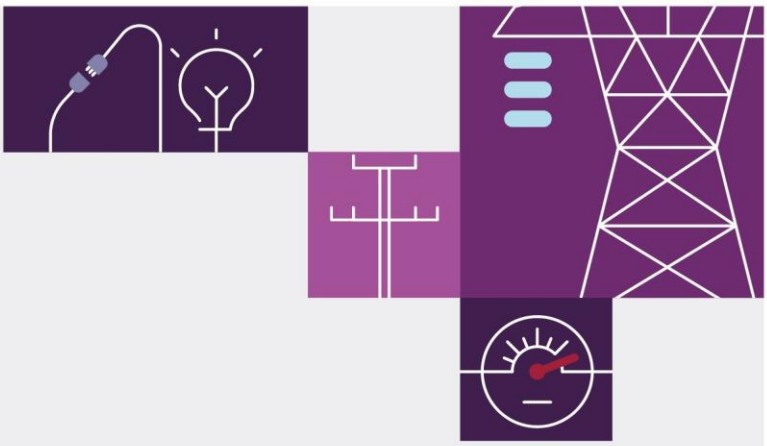
NEM2025 Implementation Roadmap

April 2022

Initiative Briefs

A reference document for the initiatives in the NEM2025 Implementation Roadmap



Important notice

Purpose

The purpose of this publication is to provide further information on each of the Energy Security Board's Post-2025 reform initiatives, as well as key AEMO strategic or foundational initiatives to help inform stakeholders understand the scope, assumptions and relationships underpinning the NEM2025 Implementation Roadmap.

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Version control

Version	Release date	Changes
1	27/04/2022	Initial publication
1.1	28/04/2022	Update to initiative briefs in line with roadmap

Overview

One of the main enablers of the Energy Security Board's (ESB's) recommended Post-2025 reforms is the development of IT systems and business processes. An initial assessment of the impacts associated with the delivery of the reforms was prepared by AEMO and formed part of the ESB's final advice to the Energy National Cabinet Reform Committee. The ESB's final advice called for further consideration of how to deliver these changes together with industry stakeholders as part of an integrated roadmap approach for National Electricity Market (NEM) regulatory and IT systems implementation.

AEMO, in partnership with the Reform Delivery Committee (RDC, or the Committee), has since compiled the NEM2025 Implementation Roadmap (the Roadmap) available on AEMO's website[1].

The purpose of the Roadmap is to establish a basis upon which to navigate the breadth of ESB reforms over the coming few years, de-risking delivery and informing implementation timing.

This reference document provides a brief description of each of the Post-2025 reform initiatives and those AEMO strategic or foundational enabling initiatives to help stakeholders understand the scope, assumptions and relationships underpinning the Roadmap. An Initiative Brief has been prepared for each initiative and provides:

- an understanding of the problem statement
- objective
- scope
- value/benefit
- key relationships, risks and assumptions
- high-level assessment of AEMO and participant impacts
- status and estimated timeline, and
- reference link to corresponding rule change, review or other.

The Post-2025 reform initiatives included in this reference document have been divided into three of the four interrelated reform pathways and supporting Data Strategy presented by the ESB in its final recommendation:

- Resource Adequacy Mechanisms (RAMS).
- Essential System Services (ESS).
- Integrating DER and Flexible Demand (DER & FD).

Transmission and Access (TA) reforms are not included in this reference document or the Roadmap because their scope is either at early policy development stage, or does not extend to AEMO's role as the market and system operator and as such, implementation does not need to be undertaken by AEMO.

The AEMO strategic and foundational initiatives – referred to as 'pre-requisite' initiatives have been grouped according to their primary functional impact and shared system and architecture relationships.

[1] At https://aemo.com.au/consultations/industry-forums-and-working-groups/list-of-industry-forums-and-working-groups/reform-delivery-committee

These groups are:

- Group A: Identity and Data.
- Group B: Operational System and Tools.
- Group C: Dispatch and Short-Term Market Operations.
- Others.

The details of each initiative are subject to change arising from further policy work or further analysis. As a result, the corresponding Initiative Briefs will need to evolve accordingly. Version control over this document will be applied to assist manage this process.

Importantly, version 1 of this document provides the baseline scope for Version 1 of the NEM2025 Implementation Roadmap. Any changes to the initiatives listed in this document will need to be analysed for their impact on the NEM2025 Implementation Roadmap.

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Tables

1 Resource Adequacy Mechanisms

1.1 Increased Medium Term Projected Assessment of System Adequacy (MT PASA) Information

1.1.1 Problem Statement

The energy transition will drive further changes to plant operating regimes where owners of thermal generation seek to reduce their overheads if low wholesale prices are expected. This could include mothballing of units for prolonged periods of time and/or seasonal shutdowns, or cyclical running regimes, e.g. weekday/weekend, day/night.

The challenges arising from these changes to plant operating regimes could include:

- The reduction in the number of units made available at specific plants during certain periods of the day or year could lead to a potential lack of reserve or essential system services.
- Lack of standardised information around when generators are available to supply, and the lead time required for recall from an outage make it difficult for AEMO to effectively plan and operate the system.
- Increased complexity for the Australian Energy Regulator (AER) in assessing compliance under the current notice of closure arrangements.
- Limitations on the ability of participants to use MT PASA reporting for coordinating participant maintenance schedules.
- Weakened investment signals for potential replacement plants if it is unclear why existing units are unavailable.

1.1.2 Objective

- Establishing the reporting of a unit's status through reason codes via MT PASA in accordance with IEEE Standard 762-2006 definitions for use in reporting electric generating unit reliability, availability and productivity, and tailored to a domestic context or equivalent.
- Establishing the reporting of recall times via MT PASA when triggered through a reason code.

1.1.3 Value/Benefit

Standardised information around when generators are available to supply, and the lead time required for recall from an outage may support:

- AEMO to effectively plan and operate the system.
- The AER in assessing compliance under the current notice of closure arrangements.
- Participants to coordinate maintenance schedules.
- Investors to assess opportunities for replacement plant.

1.1.4 Project Scope/Proposed Solution

- Consultation on design and definition of reason codes and recall times within AEMO's MT PASA framework.
- Consultation and drafting of amendments to key processes and supporting documentation (Reliability Standard Implementation Guidelines (RSIG), MT PASA Process Description, NEM Electricity Statement of Opportunities (ESOO) and Reliability Forecast guidelines, and MT PASA bid format and validation processes).
- Amendments to AEMO's MT PASA systems, models and reports (e.g. Participant Markets Portal)

1.1.5 Key Assumptions

- The scope of the final rule is limited to establishing reason codes and recall times and no additional MT PASA modelling runs will be mandated.
- IEEE 762-2006 will be tailored to a domestic context in collaboration with participants.
- Reporting of reason codes and recall times will require IT redesign of the existing submission portal.

1.1.6 Key Initiative Relationships

Table 1 Increased MT PASA initiative relationships

Name	Description
ST PASA Replacement Project	There are no direct project dependencies or relationships. However, there could be an opportunity to align AEMO's consultation on the MT PASA changes to the RSIG, with the RSIG consultation required for the ST PASA changes.

1.1.7 Risks

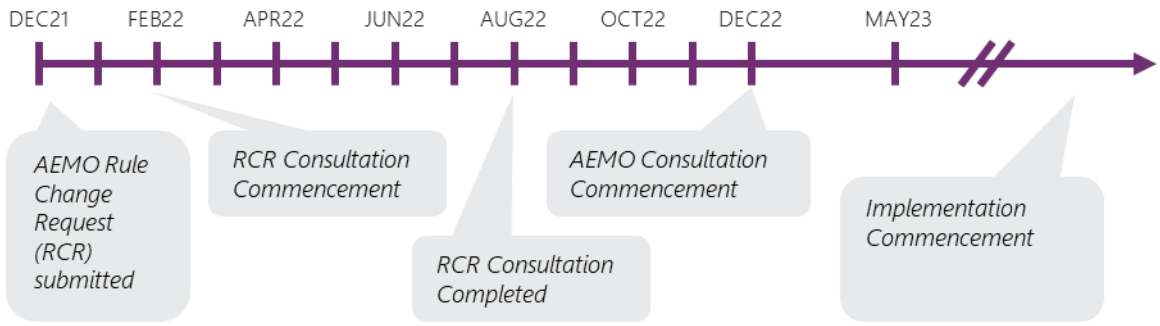
Table 2 Increased MT PASA initiative risks

Risk ID	Risk Type	Description	Mitigation
1	Scope	NSW has requested the addition of formal notification obligations in the rule change. These would require AEMO to formally notify a jurisdiction in a timely manner if it its reliability target would be breached.	AEMO has agreed to leverage its position as Energy Security Monitor to provide this service to the NSW Government.

1.1.8 Next Steps

- AEMC rules consultation: the Draft Rule Determination is anticipated in May 2022 and Final Rule Determination is anticipated in August 2022.
- AEMO consultation on changes to processes and guidelines: approximately 6 months (December 2022 - May 2023).
- AEMO/Participant implementation: estimated October 2023.

1.1.9 Indicative Schedule



Initial RDC feedback:

- The reform initiative is limited to AEMO and generators.
- This initiative has a relatively low impact and low complexity in terms of changes to MT PASA related systems and processes.
- Solution is subject to the structure of the final codes and recall times.

1.1.10 Reference

https://www.aemc.gov.au/rule-changes/enhancing-information-generator-availability-mt-pasa

2 Essential System Services

2.1 Fast Frequency Response

2.1.1 Problem Statement

The power system is in the process of transitioning from a system dominated by centralised coal and gas thermal generation to a system comprised of a diverse portfolio of behind-the-meter and grid-scale inverter-based energy resources as well as a more flexible demand side. This transition is leading to a reduction in inertia which presents operational challenges associated with maintaining a secure power system and controlling system frequency following contingency events.

At lower operating levels of inertia, increased volumes or faster acting frequency control services are required to arrest and stabilise the system frequency within the existing system operating standards. This could lead to a significant increase in the costs for fast six-second Frequency Control Ancillary Services (FCAS), which could be partially mitigated by the procurement of faster responding services.

Fast frequency response (FFR) refers to the delivery of a rapid active power increase or decrease by generation or load in a time frame of two seconds or less, to correct a supply demand imbalance and assist in managing power system frequency. FFR is a relatively new service that can be offered by inverter-based technologies such as wind, solar photovoltaics (PV), batteries and demand-side resources.

2.1.2 Objective

- Establish two new market ancillary services – very fast raise and very fast lower – to operate alongside the existing contingency FCAS markets.
- The market arrangements for the new market ancillary services will be the same as those for the existing fast raise and fast lower services. This includes the arrangements for registration, scheduling, dispatch, pricing, settlement and cost allocation.

2.1.3 Value/Benefit

- An alternative additional frequency control option may reduce the overall costs of managing power system frequency relative to the status quo or other alternative arrangements. For example, through a reduction in the costs for fast six-second FCAS.
- Incentivises investment in resources capable of providing very fast FCAS.
- Encourages innovation and technology development in resources capable of providing very fast FCAS.

2.1.4 Project Scope/Proposed Solution

- The solution will provide the development of spot-market arrangements for the provision of FFR. This will be based on the AEMC's and industry's preferred option – new market ancillary services to procure FFR FCAS using existing contingency FCAS arrangements.
- Develop and consult on FFR Market Ancillary Service Specification (MASS).

- IT related changes to AEMO/Participant FCAS systems/ models, bidding interfaces and reports, NEM Dispatch Engine (NEMDE), and Settlement Systems.
- Updates to relevant AEMO/Participant policies, processes, guidelines.

2.1.5 Key Assumptions

- The proposed solution will leverage existing contingency FCAS market arrangements and design.
- Changes will be made in line with recently implemented 5MS frameworks.

2.1.6 Key Initiative Relationships

Table 3 Fast Frequency Response initiative relationship

Name	Description
Integrating Energy Storage (IES)	• The IES rule changes create a new participant category called an Integrated Resource Provider (IRP). • This new category allows participants with bi-directional energy flows (such as aggregators of small generation and storage units) to provide energy and ancillary services. • As such, as the IES initiative is implementing the changes to enable IRP participation in ancillary services, they will need to consider the new FFR services being implemented through the FFR initiative. • The registration model developed by IES will be used by FFR. • The recovery of FFR costs will be amended in June 2024 by changes to the Non-Energy Cost Recovery framework in the IES rule change.
Operational-Decision Making Tools (ODMT)	• ODMT comprises a new enterprise platform for new decision-making tools used by the AEMO control room operators. Multiple disparate user interfaces converged into single user experience platform, capabilities for improved analytics and handling greater volumes of transactional data. This would extend to FFR related control room operations.
Dispatch Target State	
Bids/Offers Target state	• This trio comprises a technology uplift of AEMO backend market platform services to replace legacy technology. The scope of the target state needs to be defined and the needs of FCAS markets considered in that process.
Constraints Target State	

2.1.7 Risks

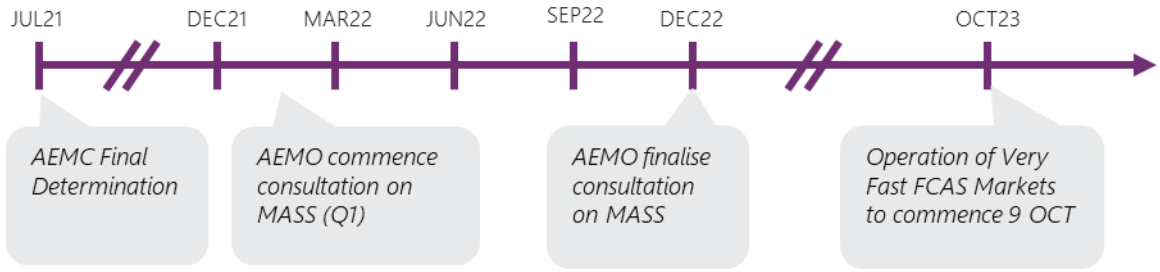
Table 4 Fast Frequency Response initiative risks

Risk ID	Risk Type	Description	Mitigation
1	Implementation	Increased complexity if co-optimisation is needed for the 1-6 seconds services in dispatch.	Design/Trials
2	Dependencies	Increase in project complexity due to multiple dependencies/synergies and overlapping projects in a similar timeline.	Planning and scheduling

2.1.8 Next Steps

- AEMO to consult on MASS changes.

2.1.9 Indicative Schedule



Initial RDC feedback:

- Retailer/generator impacts are likely minimal provided there is duplication of existing contingency FCAS market arrangements/design and no change to how those existing contingency markets operate.

2.1.10 Reference

https://www.aemc.gov.au/rule-changes/fast-frequency-response-market-ancillary-service

2.2 Mandatory Primary Frequency Response

2.2.1 Problem Statement

A high aggregate level of frequency responsiveness is a critical prerequisite for optimal frequency control outcomes as the supply mix continues to become increasingly decentralised, inverter-based, and variable.

It is challenging to define an exact level of future primary frequency response (PFR) requirements that will be sufficient across all plausible operational conditions. However, the need for PFR can be reasonably expected to grow over time due to factors including increasing price-driven movement in both generation and load, the introduction of five-minute settlement in 2021, increasing generation variability due to growth in variable renewable energy (VRE), and increasing uptake of distributed PV, currently without narrowband PFR enabled.

The AEMC has previously made a Rule to ensure all generators provide tight dead-band, (close to 50Hz), PFR. This is often known as 'droop' response and is an automatic active power response inversely in proportion to the change in Hz. This Rule has a sunset date of June 2023.

2.2.2 Objective

- Continuation of mandatory PFR requirements beyond the June 2023 sunset date, i.e. going forward all scheduled and semi-scheduled generators will be required to provide PFR.
- To design a new cost allocation system for Regulation FCAS, known as 'Causer Pays' based on, and which supports, tight dead-band MPFR.

2.2.3 Value/Benefit

- Reforms to the Causer Pays process for the allocation of regulation FCAS costs can deliver improved valuation and pricing of plant behaviour that impacts on power system frequency.
- Better alignment of the economic incentives for plant active power performance, with the impact of that behaviour on the need for corrective action through the deployment of regulation services to rebalance supply and demand and restore power system frequency to 50Hz.
- Lower costs to consumers.
- Improved transparency and provision of relevant information to Market Participants and stakeholders to assess the effectiveness and efficiency of the frequency control frameworks over time.

2.2.4 Project Scope /Proposed Solution

- Development and consultation on frequency contribution factors procedure and final PFR requirements to replace the existing Regulation FCAS Contribution Factor (Causer Pays) procedure.
- Design, build and implement a new IT system to determine contribution factors, and modify the existing NEM Settlements system to apply these factors during settlement. Effectively replacing AEMO's existing Causer Pays systems.
- Minor changes to AEMO registration procedures.

2.2.5 Key Assumptions

- The AEMC final determination will be in line with draft determination (i.e. retain tight dead-band).
- Changes to align with the IES design (e.g. registration function and rules for dispatch).

2.2.6 Key Initiative Relationships

- No key pre-requisite dependencies have been identified.
- However, MPFR and Scheduled Lite have a relationship through the ability to utilise the replacement Causer Pays system.

Table 5 Mandatory Primary Frequency Response initiative relationships

Name	Description
Scheduled Lite	• The relationship between MPFR and Scheduled Lite is the ability to utilise updated Causer Pays system. • It's a soft relationship in the sense that neither one 'must' precede the other. Rather, it would be efficient to align the development of Causer Pays replacement with all reforms that need it to the extent possible.
Integrating Energy Storage	• It is likely that Causer Pays arrangements for Hybrid systems will need to be amended as part of the IES rule implementation.

2.2.7 Risks

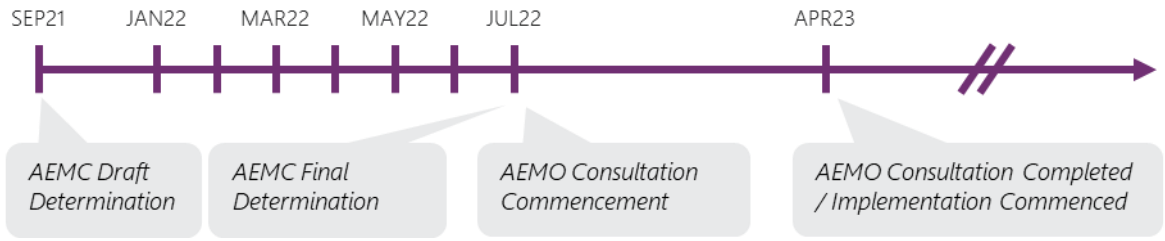
Table 6 Mandatory Frequency Response initiative risks

Risk ID	Risk Type	Description	Mitigation
1	Data processing	The solution will be required to process a high volume of data (4 second reads) and then aggregate into 5-minute intervals to calculate a settlement factor. This near to real time calculation is a major change from the current approach of using a sample of 28 days of data. Future usage of the solution should be considered to ensure that growth requirements are taken into account. A cloud -based solution would provide the expected scalability.	Design/Implementation

2.2.8 Next Steps

- The AEMC final determination is anticipated in July 2022.
- AEMO consultation on frequency contribution factors procedure.

2.2.9 Indicative Schedule



Initial RDC feedback:

- The reform initiative is limited to AEMO and potentially generators.
- For generators, Causer Pays updates may result in changes to generator procedures and how they participate in the market. However, it is unknown at this time until the final determination and procedure are developed.

2.2.10 Reference

https://www.aemc.gov.au/rule-changes/primary-frequency-response-incentive-arrangements

2.3 Operating Reserves

2.3.1 Problem Statement

Operating reserves are currently valued implicitly through the energy spot market. However, current arrangements may not be sufficient to address increased variability and uncertainty as the power system transitions in a manner that is sufficient to prevent AEMO intervention.

There is growing forecast uncertainty and variability in net demand over timescales of minutes to hours. Lack-of-reserve occurrences are increasing, and participant behaviour is not always responding to reduce system risk.

A new reserve service market could provide an explicit value for flexible capacity to be available to meet these net demand ramps spanning multiple dispatch intervals.

This market may complement the suite of resource adequacy reforms, rather than acting as a mechanism to deliver long term investment signals.

2.3.2 Objective

- An operating reserve market would unbundle reserves from energy to separately value flexible, responsive resources, through one or more new markets, and in doing so provide a separate and explicit signal for their provision.

2.3.3 Value/Benefit

Establishing a new reserve services market could:

- Reduce AEMO intervention (including RERT procurement).
- Incentivise reserves that are currently out-of-market (like RERT providers) to participate in-market to respond to unexpected changes.
- Support participation of demand side resources as scheduled resources in wholesale markets.
- Enhance operational signals at times of scarce reserves.
- Support greater power system resilience in procuring greater reserves than current minimum levels when efficient.
- Incentivise investment in flexible dispatchable resources.

2.3.4 Project Scope/Proposed Solution

- Delivery scope is potentially complex given the requirement to design a new market service requiring new formulation National Electricity Rules (NER), Procedures (including MASS) and guidelines.
- IT related changes to AEMO / Participant systems and models including bidding interfaces, settlement and cost-recovery processes, NEMDE or separate solver, operational tools/interfaces.
- Updates to relevant AEMO/Participant policies, processes, guidelines.

2.3.5 Key Assumptions

- The AEMC direction paper highlighted four alternative reserve procurement models. However, a preferred working model between market bodies was identified (option 2 below):
  1. A co-optimised operating reserve market.
  2. A co-optimised availability market – the current working assumption is a 30-minute reserve market co-optimised with energy and FCAS, labelled 'co-optimised availability market'.
  3. A callable operating reserve market.
  4. A ramping commitment market.
- Project scope is subject to final design recommendations.

2.3.6 Key Initiative Relationships

Table 7 Operating Reserves initiative relationships

Name	Description
ST PASA Replacement Project	• The replacement project involves a review of the Pre-dispatch (PD) and Short Term (ST) PASA methodology and supporting systems and processes. • The proposed rule change for an Operating Reserves (OR) market includes the development of an operating reserve demand curve. Certain inputs into the calculation of the curve, such as uncertainty measures, may change as a result of ST PASA process changes.
Operational Decision-Making Tools	• ODMT comprises a new enterprise platform for new decision-making tools used by the AEMO control room operators. Multiple disparate user interfaces converged into single user experience platform, capabilities for improved analytics and handling greater volumes of transactional data. This would extend to OR related control room operations. • ODMT is being delivered incrementally through an agile delivery model over several years – therefore, changes required by NEM2025 can be accommodated across varying timeframes.
Dispatch Target State **Bids/Offers Target State** **Constraints Target State**	• This trio comprises a technology uplift of AEMO backend market platform services to replace legacy technology. • The proposed change to create a new system service to procure energy reserves would have significant interaction with the dispatch and ST Markets systems. It has been proposed that AEMO would procure, on a rolling-basis in every 5-minute dispatch interval, a certain volume of operating reserves with the capability to dispatch it as energy in the dispatch interval 30-minutes ahead.
Forecasting Platform Uplift	• The uplift includes a converged modelling platform that supports model development, interfaces for forecasting-as-a-service providers and layered blended models across a number of modelling domains e.g. demand and VRE. • An Operating Reserves Market means that AEMO would need to forecast reserves needed to meet net demand forecasts that account for uncertainty and variability.

2.3.7 Risks

- Risks will be identified closer to the AEMC final determination.

2.3.8 Next Steps

- Further technical advice requested by the AEMC from AEMO on key design elements, including:
  - The development of an operating reserve demand curve.

  - The implementation of a Causer Pays cost recovery mechanism for the market.
  - The reserves obligation and interactions with dispatch and other processes.
- AEMO will provide technical advice to AEMC for consideration by mid 2022.
- AEMC draft determination anticipated June 2023.

2.3.9 Indicative Schedule

Initial RDC feedback:

- The reform initiative is still subject to significant design/policy consideration.
- It is expected that the stakeholders directly impacted by the reform initiative is limited to those Market Participants that elect to participate in the new service.

2.3.10 Reference

https://www.aemc.gov.au/rule-changes/operating-reserve-market

2.4 System Strength Planning

2.4.1 Problem Statement

System strength is the measure of a power system's ability to maintain a stable voltage and is critical to a secure power system[2]. Historically it has been supplied by synchronous generators[3]. The rapid changes in the energy market are resulting in these generators retiring from the market or operating less frequently and the supply of system strength has reduced.

Inverter based resources (IBR) such as wind, solar and batteries demand system strength[4]. As more of these generators enter the market, the demand for system strength is also increasing.

This combination has resulted in a decline in supply and increase in demand for system strength, and new solutions for providing system strength services are needed in the NEM[5].

The current frameworks have been reactive and slow to provide the necessary levels of system strength, leading to deficiencies in this essential service which can create problems in the power system, including wholesale market interventions and the constraint of IBR[6]. As a result, AEMO has needed to intervene and displace IBR by directing typically more expensive thermal generation[7]. This results in increased costs for consumers.

2.4.2 Objective

- Evolve the framework to address the need for a more forward-looking, coordinated solution for the supply and demand of system strength in the NEM.
- Enable a supply side solution through a new transmission standard for the provision of system strength when and where it is needed. A subset of Transmission Network Service Providers (TNSPs), known as system strength service provider (SSS Provider), will need to meet two components of the standard as set by AEMO forecasts.
- Enable a demand side solution through new access standards for relevant generators, loads and market network service providers.
- Enable a charging mechanism where parties who use system strength services pay for them, based on location in the network and the amount of system strength the connecting plant may consume, thereby sending a price signal to connecting parties.

2.4.3 Value/Benefit

- Facilitates the rapid integration of IBR and batteries into the power system to support its transition towards a lower carbon future.
- A forward-looking approach ensures system strength is available when and where it is needed. This facilitates the connection of IBR and reduces the need for interventions.

[2] AEMC. Information Sheet - Efficient management of system strength on the power system. Available here.
[3] Ibid.
[4] Ibid.
[5] Ibid.
[6] Ibid.
[7] Ibid.

- New access standards will ensure that connecting parties reduce demand for system strength by using high quality plant.
- A price signal from the charging mechanism should encourage connections that are coordinated with SSS Provider's system strength investments.

2.4.4 Project Scope/Proposed Solution

- AEMO will comply with the new Rules by updating the system strength requirements methodology and system strength impact assessment guidelines.
- Relevant TNSPs will meet the new network service obligation in the same manner as they meet other prescribed transmission services.
- The AER will develop a guideline for relevant TNSPs to update their pricing methodology documents.

2.4.5 Key Assumptions

- Implementation will be led by transmission network service providers (SSS providers, including AEMO in Victoria in its capacity as transmission network planner).
- AEMO System Design and Engineering have resources to update the requirements methodology, impact assessment guidelines and issue the first system strength requirements by end of Dec 2022.

2.4.6 Key Initiative Relationships

Table 8 System Strength Planning initiative relationships

Name	Description
Operational Security Mechanism (OSM)	Relationship, not a dependency - provide a procuring and scheduling process for ESS by producing a least-cost, inter-temporal optimised dispatch schedule.

2.4.7 Risks

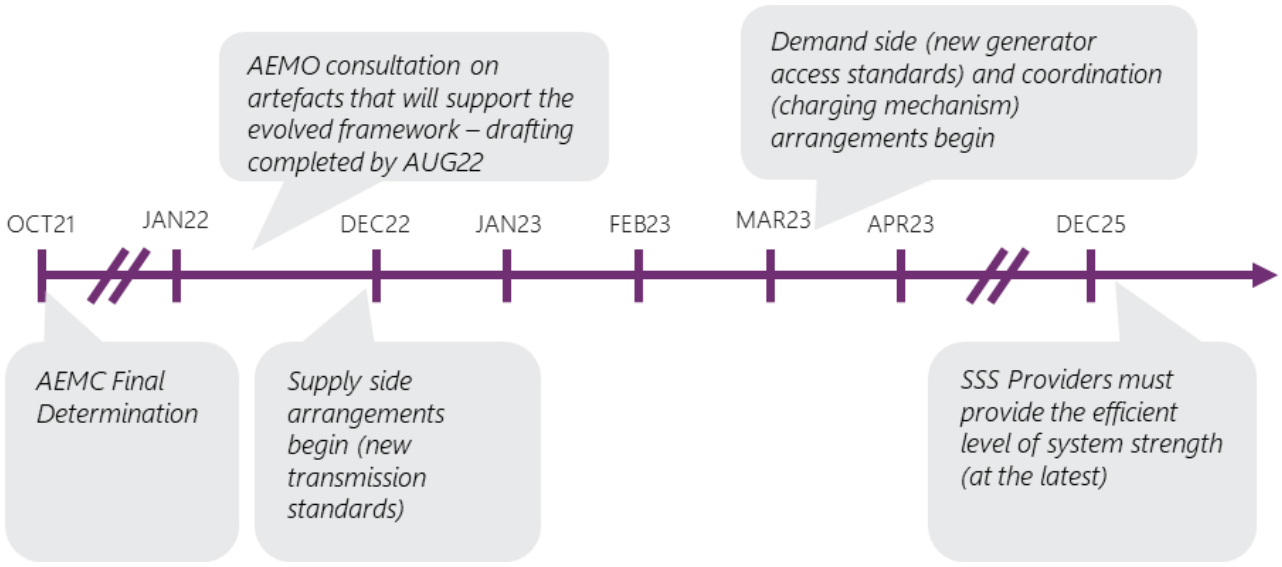
Table 9 System Strength Planning initiative risks

Risk ID	Risk Type	Description	Mitigation
1	Coordination	Interactions between procurement in operational timeframes (for which AEMO is responsible) and planning timeframes (system strength service providers).	Stakeholder engagement
	Implementation	The ability to meet regulatory timeframes for the December 2025 system strength planning standard. In light of RIT-T requirements, this will impose tight timeframes on the procurement and installation of any new build associated with network or non-network solutions.	AEMO publishes of system strength requirements in Dec 2022 - as it is obligated to do.
	Implementation	The system strength (planning) and structured procurement and scheduling mechanism work programs to be finalised well ahead of December 2025 to allow for most efficient implementation of solutions by system strength service providers	AEMO and TNSPs complying with the system strength Rule does not require and is not dependent on another Rule being made.

2.4.8 Next Steps

- AEMO will draft the new Requirements Methodology and Impact Assessment Guidelines by Aug 2022 to allow for the first publication of system strength requirements in Dec 2022.

2.4.9 Indicative Schedule



Initial RDC feedback:

- The System Strength Planning reforms has been included in the NEM2025 Roadmap to highlight relationships and dependencies for industry.

2.4.10 Reference

https://www.aemc.gov.au/rule-changes/efficient-management-system-strength-power-system

2.5 Operational Security Mechanism (OSM)

2.5.1 Problem Statement

Essential system services (ESS) are critical to maintaining overall power system security and reliability by meeting core power system requirements. The NEM's significant transition away from ageing thermal synchronous fleets, which the power system was designed around, toward increasing amounts of renewables and batteries is pressing the limits of current system security and operational experience. While historically these synchronous generators (such as large coal, gas and hydro generators) supplied essential system services simply as a by-product of energy, new non-synchronous generators (such as solar PV, wind and batteries) do not automatically provide these services.

Consequently, under the current market design, which does not explicitly value all ESS, the changing generation mix is providing fewer of these services, and further engineering understanding is required to determine the appropriate mix, definition and quantification of the services. From there, there is a need to co-ordinate the interaction between these services and the resources providing.

As a result, currently, AEMO is increasingly making operational decisions, such as directing generators to be online when they wouldn't otherwise be to support a secure power system.

2.5.2 Objective

- Provide a valuation, procurement and scheduling process for ESS by producing a least-cost, inter-temporal optimised dispatch schedule which considers attendant technical constraints and costs for unit commitment and system security.
- The AEMC are considering two broad approaches to scheduling resources to ensure the power system remains secure and consumer costs are minimised:
  - A market ancillary services (MAS) approach – which would introduce new services to be scheduled through the pre-dispatch engine to allow it to produce dispatch schedules that result in secure dispatch.
  - A non-market ancillary services (NMAS) approach – which would introduce new services to be procured and scheduled in an optimisation approach outside of the spot market, to ensure secure dispatch in a more efficient manner.

2.5.3 Value/Benefit

- Establishing a structured procurement and scheduling mechanism for ESS is expected to:
  - Provide an investment signal through commercial return for the provision of services supporting power system security.
  - Provide an additional tool for AEMO to procure for requirements ahead of using directions.
  - Reduce labour associated with manual market intervention for real time operators (RTO) and support staff, and improved situational awareness for operators.
  - Improve operational efficiency through transparency of integration of secure unit configurations with pre-dispatch.

2.5.4 Project Scope/Proposed Solution

- Delivery scope is highly complex and subject to ongoing consultation on possible design, rules and implementation options. Assumption for the initial roadmap is that the NMAS approach will be adopted, consistent with the final ESB recommendation for a Unit Commitment for Security and System Security Mechanism model for operational structured procurement.
- IT related changes to AEMO/Participant systems/models, bidding interfaces/settlement and cost-recovery processes (e.g. new solver engine, NEMDE, operational tools/interfaces, settlement, billing and Prudentials).
- Updates to relevant AEMO/Participant policies, processes, guidelines.

2.5.5 Key Assumptions

- The final solution provides for an NMAS approach and single optimisation engine to be run ahead of real time, separate to NEMDE

2.5.6 Key Initiative Relationships

Table 10 Operational Security Mechanism initiative relationships

Name	Description
ST PASA Replacement Project	• The replacement project is a review of the Pre-dispatch (PD) and Short Term (ST) PASA methodology and supporting systems and processes. • These processes consider system security and reliability over the same timeframes as the proposed OSM. • There are technology synergy opportunities to utilise the same solver platform (SCED) but no direct dependencies.
Operating Reserve	• OR proposes the unbundling of reserves from energy to value flexible, responsive resources, through one or more new markets. • There are potential technology synergies.
Operational-Decision Making Tools	• ODMT comprises a new enterprise platform for new decision-making tools used by the AEMO control room operators. Multiple disparate user interfaces converged into single user experience platform, capabilities for improved analytics and handling greater volumes of transactional data. This would extend to OSM related control room operations. • ODMT is being delivered incrementally through an agile delivery model over several years – therefore, changes required by NEM2025 can be accommodated across varying timeframes.
Dispatch Target State **Bids/Offers Target State** **Constraints Target State**	• This trio comprises a technology uplift of AEMO backend market platform services to replace legacy technology. • The proposed rule change would create a procurement service in operational timeframes to schedule the system services contracted in planning timeframes. • The procurement and scheduling process would need to produce an inter-temporal optimised dispatch schedule that considers technical constraints and costs for unit commitment and system security. • The target state does not have a direct relationship to OSM because it is assumed there will be a single optimisation engine run ahead of time that is separate to NEMDE. However, there are potential opportunities to use the same SCED engine for ST PASA and the Dispatch uplift.
System Strength Planning	• System Strength Planning reforms provide an evolved the framework to address the need for a more forward-looking, coordinated solution for the supply and demand of system strength in the NEM. This means there is a relationship with OSM which seeks to provide a procuring and scheduling process for ESS by producing a least-cost, inter-temporal optimised dispatch schedule

2.5.7 Risks

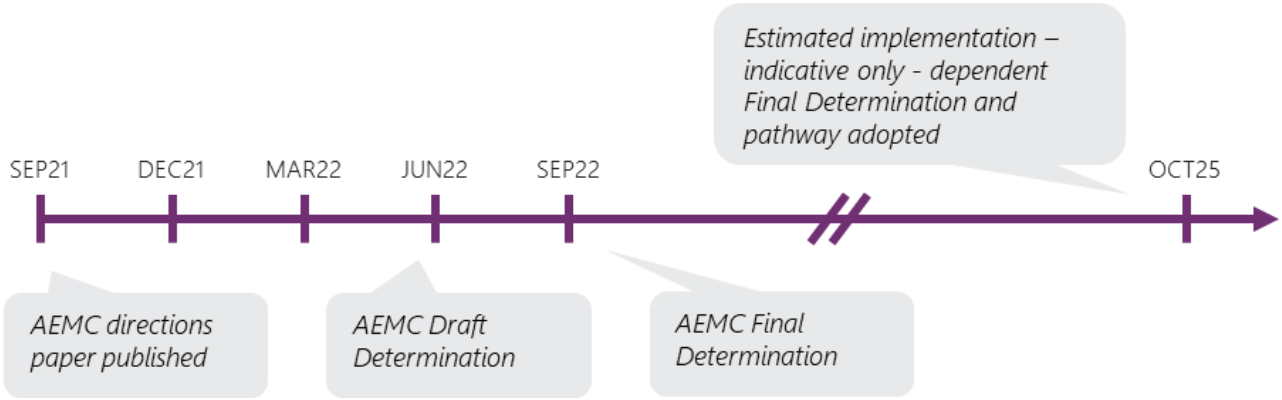
Table 11 Operational Security Mechanism initiative risks

Risk ID	Risk Type	Description	Mitigation
1	Scope	MAS vs NMAS approaches represent different scopes of work and will therefore impact overall implementation	Planning and scheduling

2.5.8 Next Steps

- The AEMC draft determination is anticipated 30 June 2022

2.5.9 Indicative Schedule



Initial RDC feedback:

- Of the initiatives considered this appears to be the most complex. Of the options considered the NMAS is likely to be simpler and lower cost.
- AEMO have not completed a detailed assessment of the implications of the MAS approach at this time.
- The NMAS is to be broader considering all aspects of managing system security. It is anticipated the NMAS approach will allow for integration with system strength planning approach.
- Delivery of new technology by AEMO will have a substantial flow on impact for participants. This requires careful planning/scheduling and in particular allowing sufficient time to consider the necessary changes to policies, processes and guidelines in addition to system changes.
- If sufficient detail exists, commercial negotiations with technology providers can run concurrently.

2.5.10 Reference

https://www.aemc.gov.au/rule-changes/operational-security-mechanism

3 Integrating DER and Flexible Demand

3.1 Integrating Energy Storage

3.1.1 Problem Statement

As our electricity system transitions to a net zero system with very high proportions of variable renewable energy, energy storage is set to play an increasingly important role to firm up the expanding volume of renewable energy and deliver the growing need for critical system security services as thermal generators retire.

Storage capacity is forecast to increase significantly over the coming years. The regulatory framework needs to facilitate this shift.

3.1.2 Objective

- In order to facilitate energy storage participation in the NEM, the AEMC has introduced the rule change for integrating energy storage systems (IESS) into the NEM to better integrate and utilise energy storage and hybrid systems (i.e. batteries).

3.1.3 Value/Benefit

- Simplification of the registration process for storage/ hybrid participants.
- Establishing a framework that incentivises participants to manage their demand by recovering non-energy costs proportionally from those who benefit from or cause the need for them.
- A consistent minimum ramp rate set for:
  - storage and non-storage participants,
  - load and generation units, and
  - scheduled and semi scheduled units, that have the same number of units and MW capacity.
- A consistent intervention compensation framework.

3.1.4 Project Scope/Proposed Solution

- The delivery scope is complex, given the substantial changes to NER chapters, industry procedures and guidelines, which drives changes across AEMO processes and systems.
- Establish the Integrated Resource Provider (IRP) registration category to:
  - Allow storage and hybrids to register and participate in a single registration category.
  - Allow aggregators for small generators to register as an IRP, and provide ancillary services.
- Major IT related changes to AEMO/Participant systems/models (e.g. registrations, dispatch and operations, FCAS, Marginal Loss Factors (MLF), constraints, RERT, metering and settlement systems).
- Minor IT related changes to AEMO systems to integrate new participant category across market systems.

- Updates to relevant AEMO/Participant policies, processes, guidelines – more than 150 impacted procedures have been identified (e.g. registrations, non-energy cost recovery settlement).

Initial RDC feedback:

- Configuration of metering arrangements and changes to non-energy cost recovery arrangements will result in impacts to retailers,
- Providing the right level of visibility will be critical across all initiatives.
- From a network perspective, IES implementation will be prior to Dynamic Operating Envelopes (DOE).
- Moderate level of complexity for the retailers and generators to implement.

3.1.5 Key Assumptions

- Input from related projects could impact IES business and technical requirements and design.
- AEMO published a High-Level Design for consultation and implementation.

3.1.6 Key Initiative Relationships

Table 12 Integrating Energy Storage initiative relationships

Name	Description
ST PASA Replacement Project	• The IES rule changes create a new participant category called an Integrated Resource Provider (IRP) that can register and participate in markets • IES changes the structure of market offers that come in, and as such need to feed into input of ST PASA. • The IES rule changes requires participating units to provide forecast information into the PASA processes.
Operational Decision-Making Tools	• ODMT is a new enterprise platform for new decision-making tools used by the AEMO control room operators. Multiple disparate user interface converged into single user experience platform, capabilities for improved analytics and handling greater volumes of transactional data. This would extend to IES related control room operations. • ODMT is being delivered incrementally through an agile delivery model over several years – therefore, changes required by IES can be accommodated across varying timeframes.
Dispatch Target State **Bids/Offers Target State** **Constraints Target State**	• This trio comprises a technology uplift of AEMO backend market platform services to replace legacy technology. • The IES rule change allows storage units to participate in dispatch as a single unit, and for hybrid systems to store or consume energy when some constraints apply through aggregated dispatch conformance. • The IES rule means there will be an increased volume of fast-responding dispatchable resources. • Accordingly, IES will need to be integrated into the bidding interfaces and dispatch systems.
Fast Frequency Response	• FFR will establish two new market ancillary services; very fast raise and very fast lower to operate alongside the existing contingency FCAS markets. • The IES rule changes create a new participant category called an Integrated Resource Provider (IRP). • This new category allows participants with bi-directional energy flows (such as aggregators of small generation and storage units) to provide energy and ancillary services. • As such, as the IES initiative is implementing the changes to enable IRP participation in ancillary services, they will need to consider the new FFR services being implemented through the FFR initiative. • The registration model developed by IES will be used by FFR.

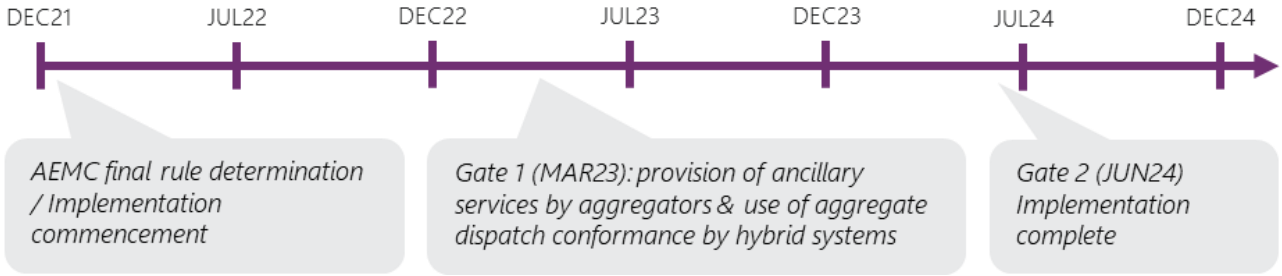
Name	Description
Mandatory Primary Frequency Response	• MPFR will design a new cost allocation system for Regulation FCAS based on, and which supports, tight dead-band MPFR. • A relationship exists with IES through availability of the updated causer pays system
Scheduled Lite	• Schedule Lite will establish opt-in framework to provide incentives for flexible demand, aggregated portfolios of DER and small generation resources (between 5 MW and 30 MW) to either provide visibility and/or participate in dispatch. • The registration model developed for IES will be used by Scheduled Lite. • IES has a relationship with Scheduled Lite and MPFR through updated causer pays system. • Due to regulatory deadlines, IES is unlikely to implement an updated causer pays system. It will need to be retrofit once either MPFR or Scheduled Lite delivers it.
SCADA Lite	• A low-cost mechanism to support telemetry services. • SCADA Lite will provide a platform for participants, such as VPPs, to communicate with AEMO and provide visibility of their DER device activities and participate in dispatch with lighter telemetry.
Flexible Trading Arrangements Model 2	• FTA2 establishes a framework for 'minor energy flow' metering installations, to reduce barriers, create greater flexibility for the introduction of new technologies. • The registration model developed for IES will be used by FTA. • .

3.1.7 Risks

Table 13 Integrating Energy Storage initiative risks

Risk ID	Risk Type	Description	Mitigation
1	Dependencies	Input from related projects could impact IES business and technical requirements and design.	Planning and scheduling

3.1.8 Indicative Schedule



Initial RDC feedback:

- Minor changes to implement new participant category (i.e. IRP). Material changes are to market systems (registration, dispatch (NEMDE), operation and metering and settlements systems).
- Substantial volume of AEMO procedures to be amended. There is potential for issues to be identified when detailed analysis occurs that could disrupt the implementation timelines.

3.1.9 Reference

https://www.aemc.gov.au/rule-changes/integrating-energy-storage-systems-nem

https://aemo.com.au/initiatives/submissions/integrating-energy-storage-systems-iess-into-the-nem

3.2 Flexible Trading Arrangements (Model 2)

3.2.1 Problem Statement

There are material barriers which prevent or deter customers from accessing services which separate active, price-responsive resources from passive loads (so that they can be aggregated and traded in the market).

The establishment of second connection points to the Distribution Network Service Provider (DNSP) network are often blocked via DNSP policy or costs, upfront and ongoing. Customers are prevented from obtaining competitive products and services for DER, and DER is less able to actively participate in the market.

3.2.2 Objective

- Remove or materially reduce barriers preventing customers obtaining additional retail arrangements for DER, enabling competition and active management of DER, providing customers with rewards for their flexible demand and generation.
- Establish a framework for 'minor energy flow' metering installations to reduce barriers further, create greater flexibility for the introduction of new technologies and enable access to retail competition for legacy connections in the NER.
- Flexible Trading Arrangements (FTA) Model 2 would establish a specific category of connection arrangement, a Private Metering Arrangement (PMA), enabling a NMI to be established within a customer's electrical installation.

3.2.3 Value/Benefit

- Reduced barriers to entry for traders of DER that can help consumers obtain value from their DER assets or their flexible demand.
- This allows the trader to participate in the wholesale market or provide network support on behalf of small customers with EV chargers, batteries, and other controllable DER resources.
- The management of controllable resources can also provide a market-driven response to issues affecting the energy system, such as minimum system load and directly benefiting the customer.

3.2.4 Project Scope/Proposed Solution

- Delivery scope is moderately complex relative to other initiatives.
- IT related changes to AEMO/Participant systems/models and reports (e.g. registration, metering and settlement systems).
- Updates to relevant AEMO/Participant policies, processes, guidelines (e.g. registration and accreditation, metering, settlements, consumer protections).

3.2.5 Key Assumptions

- Implementation linked to and leverages IES project delivery implementing FTA (Model 1).
- Provision of services from market be opt-in under the rule change request.

- No requirements placed on DNSPs to enable FTA Model 2.
- Outcomes from existing or upcoming reviews may impact on scope/design including:
  - AEMC Review of the Regulatory Framework for Metering Services.
  - AER review of Retail Authorisation and Exemptions.

3.2.6 Key Initiative Relationships

Table 14 Flexible Trading Arrangements Model 2 initiative relationships

Name	Description
Integrating Energy Storage	• The IES rule changes create a new participant category called an Integrated Resource Provider (IRP). • The registration model developed by IES will be used by FTA Model 2.
Scheduled Lite	• Schedule Lite will establish opt-in framework to provide incentives for flexible demand, aggregated portfolios of DER and small generation resources (between 5 MW and 30 MW) to either provide visibility and/or participate in dispatch. • FTA2 enables the management of controllable resources. The framework developed for FTA2 to support the management of controllable resources will be used by Scheduled Lite.
FRC Target State	• FTA2 will touch Retail processes, including MSATS (process changes to identify flexible NMIs, reconciliation of network charges). Proposal is an extension of existing embedded network processes. Many of the participants for FTA2 will also be participants in 'traditional' Retail systems.
DER Marketplace reforms (e.g. DOE, DER Data Hub and Registry Services, DER Operational Tools)	• FTA2 will establish a framework for the management of controllable resources that supports the objectives of the DER Marketplace reforms (integrating DER into wholesale market and systems).

3.2.7 Risks

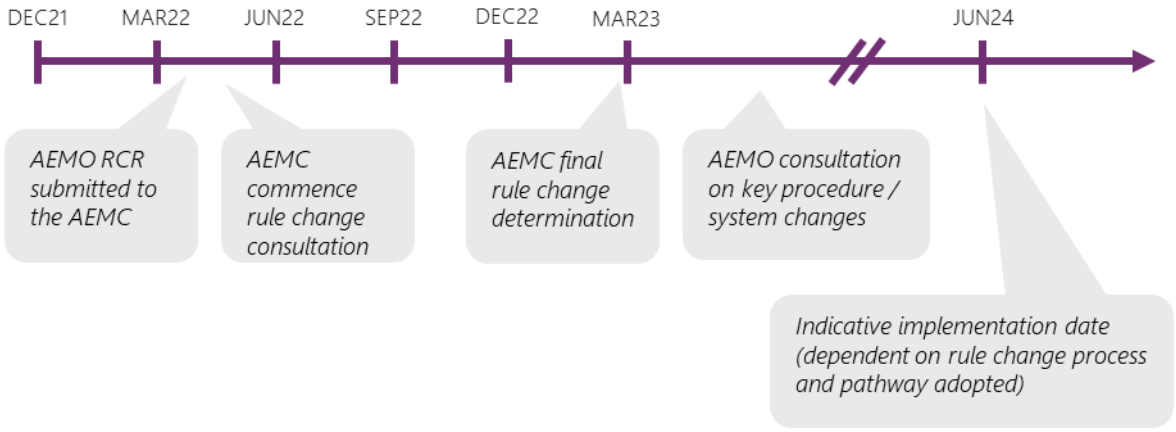
Table 15 Flexible Trading Arrangements Model 2 initiative risks

Risk ID	Risk Type	Description	Mitigation
1	Dependencies	Delays to implementation of FTA Model 1 via the IESS rule change.	Planning and scheduling
2	Metering review	Scope of the proposal changes following AEMC's metering framework review which might complicate the delivery of the proposal.	Monitor

3.2.8 Next Steps

- AEMO is currently drafting a rule change request (RCR) to the AEMC with an anticipated submission date in calendar Q2 2022.
- AEMC anticipated to commence consultation on RCR in calendar Q2 2022.

3.2.9 Indicative Schedule



Initial RDC feedback:

- The majority of processes to deliver FTA 2 are in operation already or will be implemented through IES, however some will require additional amendment, e.g. settlements.
- Secondary metering installation will be separate and therefore visible to the market, although it is anticipated that linking with primary metering installation will also visible.
- Design of DOE could become more complex as a result of FTA. For example, it will need to consider who is responsible at the connection point (e.g. primary metering installation) and treatment of load.

3.2.10 Reference

https://www.datocms-assets.com/32572/1629945809-post-2025-market-design-final-advice-to-energy-ministers-part-b.pdf

https://www.datocms-assets.com/32572/1629945838-post-2025-market-design-final-advice-to-energy-ministers-part-c.pdf

3.3 Scheduled Lite

3.3.1 Problem Statement

Balancing supply and demand is becoming increasingly challenging in the context of higher proportions of loads, aggregated DER and small generators (< 30MW) resources that are active and responding to wholesale market prices. These resources are not visible to the system operator and are having the effect of reducing operational oversight and market efficiency. These resources currently operate outside the NEM dispatch and scheduling processes.

3.3.2 Objective

To establish an 'opt-in' framework through lowering barriers and providing incentives for flexible demand, aggregated portfolios of DER and small generation resources (between 5 MW and 30 MW) to either:

- provide greater visibility to the market operator about intentions in the market, or
- to participate in dispatch of energy and ancillary services.

3.3.3 Value/Benefit

- Greater visibility over these resources supports increased certainty, benefiting all customers via more efficient market outcomes and increased competition.
- Participation through the dispatch process provides for additional benefits including:
  - more accurate scheduling for all participants
  - possibility of additional revenue streams for responsive resources (increased value from DER, small generators and load).

3.3.4 Project Scope/Proposed Solution

- The scope and solution is subject to the design option implemented (i.e. Visibility model and Dispatchability model).
- The Visibility model may include amendments to AEMO systems and processes including registration, demand forecasting systems/processes, control room displays and tools, as well as updates to corresponding procedures and guidelines.
- The Dispatchability model builds on the Visibility model and may include amendments to dispatch and pre-dispatch systems, bidding interfaces, compliance monitoring and reporting, settlement and prudential systems, MASS, as well as updates to corresponding procedures and guidelines.

3.3.5 Key Assumptions

- Several reviews or work programs currently underway outside of AEMO may impact on the final design and therefore the project scope including:
  - Power System Data Communications Standard Review.
  - GridNet Network Infrastructure.

- Distributed Energy Integration Program (DEIP) workstream for Dynamic Operating Envelopes.
- Insights and learnings from Project EDGE.

3.3.6 Key Initiative Relationships

Table 16 Scheduled Lite initiative relationships

Name	Description
SCADA Lite	• A low-cost mechanism to support telemetry services. • SCADA Lite will provide a platform for participants, such as VPPs, to communicate with AEMO and provide visibility of their DER device activities.
Integrating Energy Storage	• Schedule Lite will establish opt-in framework to provide incentives for flexible demand, aggregated portfolios of DER and small generation resources (between 5 MW and 30 MW) to either provide visibility and/or participate in dispatch. • The registration model developed for IES will be used by Scheduled Lite. • Scheduled Lite has a relationship with MPFR through utilisation of the Causer Pays replacement system.
Flexible Trading Arrangements Model 2	• FTA2 enables the separate trading of controllable resources in the market. The framework developed for FTA2 to support the management of controllable resources could be used by Scheduled Lite participants.
DER Marketplace (e.g. DOE, DER Data Hub and Registry Services, DLNS, DER Operational Tools)	• Scheduled Lite will establish a framework that enables greater visibility and management (dispatchability) of DER devices. • Scheduled Lite design will need to build on solutions delivered through DOE, local services and data hub initiatives.
Operational Decision-Making Tools	• Scheduled Lite allows small to medium resources to participate in market processes either through providing additional information on future behaviour and intentions (visibility) or participating in the NEM dispatch process (dispatchability). • This means there may be a need to update control room displays and tools to integrate new data types.
ST PASA Replacement	• Scheduled Lite allows more resources to either provide visibility or participate directly in the NEM dispatch process. • This has an impact on the forecasting processes that will need to be able to absorb forecasting information from participating resources, provide more accurate operational forecasts and increase scheduling accuracy.

3.3.7 Risks

Table 17 Scheduled Lite initiative risks

Risk ID	Risk Type	Description	Mitigation
1	Dependencies	Delays to other reform initiatives could impact delivery.	Planning and scheduling
2	Uptake	'Opt-in' model may result in limited uptake by users.	Encourage uptake through knowledge sharing of the benefits and value of participation from proof-of-concept trials such as Project EDGE.

3.3.8 Next Steps and Indicative Schedule

- AEMO will progress with further consultation with industry on high-level design with the intention to bring together a rule change request for consideration by the AEMC by mid 2022.
- The indicative schedule to be confirmed beyond rule change request.

Initial RDC feedback:

- DNSP feedback indicates that the initiative can add value and efficiency to the system. Impacts likely to be moderate (particularly the Visibility model).
- Minimal impacts to existing registered generators (> 30MW) and consumers anticipated at this time. Moderate impacts to non-scheduled generators and loads and traders of aggregated DER portfolios that elect to participate in the mechanism.

3.3.9 Reference

https://www.datocms-assets.com/32572/1629945809-post-2025-market-design-final-advice-to-energy-ministers-part-b.pdf

3.4 Dynamic Operating Envelopes

3.4.1 Problem Statement

There is a need for a system-wide standard to apply limits to the import and export at DER connection points to the grid in order to help manage known issues across the power system such as (but not limited to) minimum system load and local congestion.

At present, these limits are static, but dynamic limits have the potential to better manage congestion on the distribution network and allow for more flexibility in exporting. These are referred to as dynamic operating envelopes (DOEs) where maximum levels of exporting and importing are set and change over time.

3.4.2 Objective

- To date, DOEs have been developed through a number of industry trials. Implementing DOEs as a mandatory requirement for all new DERs connecting to the grid requires coordination of several key reforms:
  - Establishing new connection agreements with customers that refer to these dynamic limits, and the obligations of the customer, via the retailer / aggregator to maintain these limits.
  - DNSPs to develop capacity allocation principles on how to fairly allocate these limits to different customers at times when constraints are required.
  - New obligations on the retailer / aggregator to operate DER within these limits, where they are operating DER on behalf of customers.
  - Creating new standards for interoperability and cyber security so that DER devices communicate in a standard manner, support a simple process to switch from one provider to another, and enable any provider to ensure compliance with DOEs.

3.4.3 Value/Benefit

- There are various benefits from the establishment of DOEs including:
  - Increased network utilisation.
  - Improved coordination of access.
  - Improve DER optimisation.
  - Improve investment cases for network investment.
  - Efficient operation of the power system and market.
  - Unlocking value for those customers with DER.

3.4.4 Project Scope/Proposed Solution

- The potential scope of work across industry includes:
  - Establish DER technical standards (e.g. communications and interoperability).
  - Limits and constraint advice.

  - Capacity allocation rules, monitoring and compliance advice (Access and Pricing Rule Change – AEMC process, AER policy and regulation).
  - Connection agreement framework.
  - Metering guidelines/review (Metering Review – through the AEMC process).
  - DOE reposit (Projects EDGE and Symphony – through proof-of-concept trials)
- At this stage it is expected that AEMO's scope of work is limited to the receipt and sharing of DOE related information.

3.4.5 Key Assumptions

- The following is out of scope:
  - Distribution level dynamic limits.
  - Dynamic limit retrieval.
  - Auto-compliance monitoring (DNSP).
  - Local Services Exchange Markets settings.
  - Co-existing network capabilities influencing DOEs.

3.4.6 Key Initiative Relationships

Table 18 Dynamic Operating Envelope initiative relationships

Name	Description
Flexible Trading Arrangements Model 2	• FTA2 will establish a framework for the separation and trading of controllable resources. DOE solution will need to support multiple traders operating at a primary connection point.
Scheduled Lite	• Scheduled Lite will establish a framework that enables greater visibility and management (dispatchability) of DER devices. • Scheduled lite requirements for DOE include: – DOEs are available to DER traders so that they can manage their market bids. – DOEs are available for use in market systems where it is necessary to incorporate limits into short-term forecasts, security or reliability processes. – Where there are multiple traders at a Distribution Connection Point, a mechanism is required to coordinate, share and allocate limit between the traders.
FRC Target State	• Many participants in a DER Marketplace are likely to be active across other markets, and may include a new cohort of participants (e.g. 'traders/aggregators'). Therefore, the objectives of FRC target state to provide unified services through a shared, single access platform to AEMO's retail systems and processes would support a more efficient experience for a market likely to have a greater number of participants compared to the current Retail market.
DER Data Hub and Registry Services	• DER Data Hub would provide efficient and scalable data exchange and registry services for DER between industry actors. This could include information related to DOEs
Distribution Local Network Services	• This initiative will evaluate how local services interact with dynamic operating envelopes and dynamic network tariffs.
DER Operational Tools	• This initiative builds DER operational tools and capabilities to maintain local and overall power system security in a high-DER future. For example, operational forecasts developed by DNSPs to calculate DOEs could be shared with AEMO.

- In addition, there are relationships and dependencies with various industry trials (AEMO – Project Evolve, Project EDGE, Project Edith, Project Symphony), market reviews (DEIP DOE Whitepaper, DSPI, Review of the Regulatory Framework for Metering Services).

3.4.7 Risks

- Risks will be confirmed subject to final scope and progress on other reform initiatives and industry trials.

3.4.8 Next Steps

- ESB consultation – Interoperability Policy Framework.
- AER DOE policy and regulation initiative.
- Work remains subject to various ongoing trials and market reviews.

3.4.9 Indicative Schedule

- Related Rule Change effective dates and implementation completion dates are yet to be determined.

3.4.10 Reference

https://www.datocms-assets.com/32572/1629945809-post-2025-market-design-final-advice-to-energy-ministers-part-b.pdf

3.5 Distribution Local Network Services

3.5.1 Problem Statement

Large scale penetrations of DER, such as those projected in the 2022 Draft Integrated System Plan (ISP), could be utilised by networks to defer or displace network augmentations, and assist them in actively managing power flows on their network. Currently, however, DNSPs rarely procure services from DER and do so in bespoke bilateral contracts that lead to high transaction costs.

3.5.2 Objective

- To identify ways to make it easier for DER aggregators to trade local network support services with DNSPs/Distribution System Operators (DSOs), through greater visibility of local network constraints aligning the definitions of local services and how they are traded between regions.

3.5.3 Value/Benefit

- The Network Transformation Roadmap from Energy Networks Australia (ENA) and CSIRO projected that DNSPs could procure up to $2.5bn per annum of local network support services from DER by 2050.
- Various benefits from efficient provision of local network services include:
  - Increased network utilisation and potential deferral of network augmentation.
  - Improved DER optimisation.
  - Improved investment cases for network investment through being able to identify the cost of managing constrained parts of the network.
  - Efficient operation of the power system and market.
  - Unlocking value for those customers with DER.

3.5.4 Project Scope/Proposed Solution

- Potential scope across industry includes:
  - develop guideline to align the definition of local services and how they are traded (for instance via standardised bilateral contacts) between regions could make it easier for aggregators operating across regions to engage and deliver local network services for DNSPs as DER penetrations grow.
  - The guideline could also outline the information DNSPs should publish, over and above what is required in the DAPRs, in relation to network constraints and network service requirements, and how that information should be made available.
  - Evaluate how local services interact with dynamic operating envelopes and dynamic network tariffs – for instance networks could utilise DOE and dynamic tariffs in the first instance to manage power flows, but could then procure a service to give them greater certainty when managing persistent constraints.
- At this stage it is assumed that scope relating to AEMO is limited to a simple platform for DSO and aggregators to exchange information on local service requirements and supply.

3.5.5 Key Assumptions

- Services likely derived by DNSPs entering bilateral contractual arrangements with aggregators or agents of DER for provision of services such as voltage support.
- DNSP seen as DSO and having responsibility for scope and provision of local network services (i.e. transactions are executed and settled between DNSP/DSO and aggregator).
- AEMO has a very limited interaction in this trade. AEMO is not involved in the definition, scheduling or settlement of local services, but is likely to require visibility of scheduled local services at an aggregated level as the trade of local services grows in scale.

3.5.6 Key Initiative Relationships

Table 19 Distribution Local Network Services initiative relationships

Name	Description
DER Data Hub and Registry Services	• To facilitate efficient and scalable growth of local network services, it may be beneficial to exchange data and registry information via the DER Data Hub envisaged in this project.
Dynamic Operating Envelopes	• DNSPs using DOEs to manage power flows so that network limits are not breached may reduce the need for some local services, but equally where DOEs are being used to persistently constrain PV exports it may be beneficial to procure local services (e.g. voltage support) to enable greater exports at specific times.
SCADA Lite (TBC)	• As a low-cost mechanism to support telemetry services, SCADA Lite may provide a platform for participants to communicate with AEMO and provide visibility of their DER device activities.

3.5.7 Risks

- Risks will be confirmed closer to project commencement.

3.5.8 Next Steps

- Yet to be determined

3.5.9 Indicative Schedule

- Schedule will be confirmed at a later time.

Initial RDC feedback:

- AEMO will reconsider the implications for retailers associated with this initiative given their role as the interface with customers as the initiative develops.
- Substantial policy/design work to be progressed.
- Need to consider the design (and therefore implementation) over multiple horizons, for example an exchange today may not facilitate sufficient competition – this will help understand trade off/costs and benefits.

3.5.10 Reference

https://www.datocms-assets.com/32572/1629945809-post-2025-market-design-final-advice-to-energy-ministers-part-b.pdf

https://aemo.com.au/en/initiatives/major-programs/nem-distributed-energy-resources-der-program/der-demonstrations/project-edge

3.6 DER Data Hub and Registry Services

3.6.1 Problem Statement

The Draft 2022 ISP projects that by 2050 there will be over 100 GW of distribution connected resources on the NEM, 40% of total installed capacity, which requires DER coordination to maintain system security.

DER coordination at this scale requires high volumes of data and control signals to be exchanged between many parties. For instance, DNSPs sending DOEs or dynamic tariffs to customer agents, and retailers sending exports limits to customer agents to manage negative spot price exposures.

Exchanging data relating to 100+ GW of DER without consistent data models, and commands would add unnecessary and material costs to consumers, whilst restricting innovation and raising barriers to entry. Efficient and scalable DER coordination requires systems thinking and consistent approaches.

3.6.2 Objective

- Establish a DER Data Hub to provide efficient and scalable data exchange and registry services for DER between industry actors (Customer Agents, DNSPs, retailers, AEMO. Customer Agent to device communications is addressed in technical standards processes).
- The DER Data Hub could also use digital identities to enable more efficient and permission-based sharing and access to information, which could link to an augmented DER Register that contains more than just standing data.

3.6.3 Value/Benefit

- More efficient and scalable exchange of data between distribution level actors.
- Enables customer agents/aggregators operating across the NEM to receive DOEs from all DNSPs or export limits from retailers through one connection to the Data Hub.
- Enables consistent command signals to be sent from DNSPs to Customer Agents for dispatch/delivery of local network services

3.6.4 Project Scope/Proposed Solution

- Project EDGE (a collaboration between AEMO, AusNet Services and Mondo) is trialling a proof-of-concept DER Data Hub. Two approaches are being tested – a centralised hub (that operates similarly to the eHub) and a decentralised data hub.
- Project EDGE is delivering an independent cost benefit analysis examining scalability of the data hub approach versus current point-to-point approaches to data exchange.
- The practical test and a cost benefit analysis (CBA) will inform whether this concept is in consumers' long-term interests

3.6.5 Key Assumptions

- Further process should be informed by evidence from Project EDGE and other initiatives.

3.6.6 Key Initiative Relationships

Table 20 DER Data Hub and Registry Services initiative relationships

Name	Description
Distribution Local Network Services	• To facilitate efficient and scalable growth of local network services, it may be beneficial to exchange data and registry information via the DER Data Hub envisaged in this project.
Dynamic Operating Envelopes	• DNSPs using DOEs to manage power flows so that network limits are not breached may reduce the need for some local services, but equally where DOEs are being used to persistently constrain PV exports it may be beneficial to procure local services (e.g. voltage support) to enable greater exports at specific times.
Flexible Trading Arrangements Model 2	• FTA2 will establish a framework for the separation and trading of controllable resources that supports the objectives of the DER Marketplace reforms (integrating DER into wholesale market and systems).
FRC Target State	• Many participants in a DER Marketplace are likely to be active across other markets, and may include a new cohort of participants (e.g. 'traders/aggregators'). Therefore, the objectives of FRC target state to provide unified services through a shared, single access platform to AEMO's retail systems and processes would support a more efficient experience for a market likely to have a greater number of participants compared to the current Retail market.
Identity and Access Management	• A unified mechanism to authenticate participant users and applications when accessing AEMO services. • A more efficient and scalable framework will reduce entry barriers for the anticipated increase in participants as a DER Marketplace develops. • The DER Data Hub provides a secure and efficient methods to manage organisational identity and access.
Industry Data Exchange	• Unified access to AEMO services across all markets using modern authentication and communication protocols. • A DER Marketplace is anticipated to require capabilities to manage orders of magnitude more data.
SCADA Lite	• A low-cost mechanism to support telemetry services. • SCADA Lite may provide a platform for participants to communicate with AEMO and provide visibility of their DER device activities

3.6.7 Risks

- Risks will be confirmed closer to project commencement.

3.6.8 Next Steps

- To be confirmed.

3.6.9 Indicative Schedule

- Schedule to be confirmed at a later time.

3.6.10 Reference

https://www.datocms-assets.com/32572/1629945809-post-2025-market-design-final-advice-to-energy-ministers-part-b.pdf

3.7 DER Operational Tools

3.7.1 Problem Statement

The Draft 2022 ISP projects that by 2050 there will be over 100 GW of distribution connected resources on the NEM, 40% of total installed capacity, which requires DER coordination to maintain system security.

New operational tools relating to DER, and interactions between AEMO and DNSPs, will be required to maintain power system security at times when the entire NEM demand could be met with distribution connected resources. AEMO, transmission network operators and DSOs will need to collaborate and communicate in a greater capacity to ensure the system services required to maintain security will be provided in the most cost-effective manner[8].

3.7.2 Objective

- To identify and develop, in collaboration with DNSPs, new DER operational tools that may be required by each party, which can work together to maintain efficient and secure power system operations at times when up to 100% of system load can be met with DER.

3.7.3 Value/Benefit

- Continued power system security when operating at very high penetrations of DER.
- Enabling more dynamic operations of the distribution network by DNSPs (with visibility shared with AEMO) will enable continued local network security and will maximise the renewables hosting capacity of the distribution network.
- Meanwhile, consumers benefits through:
  - More accurate operational forecasts and management of the supply demand balance, leading to reduced wholesale electricity prices and lower system service costs for all consumers.
  - Improved DER optimisation also facilitates efficient operation of the power system and market and unlocks value for those customers with DER.

3.7.4 Project Scope/Proposed Solution

- AEMO and DNSPs will engage to understand what DER operational tools/capabilities they will each need to fulfil their respective roles in future, and how those tools/capabilities will need to interact to maintain local and overall power system security.
- For AEMO, this project builds on their Operational Decision-Making Tools to specifically engage with DNSPs and address DER operational tools that control room staff will need in future.
- For example, DNSPs will need to develop an operational forecasting function to calculate DOEs; those forecasts, aggregated at an agreed point, could be shared with AEMO to improve their operational forecasting accuracy. Equally, AEMO's operational forecasting expertise could help DNSPs establish their new operational forecasting function.

[8] AEMO submission to parliamentary inquiry on Modernising Australia's Electricity Grid. Available: https://www.aph.gov.au/Parliamentary_Business/Committees/House/Environment_and_Energy/modernelectricitygrid/Submissions

3.7.5 Key Assumptions

- AEMO and DNSPs need to work closely with each other to identify what data and systems need to be shared/interact with each other to maintain efficient and secure power system operations in a high DER future.

3.7.6 Key Initiative Relationships

Table 21 DER Operational Tools initiative relationships

Name	Description
Operational Decision-Making Tools	• DER Operational Tools builds on Operational Decision-Making Tools to specifically engage with DNSPs and provide DER operational tools to maintain local and overall power system security for the control room.
FRC Target State	• Many participants in a DER Marketplace are likely to be active across other markets, and may include a new cohort of participants (e.g. 'traders/aggregators'). Therefore, the objectives of FRC target state to provide unified services through a shared, single access platform to AEMO's retail systems and processes would support a more efficient experience for a market likely to have a greater number of participants compared to the current Retail market.
Flexible Trading Arrangements Model 2	• FTA2 will establish a framework for the management of controllable resources that supports the objectives of the DER Marketplace reforms (integrating DER into wholesale market and systems).
DER Marketplace (e.g. DOE, DER Data Hub and Registry Services, DER Operational Tools)	• There is a close relationship between DOEs, Distribution/Local Network Services, DER Data Hub and Registry Services, and DER Operational Tools in that these four initiatives support a DER Marketplace and facilitate communication and exchange of data related to network limits (DOEs) and local network services and support the efficient and scalable integration of DER.
SCADA Lite	• A low-cost mechanism to support telemetry services. • SCADA Lite may provide a platform for participants to communicate with AEMO and provide visibility of their DER device activities

3.7.7 Risks

- Risks will be confirmed subject to final scope and progress on other reform initiatives

3.7.8 Next Steps and Indicative Schedule

- Monitor the progress of other reform initiatives, reviews and work programs.
- Schedule to be confirmed at a later time.

Initial RDC feedback:

- There is a need to consider sequencing in particular with other initiatives.
- Changes are likely to impact pre-dispatch systems and processes.

3.7.9 Reference

https://www.datocms-assets.com/32572/1629945809-post-2025-market-design-final-advice-to-energy-ministers-part-b.pdf

3.8 Turn-up Services

3.8.1 Problem Statement

A key challenge associated with the introduction of emergency 'back-stop' measures has been the lack of corresponding market-based measures or incentives introduced at the same time. While emergency levers are likely to be important as enduring solutions, it is critical they become a genuine 'back-stop', with an increased focused on encouraging the shifting of flexible load into periods of low or negative wholesale prices.

A turn-up service is a demand response mechanism that facilitates an increase or shifting of load in response to low prices. A turn-up service could be activated commercially to allow consumers to benefit from increasing their load during periods of low prices or it could be activated as a security service to provide minimum system load for secure operation of the power system.

The existing Wholesale Demand Response (WDR) mechanism facilitates a 'turn-down' service only.

3.8.2 Objective

- Increase the capability and capacity of load to respond to low or negative price signals during times of abundant variable renewable energy, which is correlated to periods of minimum system load.

3.8.3 Value/Benefit

- Establish additional tools to support future operation of the power system.
- Develop alternative revenue streams for load/DER.
- Provide insights relating to how:
  - Customers can earn the spot revenue and demonstrate a working example to inform potential rule changes.
  - Service providers might adjust the tariffs to reflect the pool price (price signal).
  - Provide insights into consumer behaviour and preferences.
- Provides a demonstration in highlighting the technical and regulatory barriers, challenges and opportunities.
- Provides a technical understanding of response, forecasting and response timelines.
- Provides assessments on the risks associated with retailer and network tariffs and how they could be mitigated.
- Foundational research on how real-time wholesale market data is received.

3.8.4 Project Scope/Proposed Solution

- Scope dependent on design but may include:
  - Facilitating increase in load in response to low prices through amendment to WDR.
  - Allowing turn-up service within RERT that is called on to address security issues at times of low operational demand.

  - Provide price signal for flexible load and generation to respond.
- IT related changes to AEMO/Participant systems/models (e.g. registrations, dispatch and operations, metering and settlement systems).
- Updates to relevant AEMO/Participant policies, processes, guidelines (e.g. registrations, non-energy cost recovery settlement).

3.8.5 Key Assumptions

- Related process and system implications subject to trials

3.8.6 Key Initiative Relationships

Table 22 Turn-up Services initiative relationships

Name	Description
Dispatch Target State	• Policy uncertainty means the design scope is unknown at this time. It could entail facilitating increase in load in response to low prices through amendments to the Wholesale Demand Response mechanism. • Alternatively, it could allow a turn-up service within the RERT called on to address security issues during low operational demand. • It could also be activated commercially to provide price signals for flexible load and generation to respond • It will likely impact bidding interfaces and dispatch systems.
Bids/Offers Target State	
Constraints Target State	
SCADA Lite	• Policy uncertainty means the design scope is unknown at this time. It could entail facilitating increase in load in response to low prices through amendments to the Wholesale Demand Response mechanism. Alternatively, it could allow a turn-up service within the RERT called on to address security issues during low operational demand. • If Turn-Up Services are activated commercially through price signals to flexible load and generation to respond, it is likely to have a relationship with SCADA Lite, which would be used by consumer devices to communicate and provide visibility to AEMO.

- In addition, there are relationships and dependencies with various industry trials (AEMO - Project Evolve, Project EDGE, Project Edith, Project Sympathy), and recent work completed implementing WDR.

3.8.7 Risks

- Risks will be confirmed subject to trials, final scope, and progress on other reform initiatives.

3.8.8 Next Steps and Indicative Schedule

- Trials will be designed and run in conjunction with ARENA over the next 12 months.

Initial RDC feedback:

- Consistent with the horizons within the DER Implementation Plan.
- If result of trials indicate turn-up services are not viable then we expect it would be removed from the Roadmap.

3.8.9 Reference

https://www.datocms-assets.com/32572/1629945809-post-2025-market-design-final-advice-to-energy-ministers-part-b.pdf

4 Data Strategy

4.1 Data Services

4.1.1 Problem Statement

Access to data is rarely sufficient to increase its value and impact, as safely sharing or analysing large-scale data sets requires access to advanced skills and systems, as well as clear data curation, management, and approvals processes. These organisational barriers can limit and delay benefits to a range of stakeholders, including consumers, policymakers and Market Participants.

4.1.2 Objective

- To define and deliver data services models that enable greater access to, and derived value from, existing data via innovative data services and analytics capabilities.
- The Data Services workstream is a targeted capability building initiative under discussion with the ESB, with the aim to recommend the introduction of new Data Services model(s). The delivery model(s) will encompass a target operating model, including governance, resourcing and funding solutions, enabling the delivery of data-based services and outcomes to stakeholders.
- The models are to be investigated in 2022 by a newly created Data Leadership and Coordination working group (DataLAC), led by ESB and market bodies.
- DataLAC will work with agencies and technical advisors to collaboratively develop the data services delivery models.

4.1.3 Value/Benefit

- Data services can increase value from data by facilitating a range of different ways to access data safely and can resolve many barriers such as available skills and standard service arrangements.
- Examples of where data services could usefully be developed include analysis of jurisdictional policies and programs. AEMO is often requested of by jurisdictions to assist in such activities (to enable meter data to be linked to measure impacts). This can be a highly valuable output for policy makers, but often face limitations in the absence of data services due to practicalities such as resourcing constraints, non-standard service agreements requiring (lengthy) legal negotiations, concerns regarding publication of analysis and lack of standard analytical methodologies like control groups.

4.1.4 Project Scope/Proposed Solution

Data services delivered are envisaged to be broad, examples including:

- Shared resources - such as dashboards, metrics or reports for multiple users or the public/market.
- Protected data linking (such as to analyse the impact of a program).
- Facilitating sharing of protected data where appropriate.
- Data management and curation services – providing wider safe access to data from a range of sources.

- Tailored aggregated data sets and advanced data analytics on request.

4.1.5 Key Assumptions

- Initial regulatory reforms are progressed in parallel and, as appropriate enable data sharing models as defined by the Data Services workstream, including:
  - Greater access to prescribed agencies.
  - Clarifying market body capabilities.

4.1.6 Key Initiative Relationships

- No project dependencies have been identified.

4.1.7 Risks

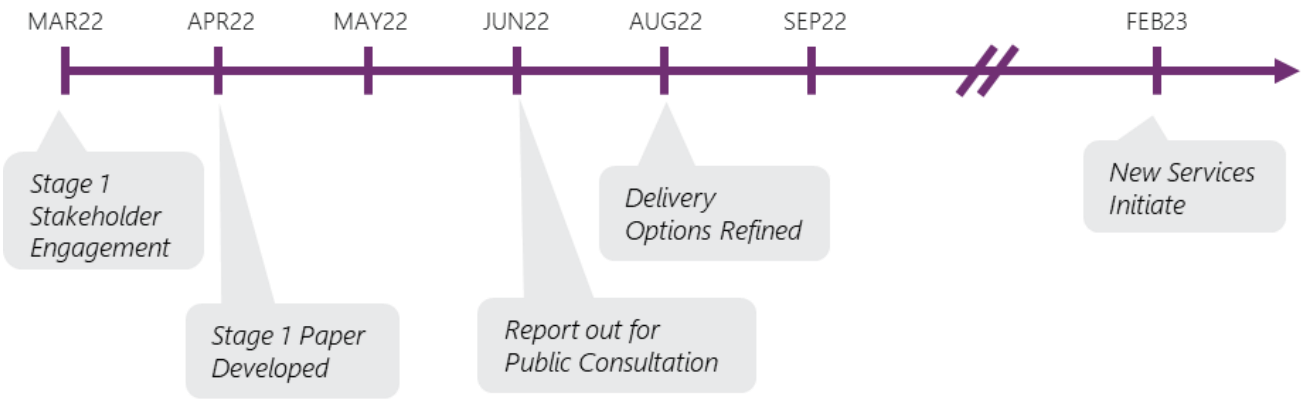
Table 23 Data Services initiative risks

Risk ID	Risk Type	Description	Mitigation
1	Scope	The exact scope of the data services to be delivered and by whom is still to be determined	Planning and scheduling
2	Dependencies	The delivery of this workstream is dependent on the successful delivery of the legal and regulatory reforms workstream	Planning and scheduling

4.1.8 Next Steps

- Stakeholder engagement on data services needs: March 2022.
- Stage 1 report finalise, including defining stakeholder needs and delivery models to be assessed: April 2022.
- Stage 2 draft public report for ESB/agency review: May 2022.
- Stage 2 report finalised for public consultation: June 2022.
- Delivery options refined based on consultation: August 2022.
- Recommendations to Ministers drafted and approved by ESB/agencies: September 2022.

4.1.9 Indicative Schedule



4.2 Bill Transparency

4.2.1 Problem Statement

As energy market services become more complex there are flow-on considerations for consumer protections. The opportunity exists to address emerging gaps in consumer protections by allowing for better understanding of:

- The way different consumer segments, including vulnerable consumers, are impacted by new technologies and services.
- How consumers and technologies are responding to market price signals.
- The effectiveness of competitive retail markets.

This is an initiative under discussion with the ESB and to be investigated in FY22 by a newly created Data Leadership and Coordination working group (DataLAC), led by the ESB and market bodies.

4.2.2 Objective

- Resolve current duplication of retail reporting arrangements, reducing retail market costs.
- Provide a statistically robust, accessible source of data on what consumers are actually paying, linking their retail arrangements and usage to understand both billing arrangements and associated market outcomes.
- Track consumer outcomes on an ongoing, rather than in-frequent, manner and this information should be readily accessible by market regulators.
- Be able to link analysis to a range of factors, such as regional demographics and DER services, hardship programs, and jurisdictional subsidies.
- This measure will reduce the existing burden on retailers, and the retail consumer base, thus encouraging innovation and increasing consumer choice.

4.2.3 Value/Benefit

- Increase understanding and awareness of consumer billing, supporting retail energy market policy development and associated outcomes, including those associated with energy equity.
- Reduced cost and greater affordability through more transparency in competition and reforms.
- More effective and less costly consumer protections, particularly associated with new technologies and services, such as flexible trading arrangements.
- Streamline price reporting, reducing duplication.
- Support for more accurate forecasting through greater awareness of how consumers respond to price signals.

4.2.4 Project Scope/Proposed Solution

- This workstream will cover:
  - Options for reporting consumer bill outcomes, engaging closely with stakeholders.
  - Identifying streamlining opportunities across existing retail reporting and consumer research, and synergies with reforms such as the Consumer Data Right.

- Out of scope:
  - Change to regulatory roles – supports existing roles through data sharing.
  - Change to privacy settings - builds on existing protected data and aggregate analysis.

4.2.5 Key Assumptions

- Initial regulatory reforms are progressed in parallel and, as appropriate enable data sharing models as defined by the Data Services workstream, including:
  - Greater access to prescribed agencies.
  - Clarifying market body capabilities.

4.2.6 Key Initiative Relationships

- No dependencies with NEM2025 initiatives have been identified.
- Possible dependencies on the implementation of Tranche 3 of the Consumer Data Right (November 2023).

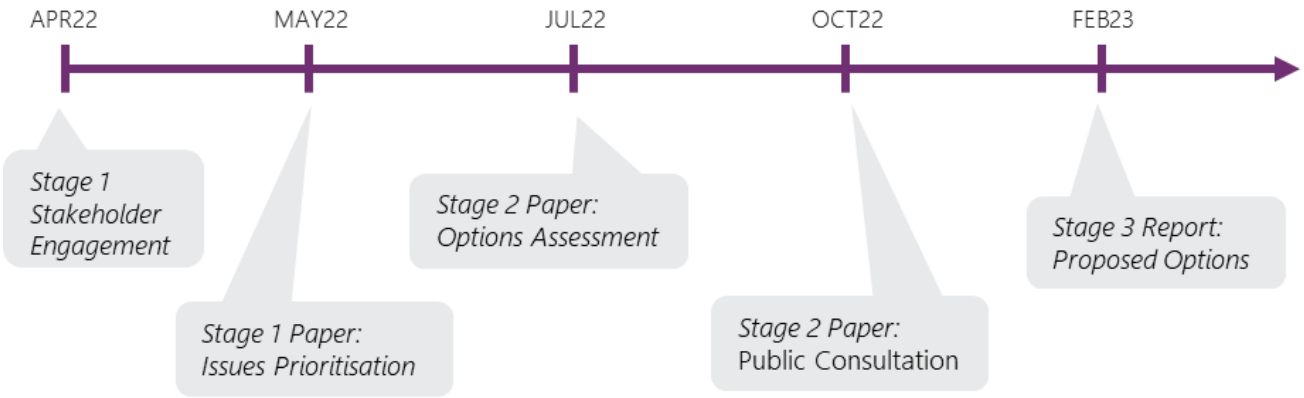
4.2.7 Risks

- Risks will be identified closer to related policy and regulatory determinations.

4.2.8 Next Steps

- Stage 1 Stakeholder engagement on reform options: April 2022.
- Stage 1 paper developed detailing the prioritised issues for ESB and agency consideration and agreement: May 2022.
- Stage 2 paper developed detailing options to implement desired reform: July 2022.
- Public consultation on Stage 2 options paper: October 2022.
- Stage 3 options report developed and delivered for ESB and agency consideration: February 2023.

4.2.9 Indicative Schedule



Initial RDC feedback:

- Committee members raised concerns about access to data, consumer protections and duplication of reporting across market bodies.
- The Committee noted there is a need to streamline how data is shared providing for a more timely and useful data set.
- The Committee noted the staged consultation process run by the ESB, with Stage 1 to focus on what the options could be.
- AEMO does not intend on having a consumer interface. AEMO are focused on the data sharing aspects of the initiative.

4.2.10 Reference

https://www.datocms-assets.com/32572/1630275857-esb-data-strategy-july-2021.pdf

4.3 Electric Vehicles

4.3.1 Problem Statement

There is no clear owner of Electric Vehicle (EV) data within the energy sector. AEMO has a need for EV data in forecasting, but this is currently not available. Networks and research projects are all seeking their own data sources.

The opportunity is to provide a solution for reporting installation, location, and characteristics of electric vehicle supply equipment (chargers). This is an initiative under discussion with the ESB and to be investigated in FY22 by a newly created Data Leadership and Coordination working group (DataLAC), led by ESB and market bodies.

Coordination with transport sector required - no trigger to capture data in the energy sector.

4.3.2 Objectives

- It is critical to ensure agencies and market participant have sufficient visibility of emerging EV technologies to support efficient and responsive forecasting, planning, and operational management. The EV workstream will ensure that:
  - Uptake and behaviour of emerging EV technologies is well understood, supporting efficient and responsive forecasting, planning, and operational management.
  - Data on Electric Vehicle Supply Equipment (EVSE) installations is timely, available at localised levels to support local network planning, and can be linked to ongoing usage data to support research and forecasting.
  - Processes to gather EVSE data are streamlined with wider reforms supporting EVs, including any new requirements for EVSE standards, installations or connection agreements, DER register and jurisdictional transport data.
  - EV research and program data is coordinated and accessible, providing data on EV behaviour and uptake.

4.3.3 Value/Benefit

- EVs are expected to be the largest driver of new demand in the future NEM but uptake remains highly uncertain with a broad range of scenarios.
- Planning and operational risks inherent to uncertainty around uptake and behaviour of EVs.
- It will facilitate the need to resolve issues prior to uptake accelerating to mitigate the risk of a large invisible, passive EV population.

4.3.4 Project Scope/Proposed Solution

- To establish a minimum viable product for an EVSE standing data register under the existing electricity rules and regulatory frameworks.
- Wider consideration of EV forecasting options, including shared approaches with the transport sector.
- Work with stakeholders including DEIP EV task groups to consider related options and recommendations.
- Potential change will be required to AEMO portal to provide self service capabilities.

- Regulatory changes are expected to be required for this initiative along with integration with third parties for access to EV data.

4.3.5 Key Assumptions

- The ongoing RACE, C4NET and DEIP EV workstreams will have capacity to contribute to this initiative.

4.3.6 Key Initiative Relationships

- No direct dependencies with NEM2025 initiatives have been identified.
- This initiative will need to be aligned with the FRC Target State initiative as a pre-requisite to establishing this register.

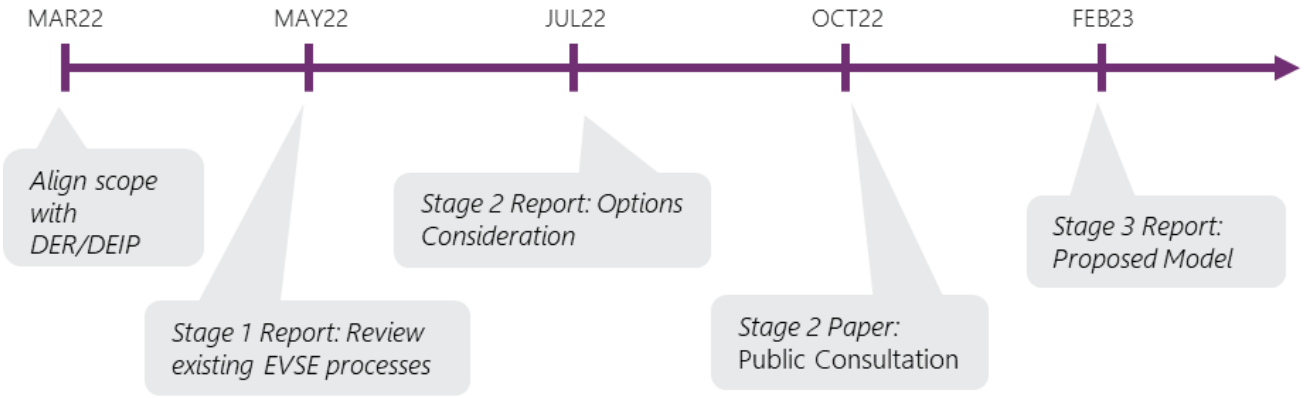
4.3.7 Risks

- Risks will be identified closer to related policy and regulatory determinations.

4.3.8 Next Steps

- Align scope with DER and DEIP work: March 2022.
- Stage 1 report developed detailing the current processes which apply to EVSE for ESB and agency consideration and agreement: May 2022.
- Stage 2 paper developed detailing options to implement desired reform: July 2022.
- Public consultation on stage 2 options paper: October 2022.
- Stage 3 options report developed and delivered for ESB and agency consideration: February 2023.

4.3.9 Indicative Schedule



4.3.10 Reference

https://www.datocms-assets.com/32572/1630275857-esb-data-strategy-july-2021.pdf

4.4 Network Visibility

4.4.1 Problem Statement

Optimising DER integration requires greater visibility of the low voltage network, with needs for networks, network service providers, DER investors/service providers, consumers, and regulators to all manage risks around network and DER capacity and emerging constraints.

As regulated monopolies, networks should be required to be appropriately transparent about constraints placed on consumers – such as constraints on DER export. Currently networks are required to publish detailed information and consult on how network prices are developed, as well as higher level data on network planning. They do not yet have requirements to publish details supporting DER constraints.

The dual issues of consistency of data availability across the low voltage networks and the access to this data must be solved simultaneously to deliver benefits to network and market operators, consumers and policy makers.

4.4.2 Objective

- Consumers, DER providers and the wider market are empowered and incentivised to optimise benefits from DER and the network, through datasets providing clear visibility of network capacity/constraints, DER and network performance, and related risks and opportunities.
- Datasets are readily available, localised, comparable and ongoing.
- Consumers can see and engage in localised needs across the network, supporting informed consumer decisions and consumer engagement in regulatory requirements, pricing and consumer protections.

4.4.3 Value/Benefit

- Greater visibility of the low voltage network will lower network/DER costs in integrating DER by:
  - Enabling greater use of existing network capacity: existing data allowing DER and network service providers to target development around emerging constraints, managing their own risks and optimising local outcomes.
  - Lowering DER constraints: empowering consumers, DER providers, and regulators to better engage with network to increase efficiency, understanding and acceptance of any DER constraints deemed necessary.
  - Better targeting of network expansion: allowing for constraints and DER impacts of localised issues to be more transparently considered by alternative service providers and regulators.

4.4.4 Project Scope/Proposed Solution

- Design and cost options to optimise network data availability to the DER market.
- Create an efficient path to the shared network data needed to optimise DER and inform decisions of DER providers, consumers, and regulators.

4.4.5 Key Assumptions

- Initial regulatory reforms are progressed in parallel and, as appropriate enable data sharing models as defined by the Data Services workstream, including:
  - Greater access to prescribed agencies.
  - Clarifying market body capabilities.

4.4.6 Key Initiative Relationships

- Potential links to Data Services workstream – access to AEMO metering data and DER Register data could be inputs, with costs minimised with data coming from a single source.

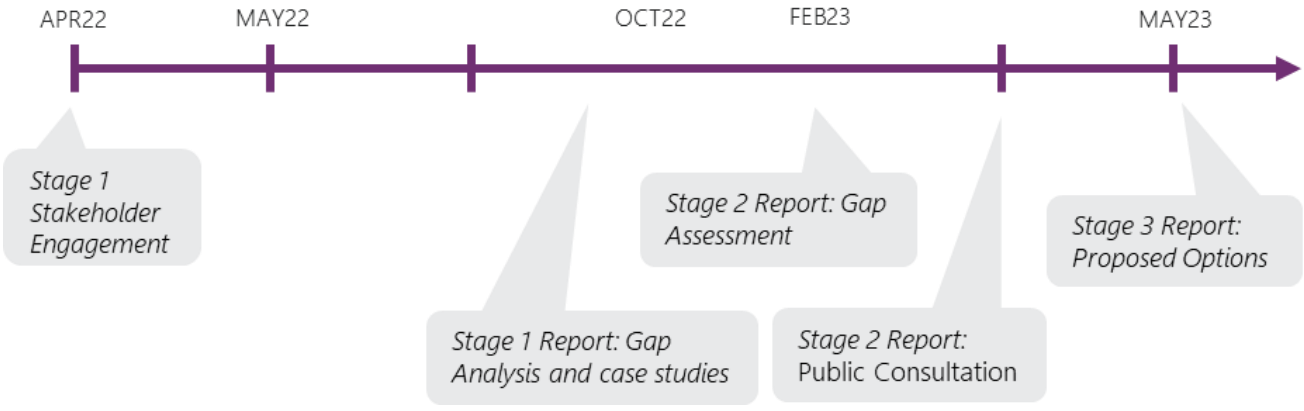
4.4.7 Risks

- Risks will be identified closer to related policy and regulatory determinations.

4.4.8 Next Steps

- Workshop data priorities with stakeholders: April 2022.
- The AER has been tasked to document register of existing LV data availability: May 2022.
- Review workshop outcomes, AER input, analyse for gaps and develop case studies as inputs to stage 1 gap analysis report: August 2022.
- Develop stage 1 gap analysis report and associated case studies for ESB and agency consideration: October 2022.
- Stage 2 report on pathway to address gaps developed and delivered for ESB and agency consideration: February 2023.
- Public consultation on stage 2 report: March 2023.
- Stage 3 proposed solutions report developed and delivered for ESB and agency consideration: May 2023.

4.4.9 Indicative Schedule



Initial RDC feedback:

- It has been proposed the ESB will kick-off this as one of the first initiatives in the Data Strategy workstream.
- There is some overlap with other initiatives (e.g. DOE). However, the focus of this initiative is on the medium to longer term data requirements (e.g. from a planning perspective) relative to real time requirements.
- There is a need to be cognisant of the interactions across initiatives.

4.4.10 Reference

https://www.datocms-assets.com/32572/1630275857-esb-data-strategy-july-2021.pdf

5 Pre-requisite initiatives – Group A (Identity and Data)

5.1 Portal Consolidation Framework

5.1.1 Problem Statement

AEMO currently provides Participants with an end-to-end experience that is multi-step and multi-system. This doesn't meet the expectations of AEMO's stakeholders and potential partners of a one-stop service for all their needs. There is a need for enhanced user interfaces through a web-facing portal for AEMO, Market Participants and non-registered market participants to manage users, and user roles and rights.

5.1.2 Objective

- Implement the framework, and roadmap for transition and implementation, to enable stakeholders with the ability to self-manage their user experience by delivering a new web and mobile user portal that provides personalised, secure, single pane of glass access to data and services.
- Provide integration with the enterprise identity management and user authentication solution.
- Deliver a User Access Management application (SAM) for use by external administration to support the management of application users and permissions.

5.1.3 Direct Value/Benefit for Participants

- A consolidated web-facing portal will provide Participants an enhanced and frictionless user management experience, which would deliver efficiency benefits for stakeholders. An improved and consolidated user interface also reduces user pain points of being required to interact through different access points.
- Data entry validation rules and management processes and controls reduce data breach risk and improved data quality and reliability. This provides data security value to Participants and ensures their data provided to, and held by AEMO, is accurate.

5.1.4 Indirect Value/Benefit for Participants

- A consolidated access portal enhances the ability to flexibly and quickly adapt to market developments which results in overall cost efficiency in a rapidly changing energy landscape. This also supports speed for innovation that can provide operational efficiency benefits and value to Participants.
- Improved operational efficiency in collecting data from Participants reduces the operational and administrative burden on Participants.

5.1.5 Project Scope/Proposed Solution

- A new consolidated web-facing portal for hosting applications and use by both registered and non-registered users that includes a fully featured online user help function.

- Integration with the new identity and access management platform and decommissioning the current application.
- Building on the foundational CRM platform to reduce manual processes which can be automated to improve efficiency and reduce human error. This operational efficiency extends value to Participants through faster interactions.

5.1.6 Key Initiative Relationships

Table 24 Portal Consolidation Framework initiative relationships

Name	Description
Consolidated Master Data Repository Phase 2	• The Consolidated Master Data Repository initiative will establish an internal master data management platform hosting information about power system asset data (e.g. NMI standing data, DER devices) used by AEMO market systems. • Aligning Portal Consolidation with the master repository facilitates the objective of creating a single source of truth to track organisational identity and their authorised contacts.
Identity and Access Management	• The framework for Portal Consolidation will enable integration with IDAM. • The design of the Portal Consolidation framework needs to account for the interactions with the authentication and authorisation patterns in the new IDAM framework to support effective integration. • Portal Consolidation will establish the User Access Management application that supports management of application users and permissions.
Industry Data Exchange	• Portal Consolidation framework enables the roadmap toward a single pane of glass user experience for participants accessing all AEMO browser-based services. • IDX will need to include a unified data exchange approach and methods which will need to consider work from Portal Consolidation to facilitate integration where needed.

5.1.7 Delivery risks

Table 25 Portal Consolidation Framework initiative delivery risks

Risk ID	Risk Type	Description	Mitigation
1	Implementation	Alignment of implementation in time to support regulatory deadlines of core reform initiatives that this would support.	Planning and scheduling
2	Relationships	Increase in project complexity due to multiple dependencies/synergies and overlapping projects in a similar timeline.	Planning and scheduling

5.1.8 Risks to Participants if not delivered with NEM2025 reforms

Table 26 Portal Consolidation Framework initiative Participant risks

Risk ID	Risk Type	Description	Impact
1	Data accessibility reliability	The current fragmented framework means it is more challenging for Participants to access their data. This makes it difficult for Participants to access a single view of all their data. It also means Participants may be required to input the same data multiple times. This increases the risk of duplication.	High

5.1.9 Next Steps

- Implementation will be dependent on the roadmap pathway adopted.

5.2 Consolidated Master Data Repository (Foundation Expansion)

5.2.1 Problem Statement

Master and reference data related to organisational identity is held in siloed applications, often with duplication. This has potentially adverse business implications for Participant experience and efficiency.

5.2.2 Objective

- Simplify the platform used to consolidate disparate data through the Consolidation of Master Data Repository by including stakeholder identity data.
- Provide Master Data as a service (in batch and real time).
- Improve Participant user experience by providing a single source of truth and data quality management.
- Improve ability to maintain external user's roles accurately and thereby minimise the risk of data breaches.

5.2.3 Direct Value/Benefit for Participants

- The consolidated master data repository will improve the Participant user experience by consolidating data contained within multiple applications otherwise storing data in silos. This means Participants will be able to access a single source of truth for all of their data.
- Providing data as a service and easier access to consistent quality data and simplified, unified information to Participants.
- Providing a single source of truth also reduces the need for a Participant active in different process and/or markets to provide organisational data multiple times through different applications. Participants will be able to provide one update that will map across various AEMO applications and remove the need for Participants to engage with multiple AEMO business units.
- This streamlined process will provide Participants with improved service and time efficiencies.

5.2.4 Indirect Value/Benefit for Participants

- Consolidated master data creates operational efficiencies for AEMO by providing a unified view (single source of truth) across data lifecycle stages which Control Room operators can access. This reduces manual processes and creates efficiencies in AEMO's data auditing and reporting capabilities.
- Improved operational efficiency and data quality also deliver value for Participants through enhanced data quality management.

5.2.5 Project Scope/Proposed Solution

- AEMO is in the process of completing the scope for Consolidated Master Data Repository Phase 2 to deliver any outstanding scope from Phase 1 (which establishes the foundation by building the new master data management platform to load data from an agreed suite of applications and enables loading of operational data).

- Consideration for new technologies such as DER, EVs and battery data collations via aggregators to understand the systems that will be used, and which will require mapping to the consolidated master data repository.

5.2.6 Key Initiative Relationships

Table 27 Consolidated Master Data Repository (Foundation Expansion) initiative relationships

Name	Description
ST PASA replacement	• The ST PASA replacement initiative is a review of the Pre-dispatch (PD) and Short Term (ST) PASA methodology and supporting systems and processes. • ST PASA will consume data from the master data repository.
Operational Decision-Making Tools	• ODMT established a new enterprise platform for new decision-making tools used by the AEMO control room operators. Multiple disparate user interfaces converged into single user experience platform, capabilities for improved analytics and handling greater volumes of transactional data. • ODMT will consume data from the master data repository.
Forecasting Platform Uplift	• The initiative establishes a converged modelling platform that supports model development, interfaces for forecasting-as-a-service providers and layered blended models across a number of modelling domains e.g. demand and VRE. • The platform is part of a future state forecasting roadmap where new third party vendors (forecasting a service providers) could submit forecasts. The organisational identity management of these participants will need to be mapped to the consolidated master data repository.
OSM	• OSM provides a procuring and scheduling process for ESS by producing a least-cost, inter-temporal optimised dispatch schedule. • The master repository platform needs to be in place so that new participants can be mapped into new systems.
Operating Reserves	• The Operating Reserves reform aims to unbundling reserves from energy to value flexible, responsive resources, through one or more new markets. • The master repository platform needs to be in place so that new participants can be mapped into new systems.
Electric Vehicles	• EV standing data would be captured in the consolidated master data repository. (Further scoping needed)

5.2.7 Delivery Risks

Table 28 Consolidated Master Data Repository (Foundation Expansion) initiative delivery risks

Risk ID	Risk Type	Description	Mitigation
1	Relationships	Alignment of implementation in time to support regulatory deadlines of core reform initiatives that this would support.	Planning and scheduling
2	Relationships	Increase in project complexity due to multiple dependencies/synergies and overlapping projects in a similar timeline.	Planning and scheduling

5.2.8 Risks to Participants if not delivered with NEM2025 reforms

Table 29 Consolidated Master Data Repository (Foundation Expansion) initiative Participant risks

Risk ID	Risk Type	Description	Impact
1	Data security	Managing data security across multiple access portals for Participants increases the risk of a data privacy incident.	High

Risk ID	Risk Type	Description	Impact
2	Communication	Disparate Participant contact databases increases the risk of duplicated communications. This creates inefficiencies for Participants and the risk that communications may be less effective.	High

5.2.9 Next Steps

- Develop and finalise full scope of Phase 2.
- Implementation dependent on the roadmap pathway adopted.

5.3 Identity and Access Management (IDAM)

5.3.1 Problem Statement

Current identity and access management (IDAM) services provide an inconsistent and disjointed user experience where external IDAM services are primarily internalised within business applications. There are also duplicated external actor identities in AEMO systems. Furthermore, existing authentication models for external actors will not scale digitally.

5.3.2 Objective

- Integrate the design, testing and implementation of the legacy authentication interface with the B2C platform.
- Seamless integration capabilities with AEMO downstream systems to ensure authorised users/systems retain access to their applications / services.
- Ability to store validated credentials in AEMO's external identity provider.
- Reporting of success and exceptions encountered during this process so that external parties can be serviced should errors occur.

5.3.3 Direct Value/Benefit for Participants

- As part of an inter-related work program that includes Portal Consolidation and Industry Data Exchange, this Identity and Access Management initiative will enable capabilities for a single pane of glass for Participants accessing AEMO applications. This simplification will reduce friction and facilitate a consistent user experience. Delivering this user experience depends on the implementation of the inter-related initiatives.
- Implementation of consistent cyber security controls for Participants will improve the overall security maturity level or posture.
- Federated access for Participants will enable external identity lifecycle events to be managed entirely by Participants. This not only provides a better user experience but creates time efficiencies for Participants.

5.3.4 Indirect Value/Benefit for Participants

- Deduplication of Participant identities provides a data integrity and security value to Participants because it facilitates a more secure and controlled credential and access process.

5.3.5 Project Scope/Proposed Solution

- Existing and new applications that are hosted on the current cloud should consume a consistent set of IDAM B2C access controls.

5.3.6 Key Initiative Relationships

Table 30 IDAM initiative relationships

Name	Description
Portal Consolidation Framework	• The framework for Portal Consolidation will enable integration with IDAM and IDX. • The design of the Portal Consolidation framework needs to account for the interactions with the authentication and authorisation patterns in the new IDAM framework to support effective integration. • Portal Consolidation will establish the User Access Management application that supports management of application users and permissions.
Industry Data Exchange	• IDX establishes unified access to AEMO services across all markets using modern authentication and communication protocols. This initiative will leverage IDAM. • IDAM and IDX feed into each other to enable consolidated management of participant identities and their authentication and access. • IDAM enables IDX.
Forecasting Platform Uplift	• The initiative established a converged modelling platform that supports model development, interfaces for forecasting-as-a-service providers and layered blended models across a number of modelling domains e.g. demand and VRE. • The platform is part of a future state forecasting roadmap where new third party vendors (forecasting a service providers) could submit forecasts. IDAM will support the management of identification and authorisation of these participants.
Consolidated Master Data Repository Phase 2	• As the single source of truth for organisational identity, it is important that the master data repository maps data from the new IDAM framework. • The consolidation of users and user roles from the new IDAM framework will map into Consolidated Master Data Repository, which will act as the single source of truth for organisational identity.
FRC Target State	• FRC includes establishing a consolidated Asset and Participant Relationship Management system (APRM) that enables unification of services onto a shared platform, single access to AEMO's Retail systems, and simplification of Participants' and AEMO processes. • As markets and systems are consolidated through FRC, the new IDAM framework is in place to facilitate a cohesive approach to management organisational authorisation and access.
All DER Marketplace initiatives (e.g. DOE, DER Data Hub and Registry Services, DER Operational Tools)	• As the DER reforms are implemented and a new cohort of Participants interact with AEMO's systems, it becomes increasingly important that IDAM systems can efficiently manage the anticipated increased volume of interactions and entities.

5.3.7 Delivery Risks

Table 31 IDAM initiative delivery risks

Risk ID	Risk Type	Description	Mitigation
1	Relationships	Alignment of implementation in time to support regulatory deadlines of core reform initiatives that this would support.	Planning and scheduling
2	Relationships	Increase in project complexity due to multiple dependencies/synergies and overlapping projects in a similar timeline. The scope also needs to consider external organisation registration processes and needs	Planning and scheduling

5.3.8 Risks to Participants if not delivered with NEM2025 reforms

Table 32 IDAM initiative Participant risks

Risk ID	Risk Type	Description	Impact
1	Scalability	The introduction of new markets and anticipated volume of a new cohort of Participants means that more Participants will be exposed to existing pain points regarding an inconsistent, fragmented and duplicated user experience when accessing AEMO's systems.	Moderate

5.3.9 Next Steps

- Implementation will be dependent on the roadmap pathway adopted.

5.4 Industry Data Exchange

5.4.1 Problem Statement

AEMO's existing data exchange systems have been variously acquired over the last 10-15 years, and use inconsistent standards, protocols and formats. Data exchange is therefore costly and complex for Participants and AEMO. AEMO's markets are also undergoing significant transformation resulting in new data exchange needs. AEMO is introducing new data exchange patterns (e.g. Power of Choice (PoC), Five-Minute Settlements (5MS) projects) without a target state and roadmap which is inhibiting Participants from modernising their systems and quantifying the benefits of investment on their side.

5.4.2 Objective

- Develop unified data exchange standards covering (but not limited to) protocols, payloads, connectivity methods, authentication/authorisation.
- Agree on the target state architecture of the data exchange channels and patterns with Participants.
- Develop a roadmap of how the interfaces will be transitioned to the target state detailing the transition requirements/solution and sunset timeframes.
- Provide principles, guardrails and foundational data exchange patterns and standards for core reforms such as those related to the DER Marketplace.

5.4.3 Direct Value Benefit for Participants

- Consolidated systems and standards will lower entry barriers for new Participants and reduce overall costs for industry and implementation of future industry reforms as new reforms are implemented directly in target state. These cost benefits realised by Participants will mean that Participants can improve the cost outcomes for their customers.

5.4.4 Indirect Value/Benefit for Participants

- The modernised systems will improve speed to market of changes and support innovation and potential new business opportunities (e.g. Data Provisioning Services). This results in overall cost efficiency in a rapidly changing energy landscape and can provide operational efficiency benefits and value to Participants.
- Linking currently disparate systems will enable new work processes to be implemented within AEMO that improve data security for Participants.
- The IDX design phase will define standards, protocols, connectivity methods enabling the efficient implementation of reforms. Convergence between IDX and DER trials will significantly reduce required effort from AEMO and Participants in establishing DER specific frameworks and standards. It will also avoid implementing initiatives in the legacy interfaces which would later require additional effort and costs for Participants to migrate to the unified standards. This also facilitates Participants' ability to manage and plan their roadmaps and investments.

5.4.5 Project Scope/Proposed Solution

- Definition of target state architecture, including transition to the target state.
- Definition of guardrails/standards for protocols, authorisation/authentication patterns and payload formats.
- Deliver high-level technical solution and a roadmap illustrating the path to target state, and sunset periods for transitioning from the legacy to new systems.
- Development of the defined target solution interfaces for NEM Retail and NEM Wholesale. The intention is to progressively implement the target state solution across all retail and wholesale markets, for both fuels.
- Migration of BAU industry interfaces to eHub 2.0 (the new platform).

5.4.6 Key Initiative Relationships

Table 33 Industry Data Exchange initiative relationships

Name	Description
Identity and Access Management	• IDAM provides a unified mechanism to authenticate participant users and applications when accessing AEMO services. • IDAM is the vehicle that enables the new IDX. IDAM and IDX feed into each other to enable consolidated management of Participant identities and their authentication and access. • Secure data exchange is intrinsically linked to an authorisation and access framework. As such, IDAM and IDX need to complement each other
Portal Consolidation Framework	• Portal Consolidation framework enables the roadmap toward a single pane of glass user experience for participants accessing all AEMO browser-based services. • IDX will need to include a unified data exchange approach and methods which will need to consider work from Portal Consolidation to facilitate integration where needed.
Consolidated Master Data Repository Phase 2	• As the single source of truth for organisational data, the master data repository will need to adopt industry data exchange standards that integrated with the IDX framework. • The consolidation of users and user roles from the new IDAM and IDX framework will map into Consolidated Master Data Repository, which will act as the single source of truth for organisational identity.
FRC Target State	• FRC includes establishing a consolidated Asset and Participant Relationship Management system (APRM) that enables unification of services onto a shared platform, single access to AEMO's Retail systems, and simplification of Participants' and AEMO processes. • As markets and systems are consolidated through FRC, the new IDX framework is in place to facilitate a cohesive approach to industry data exchange.
DER Marketplace (e.g. DOE, DER Data Hub and Registry Services, DER Operational Tools)	• A core element of the DER Marketplace initiatives is data exchange that enables the effective and efficient integration of DER into wholesale markets, and supports a local services exchange. This will mean orders of magnitude more data that will need to be absorbed, governed, and exchanged. • It would be inefficient to establish a new DER Marketplace under legacy systems that would need to be retrofit.
Forecasting Platform Uplift	• IDX will provide a unified access to AEMO services across all markets using modern authentication and communication protocols. This initiative will leverage Identity and Access Management and could support the data exchange to and from forecasting service suppliers.
All NEM2025 reforms	• The standards, protocols and architecture will enable the data exchange elements of all NEM2025 reforms. All reforms – particularly those introducing new markets and new cohorts of Participants, will use the new IDAM and IDX frameworks.

5.4.7 Delivery Risks

Table 34 Industry Data Exchange initiative delivery risks

Risk ID	Risk Type	Description	Mitigation
1	Relationships	Alignment of implementation in time to support regulatory deadlines of core reform initiatives that this would support.	Planning and scheduling
2	Relationships	Increase in project complexity due to multiple dependencies/synergies and overlapping projects in a similar timeline. The scope also needs to consider external organisation registration processes and needs.	Planning and scheduling
3	Participant costs	Investments that incumbent Participants (especially large retailers and distributors) have made may not subscribe to the design changes. There would also be capital costs for implementing new gateways.	Industry has already been consulted and the change has been broadly endorsed in principle.

5.4.8 Risks to Participants if not delivered with NEM2025 reforms

Table 35 Industry Data Exchange initiative Participant risks

Risk ID	Risk Type	Description	Impact
1	Complexity	The current framework creates complexities and costs for Participants in managing data exchange requirements and creates a barrier to entry for new Participants.	High

5.4.9 Next Steps

- Implementation will be dependent on the roadmap pathway adopted

6 Pre-requisite initiatives – Group B (Operational Systems and Tools)

6.1 Operational Decision-Making Tools

This project is already in execution and has been included for transparency because various NEM2025 initiatives will build on the platform this establishes.

6.1.1 Problem Statement

AEMO's existing control room tools – the operational decision-making tools – are based on legacy systems and software that expose potential gaps. The gaps, which relate to capabilities and user experience include:

- Insufficient predictive analytics and alerts for situational awareness.
- Disparate tools that impede efficient control room agility, and are cumbersome for accessing and combining data sources.
- Legacy software, including some applications older than 20 years, for which it is costly and difficult to apply rapid bug fixes and enhancement.

These user experience challenges present opportunities for improvement.

6.1.2 Objective

- Design and build a new enterprise platform for new tools that will be developed and deliver a customisable NEM common graphical user interface (GUI) for NEM operations, including a model to manage data access and storage for Operations.
- Develop:
  - Decision-making tools that are highly adaptable to changing requirements.
  - Operational dashboards that enable faster and lower cost updates in future.
  - Analytics to convert raw data into targeted information, based on user-workflow.
  - Capabilities to handle greater volumes of data from a much wider variety of sources.

6.1.3 Indirect Value/Benefit for Participants

- Improved workflow alignment, automation, dashboards, and consolidation of data from multiple sources create operational efficiencies that benefit all Participants through more effective decision-making and reduced risk of incorrect decisions caused by insufficient situational awareness.
- The new decision-making tools will establish more sophisticated and agile capabilities that place AEMO in a better position to adapt flexibly and quickly to industry disruptors and continue to maintain effective and efficient operation of a rapidly transforming NEM.

- AEMO's ability to manage changing operational demands more efficiently benefits all incumbent and future Participants because it means AEMO continues to have the most appropriate tools to undertake its critical function to maintain power system security.

6.1.4 Project Scope/Proposed Solution

- Detailed design and build of the control room user interface platform, including the development or update of at least 220 Application Programming Interfaces (APIs) for use by the new tools.
- Data capabilities uplifts including an Operations data governance model to improve data consistency and usability, and the extension of operational data, including Black Start resilience, into the Enterprise data platform.
- Develop new tools including a simplified dashboard displaying real-time, pre-dispatch and short-term critical information, and other system and market monitoring, management, communication and reporting tools.

6.1.5 Key Initiative Relationships

Table 36 Operational Decision-Making Tools initiative relationships

Name	Description
ST PASA replacement	• The review of the Pre-dispatch (PD) and Short Term (ST) PASA methodology and supporting systems and processes will deliver a significant capability uplift which will use control room management task screens and interfaces.
Fast Frequency Response	• The changes in the FFR reform will require integration with the FFR related operational tools.
Operating Reserve	• The changes in the Operating Reserve reform will require integration with related operational tools.
Operational Security Mechanism	• The changes in the OSM reform will require integration with related operational tools.
Operational Data Store	• ODS establishes a capability for storing high volume of operational transactional data at near-real-time. • Operational Data Store feeds into the uplifts of the ODMT enterprise platform. • ODS surfaces data – it is a series of layers ('technology behind the scenes') that changes task-oriented interfaces and uses elements from other systems (e.g. SCADA, forecasting) and brings them together.
Business Rules Engine	• BRE creates the reference architecture; an internal technology capability within which to define business rules and processes. Core market platforms will leverage this capability as a foundation building block. • BRE feeds into the uplifts of the ODMT enterprise platform. • BRE scope covers ODMT requirements and will enhance ODMT by providing an enterprise-wide solution.
Consolidated Master Data Repository Phase 2	• This initiative will establish an internal master data management platform hosting information about power system asset data (e.g. NMI standing data, DER devices) used by AEMO market systems. • ODMT will consume data from the master data repository.

6.1.6 Delivery Risks

Table 37 Operational Decision-Making Tools initiative delivery risks

Risk ID	Risk Type	Description	Mitigation
1	Relationships	Alignment of implementation in time to support regulatory deadlines of core reform initiatives that this would support.	Planning and scheduling
2	Relationships	Increase in project complexity due to multiple dependencies/synergies and overlapping projects in a similar timeline. The scope also needs to consider external organisation registration processes and needs	Planning and scheduling

6.1.7 Risks to Participants if not delivered with NEM2025 reforms

Table 38 Operational Decision-Making Tools initiative Participant risks

Risk ID	Risk Type	Description	Impact
1	System security	As the NEM transforms rapidly, operational tools that are agile enough to keep pace with changing and growing operational demands increases the risk of instances that could lead to system security incidents.	Critical

6.1.8 Next Steps

- NEM2025 reform initiatives will build on the platform established.

6.2 Operational Data Store

6.2.1 Problem Statement

Several Operations projects currently being initiated within AEMO, including Control Room projects, are looking to establish (or leverage) a capability for storing high volume operational transactional data at near-real-time. Such a capability is called an 'Operational Data Store' (ODS). AEMO currently has numerous legacy systems that provide capabilities to store high volume operational transactional data at near-real-time – Operational Data Store functionality – but the framework fragments without a single 'Enterprise solution'. Functionality of existing solutions is complex, constrained by older technology, and does not facilitate a simple and efficient interface for business use.

6.2.2 Objective

- An Enterprise Data Platform (EDP) that offers a portfolio of data services across multiple use cases (across the enterprise), including analytical and use cases related to core/critical systems (market and energy systems).

6.2.3 Indirect Value/Benefit for Participants

- An improved EDP offering a portfolio of data services provides clear boundaries across application data, master data, and operational data store and reduces the proliferation of data and point-to-point integration. The value this provides to Participants is through improved operational efficiencies and data reliability and accessibility.
- The move away from the use of non-standard technology that is challenging to maintain, and update will deliver value through overall cost efficiency that benefit all Participants.

6.2.4 Project Scope/Proposed Solution

- The full scope is being developed. The scope will relate to the design, and implementation of an Operational Data Store – event/transactional data (that cut across applications) supporting use cases related to core/critical systems (market and energy systems)

6.2.5 Key Initiative Relationships

Table 39 Operational Data Store initiative relationships

Name	Description
Operational Decision-Making Tools	• Operational Data Store feeds into the uplifts of the ODMT enterprise platform. • ODS surfaces data – it is a series of layers ('technology behind the scenes') that changes task-oriented interfaces and uses elements from other systems (e.g. SCADA, forecasting) and brings them together.
SCADA Lite	• ODS establishes a capability for storing high volume of operational transactional data at near-real-time. • SCADA Lite will provide a low-cost mechanism for secure communications with new actors in the industry as DER integration progresses at scale in the NEM. This initiative provides high reliability and lower cost data communication technology for SCADA quality data. • ODS surfaces data – it is a series of layers ('technology behind the scenes') that uses elements from other systems (including SCADA) and brings them together.

Name	Description
ST PASA replacement	• Several reforms will change the structure of market offers, and other operational data that is received by AEMO and feed into input of ST PASA processes. • As the integration of DER into the NEM increases, AEMO will need to be able to absorb operational forecasting information in operational timeframes. • ODS will store PASA related operational transactional data and will surface PASA (forecasting) related data from other systems, including PASA systems, and bring them together.
Forecasting Platform Uplift	• The uplift includes a converged modelling platform that supports model development, interfaces for forecasting-as-a-service providers and layered blended models across a number of modelling domains e.g. demand and VRE. • The platform will provide forecasting capabilities for operational timeframes. ODS will be able to store high volume of operational forecasting data.

6.2.6 Delivery Risks

Table 40 Operational Data Store initiative delivery risks

Risk ID	Risk Type	Description	Mitigation
1	Relationships	Alignment of implementation in time to support regulatory deadlines of core reform initiatives that this would support.	Planning and scheduling
2	Relationships	Increase in project complexity due to multiple dependencies/synergies and overlapping projects in a similar timeline. The scope also needs to consider external organisation registration processes and needs	Planning and scheduling

6.2.7 Risks to Participants if not delivered with NEM2025 reforms

Table 41 Operational Data Store initiative Participant risks

Risk ID	Risk Type	Description	Impact
1	Cost inefficiencies	A non-consolidate approach to store high volume operational transactional will increase the risk of inefficient operational processes that impact on cost efficiencies for Participants and operational data quality.	Medium

6.2.8 Next Steps

- Implementation dependent on the roadmap pathway adopted.

6.3 Business Rules Engine

6.3.1 Problem Statement

A Business Rules Engine (BRE) platform that documents, tests and automates business rules is necessary to accommodate rapid changes in business rules effectively and efficiently, while lowering software implementation and support costs. An enterprise-wide BRE platform is required for various projects to leverage this ability and implement enterprise-wide business rules.

6.3.2 Objective

- Develop a rules engine framework and decision automation platform for AEMO to make optimised, data and situation-aware decisions.
- Efficiently model, analyse and deploy operational decisions via business rules implementation.
- Enable AEMO to implement business rules and analytics across various workflows, business processes and data to deliver business values despite facing frequent changes.
- Improve effectiveness and efficiency of operational decisions influenced by frequent changes in data, process, and regulatory market rules.
- Manage and model the business decisions and their relationships over the outcomes of the business rules.

6.3.3 Indirect Value/Benefit for Participants

- The benefits to Participants are through faster and more efficient implementation of changes and more effective management of releases (both in regard to quality and frequency). Value is also provided to Participants through reduced implementation costs for AEMO. This has a flow-on benefit to costs for Participants. These efficiency gains result from:
  - Streamlining the process related to system logic and business processes when implementing changes. There will also be a reduced dependency on developers, and coders. This enables more efficient implementation of procedural changes, new reforms and other necessary enhancements.
  - Improved governance through the creation of a single source of truth for business rules, centralising the repository of knowledge base and enabling reusability across the AEMO systems under one platform.
  - Orchestrated operational decisions that create outcomes for relevant contexts. This becomes increasingly valuable because it supports efficient operations in a rapidly transitioning market and reduces costs to delivery on market system changes.

6.3.4 Project Scope/Proposed Solution

- Capture enterprise-wide business requirements, drivers and tangible and intangible benefits.
- Develop enterprise reference architecture and solution definition for Business Rules Engine.
- Enhance the Operational Decision-Making Tools solution to deliver an enterprise solution (or) recommend and implement an alternate enterprise rules engine product and a transition roadmap to migrate the Operational Decision-Making Tools solution to the new product.

- Configure business rules and integrate it with the applications for the NEM2025 specific requirements.

6.3.5 Key Initiative Relationships

Table 42 Business Rules Engine initiative relationships

Name	Description
Operational Decision-Making Tools	• BRE creates the reference architecture; an internal technology capability within which to define business rules and processes. Core market platforms will leverage this capability as a foundation building block. • BRE feeds into the uplifts of the ODMT enterprise platform. • BRE scope covers ODMT requirements and will enhance ODMT by providing an enterprise-wide solution.
FRC Target State	• BRE creates the reference architecture; an internal technology capability within which to define business rules and processes. Core market platforms will leverage this capability as a foundation building block. • BRE will capture enterprise-wide business requirements to accommodate process changes efficiently. • FRC cannot be completed without BRE. The business rules implemented will enable the development of the FRC consolidated platform.

6.3.6 Delivery Risks

Table 43 Business Rules Engine initiative delivery risks

Risk ID	Risk Type	Description	Mitigation
1	Relationships	Alignment of implementation in time to support regulatory deadlines of core reform initiatives that this would support.	Planning and scheduling
2	Relationships	Increase in project complexity due to multiple dependencies/synergies and overlapping projects in a similar timeline. The scope also needs to consider external organisation registration processes and needs	Planning and scheduling

6.3.7 Risks to Participants if not delivered with NEM2025 reforms

Table 44 Business Rules Engine initiative Participant risks

Risk ID	Risk Type	Description	Impact
1	Cost inefficiencies	Increasing costs to manage diversified procedures and systems, and maintain ageing legacy systems. This creates the risk that it may become costly and complex for Participants to remain operational in the market. This also presents a barrier to entry for Participants operating in multiple markets.	Medium

6.3.8 Next Steps

- Implementation dependent on the roadmap pathway adopted.

6.4 SCADA Lite

6.4.1 Problem Statement

Market Participants need appropriate communication and/or telemetry systems to support dispatch instructions and auditing of responses. These systems are also needed to provide the increased visibility of resources under the DER reforms work program. Greater visibility of the power system also enables AEMO to support management of grid security. While Supervisory Control and Data Acquisition (SCADA) systems are critical to the operation of the NEM's current scheduling framework, they are a significant entry barrier for smaller participants into central dispatch due to the granularity of data they communicate with AEMO's control rooms

6.4.2 Objective

- Enable capabilities for providing a service that aggregators or distribution network connected generators/loads can utilise if they cannot access the service through their network.
- This work is part of an operational data exchange strategy that includes cost, resilience and technology considerations for the changing system with higher volume of active DER.

6.4.3 Direct Value/Benefit for Participants

- Reduced entry barriers for smaller generators and demand side resources to provide greater visibility to AEMO and participate in the market with lighter telemetry.

6.4.4 Indirect Value/Benefit for Participants

- Accurate forecasts of active DER shifting load or generation enable AEMO to reflect DER in load forecasts provided to the market and for generation scheduling. This benefits Participants in the NEM, including DNSPs and scheduled and semi-scheduled generators.

6.4.5 Project Scope/Proposed Solution

- Scope is in development but likely to include setting up processes covering application, onboarding network and Energy Management System (EMS) configuration.
- The proposed solution will need to consider the Power and Data Communications Standard review underway and cater for market design and grid architecture.
- The scope does not include changes to NEMDE or receiving bids or dispatch instructions.

6.4.6 Key Initiative Relationships

Table 45 SCADA Lite initiative relationships

Name	Description
Scheduled Lite	• SCADA Lite will provide a platform for participants, such as VPPs, to communicate with AEMO and provide visibility of their DER device activities.

Name	Description
Integrating Energy Storage	• SCADA Lite will provide a platform for participants, such as VPPs, to communicate with AEMO and provide visibility of their DER device activities and participate in dispatch with lighter telemetry.
Turn-up Services	• Policy uncertainty means the design scope is unknown at this time. It could entail facilitating increase in load in response to low prices through amendments to the Wholesale Demand Response mechanism. Alternatively it could allow a turn-up service within the RERT called on to address security issues during low operational demand. • If Turn-Up Services are activated commercially through price signals to flexible load and generation to respond, it is likely to have a relationship with SCADA Lite, which would be used by consumer devices to communicate and provide visibility to AEMO.
Operational Data Store	• ODS establishes a capability for storing high volume of operational transactional data at near-real-time. • SCADA Lite will provide a low-cost mechanism for secure communications with new actors in the industry as DER integration progresses at scale in the NEM. This initiative provides high reliability and lower cost data communication technology for SCADA quality data. • ODS surfaces data – it is a series of layers ('technology behind the scenes') that uses elements from other systems (including SCADA) and brings them together.
DER Data Hub and Registry Services	• A low-cost mechanism to support telemetry services. • SCADA Lite may provide a platform for participants to communicate with AEMO and provide visibility of their DER device activities
DER Operational Tools	
Distribution/Local Network Services (TBC)	

6.4.7 Delivery Risks

Table 46 SCADA Lite initiative delivery risks

Risk ID	Risk Type	Description	Mitigation
1	Relationships	Alignment of implementation in time to support regulatory deadlines of core reform initiatives that this would support.	Planning and scheduling
2	Relationships	Increase in project complexity due to multiple dependencies/synergies and overlapping projects in a similar timeline. The scope also needs to consider external organisation registration processes and needs	Planning and scheduling

6.4.8 Risks to Participants if not delivered with NEM2025 reforms

Table 47 SCADA Lite initiative Participant risks

Risk ID	Risk Type	Description	Impact
1	System security	AEMO would face operational challenges in collating SCADA data which may reduce visibility of DER in the market. This creates risks to the effective integration of an anticipated increased in DER and may result in risks to system security.	High

6.4.9 Next Steps

- Implementation dependent on the roadmap pathway adopted.

6.5 Forecasting Platform Uplift

6.5.1 Problem Statement

The rapidly changing power system may increase the likelihood, consequence and subsequent risk of AEMO's future ability to maintain power system security and reliability. Accordingly, there is a need to project future capabilities that will be needed as the power system continues to transform, and establish the necessary foundations before they are needed in order for AEMO to sustain its current operating postures.

The growth in DER and the large number of wind and solar generators has increased the sensitivity of the power system operation to accurate weather forecasts. The risk of inaccurate weather forecasts can, for example, impact power system reliability through the inadequate procurement of RERT. The changes means that AEMO's capabilities for operational forecast uncertainty may be outside the operating envelope for a stable grid state.

The introduction of new markets will require AEMO to uplift its forecasting capabilities. AEMO's existing applications are not fit-for-purpose to meet the requirements of new proposed markets such as Operating Reserves, and not agile enough to deal with the rapid changes in the industry.

6.5.2 Objective

- Re-engineer the forecasting system, including developing an integrated platform.
- Improve quality of data, models and ability for bottom-up forecasting to reduce the operational data blind spots.
- Establish business processes to provide uncertainty information on all products delivered to Real Time Operators (RTO).
- Deliver risk assessment tools to be able to monitor and assess the risk of high impact events.
- Deliver ramping forecasts and classification tooling and business process.

6.5.3 Direct Value/Benefit for Participants

- An integrated platform would allow AEMO to rapidly evolve forecasting models more quickly than what is currently possible with existing solutions.
- New capabilities can be used to gain an understanding of the uncertainty in the forecast, assign probability (or conversely, to understand the uncertainty) to/of the forecast scenario.
- These improved forecasting capabilities reduce the risk of system security events (including critical risk events such as system black). They also reduce the likelihood of instances of large-scale load shedding or extended market suspension.
- With an improved understanding of uncertainty, the downside risk of the forecast conditions can be managed effectively and prudently.

6.5.4 Project Scope / Proposed Solution

- The scope is being developed but the proposed solution being considered includes completing dispatch forecasting MVP.
- Develop an end state IT solution including data modelling and business architecture designs.

- Develop business process design to enable the Operations teams to utilise the new ensemble forecasting platform.
- Develop a process to enable fast switching between forecasting suppliers.
- Develop a legal framework and standard contracts to enable fast onboarding and off-boarding of suppliers.

6.5.5 Key Initiative

Table 48 Forecasting Platform Uplift initiative relationships

Name	Description
Operating Reserve Market	• The forecasting platform uplift includes a converged modelling platform that supports model development, interfaces for forecasting-as-a-service providers and layered blended models across a number of modelling domains e.g. demand and VRE. • An Operating Reserves Market means that AEMO would need to forecast reserves needed to meet net demand forecasts that account for uncertainty and variability. This requires a need to improve the accuracy of net demand forecasts.
ST PASA replacement	• The platform will provide forecasting capabilities for operational timeframes. • The ST PASA process inherently relates to operational forecasting and accordingly shares a relationship with this uplift.
Operational Data Store	• The forecasting platform uplift includes a converged modelling platform that supports model development, interfaces for forecasting-as-a-service providers and layered blended models across a number of modelling domains e.g. demand and VRE. • The platform will provide forecasting capabilities for operational timeframes. ODS will be able to store high volume of operational forecasting data.
Consolidated Master Data Repository Phase 2	• The forecasting platform is part of a future state forecasting roadmap where new third party vendors (forecasting a service providers) could submit forecasts. The organisational identity management of these participants will need to be mapped to the consolidated master data repository.
Identity and Access Management	• IDAM will establish a unified mechanism to authenticate participant users and applications when accessing AEMO services. • The forecasting platform is part of a future state forecasting roadmap where new third party vendors (forecasting a service providers) could submit forecasts. IDAM will support the management of identification and authorisation of these participants.
Industry Data Exchange	• IDX will provide a unified access to AEMO services across all markets using modern authentication and communication protocols. This initiative will leverage Identity and Access Management and could support the data exchange to and from forecasting service suppliers.

6.5.6 Delivery Risks

Table 49 Forecasting Platform Uplift initiative delivery risks

Risk ID	Risk Type	Description	Mitigation
1	Relationships	Alignment of implementation in time to support regulatory deadlines of core reform initiatives that this would support.	Planning and scheduling
2	Relationships	Increase in project complexity due to multiple dependencies/synergies and overlapping projects in a similar timeline. The scope also needs to consider external organisation registration processes and needs	Planning and scheduling

6.5.7 Risks to Participants if not delivered with NEM2025 reforms

Table 50 Forecasting Platform Uplift initiative Participant risks

Risk ID	Risk Type	Description	Impact
1	Operational	Existing applications are not fit-for-purpose for new markets such as Operating Reserves, and not agile enough to deal the rapid energy transition. This could result in functions of new markets not being executed effectively and efficiently.	Critical
2	System Security	Inability to provide accurate forecasts could result in load-shedding, market suspension and system security events.	Critical

6.5.8 Next Steps

- Implementation dependent on the roadmap pathway adopted.

6.6 ST PASA Replacement

This project is not part of the NEM2025 reform program initiatives and has been included for transparency because it has relationships with various NEM2025 initiatives and will feed into design considerations for some of the reform initiatives.

6.6.1 Problem Statement

The Pre-Dispatch (PD) and Short-Term Projected Assessment of System Adequacy (ST PASA) systems are one of the core systems used by AEMO and Participants to warn of any system reliability issues in the pre-dispatch and short-term time frame.

The current ST PASA system is not flexible enough to evolve with the changing power system and the accuracy of this system is continuing to decline. For example, new technologies, such as battery storage, VPPs, and DER, cannot be easily modelled in the current system and power system security issues cannot be modelled under all conditions, such as minimum demands.

For AEMO to continue to provide reliable, secure and efficient system operations, it is essential that the ST PASA systems (Pre-Dispatch and Short-Term) are redeveloped. Inaccurate information from these systems could either lead to avoidable load shedding or over-utilisation of RERT. These systems are also used by Participants to make commercial decisions, plus co-ordinate planned outage and maintenance works.

6.6.2 Objective

- The objective of the ST PASA Replacement Project is to do a holistic review of the PD and ST PASA methodology and develop a system that is flexible enough to serve the market now and into the future.
- Re-develop lack of reserve indicators and procedures based on the new more granular schedules.
- Test, select, procure and deploy a commercial SCED/SCUC market clearing engine subsystem.
- Design and build overall system.
- Design and develop business driven data management processes to enable stable long-lived integration.

6.6.3 Direct Value/Benefit for Participants

- AEMO will be able to continue to provide accurate system security and reliability information to Participants in light of the changing power system and any future changes to the market design.
- A nodal model will provide more granular and localised information on network issues and produce more accurate understanding of system reliability that will benefit effective and efficient management of the system and network, not only for AEMO but also for Participants.

6.6.4 Indirect Value/Benefit for Participants

- Minimise the risk of impact to consumers. The cost to consumers of not doing this redevelopment would be an inaccurate reflection of RERT requirements in the operational timeframe and could either lead to avoidable load shedding or over-utilisation of RERT services on required days to manage reserve shortfall situations.

- The flexible design of the new system will enable future power system changes to be implemented more easily and efficiently, thereby providing a cost efficiency benefit and value to Participants.

6.6.5 Project Scope/Proposed Solution

- The project will deliver a replacement PD/ST-PASA subsystem and technology platform whilst maintaining the availability and reliability profile already established for this service.
- The business processes will be transformed to support the new solution and rule changes where the definition and specification of the reserve management process is modified to encompass the more granular information provided through the shift to a nodal projection rather than the existing regional projections.
- The technology platform will enable reliable delivery of the required projections based on the integration of a new commercial dispatch engine with the rest of the AEMO market, grid and short horizon forecasting technology environments that provide the inputs and consume the outputs of the system.

6.6.6 Key Initiative Relationships

Table 51 ST PASA Replacement initiative relationships

Name	Description
Consolidated Master Data Repository Phase 2	• This initiative will establish an internal master data management platform hosting information about power system asset data (e.g. NMI standing data, DER devices) used by AEMO market systems. • ST PASA will consume data from the master data repository.
Forecasting Platform Uplift	• The forecasting platform uplift will provide forecasting capabilities for operational timeframes. • The ST PASA process inherently relates to operational forecasting and accordingly shares a relationship with this uplift.
Operational Decision-Making Tools	• ODMT will establish a new enterprise platform for new decision-making tools used by the AEMO control room operators. Multiple disparate user interfaces converged into single user experience platform, capabilities for improved analytics and handling greater volumes of transactional data. • The review of the Pre-dispatch (PD) and Short Term (ST) PASA methodology and supporting systems and processes will deliver a significant capability uplift which will use control room management task screens and interfaces.
Operational Data Store	• Several reforms will change the structure of market offers, and other operational data that is received by AEMO and feed into input of ST PASA processes. • As the integration of DER into the NEM increases, AEMO will need to be able to absorb operational forecasting information in operational timeframes. • ODS will store PASA related operational transactional data and will surface PASA (forecasting) related data from other systems, including PASA systems, and bring them together.
Integrating Energy Storage	• The IES rule changes create a new participant category called an Integrated Resource Provider (IRP) that can register and participate in markets. • IES changes the structure of market offers that come in, and as such need to feed into input of ST PASA. • The IES rule change requires participating units to provide forecast information into the PASA processes.
Scheduled Lite	• Scheduled Lite allows more resources to either provide visibility or participate directly in the NEM dispatch process. • This has an impact on the forecasting processes that will need to be able to absorb forecasting information from participating resources, provide more accurate operational forecasts and increase scheduling accuracy.
Operating Reserve	• The proposed rule change for an Operating Reserve Market includes the development of an operating reserve demand curve. Certain inputs into the calculation of the curve, such as uncertainty measures, may change as a result of ST PASA process changes. • However, the rule change is not yet at a stage where the extent of the relationship can be validated.

Name	Description
Dispatch Target State	• A technology uplift of AEMO backend market platform services to replace legacy technology. In the case of bids/offers this will leverage 5MS deliverables. • The design of ST PASA could feed into the design, or become, the dispatch target state
Bids offers target state	
Constraint target state	

6.6.7 Delivery Risk

Table 52 ST PASA Replacement initiative delivery risks

Risk ID	Risk Type	Description	Mitigation
1	Relationships	Alignment of implementation in time to support regulatory deadlines of core reform initiatives that this would support.	Planning and scheduling
2	Relationships	Increase in project complexity due to multiple dependencies/synergies and overlapping projects in a similar timeline. The scope also needs to consider external organisation registration processes and needs	Planning and scheduling

6.6.8 Next Steps

- Further analysis on whether scope and solution will meet all of the NEM2025 requirements

7 Pre-requisite initiatives – Group C (Dispatch and Short-Term Market Operations)

7.1 Dispatch, Bids/Offers, and Constraints Target State

7.1.1 Problem Statement

AEMO's core market Dispatch and Constraints platform is at end of technical life and the technologies which underpin this platform are legacy. There is a rapidly diminishing footprint of resources in the contract market with skills in these technologies available.

7.1.2 Objective

- To modernise the core market dispatch and short-term market systems to align it with modern technologies that are widely supported in AEMO and for which external resources with those skill sets readily exist.

7.1.3 Direct Value/Benefit for Participants

- Ensures the ongoing viability and maintainability of the core market Dispatch and Constraints platforms – which are mission critical to enable secure and optimised participation by actors in various markets in the NEM.

7.1.4 Indirect Value/Benefit for Participants

- Adoption of modern delivery frameworks will improve the ability of AEMO to deliver changes to these platforms which will be increasingly required as the energy transition continues. This will provide cost efficiency benefits and value to Participants through reduced implementation costs.
- Avoids the need for future investment after the reforms have been implemented. The work to update the core market dispatch platform is already planned due to it been close to the end of its technical life. Accordingly, bringing forward its implementation in the context of the reforms provides cost-efficiency value through avoided sunk technology costs.

7.1.5 Project Scope/Proposed Solution

- An upgrade of the Dispatch and Constraints platforms is already planned given they are nearing their end of life and their mission critical functions in the NEM.
- The scope is being developed in the context of the reforms and it is proposed that the core market Dispatch platform calculation will encompass the following business processes:
  - Dispatch

  - P5Min
  - P5Min sensitivities
  - Pre-dispatch
  - Pre-dispatch sensitivities
  - NEM Simulator training environment
- It is proposed that the core Constraints platform will encompass Constraint formulation, testing and a library and support integration to key consuming processes like Dispatch.
- The scope will include definition of a transition to the future state by all Participants.

7.1.6 Key Initiative Relationships

Table 53 Group C initiatives relationships

Name	Description
Operating Reserve Market	• The proposed change to create a new system service to procure energy reserves would have significant interaction with the dispatch and ST Markets systems. It has been proposed that AEMO would procure, on a rolling-basis in every 5-minute dispatch interval, a certain volume of operating reserves with the capability to dispatch it as energy in the dispatch interval 30-minutes ahead.
OSM	• The proposed rule change would create a procurement service in operational timeframes to schedule the system services contracted in planning timeframes. • The procurement and scheduling process would need to produce an inter-temporal optimised dispatch schedule that considers technical constraints and costs for unit commitment and system security. • The target state does not have a relationship to OSM because it is assumed there will be a single optimisation engine run ahead of time that is separate to NEMDE. However, there are potential opportunities to use the same SCED engine for ST PASA and the Dispatch uplift.
ST PASA replacement	• A technology uplift of AEMO backend market platform services to replace legacy technology. In the case of bids/offers this will leverage 5MS deliverables. • The design of ST PASA could feed into the design, or become, the dispatch target state.
Fast Frequency Response	• The scope of the target state needs to be defined and the needs of FCAS markets considered in that process.

7.1.7 Delivery Risks

Table 54 Group C initiatives delivery risks

Risk ID	Risk Type	Description	Mitigation
1	Relationships	Alignment of implementation in time to support regulatory deadlines of core reform initiatives that this would support.	Planning and scheduling
2	Relationships	Increase in project complexity due to multiple dependencies/synergies and overlapping projects in a similar timeline. The scope also needs to consider external organisation registration processes and needs	Planning and scheduling
3	Technical	Dispatch is the most ‘mission critical’ part of the NEM’s market systems. As such, the consequences of complications in the delivery of the platform are significant from a functional and potential loss of value (revenue loss) to the NEM and Market Participants.	Planning and scheduling

7.1.8 Risks to Participants if not delivered with NEM2025 reforms

Table 55 Group C initiatives Participant risks

Risk ID	Risk Type	Description	Impact
1	Cost efficiencies	The platform needs to be replaced. Implementing reforms by building on near end-of-life systems will mean that reform capabilities will need to be integrated into future state systems not long after the reforms take effect.	High

7.1.9 Next Steps

- Implementation dependent on the roadmap pathway adopted

8 Pre-requisite initiatives – Others

8.1 FRC Target State

8.1.1 Problem Statement

AEMO currently maintains multiple applications to manage assets and participant relationships in the Retail Markets. Standing Data from these systems are copied (duplicated) to other downstream systems causing data latency and quality issues. The majority of these systems are bespoke with point-to-point integration and all of the Full Retail Competition (FRC) platforms are at the end of their technical life and require renewal. There are significant regulatory changes on the horizon that require significant investment to enhance and maintain these systems and new market reforms continue to introduce additional assets and/or additional characteristics of the assets requiring smart investments.

8.1.2 Objective

- Implement a consolidated Asset and Participant Relationship Management system (APRM); that enables unification of services onto a shared platform and simplification of Participants' and AEMO processes.
- Provide single access to AEMO's Retail systems (network, portal, hub, data access and system architecture) for Participants and potentially to non-Participants such as 3rd parties (e.g. under the Consumer Data Right for Energy reforms).
- Accommodate new market assets such as DER, and Electric Vehicles (EV) into AEMO grid and market solutions.
- Provide the foundation for unifying the procedure definitions, business processes, data exchange patterns and mechanisms, and AEMO systems across jurisdictions, markets and fuels.
- Implement systems changes to improve delivery of consolidated processes at lower cost to both Market Participants and AEMO.

8.1.3 Direct Value/Benefit for Participants

- Improved operational performance by leveraging unified interface protocol and methodologies removes duplication efforts and costs to Participants across the industry.

8.1.4 Indirect Value/Benefit for Participants

- Easier market changes through reduced dependency on code changes provides value to Participants via reduced costs, time and effort for the implementation of procedure changes and enables third parties to provide system solutions at lower prices.
- A consolidated FRC platform enables visibility of all markets data in one system and utilising the same toolsets. This creates operational efficiencies that will enable AEMO to manage interactions with Participants more efficiently.

- Alignment to AEMO's cyber security standards and minimised data movement across the organisation, will improve data security, quality, latency, and accuracy.

8.1.5 Project Scope/Proposed Solution

- Develop target state and transition state architecture with a roadmap illustrating the functional and technical view and its integration with the market and other internal systems, and the draft implementation sequence.
- Design APRM platform, including the solution architecture, and its technology stack. The platform needs to enable consolidated procedures, interfaces, security standards, protocols, and support processes across all Retail Markets.
- Develop and execute an implementation roadmap - sequencing for the implementation phase(s), including the retirement transition for the legacy applications and the associated regret spend.
- Implement a consolidated FRC platform that provides visibility of all market data, and covers the applications defined in the implementation sequencing plan. The platform will extend to new assets such as DER, EVs and integrating it with the grid and other market systems.

8.1.6 Key Initiative Relationships

Table 56 FRC Target State initiative relationships

Name	Description
Identity and Access Management	• IDAM will establish a unified mechanism to authenticate participant users and applications when accessing AEMO services. • FRC includes establishing a consolidated Asset and Participant Relationship Management system (APRM) that enables unification of services onto a shared platform, single access to AEMO's Retail systems, and simplification of Participants' and AEMO processes. • As markets and systems are consolidated through FRC, the new IDAM framework is in place to facilitate a cohesive approach to management organisational authorisation and access.
Industry Data Exchange	• IDX will establish a unified access to AEMO services across all markets using modern authentication and communication protocols. This initiative will leverage IDAM. • As markets and systems are consolidated through FRC, the new IDX framework is in place to facilitate a cohesive approach to industry data exchange.
Business Rules Engine	• BRE creates the reference architecture; an internal technology capability within which to define business rules and processes. Core market platforms will leverage this capability as a foundation building block. • BRE will capture enterprise-wide business requirements to accommodate process changes efficiently. • FRC cannot be completed without BRE. The business rules implemented will enable the development of the FRC consolidated platform.
Flexible Trading Arrangements Model 2	• FTA2 will touch Retail processes, including MSATS (process changes to identify flexible NMIs, reconciliation of network charges) – through an extension of existing embedded network processes. Many of the participants for FTA2 will also be participants in 'traditional' Retail systems.
DER Marketplace	• Many participants in a DER Marketplace are likely to be active across other markets, and may include a new cohort of participants (e.g. 'traders/aggregators'). Therefore, the objectives of FRC target state to provide unified services through a shared, single access platform to AEMO's retail systems and processes would support a more efficient experience for a market likely to have a greater number of participants compared to the current Retail market.

8.1.7 Delivery Risks

Table 57 FRC Target State initiative delivery risks

Risk ID	Risk Type	Description	Mitigation
1	Relationships	Alignment of implementation in time to support regulatory deadlines of core reform initiatives that this would support.	Planning and scheduling

8.1.8 Risks to Participants if not delivered with NEM2025 reforms

Table 58 FRC Target State initiative Participant risks

Risk ID	Risk Type	Description	Impact
1	Cost efficiencies	The platform needs to be replaced. Implementing reforms by building on near end-of-life systems will mean that reform capabilities will need to be integrated into the future state systems not long after the reforms take effect. As new markets are implemented through the reforms, a non-consolidated FRC platform will increase costs to manage a large number of diverse procedures and systems.	High
2	Participant experience	Participants active in various Retail Markets, including new DER Markets, will have a fragmented experience that creates operational inefficiencies for Participants managing FRC processes across markets.	High

8.1.9 Next Steps

- Implementation dependent on the roadmap pathway adopted.

A1. Appendix A – ESB Post-2025 Program

The following table provides a summary of each of the four major reform pathways put forward by the ESB and those reform initiatives (in bold) considered within that will form the basis of the NEM2025 Roadmap

Table 59 Summary of the ESB reform pathways

Pathway	Objective	This means	Reform Initiative*
Resource Adequacy Mechanism	• Establish new market-based arrangements to explicitly value capacity to provide an 'investable' and enduring long-term signal. • Establish market arrangements that support efficient allocation of investment risk between participants, jurisdictions, and consumers. • Establish tools that provide jurisdictions sufficient confidence that reliability will be maintained in a way that preserves market signals.	We have investment in the right mix of resources (generation, storage and demand response) in place prior to anticipated plant closures, and that plant exit does not cause significant price or reliability shocks to consumers through the transition.	• Investment principles for jurisdictional schemes • **MT PSA Enhancements** • Jurisdictional Strategic Reserve • Ministerial RRO Trigger • Capacity Mechanism • Ongoing Monitoring
Essential System Services	• Establish new market-based arrangements to value the services needed to support the changing mix of resources in the NEM (frequency, inertia, system strength, and operating reserves). • Establish new market mechanisms to support efficient scheduling and dispatch by AEMO. • Deliver a range of supply and demand-based technologies and resources with capabilities to deliver these essential services.	We have the resources and services when needed to manage the complexity of dispatch and to deliver a secure supply to customers.	• **Fast Frequency Response** • **Mandatory Primary Frequency Response** • **Operating Reserve Market** • **System Strength (Planning)** • **Operational Security Mechanism** • Unbundling system services • Integrated ahead market
Integration of DER and Flexible Demand	• Establish frameworks that enable consumers to be rewarded for their flexible demand and generation, facilitate options for how they want to engage and remain protected by a fit-for-purpose consumer protections framework. • Establish wholesale market arrangements that support innovation, the integration of new business models and a more efficient supply and demand balance. • Establish networks with the ability to accommodate the continued update of DER, two-way energy flows, and manage the security of the network in a cost-effective way. • Provide AEMO with the visibility and tools it needs to continue to operate a safe, secure, and reliable system, including maintaining system security associated with low minimum system load conditions.	We create new opportunities for consumers about how they receive and use energy and are rewarded for doing so flexibly.	• **Integrating Energy Storage** • **Flexible Trading Arrangements** • **Scheduled Lite** • **Dynamic Operating Envelopes** • **Distribution Local Network Services** • **Turn-up Services** • **DER Data Hub and Registry Services** • **DER Operational Tools**
Transmission and Access	• Establish better signals for generators to locate in areas where there is available generation capacity - namely in the REZs. • Reduced uncertainty for investors, through measures that give rise to more predictable future patterns of congestion, and a more orderly and predictable connections process. • Establish better use of the network, resulting in more efficient dispatch outcomes and lower costs for consumers. • Ensure batteries are locating where they are needed most and being paid to operate in ways that benefit the broader system.	We have a network to meet future needs, renewable energy zones, and a targeted set of investments that can deliver the energy transition at lower cost.	• Dedicated connection assets and system strength • Interim REZ framework • Transmission Access Reform • Transmission Planning and Investment Review • Enhanced congestion information • LMP and FTR

A2. Appendix B – References

Workstream	Reform Initiative	Reference (link to rule change, market review, or latest ESB publication)
RAMS	MT PASA Enhancement	https://www.datocms-assets.com/32572/1629945809-post-2025-market-design-final-advice-to-energy-ministers-part-b.pdf
ESS	Fast Frequency Response	https://www.aemc.gov.au/rule-changes/fast-frequency-response-market-ancillary-service
	Mandatory Primary Frequency Response	https://www.aemc.gov.au/rule-changes/primary-frequency-response-incentive-arrangements
	Operating Reserve Market	https://www.aemc.gov.au/rule-changes/operating-reserve-market
	System Strength (Planning)	https://www.aemc.gov.au/rule-changes/efficient-management-system-strength-power-system
	Operational Security Mechanism (formerly Structured procurement and Scheduling Mechanism)	https://www.aemc.gov.au/rule-changes/operational-security-mechanism
	Unbundling system services (e.g., inertia)	N/A
	Integrated ahead market	N/A
T&A	Dedicated connection assets and system strength	https://www.aemc.gov.au/rule-changes/connection-dedicated-connection-assets https://www.aemc.gov.au/rule-changes/efficient-management-system-strength-power-system
	Interim REZ framework	https://www.datocms-assets.com/32572/1629945809-post-2025-market-design-final-advice-to-energy-ministers-part-b.pdf
	Transmission Access Reform	https://www.datocms-assets.com/32572/1637195419-transmission-access-reform-scope-of-work-and-forward-project-plan.pdf
	Transmission Planning and Investment Review	https://www.aemc.gov.au/market-reviews-advice/transmission-planning-and-investment-review
	Enhanced congestion information	https://aemo.com.au/consultations/current-and-closed-consultations/2021-congestion-information-resource-guidelines
	LMP and FTR	N/A
DER	Integrating Energy Storage	https://www.aemc.gov.au/rule-changes/integrating-energy-storage-systems-nem

Workstream	Reform Initiative	Reference (link to rule change, market review, or latest ESB publication)
	Flexible Trading Arrangements (Model 2)	https://www.datocms-assets.com/32572/1629945809-post-2025-market-design-final-advice-to-energy-ministers-part-b.pdf https://www.datocms-assets.com/32572/1629945838-post-2025-market-design-final-advice-to-energy-ministers-part-c.pdf
	Scheduled Lite	https://www.datocms-assets.com/32572/1629945809-post-2025-market-design-final-advice-to-energy-ministers-part-b.pdf
	Dynamic Operating Envelops	https://www.datocms-assets.com/32572/1629945809-post-2025-market-design-final-advice-to-energy-ministers-part-b.pdf
	Distribution Local Network Services	https://www.datocms-assets.com/32572/1629945809-post-2025-market-design-final-advice-to-energy-ministers-part-b.pdf https://aemo.com.au/en/initiatives/major-programs/nem-distributed-energy-resources-der-program/der-demonstrations/project-edge
	Turn-up Services	https://www.datocms-assets.com/32572/1629945809-post-2025-market-design-final-advice-to-energy-ministers-part-b.pdf
	DER Platform Registry Services	https://www.datocms-assets.com/32572/1629945809-post-2025-market-design-final-advice-to-energy-ministers-part-b.pdf
	Market and System Operator Integration	https://www.datocms-assets.com/32572/1629945809-post-2025-market-design-final-advice-to-energy-ministers-part-b.pdf
Data Strategy	Data Services	https://www.datocms-assets.com/32572/1630275857-esb-data-strategy-july-2021.pdf
	EV Charger Standing Data Register	https://www.datocms-assets.com/32572/1630275857-esb-data-strategy-july-2021.pdf
	Bill Transparency	https://www.datocms-assets.com/32572/1630275857-esb-data-strategy-july-2021.pdf
	Network Transparency	https://www.datocms-assets.com/32572/1630275857-esb-data-strategy-july-2021.pdf
	Over Voltage	https://www.datocms-assets.com/32572/1630275857-esb-data-strategy-july-2021.pdf