forums.

7 Indicative implementation timeline and risks

Figure 6 below provides an indicative implementation pathway for the Inverter Dispatch initiative. AEMO will provide updates to this timeline, if required, via its NEM Reform forums[14].

Figure 6 Indicative project implementation timeline



[14] See https://www.aemo.com.au/consultations/industry-forums-and-working-groups/list-of-industry-forums-and-working-groups.

7.1 Risk impact ratings and mitigation strategies

Table 11 Initial assessment of the Inverter Dispatch key implementation risks

Identified risk	Current rating	Mitigation strategies	Residual rating
Participant preparedness to make relevant process and systems changes	Medium	• Early engagement and clear communication of indicative timeframes to drive awareness with participants and enable consideration of system and process changes. • Resource/s assigned to drive high levels of stakeholder engagement. • Provision of interim solution for early adopters.	Low
Initiative unable to be delivered in time to meet urgent need for a less manual approach, so that AEMO can manage power system security	Medium	• AEMO planning for a 2026 implementation date. • AEMO introducing interim approach to accommodate early adoption, potentially by participants most affected by current manual arrangements. • Where possible, leverage existing systems and processes to minimise implementation complexity for participants and AEMO.	Low
Any change and potential instability due to operational emergencies leading shift in focus from reform to operations	Medium	Target to complete the project before summer to avoid high risk implementation window.	Low
Insufficient participant involvement during procedure development, implementation design and industry testing	Medium	Effective engagement and clear communication with industry participants regarding objectives and time frames which can increase awareness, participation and readiness.	Low

See **Appendix A1** for description of impact ratings.

A1. Impact ratings

Table 12 Description of AEMO's reform impact ratings for industry systems, processes and documentation

Impact rating	Description	Comments
No impact	• No change's to AEMO or industry systems, processes, guidelines, or procedures • Stakeholder consultation not required	• No changes
Immaterial	• Immaterial impact to AEMO or industry systems, process, guidelines, or procedures • Stakeholder feedback sought	• Immaterial administrative changes to AEMO procedures and/or guidelines, purposes of consistency • Immaterial changes or additions to existing business processes and/or technology systems • Stakeholder consultation not required
Low	• Low impact to AEMO or industry systems, processes, guidelines, or procedures • Stakeholder consultation may be required, or feedback sought	• Minor changes, additions, or updates to AEMO procedures and/or guidelines, purposes of consistency • Minor changes, additions, or updates to existing business processes and/or technology systems • Stakeholder consultation not anticipated but may be required
Medium	• Medium impact to AEMO or industry systems, processes, guidelines, or procedures • Stakeholder consultation required	• Material changes or additions to AEMO procedures and/or guidelines • Significant changes or additions to existing business processes and/or technology systems • Stakeholder consultation required
High	• High impact to AEMO or industry systems, processes, guidelines, or procedures • Stakeholder consultation required	• Significant changes, additions, or creation of new AEMO procedures, and/or guidelines • Significant changes, additions, or the creation of new business processes and/or technology systems • Stakeholder consultation required
Very High	• Large impacts to AEMO or industry systems, processes, guidelines or procedures • Stakeholder consultation required	• Large changes, additions or creation of new AEMO procedures and/pr guidelines • Major changes, additions or creation of new business processes and/or technology systems • Stakeholder consultation required