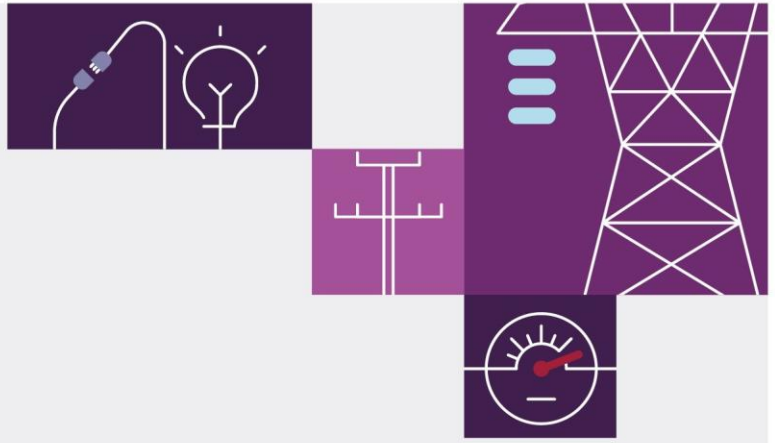


# NEM Reform Program Initiative Briefs

October 2023

A reference document for the Post-2025 initiatives  
captured in the NEM Reform Implementation Roadmap  
Version 3





# Important notice

## Purpose

The purpose of this publication is to provide further information on each of the Post-2025 initiatives captured in the NEM Reform Program, including key AEMO strategic or foundational initiatives, to help inform stakeholders understand the scope, assumptions and relationships underpinning the NEM Reform Implementation Roadmap.

## Disclaimer

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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 NEM Reform Implementation Roadmap   |
| 2       | 31/08/2022   | Update to initiative briefs to update initiative scope, including removal of four initiatives (Operational Decision-Making Tools, Operational Data Store, Business Rules Engine and Forecasting Platform Uplift) and addition of two initiatives (Capacity Mechanism and Congestion Management Mechanism). |
| 3       | 27/04/2023   | Update to initiative briefs to reflect current scope and timing. Removal of Turn-up Services brief following de-scoping from the NEM Reform Program.   |
| 4       | 05/10/2023   | Update to initiative briefs to reflect current scope and timing including the following initiatives 2.2, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 6.1, 6.2, 6.3, 6.4, 7.1, 7.2, 7.3, 8.1, 8.4.   |



# 1 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 NEM Reform Implementation Roadmap (the Roadmap) available on AEMO's website<sup>1</sup> which details an integrated timeline for implementing the reform initiatives that comprise the ESB's Post-2025 recommendations, as well as broader NEM and gas related reform initiatives that collectively make up the NEM Reform Program.<sup>2</sup>

The purpose of the Roadmap is to establish a basis for navigating the breadth of 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 that are captured within the NEM Reform Program 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 key material.

The Post-2025 reform initiatives included in this reference document have been divided into 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 Distributed Energy Resources (DER) and Flexible Demand (DER & FD); and
- Transmission and Access (TA).

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

<sup>2</sup> The NEM2025 Implementation Roadmap has been integrated with the Regulatory Implementation Roadmap and East Coast Gas Reform Implementation Roadmap to form the NEM Reform Implementation Roadmap.



In addition to the reform initiatives, AEMO has identified a subset of enabling initiatives. Each of these initiatives represents either a:

- **Foundational** investment in an AEMO legacy system to deliver an uplift to base capability on which reforms are dependent; or
- **Strategic** investment where system uplift is required at some time in the future and AEMO sees the opportunity for this life-cycle type investment to be brought forward and delivered in the same timeframes as the reforms for efficiency purposes.

Finally, AEMO has identified several initiatives that will be monitored as dependent projects and will be delivered in accordance with the AEMO Operational Technology Roadmap.<sup>3</sup>

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 used to manage this process.

This reference document aligns with the Post-2025 reform initiatives captured in the NEM Reform Implementation Roadmap. As such, this document is revised periodically to reflect changes in scope or timelines as policy or designs are being finalised or as new rule determinations are made.

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<sup>3</sup> Available on AEMO's website: <https://www.aemo.com.au/initiatives/major-programs/operations-technology-program/operations-technology-roadmap>

# Contents

|     |   |    |
|-----|---|----|
| 1   | Overview  | 3  |
| 2   | Resource Adequacy Mechanisms  | 8  |
| 2.1 | Increased Medium Term Projected Assessment of System Adequacy (MT PASA) Information | 8  |
| 2.2 | Capacity Investment Scheme  | 10 |
| 3   | Essential System Services   | 12 |
| 3.1 | Fast Frequency Response   | 12 |
| 3.2 | Frequency Performance Payments (part of PFR Incentive Arrangements rule)            | 15 |
| 3.3 | Operating Reserves Market   | 18 |
| 3.4 | Improving security frameworks for the energy transition                             | 21 |
| 3.5 | Efficient management of system strength on the power system                         | 24 |
| 4   | Transmission and Access   | 27 |
| 4.1 | Enhanced Information  | 27 |
| 4.2 | Congestion Relief Market & Priority Access Model                                    | 29 |
| 5   | Integrating DER and Flexible Demand   | 32 |
| 5.1 | Integrating Energy Storage Systems  | 32 |
| 5.2 | Unlocking Consumer Energy Resources (CER) benefits through flexible trading         | 35 |
| 5.3 | Integrating price responsive resources into the NEM                                 | 38 |
| 5.4 | Dynamic Operating Envelopes   | 41 |
| 5.5 | Distribution Local Network Services   | 44 |
| 5.6 | DER Data Hub and Registry Services  | 46 |
| 5.7 | DER Operational Tools   | 49 |
| 6   | Data Strategy   | 51 |
| 6.1 | Data Services   | 51 |
| 6.2 | Electric Vehicles Supply Equipment Standing Data Register                           | 53 |
| 6.3 | Bill Transparency   | 56 |
| 6.4 | Network Visibility  | 58 |
| 7   | AEMO Foundational Initiatives   | 60 |
| 7.1 | Identity and Access Management  | 60 |
| 7.2 | Industry Data Exchange  | 63 |
| 7.3 | SCADA Lite  | 67 |
| 8   | AEMO Strategic Initiatives  | 70 |
| 8.1 | Portal Consolidation  | 70 |
| 8.2 | Consolidated Master Data Repository   | 73 |
| 8.3 | FRC Target State  | 76 |
| 8.4 | Dispatch, Bids/Offers, and Constraints Target State                                 | 79 |



|     |                                    |    |
|-----|------------------------------------|----|
| 9   | AEMO Dependent Initiatives         | 82 |
| A1. | Appendix A – ESB Post-2025 Program | 83 |
| A2. | Appendix B – References            | 85 |

## Tables

|          |  |    |
|----------|--|----|
| Table 1  | Increased MT PASA initiative risks   | 9  |
| Table 2  | Fast Frequency Response initiative relationship  | 13 |
| Table 3  | Fast Frequency Response initiative risks   | 13 |
| Table 4  | Frequency Performance Payments initiative risks  | 16 |
| Table 5  | Operating Reserves initiative relationships  | 19 |
| Table 6  | Improving security frameworks for the energy transition initiative relationships                     | 22 |
| Table 7  | Efficient management of system strength on the power system initiative relationships                 | 25 |
| Table 8  | Efficient management of system strength on the power system initiative risks                         | 25 |
| Table 9  | Integrating Energy Storage Systems initiative relationships  | 33 |
| Table 10 | Integrating Energy Storage Systems initiative risks  | 34 |
| Table 11 | Unlocking Consumer Energy Resources (CER) benefits through flexible trading initiative relationships | 36 |
| Table 12 | Unlocking Consumer Energy Resources (CER) benefits through flexible trading initiative risks         | 37 |
| Table 13 | Integrating price responsive resources into the NEM initiative relationships                         | 39 |
| Table 14 | Integrating price responsive resources into the NEM initiative risks                                 | 40 |
| Table 15 | Dynamic Operating Envelope initiative relationships  | 42 |
| Table 16 | Distribution Local Network Services initiative relationships   | 45 |
| Table 17 | DER Data Hub and Registry Services initiative relationships  | 47 |
| Table 18 | DER Operational Tools initiative relationships   | 50 |
| Table 19 | Data Services initiative risks   | 52 |
| Table 20 | IDAM initiative relationships  | 61 |
| Table 21 | IDAM initiative delivery risks   | 61 |
| Table 22 | IDAM initiative Participant risks  | 62 |
| Table 23 | Industry Data Exchange initiative relationships  | 64 |
| Table 24 | Industry Data Exchange initiative delivery risks   | 65 |
| Table 25 | Industry Data Exchange initiative Participant risks  | 65 |
| Table 26 | SCADA Lite initiative relationships  | 68 |
| Table 27 | SCADA Lite initiative delivery risks   | 68 |
| Table 28 | SCADA Lite initiative Participant risks  | 68 |
| Table 29 | Portal Consolidation Framework initiative relationships  | 71 |



|          |   |    |
|----------|---|----|
| Table 30 | Portal Consolidation Framework initiative delivery risks              | 71 |
| Table 31 | Portal Consolidation Framework initiative Participant risks           | 71 |
| Table 32 | Consolidated Master Data Repository initiative relationships          | 74 |
| Table 33 | Consolidated Master Data Repository initiative delivery risks         | 74 |
| Table 34 | Consolidated Master Data Repository initiative Participant risks      | 75 |
| Table 35 | FRC Target State initiative relationships                             | 77 |
| Table 36 | FRC Target State initiative delivery risks                            | 78 |
| Table 37 | FRC Target State initiative Participant risks                         | 78 |
| Table 38 | Dispatch, Bids/Offers, and Constraints Target State relationships     | 80 |
| Table 39 | Dispatch, Bids/Offers, and Constraints Target State delivery risks    | 80 |
| Table 40 | Dispatch, Bids/Offers, and Constraints Target State Participant risks | 80 |
| Table 41 | Summary of the ESB reform pathways                                    | 83 |

## 2 Resource Adequacy Mechanisms

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

*Last updated – 27 April 2023*

#### 2.1.1 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.

#### 2.1.2 Objective

- Establishing the reporting of a unit's status through reason codes via MT PASA.
- Establishing the reporting of recall times via MT PASA when triggered through a reason code.

#### 2.1.3 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.





## 2.1.4 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).

## 2.1.5 Key Assumptions

- No changes required to AEMO's approach to assessment of reliability and no additional MT PASA modelling runs will be required.
- Reporting of reason codes and recall times will require IT redesign of the existing submission portal.

## 2.1.6 Key Initiative Relationships

- No key relationships identified at this time.

## 2.1.7 Risks

**Table 1** 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 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. |

## 2.1.8 Next Steps

- The AEMC published their Final Rule Determination on 18 August 2022.
- AEMO commenced consultation on its NEM Reliability Forecasting Guidelines and Methodology in October 2022. The consultation provides for changes to the RSIG and MT PASA Process Description in accordance with the AEMC's final determination. This consultation was completed in April 2023.
- This rule is scheduled to commence on 9 October 2023.

## 2.1.9 Reference

AEMC Rule Determination: <https://www.aemc.gov.au/rule-changes/enhancing-information-generator-availability-mt-pasa>

AEMO Guidelines and Methodology Consultation: <https://www.aemo.com.au/consultations/current-and-closed-consultations/2022-reliability-forecasting-guidelines-and-methodology>

## 2.2 Capacity Investment Scheme

*Last updated – 05 October 2023*

### 2.2.1 Problem Statement

The ESB's final recommendations to Energy Ministers proposed that detailed design work be undertaken on a capacity mechanism to complement existing arrangements. This recommendation acknowledged the NEM is rapidly transitioning to a lower-emissions generation profile, characterised by higher levels of near-zero marginal cost variable renewable generation.<sup>4</sup> To encourage investors to take long-term capacity risk, the ESB noted the need for market arrangements that explicitly value capacity, separately from the energy price, to support the quantum of build required over the next decade.<sup>5</sup>

The aim of the capacity mechanism is therefore to provide a clear price signal for capacity that incentivises timely entry and orderly exit of resources by reducing investment uncertainty.

In December 2022, Energy Ministers endorsed the establishment of a Capacity Investment Scheme (CIS).<sup>6</sup> The CIS is to complement rather than overlap with existing State schemes such as the NSW Electricity Infrastructure Roadmap, and therefore not alter competitive tenders currently underway.<sup>7</sup> Further, the scheme will work alongside the National Energy Transformation Partnership underway, and the Rewiring the Nation plan – these policies will work in unison to ease power prices and make energy cleaner and more secure.<sup>8</sup>

### 2.2.2 Objective

The objective is to establish a new national revenue underwriting mechanism to incentivise investment in clean dispatchable power to support reliability and security as the energy market transitions.

### 2.2.3 Value/Benefit

The key benefit of the mechanism is in providing confidence to investors, governments and consumers that reliable power will be delivered as the transition continues, placing downward pressure on prices and avoiding price shocks from unexpected retirements and future market interventions.

### 2.2.4 Project Scope/Proposed Solution

The Commonwealth published a Consultation paper in August 2023 seeking feedback on the design and delivery of the CIS.<sup>9</sup> The paper noted that CIS tenders are expected to be progressively rolled out from 2023 to 2027 so

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<sup>4</sup> Energy Security Board. Website: Resource Adequacy Mechanisms and Ageing thermal Retirement. Last Accessed February 2023. Available here: <https://esb-post2025-market-design.aemc.gov.au/resource-adequacy-mechanisms-and-ageing-thermal-retirement>.


<sup>5</sup> Ibid.

<sup>6</sup> Department of Climate Change, Energy, the Environment and Water. Website: Capacity Investment Scheme to power Australian energy market transformation. Last accessed February 2023. Available here: <https://www.energy.gov.au/news-media/news/capacity-investment-scheme-power-australian-energy-market-transformation>.

<sup>7</sup> Ibid.

<sup>8</sup> Department of Climate Change, Energy, the Environment and Water. Website: Media Releases. Capacity Investment Scheme to power Australian energy market transformation – 8 December 2022. Available here: <https://minister.dcceew.gov.au/bowen/media-releases/capacity-investment-scheme-power-australian-energy-market-transformation>.

<sup>9</sup> Available on the Department of Climate Change, Energy, the Environment and Water website at: [Consultation hub | Capacity Investment Scheme – Public Consultation paper - Climate Change \(dcceew.gov.au\)](#)



that reliability needs can be addressed between FY26 and FY2030.<sup>10</sup> The first phase of the CIS, proposed to be delivered in 2023, is to involve:

- Partnership with NSW Electricity Infrastructure Roadmap – Commonwealth support for up to 550 MW of firm capacity in addition to 380 MW already committed in NSW.<sup>11</sup>
- South Australia / Victoria tender – Tender arrangements to be announced by October 2023.

As an underwriting mechanism facilitated through a tender process this initiative does not require industry wide IT system implementation or changes to business processes..

### 2.2.5 Key Assumptions

- AEMO to deliver auctions in SA and VIC and undertake contract management activities for selected projects.
- A Commonwealth / New South Wales tender in partnership with the NSW Electricity Infrastructure Roadmap.
- The Commonwealth to design the auction process in late 2023 to operate in SA and VIC and continue work on a national rollout of the scheme.
- Limited impact to AEMO and participant IT systems or business processes.

### 2.2.6 Key Initiative Relationships

- No key relationships based on current scope.

### 2.2.7 Risks

- Risks will be identified closer to final design and tender guidelines being finalised.

### 2.2.8 Next Steps

- The Commonwealth published their Consultation Paper outlining a proposed approach and design of the CIS for stakeholder feedback in August 2023.
- AEMO will incorporate emerging detailed design into its cost estimates as required. This will be completed when detailed design of the CIS is finalised in late 2023.

### 2.2.9 Reference

Commonwealth Government: <https://www.energy.gov.au/news-media/news/capacity-investment-scheme-power-australian-energy-market-transformation>

Commonwealth Government Capacity Investment Scheme – Public Consultation Paper:  
<https://consult.dcceew.gov.au/capacity-investment-scheme-public-consultation-paper>

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<sup>10</sup> The Commonwealth will reconsider the need to continue with CIS tenders post 2027 as part of the broader consideration of the long-term national energy market framework.

<sup>11</sup> This partnership was announced on 29 June 2023: [Joint media release: Capacity Investment Scheme to power NSW with clean, cheap, reliable energy | Ministers \(dcceew.gov.au\)](#)

# 3 Essential System Services

## 3.1 Fast Frequency Response

*Last updated – 05 October 2023*

### 3.1.1 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.

### 3.1.2 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.

### 3.1.3 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.
- Avoidance of future load shedding or generation curtailment.



### 3.1.4 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.

### 3.1.5 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.

### 3.1.6 Key Initiative Relationships

**Table 2 Fast Frequency Response initiative relationship**

| Name  | Description   |
|---|---|
| <b>Integrating Energy Storage Systems</b>                       | <ul style="list-style-type: none"> <li>• The IESS 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.</li> <li>• The registration model developed by IESS will be used by FFR.</li> <li>• The recovery of FFR costs will be amended in June 2024 by changes to the Non-Energy Cost Recovery framework in the IESS rule change.</li> </ul> |
| <b>Dispatch Target State</b>                                    | <ul style="list-style-type: none"> <li>• 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. There are no requirements as part of the FFR initiative that trigger the need to replace the legacy technology.</li> </ul>  |
| <b>Bids/Offers Target state</b>                                 |   |
| <b>Constraints Target State</b>                                 |   |
| <b>Operational-Decision Making Tools</b> (Dependent initiative) | <ul style="list-style-type: none"> <li>• 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.</li> </ul>  |

### 3.1.7 Risks

**Table 3 Fast Frequency Response initiative risks**

| Risk ID | Risk Type    | Description   | Mitigation              |
|---------|--------------|---|-------------------------|
| 1       | Dependencies | Increase in project complexity due to multiple dependencies/synergies and overlapping projects in a similar timeline. | Planning and scheduling |

### 3.1.8 Next Steps

- AEMO has completed its consultation and published a revised version of the MASS in October 2022.
- Consultation on AEMO procedures and guidelines has completed:
  - Final reports of the Constraints Formulation Guidelines and Schedule of Constraint Violation Penalty Factors were published on 22 June 2023.
  - The final Constraints Implementation Guidelines (CIG) was published on 20 April 2023.
  - The Dispatch Procedure (SO\_OP\_3705) became effective from 9 August 2023.
- Registration for very fast FCAS formally opened on 9 August 2023.
- Operation of very fast FCAS markets to commence 9 October 2023.

### 3.1.9 Reference

AEMC Rule Change: <https://www.aemc.gov.au/rule-changes/fast-frequency-response-market-ancillary-service>

AEMO MASS and FCAS Verification tool: <https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/system-operations/ancillary-services/market-ancillary-services-specification-and-fcas-verification-tool>

AEMO Constraint Formulation Guideline Consultation: <https://aemo.com.au/consultations/current-and-closed-consultations/cfg-and-scvpf>

AEMO Constraints Implementation Guidelines: <https://aemo.com.au/consultations/current-and-closed-consultations/constraints-implementation-guidelines>

AEMO Dispatch procedure consultation: <https://aemo.com.au/consultations/current-and-closed-consultations/dispatch-procedure-dynamic-adc>

## 3.2 Frequency Performance Payments (part of PFR Incentive Arrangements rule)

*Last updated – 05 October 2023*

### 3.2.1 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.

In September 2022, the AEMC made a final rule determination that:

- Confirmed the mandatory PFR arrangements will continue beyond the sunset date on 4 June 2023. This will mean that all scheduled and semi-scheduled generators will continue to be required to respond automatically to changes in power system frequency.
- Amends the existing provisions for the allocation of costs relating to regulating raise and regulating lower services as well as introduction of a new double-sided frequency performance payments process to encourage plant behaviour that helps to control power system frequency.
- Establishes new reporting obligations for AEMO and AER in relation to the levels of aggregate frequency responsiveness in the power system and the costs of frequency performance payments.

This initiative focuses on the second of these changes and the establishment of a new Frequency Performance Payment system and associated procedures and guidelines (including Frequency Contribution Factor Procedures).

### 3.2.2 Objective

- To implement a new Frequency Performance Payment system for Regulation FCAS (to replace existing 'Causer Pays' system) to which will provide incentives for participants to support frequency stability.

### 3.2.3 Value/Benefit

- Reforms to the Frequency Performance Payments 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.
- 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.



### 3.2.4 Project Scope /Proposed Solution

- Development and consultation on frequency contribution factors procedure to replace the existing Regulation FCAS Contribution Factor (Causer Pays) procedure.
- Review and consultation on amendments to AEMO’s PFR Requirements.
- Design, build and implement a new IT system; Frequency Performance Payments (FPP), 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.
- Support a non-financial operation for a period of three to six months prior to the effective date of 8 June 2025 to allow participants to understand and adapt to the new arrangements and also allow AEMO to calibrate the many related operational parameters.

### 3.2.5 Key Assumptions

- Changes to align with the IESS design (e.g. registration function and rules for dispatch).

### 3.2.6 Key Initiative Relationships

- No key relationships have been identified.

### 3.2.7 Risks

**Table 4** Frequency Performance Payments 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 contribution factor which must be published as soon as practical which is a major change from the current approach which is based on a 28 day cycle. Solution design will need to consider current and future usage. | Design/Implementation |

### 3.2.8 Next Steps

- The AEMC published its final determination in September 2022
- AEMO published its final report on the Primary Frequency Response Requirements consultation on 4 May 2023.
- AEMO published its final report on the Frequency Contribution Factors procedure consultation on 1 June 2023.
- AEMO and industry participant implementation and readiness activities in anticipation of Go Live in June 2025, with a six-month period of non-financial operation of the new FPP arrangements, from December 2024 to May 2025.





### 3.2.9 Reference

AEMC Rule Change: <https://www.aemc.gov.au/rule-changes/primary-frequency-response-incentive-arrangements>

AEMO FPP Project: <https://aemo.com.au/initiatives/major-programs/frequency-performance-payments-project>

AEMO FCFP Consultation: <https://aemo.com.au/consultations/current-and-closed-consultations/frequency-contribution-factors-procedure>

AEMO PFR Requirements Consultation: <https://aemo.com.au/consultations/current-and-closed-consultations/primary-frequency-response-requirements>

## 3.3 Operating Reserves Market

*Last updated – 05 October 2023*

### 3.3.1 Problem Statement

Operating reserve is defined as the capability to respond to large continuing changes in energy requirements.<sup>12</sup>

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 contributed to by factors including growing variable renewable energy (VRE) penetrations, weather, participant availability, commitment decisions, storage depth, and coordination of distributed energy resources.<sup>13</sup>

Lack-of-reserve occurrences are increasing, and participant behaviour is not always responding to reduce system risk.

### 3.3.2 Objective

- The AEMC published a directions paper in August 2023 proposing not to recommend the implementation of an Operating Reserves market. Instead, the AEMC has proposed two incremental improvements for stakeholder consideration, developing and publishing more information to the market (e.g. state of charge) with a particular focus on energy limited plant, and/or procurement of FCAS at a regional level.
- These incremental improvements are to support the current market frameworks and provide for the opportunity to observe the future fleet's response to changes in market signals, before introducing more complex changes.

### 3.3.3 Value/Benefit

- Greater and more granular information could better ensure the availability of reserves across all timeframes and allow more efficient decisions about the commitment of reserves at certain times.
- More granular information could support participants better manage their reserve availability to address shorter-duration flexibility issues.
- Potential to allow for frequency stabilisation within a region following a rapid and unexpected change in variable renewable energy (VRE) output, without being limited by interconnector headroom between regions.
- Potential for more effective use of transmission infrastructure that may improve network utilisation, potentially avoiding future transmission spend.

These benefits are to be explored further through the rule change consultation process.

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<sup>12</sup> AEMO Power System Requirements, Reference Paper July 2020.

<sup>13</sup> AEMO Engineering Framework 2022, AEMO Integrated System Plan 2022, AEMO Renewable Integration Study 2020.



### 3.3.4 Project Scope/Proposed Solution

- The AEMC published its Directions paper in August 2023 which proposed not to recommend the implementation of an operating reserve market and instead proposed the following two incremental improvements are:
  - Develop and publish more information to the market, with a particular focus on energy limited plant. This involved AEMO receiving storage and state of charge information and publishing it in either pre-dispatch or dispatch.
  - Procurement of FCAS at a regional level, or alternately limiting the amount of FCAS procured from a single region to increase the amount of FCAS procured in other regions.
- Project scope and proposed solution is subject to stakeholder feedback on the incremental options considered within the Directions Paper and the AEMC’s final rule determination.

### 3.3.5 Key Assumptions

- Key assumptions subject to stakeholder feedback on the incremental options considered within the AEMC’s Directions Paper.

### 3.3.6 Key Initiative Relationships

Table 5 Operating Reserves initiative relationships

| Name  | Description  |
|---|--|
| <b>Dispatch Target State</b>                                    | <ul style="list-style-type: none"> <li>• This trio comprises a technology uplift of AEMO backend market platform services to replace legacy technology.</li> <li>• Publishing information in either pre-dispatch (or five-minute pre-dispatch) or dispatch and/or procurement of FCAS at a regional level will have potentially significant interactions with the dispatch and ST market systems.</li> </ul>   |
| <b>Bids/Offers Target State</b>                                 |  |
| <b>Constraints Target State</b>                                 |  |
| <b>ST PASA Replacement Project</b> (Dependent initiative)       | <ul style="list-style-type: none"> <li>• The replacement project involves a review of the Pre-dispatch (PD) and Short Term (ST) PASA methodology and supporting systems and processes.</li> <li>• Publishing information in either pre-dispatch (or five-minute pre-dispatch) or dispatch and/or procurement of FCAS at a regional level may require changes to the ST PASA process.</li> </ul>  |
| <b>Operational Decision-Making Tools</b> (Dependent initiative) | <ul style="list-style-type: none"> <li>• 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.</li> <li>• ODMT is being delivered incrementally through an agile delivery model over several years – therefore, changes required by the NEM Reform Program can be accommodated across varying timeframes.</li> </ul> |

### 3.3.7 Risks

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



### 3.3.8 Next Steps

- AEMO technical advice on key design elements of an Operating Reserve Market shared with and published by the AEMC (completed).
- AEMC published its directions paper for stakeholder feedback in August 2023.
- AEMC's draft determination is expected to be published on 5 October 2023 and final determination by December 2023..

### 3.3.9 Reference

AEMC Rule Change: <https://www.aemc.gov.au/rule-changes/operating-reserve-market>

## 3.4 Improving security frameworks for the energy transition

*Last updated – 05 October 2023. Formerly – Operational Security Mechanism*

### 3.4.1 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 resources providing these security services, accounting for all services that they may provide.

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.

### 3.4.2 Objective

- An update on the approach for this initiative was published by the AEMC in May 2023 with further investigation to be carried out on options to streamline and simplify existing security services frameworks including system strength, inertia and the Network Support and Control Ancillary Services (NSCAS) frameworks.
- The AEMC published a directions paper in August 2023 proposing not to recommend the implementation of an Operational Security Mechanism (OSM).. Instead, the AEMC has proposed a several options which aim to improve the security frameworks, including:
  - aligning the existing inertia and system strength frameworks (introducing a NEM-wide inertia floor, aligning procurement timeframes with the system strength framework, and removing restrictions on the procurement of synthetic inertia);
  - removing the exclusion to procuring inertia network services and system strength in the NSCAS framework;
  - creating a new transitional non-market ancillary services (NMAAS) framework for AEMO to procure security services necessary for the energy transition;
  - requiring AEMO to enable ( or 'schedule') security services with a whole-of-NEM perspective; and
  - changing the directions reporting and compensation frameworks.



### 3.4.3 Value/Benefit

The AEMC will continue to evolve its understanding of the value of this reform through consultation on its directions paper. Its vision of the value of the reform as outlined in the directions paper includes:

- Building upon the existing security frameworks that provide for procurement of services will potentially allow for additional measures to be put in place more quickly.
- Potential opportunities to improve operational efficiency where contracts for ancillary services are scheduled in real-time, as well as improvements to the directions process.
- Potential long-term reduction in costs for consumers associated with the procurement of services through a commercial framework, and through changes to intervention processes.

### 3.4.4 Project Scope/Proposed Solution

- Project scope and proposed solution subject to the future direction of rule change and the AEMC’s final rule determination.

### 3.4.5 Key Assumptions

- Key assumptions subject to the future direction of rule change and the AEMC’s final rule determination.

### 3.4.6 Key Initiative Relationships

**Table 6 Improving security frameworks for the energy transition initiative relationships**

| Name  | Description  |
|---|--|
| <b>Dispatch Target State</b>                                    | <ul style="list-style-type: none"> <li>• This trio comprises a technology uplift of AEMO backend market platform services to replace legacy technology.</li> <li>• Scheduling of ancillary services within the operational timeframe remains a consideration of the AEMC’s rule change consultation and would require consideration of their potential impacts to dispatch and ST market systems.</li> <li>•</li> </ul>  |
| <b>Bids/Offers Target State</b>                                 |  |
| <b>Constraints Target State</b>                                 |  |
| <b>System Strength Planning</b>                                 | <ul style="list-style-type: none"> <li>• System Strength Planning reforms provide an evolved 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 the improving security frameworks rule change through the scheduling of these services within the operational timeframe.</li> </ul>   |
| <b>Operational-Decision Making Tools</b> (Dependent initiative) | <ul style="list-style-type: none"> <li>• 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 control room operations related to the improving security frameworks rule change.</li> <li>• ODMT is being delivered incrementally through an agile delivery model over several years – therefore, changes required by the NEM Reform Program can be accommodated across varying timeframes.</li> </ul> |

### 3.4.7 Risks

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



### 3.4.8 Next Steps

- AEMC draft determination was published 21 September 2022.
- Prototyping OSM Scheduler in conjunction with AEMC's OSM Technical Working Group (completed).
- The AEMC published a second Directions Paper in early September 2023.
- The AEMC final determination is anticipated to be published in December 2023.

### 3.4.9 Reference

AEMC Rule Change: <https://www.aemc.gov.au/rule-changes/improving-security-frameworks-energy-transition>

## 3.5 Efficient management of system strength on the power system

*Last updated – 05 October 2023. TNSP led initiative*

### 3.5.1 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.<sup>14</sup> Historically it has been supplied by synchronous generators.<sup>15</sup> 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.<sup>16</sup> 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.<sup>17</sup>

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.<sup>18</sup> As a result, AEMO has needed to intervene and displace IBR by directing typically more expensive thermal generation.<sup>19</sup> This results in increased costs for consumers.

### 3.5.2 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.

### 3.5.3 Value/Benefit

- Facilitates the rapid integration of IBR and batteries into the power system to support its transition towards a lower carbon future.

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<sup>14</sup> AEMC. Information Sheet - Efficient management of system strength on the power system. Available [here](#).

<sup>15</sup> Ibid.

<sup>16</sup> Ibid.

<sup>17</sup> Ibid.

<sup>18</sup> Ibid.

<sup>19</sup> Ibid.



- 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.
- 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.

### 3.5.4 Project Scope/Proposed Solution

- AEMO is required to update its 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 is required to develop a guideline for relevant TNSPs to update their pricing methodology documents.

### 3.5.5 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.

### 3.5.6 Key Initiative Relationships

**Table 7 Efficient management of system strength on the power system initiative relationships**

| Name   | Description  |
|--|--|
| <b>Improving security frameworks for the energy transition</b> | Relationship, not a dependency - provide a procuring and scheduling process for ESS by producing a least-cost, inter-temporal optimised dispatch schedule. |

### 3.5.7 Risks

**Table 8 Efficient management of system strength on the power system 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   |
| 2       | 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 (completed) |

| Risk ID | Risk Type      | Description   | Mitigation   |
|---------|----------------|---|--|
| 3       | 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. |

### 3.5.8 Next Steps

- This initiative was implemented at the end of Q1 2023.

### 3.5.9 Reference

AEMC Rule Change: <https://www.aemc.gov.au/rule-changes/efficient-management-system-strength-power-system>

# 4 Transmission and Access

## 4.1 Enhanced Information

*Last updated – 05 October 2023*

### 4.1.1 Problem Statement

While there are currently a variety of locational investment signals available in the NEM, some of these can be inconsistent across jurisdictions, incomplete, and difficult for smaller and newer stakeholders to engage with.<sup>20</sup> A complete set of information on locational factors is not currently available publicly from a single location.<sup>21</sup> Without this information, stakeholders are limited in their ability to undertake meaningful analyses, which would be informative for regulatory, connection location, and transmission augmentation decisions.<sup>22</sup>

In February 2023, Ministers agreed to immediately implement ‘enhanced information’ reforms to provide NEM participants with better information on the optimal location for new generation and storage. In June 2023, the ESB set out its final recommendations to implement the enhanced information reforms.<sup>23</sup>

### 4.1.2 Objective

- To provide NEM participants with better information on the optimal location for new generation and storage; and
- To provide wider stakeholders with better access to information about the locational characteristics of the power system to inform better regulatory, investment, and transmission augmentation decisions.

### 4.1.3 Value/Benefit

- Enhanced locational information can help deliver a least cost energy transition by supporting investments in the right places, ensuring investors aren't exposed to unnecessary risk, making sure that Renewable Energy Zones (REZ) schemes deliver expected benefits, facilitate investment in storage and flexible loads, optimise the size of the transmission network, and ensure use of the least cost combination of available resources.

### 4.1.4 Project Scope/Proposed Solution

- AEMO to develop ‘enhanced locational information’ as an annual report or webpage (options include downloadable PDF supported by data files)
- Scope of information to be provided includes: REZ scorecards from ISP (resource quality, renewable potential, Marginal Lost Factor (MLF) robustness, temperature and bushfire hazard scores, generation outlook, transmission curtailment, economic spill), Transmission augmentation page, Generator information page, NEM generation maps, MLF, ESOO reliability outlook, Congestion information resource, System


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<sup>20</sup> ESB. Transmission Access Reform. Enhance Locational Information. June 2023. Last accessed 07 August 2023. Available [here](#).

<sup>21</sup> Ibid.

<sup>22</sup> Ibid.

<sup>23</sup> Ibid.



strength charges, System security shortfalls and requirements (system strength requirements, Inertia shortfalls and requirements, NSCAS gaps).

- AEMO to work with TNSPs to consider opportunities for alignment of inputs, assumptions and methodologies for congestion and network capacity information provided through Transmission Annual Planning Reports (TAPRs).

*Note: AEMO currently intend to deliver this initiative as part of its BAU activities and therefore not part of the NEM Reform Program.*

#### 4.1.5 Key Assumptions

- The following information is excluded from the enhanced locational information report:
  - Power system data and modelling – Participants and intending participants can access technical data and models through AEMOs data request process.
  - Distribution network information – Information on available distribution networks capacity is available on the National map (previously named the Australian Renewable Energy Mapping Infrastructure map).

#### 4.1.6 Key Initiative Relationships

- The priority access reforms will build on the enhancements to information. To make more efficient decisions, investors will need information relevant to the priority access mechanism including how hosting capacity assessments translate to a priority level of access.

#### 4.1.7 Risks

- Risks will be identified following detailed planning and implementation.

#### 4.1.8 Next Steps

- AEMO to complete detailed planning and implementation activities including consulting with industry on the structure and information to be included in the Enhanced Locational Information report.
- AEMO to publish the first report by Q2 2024.

#### 4.1.9 Reference

ESB Final Decision. Transmission Access Reform – Enhanced Locational Information. June 2023 <https://www.datocms-assets.com/32572/1688514855-enhanced-locational-information-final-decision-paper.pdf>

ESB TAR Technical Working Group – Enhanced Locational Information. June 2023 <https://www.datocms-assets.com/32572/1689922810-20230629-enhanced-locational-information-update.pdf>

ESB Transmission Access Reform – Directions Paper November 2022 <https://www.datocms-assets.com/32572/1667984730-tar-directions-paper-final-for-web.pdf>

ESB Transmission Access Reform Project Update: <https://www.datocms-assets.com/32572/1677794660-transmission-access-reform-project-update.pdf>

## 4.2 Congestion Relief Market & Priority Access Model

*Last updated – 05 October 2023*

### 4.2.1 Problem Statement

Transmission congestion is expected to increase as the NEM transitions towards higher levels of variable renewable energy and flexible resources. Congestion cannot be addressed by the significant investment in transmission network augmentation alone. Moreover, it would not be efficient for the transmission network to be able to accommodate surplus generation. Nor is removing all congestion a desirable objective because to do so would incur significant costs for consumers.

### 4.2.2 Objective

The objectives set out by the ESB have been delineated into two timeframes – investment and operational.<sup>24</sup>

#### Investment timeframe objectives:

The level of congestion in the system that is consistent with an efficiency level.

- *Investment efficiency:* Provide better long-term signals for market participants to locate in areas where they can provide the most benefit to consumers, considering the impact on overall congestion.
- *Manage access risk:* Support a better balance of investment risk with continued incentives for new resource entry to facilitate effective competition that promotes the long-term interests of consumers.

#### Operational timeframe objectives:

When congestion occurs, dispatch the least cost combination of resources that securely meets demand.

- *Operational efficiency:* To remove incentives for non-cost reflective bidding to promote better use of the network in operational timeframes, resulting in more efficient dispatch outcomes and lower costs for consumers.


In addition to the above objectives, there is also one overarching objective that encompasses both timeframes – to create incentives for demand side and two-way technologies to provide congestion relief by locating where they are most needed and to operate in ways beneficial to the broader system.

### 4.2.3 Value/Benefit

- Access reform may deliver a least cost energy transition by supporting investments in the right places, ensuring investors aren't exposed to unnecessary risk, making sure that REZ schemes deliver expected benefits, facilitate investment in storage and flexible loads, optimise the size of the transmission network, and ensure use of the least cost combination of available resources.
- The ESB<sup>25</sup> note, the primary benefits of priority access reform are to improve:
  - the locational decisions of generation investments; and
  - the ability of investors to manage congestion risk.

<sup>24</sup> Ibid.

<sup>25</sup> ESB. Transmission Access Reform. Consultation Paper. May 2023. Last accessed 07 August 2023. Available [here](#).

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- The ESB<sup>26</sup> note, the primary drivers of Congestion Relief Market (CRM) are to:
    - improve dispatch efficiency by incentivising bidding behaviours in the CRM that achieve a lower system cost compared to today's market design;
    - optimise the use of the transmission network that avoids overspend of the network and maximises the value of investment in interconnectors; and
    - create market opportunities for storage and flexible demand by rewarding bidding behaviours that maximise wind and solar investments.

#### 4.2.4 Project Scope/Proposed Solution

- Project scope remains subject to ongoing policy development and design of both the CRM and Priority Access model. Following the dissolution of the ESB in June 2023, this work is now being led by the AEMC.

#### 4.2.5 Key Assumptions

- The design work is not at a stage where sufficient certainty of key assumptions can be made to inform the development of scope for an implementation initiative.

#### 4.2.6 Key Initiative Relationships

- The priority access reforms will build on the enhancements to information. To make more efficient decisions, investors will need information relevant to the priority access mechanism including how hosting capacity assessments translate to a priority level of access.
- Once greater certainty on the design and scope of the initiative is available, AEMO will conduct work to understand relationships with other initiatives.

#### 4.2.7 Risks

- Risks will be identified closer to detailed design and draft rules package being finalised.

#### 4.2.8 Next Steps

- AEMC to lead the development of policy design of CRM and Priority Access Model in consultation with stakeholders including further prototype testing of key design choices.
  - Two prototype models were developed by the ESB: a full NEM CRM prototype (CRM) and a seven node, two region, one FCAS model (priority access and CRM).
- Final recommendations on CRM and priority access design are to be made to Ministers towards the end of 2023.

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<sup>26</sup> ESB. Transmission Access Reform. Consultation Paper. May 2023. Last accessed 07 August 2023. Available [here](#).

## 4.2.9 Reference

ESB Transmission Access Reform – Directions Paper November 2022 <https://www.datocms-assets.com/32572/1667984730-tar-directions-paper-final-for-web.pdf>

ESB Transmission Access Reform Project Update: <https://www.datocms-assets.com/32572/1677794660-transmission-access-reform-project-update.pdf>

ESB Transmission Access Reform – Consultation Paper May 2023 <https://www.datocms-assets.com/32572/1682894111-esb-tar-consultation-paper-may-2023-final.pdf>

ESB Transmission Access Reform – Prototype Models <https://esb-post2025-market-design.aemc.gov.au/transmission-and-access>

ESB Transmission Access Reform – Prototype Models User Guide <https://www.datocms-assets.com/32572/1688024524-tar-power-bi-dashboard-user-guide-final.pdf>

ESB Technical Working Group: <https://esb-post2025-market-design.aemc.gov.au/transmission-and-access#congestion-management-technical-working-group>

# 5 Integrating DER and Flexible Demand

## 5.1 Integrating Energy Storage Systems

*Last updated – 05 October 2023*

### 5.1.1 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. This requires changes to the regulatory framework, as well as to various AEMO systems and processes to remove barriers and accommodate more and improved ways for storage and hybrid facilities to participate in the NEM.

### 5.1.2 Objective

- Improved integration and participation of energy storage and aggregate systems in the NEM.

### 5.1.3 Value/Benefit

- Simplifies NEM registration and participation for flexible resources by introducing:
  - A near-universal participant type – the Integrated Resource Provider (IRP).
  - A new unit type – the bi-directional unit (BDU) for plants, such as a battery, that can act as a generator and a consumer of electricity.
  - A streamlined bidding approach for BDUs.
- Provides participants access to additional value streams through opening contingency FCAS markets to Small Generation Aggregators, which in turn promotes increased competition in the contingency FCAS markets.<sup>27</sup>
- Provides operational flexibility for aggregate systems to dispatch energy at the connection point from a combination of its units rather than on a unit-by-unit basis (with some restrictions).
- Better reflects how participants use and benefit from AEMO's non-energy services by changing the way non-energy costs are recovered. These costs are currently recovered according to formulas based on participant category. The IESS changes will see non-energy costs being calculated on the share of gross measurements of consumed and sent-out energy, for all participant categories.

### 5.1.4 Project Scope/Proposed Solution

- The delivery scope is complex, given the substantial changes across the NER, industry procedures and guidelines, which in turn drive changes across AEMO's and participants' processes and systems.
- Establish an IRP registration category to:

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<sup>27</sup> For more information on Small Generation Aggregators see: <https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/participate-in-the-market/registration/register-as-a-small-generation-aggregator-sga-in-the-nem>



- Allow storage to register and participate in a single registration category.
- Allow aggregators for small generators and bi-directional units to register as an IRP and provide ancillary services.
- Major IT related changes to AEMO’s wholesale and retail systems.
- Minor IT related changes to AEMO systems to integrate new participant category across market systems.
- Updates to relevant AEMO/Participant policies, processes, guidelines. AEMO has identified more than 50 affected procedures and guidelines.

### 5.1.5 Key Assumptions

- Input from related projects could impact IESS business and technical requirements and design.

### 5.1.6 Key Initiative Relationships

**Table 9 Integrating Energy Storage Systems initiative relationships**

| Name   | Description   |
|--|---|
| <b>Dispatch Target State</b>   | <ul style="list-style-type: none"> <li>• This trio comprises a technology uplift of AEMO backend market platform services to replace legacy technology.</li> </ul>  |
| <b>Bids/Offers Target State</b>  | <ul style="list-style-type: none"> <li>• The IESS 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.</li> </ul>   |
| <b>Constraints Target State</b>  | <ul style="list-style-type: none"> <li>• The IESS rule introduces a single bid for bi-directional units, with 20 bid bands accordingly, IESS will need to be integrated into the bidding interfaces and dispatch systems.</li> </ul>  |
| <b>Fast Frequency Response</b>   | <ul style="list-style-type: none"> <li>• FFR will establish two new market ancillary services; very fast raise and very fast lower to operate alongside the existing contingency FCAS markets.</li> <li>• The IESS rule changes create a new participant category called an Integrated Resource Provider (IRP).</li> <li>• 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.</li> <li>• As such, as the IESS 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.</li> <li>• The registration model developed by IESS will be used by FFR.</li> </ul> |
| <b>Integrating price responsive resources into the NEM</b>                         | <ul style="list-style-type: none"> <li>• This initiative 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.</li> <li>• The registration model developed for IESS is intended to be used by this initiative.</li> <li>•</li> </ul>   |
| <b>SCADA Lite</b>  | <ul style="list-style-type: none"> <li>• A low-cost mechanism to support telemetry services.</li> <li>• 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.</li> </ul>  |
| <b>Unlocking Consumer Energy Resources (CER) benefits through flexible trading</b> | <ul style="list-style-type: none"> <li>• Flexible trading establishes a framework for ‘minor energy flow’ metering installations, to reduce barriers, create greater flexibility for the introduction of new technologies.</li> <li>• The registration model developed for IESS is intended to be used by this initiative.</li> </ul>   |
| <b>Operational Decision-Making Tools</b> (Dependent initiative)                    | <ul style="list-style-type: none"> <li>• 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 IESS related control room operations.</li> </ul>   |

| Name | Description   |
|------|---|
|      | <ul style="list-style-type: none"> <li>• ODMT is being delivered incrementally through an agile delivery model over several years – therefore, changes required by IESS can be accommodated across varying timeframes.</li> </ul> |

### 5.1.7 Risks

**Table 10 Integrating Energy Storage Systems initiative risks**

| Risk ID | Risk Type    | Description   | Mitigation              |
|---------|--------------|---|-------------------------|
| 1       | Dependencies | Input from related projects could affect IESS business and technical requirements and design. | Planning and scheduling |

### 5.1.8 Next Steps

- AEMO consultation on various procedures, guidelines, and supporting documents. See the consultation section of AEMO’s website<sup>28</sup> and also the dedicated IESS procedure change web page.<sup>29</sup>
- AEMO implementation and readiness activities in anticipation of Go Live dates in March 2023, August 2023 and June 2024. See AEMO NEM2025 Program Stakeholder Engagement section of website.<sup>30</sup>

### 5.1.9 Reference

AEMC Rule Change (December 2021): <https://www.aemc.gov.au/rule-changes/integrating-energy-storage-systems-nem>

AEMC Rule Change Consultation (March to May 2023): <https://www.aemc.gov.au/rule-changes/implementing-integrated-energy-storage-systems>

AEMO IESS Project: <https://aemo.com.au/initiatives/submissions/integrating-energy-storage-systems-iess-into-the-nem>

<sup>28</sup> AEMO’s consultation pages: <https://aemo.com.au/consultations/current-and-closed-consultations>

<sup>29</sup> IESS procedure change program: <https://aemo.com.au/initiatives/major-programs/integrating-energy-storage-systems-project/integrating-energy-storage-systems-procedure-changes>

<sup>30</sup> AEMO NEM Reform Program Stakeholder Engagement: <https://aemo.com.au/initiatives/major-programs/nem2025-program/nem2025-stakeholder-engagement>

## 5.2 Unlocking Consumer Energy Resources (CER) benefits through flexible trading

*Last updated – 05 October 2023 . Formerly – Flexible Trading Arrangements Model 2*

### 5.2.1 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.

### 5.2.2 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.
- Establish a specific category of connection arrangement, a Private Metering Arrangement (PMA), enabling a NMI to be established within a customer’s electrical installation.

Further, the AEMC rule change consultation explores these objectives across three core areas<sup>31</sup>:

- Optimising the value of CER flexibility by examining opportunities for separately identifying and managing flexible CER.
- Flexible trading of CER with multiple energy service providers at residential and/or commercial premises.
- Opportunities to improve how energy use is measured for street lighting and other street furniture (such as park BBQs).

### 5.2.3 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.
- Multiple energy service providers, such as retailers at a single property may deliver consumer benefits via increased competition, innovation and choice of network or retail pricing offers.

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<sup>31</sup> AEMC. Directions Paper. Unlocking CER benefits through flexible trading. 3 August 2023. Available [here](#).

- 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.

#### 5.2.4 Project Scope/Proposed Solution

- The scope and solution are subject to the AEMC's final rule determination. Delivery scope based on original Rule Change Request is moderately complex relative to other initiatives.
- The AEMC's August 2023 directions paper indicates the original model proposed by AEMO is being assessed in the first instance as it applies to large customers, and single FRMP is maintained for small customers.
- AEMO has further proposed an alternative option as part of the rule change proposal that allows for an additional settlement point behind a consumer's primary connection point. These secondary settlement points would be behind the direct and existing connection to the distribution network and primary connection point. This allows for CER flows from that additional settlement point to be subject to different metering standards and recognised in wholesale energy market settlements. This is similar to the proposal for a 'Minor Flow Energy Meter' for street lighting.
- 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).

#### 5.2.5 Key Assumptions

- Implementation leverages IESS project delivery implementing FTA (Model 1)<sup>32</sup>.
- Provision of services from market be opt-in under the rule change request.
- No requirements placed on DNSPs to enable flexible trading arrangements.
- Outcomes from existing or upcoming reviews may impact on scope/design including but not limited to:
  - AEMC Review of the Regulatory Framework for Metering Services.
  - AEMC Rule Change Consultation "Integrating price-responsive resources into the NEM".
  - AEMC Review into CER Technical Standards.
  - AER review of Retail Authorisation and Exemptions.

#### 5.2.6 Key Initiative Relationships

**Table 11 Unlocking CER benefits through flexible trading initiative relationships**

| Name                                      | Description   |
|---|---|
| <b>Integrating Energy Storage Systems</b> | <ul style="list-style-type: none"> <li>• IESS will deliver FTA Model 1 upon which this initiative will be built.</li> </ul> |

<sup>32</sup> The ESB proposed two models to enable flexible trading. The first (FTA Model 1) is an extension to the current Small Generation Aggregator (SGA) framework from generation only, to cater for bi-directional energy flows and participation in ancillary services markets. This enables SGAs to provide new products and services to end users. AEMC has progressed FTA Model 1 through the Integrating Energy Storage Systems into the NEM rule change process.

| Name  | Description  |
|---|--|
| <b>Integrating price responsive resources into the NEM</b>            | <ul style="list-style-type: none"> <li>This initiative 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.</li> <li>Flexible trading arrangements enables the management of controllable resources through a second connection point. The framework developed for flexible trading arrangements to support the management of controllable resources will be used by this initiative.</li> </ul> |
| <b>FRC Target State</b>   | <ul style="list-style-type: none"> <li>This initiative 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 this initiative will also be participants in 'traditional' Retail systems.</li> </ul>  |
| <b>DOE, DER Data Hub and Registry Services, DER Operational Tools</b> | <ul style="list-style-type: none"> <li>This initiative 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).</li> </ul>   |

## 5.2.7 Risks

**Table 12 Unlocking CER benefits through flexible trading 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                 |

## 5.2.8 Next Steps

- AEMC commenced consultation on rule change request submitted by AEMO in December 2022.<sup>33</sup>
- AEMC published a directions paper in August 2023.
  - AEMO will review, in conjunction with the RDC, the implementation plan for this initiative following submissions to the AEMC's directions paper.
- It is anticipated a the AEMC will make a draft determination in December 2023 and final determination in March / April 2024.

## 5.2.9 Reference

AEMC Rule Change Consultation: <https://www.aemc.gov.au/rule-changes/unlocking-CER-benefits-through-flexible-trading>

<sup>33</sup> AEMC. Unlocking CER benefits through flexible trading. Last Accessed 17 March 2022. Available [here](#).

## 5.3 Integrating price responsive resources into the NEM

*Last updated – 05 October 2023 . Formerly – Scheduled Lite*

### 5.3.1 Problem Statement

The forecast rapid growth in distributed resources, particularly those owned by household and business consumers, is drastically changing the energy landscape of the NEM. These resources are increasingly being aggregated into large portfolios and operated in response to price signals in a manner that is not visible to the market operator. These resources currently operate outside the NEM dispatch and scheduling processes. This creates a range of operational challenges for AEMO for which its existing toolkit was not designed, particularly in managing complex operational conditions.

### 5.3.2 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:
  - provide visibility of price—responsive, distributed resources and their market intentions; and/or
  - integrate price-responsive distributed resources into the NEM dispatch and scheduling processes.

### 5.3.3 Value/Benefit

- Minimise uncertainty within operational timeframes, reducing the need to procure frequency services and emergency reserves and reduce the need for unnecessary use of curtailment and backstop mechanisms and support timely commitment decisions in the market. This more efficient system operation lowers system service costs for all consumers.
- Increased access to markets and revenue opportunities for distributed resources by rewarding service provision and lowering barriers to participation in market scheduling processes.
- Enhanced system-wide forecasting and planning assessments over the long-term, delivering a more efficient mix of resources to meet consumer needs and lowering overall system costs.

### 5.3.4 Project Scope/Proposed Solution

- The scope and solution is subject to the AEMC’s final rule determination.
- 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.

### 5.3.5 Key Assumptions

- As DER integration matures, and as several reviews or work programs currently underway outside of AEMO progress they may impact on the final design and therefore the project scope. Such reviews or work programs include:
  - AEMC Rule Change Consultation “Unlocking consumer energy resources (CER) benefits through flexible trading”.
  - GridNet Network Infrastructure.
  - Distributed Energy Integration Program (DEIP) workstream for Dynamic Operating Envelopes.
  - AER review of Flexible Export Limits.
  - Insights and learnings from Project EDGE.
  - AEMC Review into CER Technical Standards.

### 5.3.6 Key Initiative Relationships

**Table 13 Integrating price responsive resources into the NEM initiative relationships**

| Name   | Description  |
|--|--|
| <b>SCADA Lite</b>  | <ul style="list-style-type: none"> <li>• A low-cost mechanism to support telemetry services.</li> <li>• SCADA Lite will provide a platform for participants, such as VPPs, to communicate with AEMO and provide visibility of their DER device activities.</li> </ul>  |
| <b>Integrating Energy Storage Systems</b>  | <ul style="list-style-type: none"> <li>• This initiative 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.</li> <li>• The registration model developed for IESS will be used by this initiative.</li> </ul>                                   |
| <b>Unlocking Consumer Energy Resources (CER) benefits through flexible trading</b> | <ul style="list-style-type: none"> <li>• This initiative enables the separate trading of controllable resources in the market. The framework developed for this initiative to support the management of controllable resources could be used by Scheduled Lite participants.</li> </ul>  |
| <b>DOE, DER Data Hub and Registry Services, DLNS, DER Operational Tools</b>        | <ul style="list-style-type: none"> <li>• This initiative will establish a framework that enables greater visibility and management (dispatchability) of DER devices.</li> <li>• This initiatives design will need to build on solutions delivered through DOE, local services and data hub initiatives.</li> </ul>   |
| <b>Operational Decision-Making Tools</b> (Dependent initiative)                    | <ul style="list-style-type: none"> <li>• This initiative 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).</li> <li>• This means there may be a need to update control room displays and tools to integrate new data types.</li> </ul> |
| <b>ST PASA Replacement</b> (Dependent initiative)                                  | <ul style="list-style-type: none"> <li>• This initiative allows more resources to either provide visibility or participate directly in the NEM dispatch process.</li> <li>• 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.</li> </ul>           |

### 5.3.7 Risks

Table 14 Integrating price responsive resources into the NEM initiative risks

| Risk ID | Risk Type    | Description  | Mitigation   |
|---------|--------------|--|--|
| 1       | Dependencies | Delays to other initiatives could impact delivery (e.g. SCADA Lite). | 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. |

### 5.3.8 Next Steps

- AEMC commenced the rule change consultation process on 3 August 2023.
- It is anticipated a the AEMC will make a draft determination in December 2023 and final determination in May 2024.

### 5.3.9 Reference

AEMC Rule Change Consultation: <https://www.aemc.gov.au/rule-changes/integrating-price-responsive-resources-nem>



## 5.4 Dynamic Operating Envelopes

*Last updated – 05 October 2023*

### 5.4.1 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.

### 5.4.2 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.

### 5.4.3 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.

### 5.4.4 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.
- AEMC Metering Review.
- 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.

### 5.4.5 Key Assumptions

- The following is assumed 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.

### 5.4.6 Key Initiative Relationships

**Table 15 Dynamic Operating Envelope initiative relationships**

| Name   | Description  |
|--|--|
| <b>Unlocking Consumer Energy Resources (CER) benefits through flexible trading</b> | <ul style="list-style-type: none"> <li>• This initiative 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.</li> </ul>   |
| <b>Integrating price responsive resources into the NEM</b>                         | <ul style="list-style-type: none"> <li>• This initiative will establish a framework that enables greater visibility and management (dispatchability) of DER devices.</li> <li>• This initiatives requirements for DOE include:               <ul style="list-style-type: none"> <li>– DOEs are available to DER traders so that they can manage their market bids.</li> <li>– DOEs are available for use in market systems where it is necessary to incorporate limits into short-term forecasts, security or reliability processes.</li> <li>– Where there are multiple traders at a Distribution Connection Point, a mechanism is required to coordinate, share and allocate limit between the traders.</li> </ul> </li> </ul> |
| <b>FRC Target State</b>  | <ul style="list-style-type: none"> <li>• 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.</li> </ul>   |
| <b>DER Data Hub and Registry Services</b>  | <ul style="list-style-type: none"> <li>• 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</li> </ul>  |
| <b>Distribution Local Network Services</b>   | <ul style="list-style-type: none"> <li>• This initiative will evaluate how local services interact with dynamic operating envelopes and dynamic network tariffs.</li> </ul>  |

| Name                         | Description  |
|------------------------------|--|
| <b>DER Operational Tools</b> | <ul style="list-style-type: none"> <li>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.</li> </ul> |

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).

### 5.4.7 Risks

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

### 5.4.8 Next Steps

- There are several ongoing reviews and industry trials that will impact the scope of this initiative including:
  - AEMC Review of the Regulatory Framework for Metering Services (final report published August 2023)
  - AER Review of regulatory framework for flexible export limit implementation (Response to consultation published July 2023),
  - AEMC’s review of CER technical standards (Draft report published April 2023),
  - ESB’s interoperability policy (Directions Paper published October 2022), and
  - Project Edge – Fairness in DOE Objective Function Report (Report published April 2023).
- ESB CER and Data end-of-program report to be published which shows the components of the CER work program and how they fit together.
- Ongoing monitoring of other reform initiatives, reviews and work programs.

### 5.4.9 Reference

ESB Final Advice to Ministers: <https://www.datocms-assets.com/32572/1629944958-post-2025-market-design-final-advice-to-energy-ministers-part-a.pdf>

ESB Interoperability Policy Framework: <https://esb-post2025-market-design.aemc.gov.au/integration-of-distributed-energy-resources-der-and-flexible-demand#development-of-interoperability-policy>

AER Review of regulatory framework for flexible export limit implementation: <https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/review-of-regulatory-framework-for-flexible-export-limit-implementation>

AEMO Project Edge Fairness in DOE Objective Functions. <https://aemo.com.au/-/media/files/initiatives/der/2023/the-fairness-in-dynamic-operating-envelope-objectives-report.pdf?la=en>

## 5.5 Distribution Local Network Services

*Last updated – 05 October 2023*

### 5.5.1 Problem Statement

Large scale penetration of DERs 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.

### 5.5.2 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.

### 5.5.3 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.<sup>34</sup>
- 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.

### 5.5.4 Project Scope/Proposed Solution

- Potential scope across industry includes:
  - Develop guidelines 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 Distribution Annual Planning Reports (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.

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<sup>34</sup> Energy Networks Australia. Electricity Network Transformation Roadmap. Final Report April 2017. Available here: <https://www.energynetworks.com.au/resources/reports/electricity-network-transformation-roadmap-final-report/>

- 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.

### 5.5.5 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.

### 5.5.6 Key Initiative Relationships

**Table 16 Distribution Local Network Services initiative relationships**

| Name                                      | Description   |
|---|---|
| <b>DER Data Hub and Registry Services</b> | <ul style="list-style-type: none"> <li>• 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.</li> </ul>   |
| <b>Dynamic Operating Envelopes</b>        | <ul style="list-style-type: none"> <li>• 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.</li> </ul> |
| <b>SCADA Lite</b>                         | <ul style="list-style-type: none"> <li>• 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.</li> </ul>   |

### 5.5.7 Risks

- Risks will be confirmed closer to project commencement.

### 5.5.8 Next Steps

- ESB CER and Data end-of-program report to be published which shows the components of the CER work program and how they fit together.
- Ongoing monitoring of other reform initiatives, reviews and work programs.

### 5.5.9 Reference

ESB Final Advice to Ministers: <https://www.datocms-assets.com/32572/1629944958-post-2025-market-design-final-advice-to-energy-ministers-part-a.pdf>

ESB CER Implementation Plan: <https://www.datocms-assets.com/32572/1629954551-esb-final-report-explainer-clean-and-smart-power-der-pathway.pdf>

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

## 5.6 DER Data Hub and Registry Services

*Last updated – 05 October 2023*

### 5.6.1 Problem Statement

DER coordination at 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 significant volumes 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.

### 5.6.2 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 where 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.

### 5.6.3 Value/Benefit

- More efficient and scalable exchange of data between distribution level actors through standardised exchange and communication standards.
- 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.

### 5.6.4 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.
- Implementation of DER Data Hub and Registry Services will likely depend on effective implementation of Identity and Access Management (IDAM) and Industry Data Exchange (IDX) initiatives as the data hub will

utilise user access and authorisation as defined by IDAM, and approaches and patterns for sharing information across market participants as defined by IDX.

### 5.6.5 Key Assumptions

- Further process should be informed by evidence from Project EDGE and other initiatives such as IDAM and IDX.

### 5.6.6 Key Initiative Relationships

**Table 17 DER Data Hub and Registry Services initiative relationships**

| Name   | Description   |
|--|---|
| <b>Distribution Local Network Services</b>   | <ul style="list-style-type: none"> <li>• 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.</li> </ul>   |
| <b>Dynamic Operating Envelopes</b>   | <ul style="list-style-type: none"> <li>• 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.</li> </ul>   |
| <b>Unlocking Consumer Energy Resources (CER) benefits through flexible trading</b> | <ul style="list-style-type: none"> <li>• This initiative 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).</li> </ul>  |
| <b>FRC Target State</b>  | <ul style="list-style-type: none"> <li>• 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.</li> </ul> |
| <b>Identity and Access Management</b>  | <ul style="list-style-type: none"> <li>• A unified mechanism to authenticate participant users and applications when accessing AEMO services.</li> <li>• A more efficient and scalable framework will reduce entry barriers for the anticipated increase in participants as a DER Marketplace develops.</li> <li>• The DER Data Hub provides a secure and efficient methods to manage organisational identity and access. A DER Data Hub will utilise user access and authorisation as defined by IDAM.</li> </ul>          |
| <b>Industry Data Exchange</b>  | <ul style="list-style-type: none"> <li>• Unified access to AEMO services across all markets using modern authentication and communication protocols.</li> <li>• A DER Marketplace is anticipated to require capabilities to manage orders of magnitude more data.</li> <li>• A DER Data Hub will utilise IDX defined approaches and patterns for sharing information across market participants.</li> </ul>   |
| <b>SCADA Lite</b>  | <ul style="list-style-type: none"> <li>• A low-cost mechanism to support telemetry services.</li> <li>• SCADA Lite may provide a platform for participants to communicate with AEMO and provide visibility of their DER device activities</li> </ul>  |

### 5.6.7 Risks

- Risks will be confirmed closer to project commencement.

### 5.6.8 Next Steps

- ESB CER and Data end-of-program report to be published which shows the components of the CER work program and how they fit together.
- Ongoing monitoring of other reform initiatives, reviews and work programs.



### 5.6.9 Reference

ESB Final Advice to Ministers: <https://www.datocms-assets.com/32572/1629944958-post-2025-market-design-final-advice-to-energy-ministers-part-a.pdf>

ESB CER Implementation Plan: <https://www.datocms-assets.com/32572/1629954551-esb-final-report-explainer-clean-and-smart-power-der-pathway.pdf>

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



## 5.7 DER Operational Tools

*Last updated – 05 October 2023*

### 5.7.1 Problem Statement

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<sup>35</sup>.

### 5.7.2 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.

### 5.7.3 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.

### 5.7.4 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.

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<sup>35</sup> 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](https://www.aph.gov.au/Parliamentary_Business/Committees/House/Environment_and_Energy/modernelectricitygrid/Submissions)

### 5.7.5 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.

### 5.7.6 Key Initiative Relationships

**Table 18 DER Operational Tools initiative relationships**

| Name   | Description   |
|--|---|
| <b>FRC Target State</b>  | <ul style="list-style-type: none"> <li>• 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.</li> </ul> |
| <b>Unlocking Consumer Energy Resources (CER) benefits through flexible trading</b> | <ul style="list-style-type: none"> <li>• This initiative 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).</li> </ul>  |
| <b>DOE, DER Data Hub and Registry Services, DER Operational Tools</b>              | <ul style="list-style-type: none"> <li>• 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.</li> </ul>  |
| <b>SCADA Lite</b>  | <ul style="list-style-type: none"> <li>• A low-cost mechanism to support telemetry services.</li> <li>• SCADA Lite may provide a platform for participants to communicate with AEMO and provide visibility of their DER device activities</li> </ul>  |
| <b>Operational Decision-Making Tools</b> (Dependent initiative)                    | <ul style="list-style-type: none"> <li>• 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.</li> </ul>   |

### 5.7.7 Risks

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

### 5.7.8 Next Steps

- ESB CER and Data end-of-program report to be published which shows the components of the CER work program and how they fit together.
- Ongoing monitoring of other reform initiatives, reviews and work programs.

### 5.7.9 Reference

ESB Final Advice to Ministers: <https://www.datocms-assets.com/32572/1629944958-post-2025-market-design-final-advice-to-energy-ministers-part-a.pdf>

# 6 Data Strategy

## 6.1 Data Services

*Last updated – 05 October 2023*

### 6.1.1 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.

### 6.1.2 Objective

- To provide new services models which facilitate greater safe, timely and appropriate access to and public-good benefits from data sets held by AEMO and other market bodies, supporting improved policy, planning and research.
- To establish a new Data Services Unit within AEMO to be supported by a Stakeholder Advisory Group.

### 6.1.3 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 (eg. 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.
- Finally, data is critical to better understand how different consumer behaviours and needs are changing and being impacted by the energy transition, informing forecasting, investments, new services, and consumer protections.

### 6.1.4 Project Scope/Proposed Solution

- Establishment of a Data Services Unit within AEMO and supported by a Stakeholder Advisory Group to share protected data safely with trusted “prescribed” bodies (Class A – those who have prescribed statutory functions either specific to the energy industry, who work with energy data for public purposes, or who are already listed in the NEL and NGL, and Class B – Public bodies and researchers who can create clear benefits for energy consumers through greater access to data but require clear data protection obligations to ensure security).

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

- 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).
- 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.

AEMO is developing an implementation plan proposal to jurisdictional officials, with an aim to have the new Data Services Unit in place prior in the second half of 2023, to support services once the legislative amendments are in place.

### 6.1.5 Key Assumptions

- Key assumptions to be confirmed following development of AEMO’s implementation plan.

### 6.1.6 Key Initiative Relationships

- Data Services initiative is considered a critical partner enabling the initial Data Strategy reforms identified by the ESB including Bill transparency, EV Supply Equipment Standing Data Register, Network Visibility.

### 6.1.7 Risks

**Table 19 Data Services initiative risks**

| Risk ID | Risk Type | Description  | Mitigation              |
|---------|-----------|--|-------------------------|
| 1       | Scope     | The exact scope and function of the new Data Services Unit within AEMO to be finalised and agreed with Ministers | Planning and scheduling |

### 6.1.8 Next Steps

- Implementation of these legislative reforms are expected to be agreed by Ministers in August 2023 and implemented through SA Parliament in [August/September].
- If Ministers agree and legislation passed, AEMO to establish new Data Services Unit by end of 2023.

### 6.1.9 Reference

ESB Consultation Paper: <https://www.datocms-assets.com/32572/1671059508-esb-data-services-delivery-model-consultation-paper-december-2022.pdf>

ESB National Energy Laws Amendment (Data Access) Bill 2023: <https://www.datocms-assets.com/32572/1681166642-esb-data-strategy-initial-reforms-draft-bill-april-2023.pdf>

ESB Data Services Policy Position Paper: <https://www.datocms-assets.com/32572/1688102997-esb-data-strategy-initial-reforms-policy-positions.pdf>

## 6.2 Electric Vehicles Supply Equipment Standing Data Register

*Last updated – 05 October 2023*

### 6.2.1 Problem Statement

Electric vehicle (EV) charging is set to transform our electricity systems. While there is some uncertainty regarding the exact pace of adoption of EVs and the technology and charging choices of EV owners (including the use of public charging infrastructure), there is broad consensus that EV integration presents both major opportunities and challenges for the electricity grid.<sup>36</sup>

Currently, networks and AEMO do not have access to reliable data on the size, location, and characteristics of electric vehicle supply equipment (EVSE) to enable them to determine and manage these opportunities and challenges effectively.<sup>37</sup> The opportunity is to provide a solution for reporting installation, location, and characteristics of electric vehicle supply equipment (chargers).

### 6.2.2 Objectives

- It is critical to ensure agencies and market participants have sufficient visibility of emerging EV technologies to support efficient and responsive forecasting, planning, and operational management. This initiative seeks to ensure that:
  - Uptake and behaviour of emerging EV technologies is well understood, supporting efficient and responsive forecasting, planning, and operational management.
  - Data on 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.

### 6.2.3 Value/Benefit

- Providing appropriate systems and processes are in place to ensure system planners and operators, or other parties, have the information they need to manage this transition effectively.
- Improved planning and management of operational risks inherent to uncertainty around uptake and behaviour of EVs.
- Improved understanding of the costs, risks and benefits associated with the rollout of EV charger infrastructure in Australia.

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<sup>36</sup> ESB. Electric Vehicle Supply Equipment Standing Data. Consultation Paper. December 2022. Available here: <https://www.datocms-assets.com/32572/1670367035-esb-electric-vehicle-supply-equipment-standing-data-consultation-paper-december-2022.pdf>

<sup>37</sup> Ibid.

- More informed and therefore targeted network investment such that the location, timing and size of that investment is well matched to the requirement.
- Better management of demand growth including through demand management solutions, potentially reducing total capital expenditure lowering network charges to customers.
- Benefits are likely wider than electricity industry, for example Fire Services may benefit from understanding the location of EVSE installations to improve the effectiveness and manage risk in emergency response.

#### 6.2.4 Project Scope/Proposed Solution

- Extension of the DER Register data collection and reporting framework to require DNSPs to collect and provide specified standing data for all hard-wired EVSE with a connection of 15A or greater (public and private charging). This would require AEMO to:
  - develop and propose a rule change request amending NER 3.7E to extend the current scope of data that may be collected.
  - work with stakeholders to finalise the required data specification,
  - extend DER Register Information Guidelines to include requirement on DNSPs for EVSE data collection.
- Reviewing current issues in the DER Register: AEMO to work with stakeholders to improve DER Register data collection frameworks.
- Development of National EVSE Product Database: AEMO to work with industry to establish arrangements for a product list to streamline EVSE data collection, similar to the current CER Product listing service.
- Wider consideration of industry education and training, incentives for accurate collection of data from installers, DNSP incentives to verify and take corrective action in relation to data errors and non-compliance, and alternative datasets to support compliance and quality testing.

#### 6.2.5 Key Assumptions

- Excludes data associated with ongoing EV operation, which is being further considered as part of wider interoperability assessment.
- New frameworks for CER installers to be incorporated in the AEMC's Review into CER Technical Standards.

#### 6.2.6 Key Initiative Relationships

- No direct dependencies with NEM Reform Program initiatives have been identified.

#### 6.2.7 Risks

- Risks will be identified as part of the development by AEMO of a rule change request.

#### 6.2.8 Next Steps

- AEMO to develop a rule change request for AEMC consideration providing for extension of the DER Register to include EVSE data.

## 6.2.9 Reference

ESB Electric Vehicle Supply Equipment Standing Data – Consultation Outcomes Report June 2023

<https://www.datocms-assets.com/32572/1688103470-attachment-b-evse-standing-data-consultation-paper-final-june-2023.pdf>

ESB Consultation Paper – EVSE Standing Data: <https://www.datocms-assets.com/32572/1670367035-esb-electric-vehicle-supply-equipment-standing-data-consultation-paper-december-2022.pdf>

ESB Data Strategy: <https://www.datocms-assets.com/32572/1630275857-esb-data-strategy-july-2021.pdf>

## 6.3 Bill Transparency

*Last updated – 05 October 2023*

### 6.3.1 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.

In June 2023 the ESB published its Consultation Paper which considers the current approach to collection and use of billing data, as well as potential alternative approaches that could improve transparency of electricity billing data. Based on the ESB's work, the paper includes five recommendations that draws on retailer-held billing data for small customer electricity bills (covering residential and small businesses). These recommendations are explained further in section 6.3.5.

### 6.3.2 Objective

- Efficient arrangements to provide ongoing transparency of consumer bills and the impacts of different services and circumstances, to support better consumer protections and understanding of consumer needs in the market transition and streamline current inefficient retail reporting.

### 6.3.3 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.

### 6.3.4 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.

### 6.3.5 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.

Additionally, the final approach for billing data gathering and sharing will be dependent on stakeholder feedback received on the five recommendations proposed by the ESB in their Consultation Paper including:

- More timely insights for key regulators and policy makers and safe data sharing between appropriate trusted bodies.
- No reliance on the ACCC's Inquiry information gathering powers to seek national-level billing data from retailers.
- A privacy risk assessment should be undertaken as part of the detailed design of new arrangements to ensure consumer benefits and safely manage privacy.
- Enhancing the scope of retailer-held billing data collected to target key gaps in current and emerging policy needs and enable linking to wider datasets to maximise consumer benefits while managing privacy risk and costs.
- Detailed design and assessment should be undertaken on a preferred model for access to billing data, where a single body (possibly AER or AEMO) is empowered to gather retailer-held billing data.

### 6.3.6 Key Initiative Relationships

- If AEMO was required to collect billing data, this would need to be a clear separate policy decision and mandate to the Data Services initiative which is intended to facilitate access to data already provided, rather than obtaining additional datasets.
- Possible dependencies on the implementation of Tranche 3 of the Consumer Data Right (November 2023).

### 6.3.7 Risks

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

### 6.3.8 Next Steps

- Submissions on the Consultation paper are due to the AEMC by 1 September 2023.

### 6.3.9 Reference

ESB Data Strategy: <https://www.datocms-assets.com/32572/1630275857-esb-data-strategy-july-2021.pdf>

ESB Consultation Paper: <https://www.datocms-assets.com/32572/1688619055-esb-billing-transparency-consultation-paper-final-july-2023.pdf>

## 6.4 Network Visibility

*Last updated – 05 October 2023*

### 6.4.1 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.

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.

In June 2023, the ESB published its Consultation Paper that sets out how this initiative is to be undertaken in three phases (see section 6.4.4), with feedback sought on Phase 1.

### 6.4.2 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.

### 6.4.3 Value/Benefit

Greater visibility of the low voltage network will lower network/DER costs 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.

### 6.4.4 Project Scope/Proposed Solution

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



This initiative is to be undertaken in three phases:

- Phase 1 seeks to define the data sets concerning the performance of the LV network and CER that is needed by market and policy stakeholders making CER planning decisions and managing network-related risks, through examining the needs and use cases for this data and considering related challenges in accessing it.
- Phase 2 will test the challenges and value in delivering the data sets identified in Phase 1 through a range of real-world trials.
- Phase 3 will propose a pathway for ongoing delivery of priority data sets to the market, informed by the trials and considering varied opportunities and challenges for different networks.

#### 6.4.5 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.

Additionally, the final approach will be dependent on submissions received on the Consultation Paper which specifically seeks feedback on:

- Examples of the analysis of use cases.
- Key considerations and learnings in defining the data sources to be used to populate the data sets.
- Further consideration of the data sets, including the criteria likely to be most useful in assessing the overall value of these data sets to the market and any other important data required.

#### 6.4.6 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.

#### 6.4.7 Risks

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

#### 6.4.8 Next Steps

- Phase 1: Submissions to the Consultation Paper are due to the AER by 1 September 2023.

#### 6.4.9 Reference

ESB Data Strategy: <https://www.datocms-assets.com/32572/1630275857-esb-data-strategy-july-2021.pdf>

ESB Consultation Paper: <https://www.datocms-assets.com/32572/1688618798-esb-network-visibility-consultation-paper-final-july-2023.pdf>

AER's consultation page on the ESB's Consultation Paper: <https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/network-visibility>

# 7 AEMO Foundational Initiatives

## 7.1 Identity and Access Management

*Last updated – 05 October 2023*

### 7.1.1 Problem Statement

AEMO's Identity and Access Management (IDAM) services are disparate, requiring users to retain multiple sets of credentials to access AEMO business services. The legacy IDAM services do not implement best practices in cyber security controls (e.g. multifactor authentication) and are insufficient to meet new industry obligations introduced under the Security of Critical Infrastructure (SOCI) Act.

### 7.1.2 Objective

- Establish a modern and secure target state IDAM Platform suitable for consuming wide range of AEMO browser and application services
- To enable unified identification, authorisation, and entitlement management while ensuring compliance with industry obligations under cyber security policies such as the SOCI Act.
- Provide a strategy for the transition of legacy authentication interfaces.

### 7.1.3 Direct Value/Benefit for Participants

- As part of an inter-related work program that includes Portal Consolidation and Industry Data Exchange, the IDAM initiative will enable capabilities for a single pane of glass for Participants accessing AEMO applications.
  - 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.
  - 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.

### 7.1.4 Indirect Value/Benefit for Participants

- Enabling the single pane of glass for participants accessing AEMO browser services.

### 7.1.5 Project Scope/Proposed Solution

- Define the architecture of the target state, including the transition to the target state.
- Provide a high-level technical solution and a transition strategy depicting the path to the target state.

- Define principles, guidelines and consumption patterns that must be adhered to by the upcoming NEM reforms.
- Implement consistent cyber security controls for NEM services consuming target state IDAM.
- Federated access for NEM Participants to enable external identity lifecycle events to be managed entirely by Participants.
- Deliver the transition strategy as agreed in the feasibility phase.
- The implementation effort includes standing up supporting business processes.
- This initiative will employ a phased approach, and the final scope will be subject to the next phase of review.

### 7.1.6 Key Initiative Relationships

**Table 20 IDAM initiative relationships**

| Name  | Description  |
|---|--|
| <b>Portal Consolidation</b>   | <ul style="list-style-type: none"> <li>• The framework for Portal Consolidation will integrate with IDAM.</li> <li>• The design of the Portal Consolidation framework will expose number of self-serve IDAM features e.g., password reset.</li> </ul>  |
| <b>Industry Data Exchange</b>   | <ul style="list-style-type: none"> <li>• IDX establishes unified access to AEMO services across all markets using modern authentication and communication protocols. This initiative will leverage IDAM.</li> <li>• IDAM and IDX feed into each other to enable consolidated management of participant identities and their authentication and access.</li> <li>• IDAM enables IDX.</li> </ul>   |
| <b>Forecasting Platform Uplift</b> (Dependent initiative)             | <ul style="list-style-type: none"> <li>• The initiative established a converged modelling platform that supports model development, interfaces for forecasting-as-a-service providers and layered blended models across several modelling domains e.g., demand and VRE.</li> <li>• 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.</li> </ul> |
| <b>Consolidated Master Data Repository</b>                            | <ul style="list-style-type: none"> <li>• As the single source of truth for organisational identity, it is important that the master data repository maps data from the new IDAM framework.</li> <li>• 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.</li> </ul>  |
| <b>FRC Target State</b>   | <ul style="list-style-type: none"> <li>• 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.</li> <li>• 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.</li> </ul>                            |
| <b>DOE, DER Data Hub and Registry Services, DER Operational Tools</b> | <ul style="list-style-type: none"> <li>• 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.</li> </ul>  |

### 7.1.7 Delivery Risks

**Table 21 IDAM initiative delivery risks**

| Risk ID | Risk Type     | Description   | Mitigation              |
|---------|---------------|---|-------------------------|
| 1       | Relationships | Increase in project complexity due to multiple dependencies/synergies and overlapping projects in a similar timeline. | Planning and scheduling |

## 7.1.8 Risks to Participants if not delivered with NEM Reform Program reforms

Table 22 IDAM initiative Participant risks

| Risk ID | Risk Type   | Description   | Impact   |
|---------|-------------|---|----------|
| 1       | Security    | AEMO would be compelled to use legacy IDAM services which do not implement best practices in cyber security controls (e.g. multifactor authentication) and are insufficient to meet new industry obligations introduced under the SOCI Act.                     | High     |
| 2       | 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 |

## 7.1.9 Next Steps

- AEMO has developed a high-level plan that includes activities, milestones, drivers, triggers, assumptions and other factors to consider. The plan highlights the activities, process and use case development, gap analysis, ongoing industry consultations, target state development.
- As part of the product roadmap AEMO is consulting with industry to determine an appropriate target state, transition strategy and business case prior to any funding decision being made.
- Key steps include:
  - Gap analysis, High Level Business Processes and Use Cases (Cal. Q1 2023).
  - Development of conceptual architecture design
  - Industry consultation (Cal. Q1/2 2023).
  - Agreed definition of target state and transition strategy developed (Cal. Q2 2023).
  - Business case development (Cal. Q2 2023)
  - Support of Business Case through established AEMO and industry governance channels.

## 7.1.10 Reference

Foundational & Strategic Focus Group consultation: <https://aemo.com.au/en/consultations/industry-forums-and-working-groups/list-of-industry-forums-and-working-groups/nem-reform-foundational-and-strategic-initiatives-focus-group>



## 7.2 Industry Data Exchange

*Last updated – 05 October 2023*

### 7.2.1 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. AEMO's markets are also undergoing significant transformation, resulting in new data exchange needs. Existing data exchange mechanisms will not meet needs and will fail to comply with new industry obligations around cyber security such as the SOCI Act. AEMO is introducing new data exchange patterns without a target state and roadmap which is inhibiting participants from modernising their systems and quantifying the benefits of their investments.

### 7.2.2 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 existing 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.

### 7.2.3 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.

### 7.2.4 Indirect Value/Benefit for Participants

- The modernised systems will improve speed to market of changes and support innovation and support for emerging services within the energy industry (e.g. Data Sharing 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 by adoption of modern authentication and data exchange protocols.
- The IDX design phase will define standards, protocols, connectivity methods enabling the efficient implementation of reforms. 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.



### 7.2.5 Project Scope/Proposed Solution

- Define the architecture of the target state, including the transition to the target state.
- Define 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 (i.e. establish framework). The intention is to progressively implement the target state solution across all retail and wholesale markets, for both fuels but the NEM scope is limited to NEM retail and wholesale.
- Migration of BAU industry interfaces to the new platform.
- Make the new platform available in timeframes to support other NEM Reform Initiatives.
- Support data exchange for use cases for data sharing requirements among Participants,. Use cases include but not limited:
  - Business process outsourcing.
  - Operating agents working on behalf of participants (e.g. and they need to access and submit data for a particular plant).
  - Bi-lateral arrangements between participants (e.g. PPA; exchange data to understand exposure).
- This initiative will employ a phased approach, and the final scope will be subject to the next phase of review.

### 7.2.6 Key Initiative Relationships

**Table 23 Industry Data Exchange initiative relationships**

| Name  | Description  |
|---|--|
| <b>Identity and Access Management</b>                                 | <ul style="list-style-type: none"> <li>• IDAM provides a unified mechanism to authenticate participant users and applications when accessing AEMO services.</li> <li>• 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.</li> <li>• Secure data exchange is intrinsically linked to an authorisation and access framework. As such, IDAM and IDX need to complement each other</li> <li>• Consent management for data sharing agreements</li> </ul> |
| <b>Consolidated Master Data Repository</b>                            | <ul style="list-style-type: none"> <li>• 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.</li> <li>• 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.</li> </ul>  |
| <b>FRC Target State</b>   | <ul style="list-style-type: none"> <li>• 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.</li> <li>• As markets and systems are consolidated through FRC, the new IDX framework is in place to facilitate a cohesive approach to industry data exchange.</li> </ul>   |
| <b>DOE, DER Data Hub and Registry Services, DER Operational Tools</b> | <ul style="list-style-type: none"> <li>• 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.</li> <li>• It would be inefficient to establish a new DER Marketplace under legacy systems that would need to be retrofit.</li> </ul>  |



| Name  | Description  |
|---|--|
| <b>Forecasting Platform Uplift</b> (Dependent initiative) | <ul style="list-style-type: none"> <li>• 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.</li> </ul> |
| <b>All reform initiatives</b>                             | <ul style="list-style-type: none"> <li>• The standards, protocols and architecture will enable the data exchange elements of all NEM Reform Program initiatives. All reforms – particularly those introducing new markets and new cohorts of Participants, will use the new IDAM and IDX frameworks.</li> </ul>                |

## 7.2.7 Delivery Risks

**Table 24 Industry Data Exchange initiative delivery risks**

| Risk ID | Risk Type         | Description   | Mitigation  |
|---------|-------------------|---|---|
| 1       | Industry Buy-in   | Gaining agreement across multiple markets, fuels and jurisdiction for single data exchange.   | Extensive industry consultations, implementation in tranches, extended transition periods |
| 2       | Relationships     | Increase in project complexity due to multiple dependencies/synergies and overlapping projects in a similar timeline.   | 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. | AEMO to explore options to take out cost from Industry implementation                     |

## 7.2.8 Risks to Participants if not delivered with NEM Reform Programs

**Table 25 Industry Data Exchange initiative Participant risks**

| Risk ID | Risk Type  | Description  | Impact |
|---------|------------|--|--------|
| 1       | Complexity | The current suite of data exchange mechanisms across markets and fuels creates complexities and costs for Participants in managing data exchange requirements and creates a barrier to entry for new Participants. | High   |
| 2.      | Security   | Critical infrastructure and sensitive data continuing to be exchanged over less secure channels. Inability to comply with industry wide requirements under SOCI act.   | High   |

## 7.2.9 Next Steps

- AEMO has drafted a high level plan that includes activities, milestones, drivers, triggers, assumptions and other factors to consider. This plan highlights the activities, process and use case development, gap analysis, ongoing industry consultations, target state development.
- AEMO is consulting with industry to review and take feedback on a proposed target state and an appropriate transition strategy and relevant Industry cost to be incorporated into a business case.
- Key steps include:
  - Gap analysis, High Level Business Processes and Use Cases (Cal. Q1 2023).
  - Industry consultation (Started Cal. Q1/2 2023).
  - Agreed definition of target state and transition strategy developed (Cal. Q2-Q3 2023).
  - Business case developed (Cal. Q3 2023).

- Support of Business Case through established AEMO and industry governance channels.

### 7.2.10 Reference

Foundational & Strategic Focus Group consultation: <https://aemo.com.au/en/consultations/industry-forums-and-working-groups/list-of-industry-forums-and-working-groups/nem-reform-foundational-and-strategic-initiatives-focus-group>

## 7.3 SCADA Lite

*Last updated – 05 October 2023*

### 7.3.1 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 such as Virtual Power Plants (VPPs), Integrated Resource Providers (IRPs), Small Generation Aggregators (SGAs), DER Generators (5-30 MW), and remote solar and wind farms. 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.

### 7.3.2 Objective

- Establish a bi-directional communication path to exchange telemetry data and control signals between AEMO and non-NSP participants.
- The proposed solution is to be consistent with the Wholesale Demand Response (WDR) guidelines, as well as the Power System Data and Communication Standard (version 3.0, 03 April 2023)).

### 7.3.3 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.
- Lifting of exemptions for certain participants to participate in the market.

### 7.3.4 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.

### 7.3.5 Project Scope/Proposed Solution

- The proposed solution will leverage the Inter-Control Centre Communications Protocol in the first instance and secure DNP3 in the case a non-NSP participant cannot support ICCP as agreed with the industry participants as part of the 2022 review of AEMO's Power System Data and Communication Standard.
- The implementation of the solution will have the below listed impacts on AEMO from a business and technology perspective:
  - Business Process: No new processes are required. Modification to existing processes is expected such as registration of new non-NSP participants, utilisation of SCADA Lite data in grid modelling and dispatch process, creation of annual invoicing process for SCADA Lite users.

- Technology Solution: Changes include configuration and implementation of new components in networks and real time operations.

### 7.3.6 Key Initiative Relationships

**Table 26 SCADA Life initiative relationships**

| Name   | Description  |
|--|--|
| <b>Integrating price responsive resources into the NEM</b> | <ul style="list-style-type: none"> <li>• SCADA Lite will provide a platform for participants, such as VPPs, to communicate with AEMO and provide visibility of their DER device activities.</li> </ul>   |
| <b>Integrating Energy Storage Systems</b>                  | <ul style="list-style-type: none"> <li>• 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.</li> </ul>  |
| <b>Operational Data Store</b>                              | <ul style="list-style-type: none"> <li>• ODS establishes a capability for storing high volume of operational transactional data at near-real-time.</li> <li>• 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.</li> <li>• 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.</li> </ul> |
| <b>DER Data Hub and Registry Services</b>                  | <ul style="list-style-type: none"> <li>• 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</li> </ul>  |
| <b>DER Operational Tools</b>                               |  |
| <b>Distribution Local Network Services</b>                 |  |

### 7.3.7 Delivery Risks

**Table 27 SCADA Life 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.<br><br>The scope also needs to consider external organisation registration processes and needs | Planning and scheduling |

### 7.3.8 Risks to Participants if not delivered with NEM Reform Program

**Table 28 SCADA Life 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   |



### 7.3.9 Next Steps

- AEMO to complete initiative planning work in October 2023 prior to entering execution phase for the initiative.
- Industry consultation to ensure participant readiness during solution implementation.
- Solution “Go-live” anticipated March 2024.

# 8 AEMO Strategic Initiatives

## 8.1 Portal Consolidation

*Last updated – 05 October 2023*

### 8.1.1 Problem Statement

AEMO browser services are exposed over a disparate range of end points and require multiple sets of credentials to consume these services. This results in a suboptimal user experience for AEMO's stakeholders. Further, the requirement to access browser services via private networks creates technical barriers to consuming these services.

### 8.1.2 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.
- Enable users to access a single unified portal that hosts all web applications in scope.
- Provide integration with the enterprise identity management and user authentication solution.

### 8.1.3 Direct Value/Benefit for Participants

- A consolidated internet-facing portal will enable 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.

### 8.1.4 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.

### 8.1.5 Project Scope/Proposed Solution

- The aim of the Portal Consolidation project is to enable a single pane of glass experience for Energy Market Participants and other partners.
- This is to be achieved by:

- A new consolidated internet facing and mobile portal for hosting AEMO browser services for use by both registered and non-registered NEM users that includes a fully featured online user help function personalisation.
- Integration with the new identity and access management platform.
- Establish a roadmap outlining the progressive migration of AEMO’s browser services to the consolidated target state framework.
- Migration of any existing web applications to internet facing determined in scope by the feasibility phase
- The roadmap will be implemented via other business reforms for browser services that fall outside the scope of Portal Consolidation.
- Rollout to NEM Participants to enable them to access the consolidated and access to services.

### 8.1.6 Key Initiative Relationships

**Table 29 Portal Consolidation Framework initiative relationships**

| Name                                       | Description   |
|--|---|
| <b>Identity and Access Management</b>      | <ul style="list-style-type: none"> <li>• The framework for Portal Consolidation will enable integration with IDAM.</li> <li>• 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.</li> </ul>  |
| <b>Industry Data Exchange</b>              | <ul style="list-style-type: none"> <li>• Portal Consolidation framework enables the roadmap toward a single pane of glass user experience for participants accessing all AEMO browser-based services.</li> <li>• 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.</li> </ul>  |
| <b>Consolidated Master Data Repository</b> | <ul style="list-style-type: none"> <li>• 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.</li> <li>• 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.</li> </ul> |

### 8.1.7 Delivery risks

**Table 30 Portal Consolidation Framework initiative delivery risks**

| Risk ID | Risk Type      | Description  | Mitigation              |
|---------|----------------|--|-------------------------|
| 1       | Relationship   | Delays to the delivery of IDAM   | Planning and scheduling |
| 2       | Implementation | Increase in project complexity due to dependencies / synergies and overlapping projects in a similar timeline. | Planning and scheduling |

### 8.1.8 Risks to Participants if not delivered with NEM Reform Program

**Table 31 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 consume AEMO browser services. | High   |



### 8.1.9 Next Steps

- AEMO has developed a product roadmap that includes activities, milestones, drivers, triggers, assumptions and other factors to consider. This product roadmap highlights the planning activities, process and use case development, gap analysis, ongoing industry consultations, target state development.
- As part of the product roadmap AEMO will consult with industry to determine an appropriate transition strategy prior to any funding decision being made.
- Key steps include:
  - Gap analysis, development of high level conceptual architecture design (Cal. Q1 2023).
  - Industry consultation (Started Cal. Q1/2 2023).
  - Agreed definition of target state and transition strategy developed (Cal. Q2-Q3 2023).
  - Business case developed (Cal. Q3 2023).
  - Support of Business Case through established AEMO and industry governance channels.

### 8.1.10 Reference

Foundational & Strategic Focus Group consultation: <https://aemo.com.au/en/consultations/industry-forums-and-working-groups/list-of-industry-forums-and-working-groups/nem-reform-foundational-and-strategic-initiatives-focus-group>



## 8.2 Consolidated Master Data Repository

*Last updated – 27 April 2023. Note this initiative is currently subject to review as part of AEMO’s ongoing Future State Architecture assessment.*

### 8.2.1 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.

### 8.2.2 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.

### 8.2.3 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.

### 8.2.4 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.

### 8.2.5 Project Scope/Proposed Solution

- Define the architecture of the target state, including the transition to the target state.

The target state for this initiative is to eliminate data dependencies on alternative sources of truth for NEM Retail and Wholesale data, and to connect those existing sources of truth to the consolidated master data repository, thereby reducing the need for a Participant active in multiple processes and/or markets to provide organisational data multiple times through different applications.

- Provide a high-level technical solution and a roadmap depicting the path to the target state.
- Delivery of outstanding scope not delivered by 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).
- Finalise establishment of the new master data management platform.
- Load data from an agreed suite of application to enable 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.
- Data clean-up of source data being ingested by the master repository to the extent it relates to NEM Retail and Wholesale data.
- This initiative will employ a phased approach, and the final scope will be subject to the next phase of review.

### 8.2.6 Key Initiative Relationships

**Table 32 Consolidated Master Data Repository initiative relationships**

| Name  | Description   |
|---|---|
| <b>EV Supply Equipment Standing Data Register</b>               | <ul style="list-style-type: none"> <li>• EV standing data could potentially be captured in the consolidated master data repository (further scoping needed).</li> </ul>   |
| <b>ST PASA replacement</b><br>(Dependent initiative)            | <ul style="list-style-type: none"> <li>• The ST PASA replacement initiative is a review of the Pre-dispatch (PD) and Short Term (ST) PASA methodology and supporting systems and processes.</li> <li>• ST PASA will consume data from the master data repository.</li> </ul>  |
| <b>Operational Decision-Making Tools</b> (Dependent initiative) | <ul style="list-style-type: none"> <li>• 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.</li> <li>• ODMT will consume data from the master data repository.</li> </ul>   |
| <b>Forecasting Platform Uplift</b><br>(Dependent initiative)    | <ul style="list-style-type: none"> <li>• 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.</li> <li>• 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.</li> </ul> |

### 8.2.7 Delivery Risks

**Table 33 Consolidated Master Data Repository 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 |

| Risk ID | Risk Type     | Description   | Mitigation              |
|---------|---------------|---|-------------------------|
| 2       | Relationships | Increase in project complexity due to multiple dependencies/synergies and overlapping projects in a similar timeline. | Planning and scheduling |

## 8.2.8 Risks to Participants if not delivered with NEM Reform Program

**Table 34 Consolidated Master Data Repository 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   |
| 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   |

## 8.2.9 Next Steps

- Develop and finalise full scope of Phase 2.

## 8.3 FRC Target State

*Last updated – 27 April 2023. Note this initiative is currently subject to review as part of AEMO’s ongoing Future State Architecture assessment.*

### 8.3.1 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.

### 8.3.2 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 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.

### 8.3.3 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.

### 8.3.4 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.



### 8.3.5 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 and implement an Actor and Asset Management 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 (the integration for non-NEM retail markets is outside the NEM Reform Program scope).
- 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. NEM Reform Program scope only extends to NEM retail systems and Participants).
- Accommodate new market assets such as DER, and Electric Vehicles (EV) into AEMO NEM grid and market solutions.
- 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.
- Key steppingstones to get to the NEM Reform Program target state include:
  - Actor-Asset platform (single view of asset over the entire lifecycle);
  - NEM CATS;
  - NEM wholesale registration process;
  - Bring other processes and applications onto platform (e.g. DER Register); and
  - Bring EV Register onto platform.
- This initiative will employ a phased approach, and the final scope will be subject to the next phase of review.

### 8.3.6 Key Initiative Relationships

**Table 35 FRC Target State initiative relationships**

| Name                                  | Description   |
|---------------------------------------|---|
| <b>Identity and Access Management</b> | <ul style="list-style-type: none"> <li>• IDAM will establish a unified mechanism to authenticate participant users and applications when accessing AEMO services.</li> <li>• 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.</li> <li>• 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.</li> </ul> |
| <b>Industry Data Exchange</b>         | <ul style="list-style-type: none"> <li>• IDX will establish a unified access to AEMO services across all markets using modern authentication and communication protocols. This initiative will leverage IDAM.</li> <li>• As markets and systems are consolidated through FRC, the new IDX framework is in place to facilitate a cohesive approach to industry data exchange.</li> </ul>   |

| Name   | Description   |
|--|---|
| <b>Unlocking Consumer Energy Resources (CER) benefits through flexible trading</b> | <ul style="list-style-type: none"> <li>This initiative will touch Retail processes, including MSATS (process changes to identify flexible NMI, reconciliation of network charges) – through an extension of existing embedded network processes. Many of the participants for this initiative will also be participants in 'traditional' Retail systems.</li> </ul>   |
| <b>DOE, DER Data Hub and Registry Services, DER Operational Tools</b>              | <ul style="list-style-type: none"> <li>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.</li> </ul>   |
| <b>Business Rules Engine (Dependent initiative)</b>                                | <ul style="list-style-type: none"> <li>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.</li> <li>BRE will capture enterprise-wide business requirements to accommodate process changes efficiently.</li> <li>FRC cannot be completed without BRE. The business rules implemented will enable the development of the FRC consolidated platform.</li> </ul> |

### 8.3.7 Delivery Risks

**Table 36 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 |

### 8.3.8 Risks to Participants if not delivered with NEM Reform Program

**Table 37 FRC Target State initiative Participant risks**

| Risk ID | Risk Type              | Description   | Impact |
|---------|------------------------|---|--------|
| 1       | Cost efficiencies      | <p>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.</p> <p>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.</p> | 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   |

### 8.3.9 Next Steps

- AEMO has published an Expression of Interest (EOI) to scan the Market to determine what platform/product are available as well as to refine the target state architecture.
- Options assessment to be completed to determine if DER related initiatives should be on the platform (as opposed to other available options) and to sequence the changes on the platform.



## 8.4 Dispatch, Bids/Offers, and Constraints Target State

*Last updated – 05 October 2023*

### 8.4.1 Problem Statement

AEMO's core market Dispatch and Constraints platform is at the end of its 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.

### 8.4.2 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.

### 8.4.3 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.

### 8.4.4 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.

### 8.4.5 Project Scope/Proposed Solution

- Tranche 1 – A tactical incremental solution to transition from end-of-life technology to a supported platform in order to eliminate immediate technology risks and provide an opportunity to apply more readily available technology personnel, thereby enhancing scalability and organisational delivery capability. This solution can be implemented without affecting regulatory reform initiatives related to NEM Reform Program.

Once this tactical uplift is completed, the dispatch ecosystem will be fit for purpose as a base solution for implementation of further reforms for the remainder of the NEM Reform Program, subject to defined checkpoints to assess (i) any fundamental changes in the reform requirements (e.g., nodal pricing) and (ii) performance and scalability requirements that may be impacted by forthcoming DER growth and initiatives.

- Ongoing work, subject to the progress of various reform initiatives including, but not limited to, Integrating price responsive resources into the NEM and other DER related initiatives, and ST-PASA to define a target state architecture and high-level roadmap depicting the key transitional steps/components with a focus on those that resolve immediate technology risks (e.g. diminishing resource support). This provides the potential for a range of off ramps if project risks materialise.
- This initiative will employ a phased approach subject to various Checkpoints. The final scope of each phase will be subject to review.

## 8.4.6 Key Initiative Relationships

**Table 38 Dispatch, Bids/Offers, and Constraints Target State relationships**

| Name   | Description   |
|--|---|
| <b>Operating Reserve Market</b>                                | <ul style="list-style-type: none"> <li>Publishing information in either pre-dispatch (or five-minute pre-dispatch) or dispatch and/or procurement of FCAS at a regional level will have potentially significant interactions with the dispatch and ST market systems.</li> </ul>                              |
| <b>Improving security frameworks for the energy transition</b> | <ul style="list-style-type: none"> <li>Scheduling of ancillary services within the operational timeframe remains a consideration of the AEMC's rule change consultation and would require consideration of their potential impacts to dispatch and ST market systems.</li> <li></li> </ul>                    |
| <b>Fast Frequency Response</b>                                 | <ul style="list-style-type: none"> <li>The scope of the target state needs to be defined and the needs of FCAS markets considered in that process.</li> </ul>   |
| <b>ST PASA replacement (Dependent initiative)</b>              | <ul style="list-style-type: none"> <li>A technology uplift of AEMO backend market platform services to replace legacy technology. In the case of bids/offers this will leverage 5MS deliverables.</li> <li>The design of ST PASA could feed into the design, or become, the dispatch target state.</li> </ul> |

## 8.4.7 Delivery Risks

**Table 39 Dispatch, Bids/Offers, and Constraints Target State 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 such as those DER initiatives identified under the DER Marketplace banner.   | Planning and scheduling |
| 2       | Relationships | Increase in project complexity due to multiple dependencies/synergies and overlapping projects in a similar timeline.   | 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 |

## 8.4.8 Risks to Participants if not delivered with NEM Reform Program

**Table 40 Dispatch, Bids/Offers, and Constraints Target State Participant risks**

| Risk ID | Risk Type         | Description   | Impact |
|---------|-------------------|---|--------|
| 1       | Cost efficiencies | Continuous monitoring and refinement of target state architecture required (including identification of transitional steps / components) as policy / rules, scope and designs of reform initiatives are progressed to ensure platforms / systems are fit for purpose and capable of delivering changes necessary during implementation. | High   |

## 8.4.9 Next Steps

Ongoing monitoring and assessment of target state requirements at various 'Checkpoints' including:



- 
- Checkpoint 1 – Review Transmission & Access reform policy to determine whether market evolve from a regional to a nodal basis, Review the design of Integrating price responsive resources into the NEM/DER and business assumption around scalability (1-5years) which will inform whether Dispatch Target State design is fit for purpose for 5 years' worth of growth.
  - Checkpoint 2 – Review ST-PASA new Nodal Security Constrained Economic Dispatch (SCED) engine and evaluate what applications DTS can leverage. Assess WA Wholesale Energy Market (WEM) reform SCED “WEMDE” to inform the detailed design of Dispatch Target State. Evaluate Market Clearing Engine (MCE) (replacing existing clearing engine in the DWGM market).

## 9 AEMO Dependent Initiatives

The NEM Reform Implementation Roadmap includes several enabling initiatives that are to be delivered by AEMO's Operational Technology Roadmap (OTR) Program or separately as an independent project by AEMO (e.g., ST PASA Replacement). In that respect, they become dependencies for the NEM Reform Program rather than being delivered by the NEM Reform Program itself.

The following table highlights such initiatives.

| Name                                     | Description   |
|--|---|
| <b>Operational Decision-Making Tools</b> | <ul style="list-style-type: none"><li>• A refresh of the user interfaces and decision-making tools used by the AEMO control room operators to reflect the increasing demands of managing the grid. Multiple disparate User Interfaces converged into single user experience platform.</li></ul> |
| <b>Business Rules Engine</b>             | <ul style="list-style-type: none"><li>• An internal AEMO technology capability within which business rules and processes are defined. Core market platforms will leverage this capability as a foundation building block.</li></ul>   |
| <b>Operational Data Store</b>            | <ul style="list-style-type: none"><li>• Establishing a capability for storing high volume of operational transactional data at near-real-time.</li></ul>  |
| <b>Forecasting Platform Uplift</b>       | <ul style="list-style-type: none"><li>• A converged modelling platform that supports model development, interfaces for forecasting-as-a-service providers and layered blended models across several modelling domains e.g. demand and VRE.</li></ul>  |
| <b>ST PASA Replacement</b>               | <ul style="list-style-type: none"><li>• Review of the Pre-dispatch (PD) and Short Term (ST) PASA methodology and supporting systems and processes.</li></ul>  |

Further details on the OTR Program are available via AEMO's website here:

<https://aemo.com.au/initiatives/major-programs/operations-technology-roadmap>

# 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 NEM Reform Implementation Roadmap.

**Table 41 Summary of the ESB reform pathways**

| Pathway                                       | Objective   | This means   | Reform Initiative*   |
|---|---|--|--|
| <b>Resource Adequacy Mechanism</b>            | <ul style="list-style-type: none"> <li>Establish new market-based arrangements to explicitly value capacity to provide an ‘investable’ and enduring long-term signal.</li> <li>Establish market arrangements that support efficient allocation of investment risk between participants, jurisdictions, and consumers.</li> <li>Establish tools that provide jurisdictions sufficient confidence that reliability will be maintained in a way that preserves market signals.</li> </ul>  | 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. | <ul style="list-style-type: none"> <li>Investment principles for jurisdictional schemes</li> <li><b>Increased MT PASA Information</b></li> <li>Jurisdictional Strategic Reserve</li> <li>Ministerial RRO Trigger</li> <li><b>Capacity Incentive Scheme</b></li> <li>Ongoing Monitoring</li> </ul>  |
| <b>Essential System Services</b>              | <ul style="list-style-type: none"> <li>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).</li> <li>Establish new market mechanisms to support efficient scheduling and dispatch by AEMO.</li> <li>Deliver a range of supply and demand-based technologies and resources with capabilities to deliver these essential services.</li> </ul>  | We have the resources and services when needed to manage the complexity of dispatch and to deliver a secure supply to customers.   | <ul style="list-style-type: none"> <li><b>Fast Frequency Response</b></li> <li><b>Frequency Performance Payments (part of PFR Incentive Arrangements rule)</b></li> <li><b>Operating Reserve Market</b></li> <li><b>System Strength (Planning)</b></li> <li><b>Improving security frameworks for the energy transition</b></li> <li>Unbundling system services</li> <li>Integrated ahead market</li> </ul>   |
| <b>Integration of DER and Flexible Demand</b> | <ul style="list-style-type: none"> <li>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.</li> <li>Establish wholesale market arrangements that support innovation, the integration of new business models and a more efficient supply and demand balance.</li> <li>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.</li> <li>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.</li> </ul> | We create new opportunities for consumers about how they receive and use energy and are rewarded for doing so flexibly.  | <ul style="list-style-type: none"> <li><b>Integrating Energy Storage</b></li> <li><b>Unlocking Consumer Energy Resources (CER) benefits through flexible trading</b></li> <li><b>Integrating price responsive resources into the NEM</b></li> <li><b>Dynamic Operating Envelopes</b></li> <li><b>Distribution Local Network Services</b></li> <li>Turn-up Services</li> <li><b>DER Data Hub and Registry Services</b></li> <li><b>DER Operational Tools</b></li> </ul> |
| <b>Transmission and Access</b>                | <ul style="list-style-type: none"> <li>Establish better signals for generators to locate in areas where there is available generation capacity - namely in the REZs.</li> <li>Reduced uncertainty for investors, through measures that give rise to more predictable future patterns of congestion, and a more orderly and predictable connections process.</li> </ul>  | 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.  | <ul style="list-style-type: none"> <li>Dedicated connection assets and system strength</li> <li>Interim REZ framework</li> <li><b>Enhanced Information</b></li> <li><b>Congestion Relief Market &amp; Priority Access Model</b></li> </ul>   |

| Pathway | Objective  | This means | Reform Initiative*  |
|---------|--|------------|---|
|         | <ul style="list-style-type: none"> <li>Establish better use of the network, resulting in more efficient dispatch outcomes and lower costs for consumers.</li> <li>Ensure batteries are locating where they are needed most and being paid to operate in ways that benefit the broader system.</li> </ul> |            | <ul style="list-style-type: none"> <li>Transmission Planning and Investment Review</li> <li>Enhanced congestion information</li> <li>LMP and FTR</li> </ul> |

## A2. Appendix B – References

| Workstream | Reform Initiative  | Reference (link to rule change, market review, or latest ESB publication)   |
|------------|--|---|
| RAMS       | Increase MT-PASA Information   | AEMC Rule Determination:<br><a href="https://www.aemc.gov.au/rule-changes/enhancing-information-generator-availability-mt-pasa">https://www.aemc.gov.au/rule-changes/enhancing-information-generator-availability-mt-pasa</a><br>AEMO Guidelines and Methodology Consultation:<br><a href="https://www.aemo.com.au/consultations/current-and-closed-consultations/2022-reliability-forecasting-guidelines-and-methodology">https://www.aemo.com.au/consultations/current-and-closed-consultations/2022-reliability-forecasting-guidelines-and-methodology</a>   |
|            | Capacity Investment Scheme   | Commonwealth Government Announcement:<br><a href="https://www.energy.gov.au/news-media/news/capacity-investment-scheme-power-australian-energy-market-transformation">https://www.energy.gov.au/news-media/news/capacity-investment-scheme-power-australian-energy-market-transformation</a>  |
| ESS        | Fast Frequency Response  | AEMC Rule Change:<br><a href="https://www.aemc.gov.au/rule-changes/fast-frequency-response-market-ancillary-service">https://www.aemc.gov.au/rule-changes/fast-frequency-response-market-ancillary-service</a><br>AEMO MASS and FCAS Verification tool:<br><a href="https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/system-operations/ancillary-services/market-ancillary-services-specification-and-fcas-verification-tool">https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/system-operations/ancillary-services/market-ancillary-services-specification-and-fcas-verification-tool</a><br>AEMO Constraint Formulation Guideline Consultation:<br><a href="https://aemo.com.au/consultations/current-and-closed-consultations/cfg-and-scvpf">https://aemo.com.au/consultations/current-and-closed-consultations/cfg-and-scvpf</a><br>AEMO Constraints Implementation Guidelines consultation:<br><a href="https://aemo.com.au/consultations/current-and-closed-consultations/constraints-implementation-guidelines">https://aemo.com.au/consultations/current-and-closed-consultations/constraints-implementation-guidelines</a><br><br>AEMO Dispatch procedure consultation:<br><a href="https://aemo.com.au/consultations/current-and-closed-consultations/dispatch-procedure-dynamic-adc">https://aemo.com.au/consultations/current-and-closed-consultations/dispatch-procedure-dynamic-adc</a> |
|            | Frequency Performance Payments (part of PFR Incentive Arrangements rule) | AEMC Rule Change:<br><a href="https://www.aemc.gov.au/rule-changes/primary-frequency-response-incentive-arrangements">https://www.aemc.gov.au/rule-changes/primary-frequency-response-incentive-arrangements</a><br>AEMO FPP Project:<br><a href="https://aemo.com.au/initiatives/major-programs/frequency-performance-payments-project">https://aemo.com.au/initiatives/major-programs/frequency-performance-payments-project</a><br>AEMO FCFP Consultation:<br><a href="https://aemo.com.au/consultations/current-and-closed-consultations/frequency-contribution-factors-procedure">https://aemo.com.au/consultations/current-and-closed-consultations/frequency-contribution-factors-procedure</a><br>AEMO PFR Requirements Consultation:<br><a href="https://aemo.com.au/consultations/current-and-closed-consultations/primary-frequency-response-requirements">https://aemo.com.au/consultations/current-and-closed-consultations/primary-frequency-response-requirements</a>  |
|            | Operating Reserves   | AEMC Rule Change:<br><a href="https://www.aemc.gov.au/rule-changes/operating-reserve-market">https://www.aemc.gov.au/rule-changes/operating-reserve-market</a>  |
|            | Improving security frameworks for the energy transition                  | AEMC Rule Change:<br><a href="https://www.aemc.gov.au/rule-changes/improving-security-frameworks-energy-transition">https://www.aemc.gov.au/rule-changes/improving-security-frameworks-energy-transition</a>  |
|            | System Strength (Planning)   | AEMC Rule Change:<br><a href="https://www.aemc.gov.au/rule-changes/efficient-management-system-strength-power-system">https://www.aemc.gov.au/rule-changes/efficient-management-system-strength-power-system</a>  |
| TA         | Enhanced Information   | ESB Final Decision. Transmission Access Reform – Enhanced Locational Information. June 2023:<br><a href="https://www.datocms-assets.com/32572/1688514855-enhanced-locational-information-final-decision-paper.pdf">https://www.datocms-assets.com/32572/1688514855-enhanced-locational-information-final-decision-paper.pdf</a>   |

| Workstream | Reform Initiative   | Reference (link to rule change, market review, or latest ESB publication)  |
|------------|---|--|
|            |   | <p>ESB TAR Technical Working Group – Enhanced Locational Information. June 2023:<br/> <a href="https://www.datocms-assets.com/32572/1689922810-20230629-enhanced-locational-information-update.pdf">https://www.datocms-assets.com/32572/1689922810-20230629-enhanced-locational-information-update.pdf</a></p> <p>ESB Transmission Access Reform – Directions Paper November 2022:<br/> <a href="https://www.datocms-assets.com/32572/1667984730-tar-directions-paper-final-for-web.pdf">https://www.datocms-assets.com/32572/1667984730-tar-directions-paper-final-for-web.pdf</a></p> <p>ESB Transmission Access Reform Project Update:<br/> <a href="https://www.datocms-assets.com/32572/1677794660-transmission-access-reform-project-update.pdf">https://www.datocms-assets.com/32572/1677794660-transmission-access-reform-project-update.pdf</a></p>  |
|            | Congestion Relief Market & Priority Access Model                            | <p>ESB Transmission Access Reform – Directions Paper November 2022.<br/> <a href="https://www.datocms-assets.com/32572/1667984730-tar-directions-paper-final-for-web.pdf">https://www.datocms-assets.com/32572/1667984730-tar-directions-paper-final-for-web.pdf</a></p> <p>ESB Transmission Access Reform Project Update<br/> <a href="https://www.datocms-assets.com/32572/1677794660-transmission-access-reform-project-update.pdf">https://www.datocms-assets.com/32572/1677794660-transmission-access-reform-project-update.pdf</a></p> <p>ESB Transmission Access Reform – Consultation Paper May 2023:<br/> <a href="https://www.datocms-assets.com/32572/1682894111-esb-tar-consultation-paper-may-2023-final.pdf">https://www.datocms-assets.com/32572/1682894111-esb-tar-consultation-paper-may-2023-final.pdf</a></p> <p>ESB Transmission Access Reform – Prototype Models:<br/> <a href="https://esb-post2025-market-design.aemc.gov.au/transmission-and-access">https://esb-post2025-market-design.aemc.gov.au/transmission-and-access</a></p> <p>ESB Transmission Access Reform – Prototype Models User Guide:<br/> <a href="https://www.datocms-assets.com/32572/1688024524-tar-power-bi-dashboard-user-guide-final.pdf">https://www.datocms-assets.com/32572/1688024524-tar-power-bi-dashboard-user-guide-final.pdf</a></p> <p>ESB Technical Working Group:<br/> <a href="https://esb-post2025-market-design.aemc.gov.au/transmission-and-access#congestion-management-technical-working-group">https://esb-post2025-market-design.aemc.gov.au/transmission-and-access#congestion-management-technical-working-group</a></p> |
| DER & FD   | Integrating Energy Storage Systems  | <p>AEMC Rule Change Consultation:<br/> <a href="https://www.aemc.gov.au/rule-changes/integrating-energy-storage-systems-nem">https://www.aemc.gov.au/rule-changes/integrating-energy-storage-systems-nem</a></p> <p>AEMC Rule Change Consultation: <a href="https://www.aemc.gov.au/rule-changes/implementing-integrated-energy-storage-systems">https://www.aemc.gov.au/rule-changes/implementing-integrated-energy-storage-systems</a></p> <p>AEMO IESS Project:<br/> <a href="https://aemo.com.au/initiatives/submissions/integrating-energy-storage-systems-iness-into-the-nem">https://aemo.com.au/initiatives/submissions/integrating-energy-storage-systems-iness-into-the-nem</a></p>  |
|            | Unlocking Consumer Energy Resources (CER) benefits through flexible trading | <p>AEMC Rule Change Consultation:<br/> <a href="https://www.aemc.gov.au/rule-changes/unlocking-CER-benefits-through-flexible-trading">https://www.aemc.gov.au/rule-changes/unlocking-CER-benefits-through-flexible-trading</a></p>   |
|            | Integrating price responsive resources into the NEM                         | <p>AEMC Rule Change Consultation:<br/> <a href="https://www.aemc.gov.au/rule-changes/integrating-price-responsive-resources-nem">https://www.aemc.gov.au/rule-changes/integrating-price-responsive-resources-nem</a></p>   |
|            | Dynamic Operating Envelopes   | <p>ESB Final Advice to Ministers:<br/> <a href="https://www.datocms-assets.com/32572/1629944958-post-2025-market-design-final-advice-to-energy-ministers-part-a.pdf">https://www.datocms-assets.com/32572/1629944958-post-2025-market-design-final-advice-to-energy-ministers-part-a.pdf</a></p> <p>ESB Interoperability Policy Framework:<br/> <a href="https://esb-post2025-market-design.aemc.gov.au/integration-of-distributed-energy-resources-der-and-flexible-demand#development-of-interoperability-policy">https://esb-post2025-market-design.aemc.gov.au/integration-of-distributed-energy-resources-der-and-flexible-demand#development-of-interoperability-policy</a></p> <p>AER Review of regulatory framework for flexible export limit implementation:<br/> <a href="https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/review-of-regulatory-framework-for-flexible-export-limit-implementation">https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/review-of-regulatory-framework-for-flexible-export-limit-implementation</a></p> <p>AEMO Project Edge Fairness in DOE Objective Functions:<br/> <a href="https://aemo.com.au/-/media/files/initiatives/der/2023/the-fairness-in-dynamic-operating-envelope-objectives-report.pdf?la=en">https://aemo.com.au/-/media/files/initiatives/der/2023/the-fairness-in-dynamic-operating-envelope-objectives-report.pdf?la=en</a></p>  |
|            | Distribution Local Network Services   | <p>ESB Final Advice to Ministers:</p>  |

| Workstream           | Reform Initiative                                 | Reference (link to rule change, market review, or latest ESB publication)  |
|----------------------|---|--|
|                      |   | <a href="https://www.datocms-assets.com/32572/1629944958-post-2025-market-design-final-advice-to-energy-ministers-part-a.pdf">https://www.datocms-assets.com/32572/1629944958-post-2025-market-design-final-advice-to-energy-ministers-part-a.pdf</a><br>ESB CER Implementation Plan:<br><a href="https://www.datocms-assets.com/32572/1629954551-esb-final-report-explainer-clean-and-smart-power-der-pathway.pdf">https://www.datocms-assets.com/32572/1629954551-esb-final-report-explainer-clean-and-smart-power-der-pathway.pdf</a><br>AEMO Project Edge:<br><a href="https://aemo.com.au/en/initiatives/major-programs/nem-distributed-energy-resources-der-program/der-demonstrations/project-edge">https://aemo.com.au/en/initiatives/major-programs/nem-distributed-energy-resources-der-program/der-demonstrations/project-edge</a>  |
|                      | DER Data Hub and Registry Services                | As above   |
|                      | DER Operational Tools                             | As above   |
| <b>Data Strategy</b> | Data Services                                     | ESB Consultation Paper – Data Services:<br><a href="https://www.datocms-assets.com/32572/1671059508-esb-data-services-delivery-model-consultation-paper-december-2022.pdf">https://www.datocms-assets.com/32572/1671059508-esb-data-services-delivery-model-consultation-paper-december-2022.pdf</a><br>ESB National Energy Laws Amendment (Data Access) Bill 2023:<br><a href="https://www.datocms-assets.com/32572/1681166642-esb-data-strategy-initial-reforms-draft-bill-april-2023.pdf">https://www.datocms-assets.com/32572/1681166642-esb-data-strategy-initial-reforms-draft-bill-april-2023.pdf</a><br>ESB Data Services Policy Position Paper:<br><a href="https://www.datocms-assets.com/32572/1688102997-esb-data-strategy-initial-reforms-policy-positions.pdf">https://www.datocms-assets.com/32572/1688102997-esb-data-strategy-initial-reforms-policy-positions.pdf</a>                                |
|                      | Electric Vehicles Charging Standing Data Register | ESB Electric Vehicle Supply Equipment Standing Data – Consultation Outcomes Report June 2023:<br><a href="https://www.datocms-assets.com/32572/1688103470-attachment-b-evse-standing-data-consultation-paper-final-june-2023.pdf">https://www.datocms-assets.com/32572/1688103470-attachment-b-evse-standing-data-consultation-paper-final-june-2023.pdf</a><br>ESB Consultation Paper – EVSE Standing Data:<br><a href="https://www.datocms-assets.com/32572/1670367035-esb-electric-vehicle-supply-equipment-standing-data-consultation-paper-december-2022.pdf">https://www.datocms-assets.com/32572/1670367035-esb-electric-vehicle-supply-equipment-standing-data-consultation-paper-december-2022.pdf</a><br>ESB Data Strategy:<br><a href="https://www.datocms-assets.com/32572/1630275857-esb-data-strategy-july-2021.pdf">https://www.datocms-assets.com/32572/1630275857-esb-data-strategy-july-2021.pdf</a> |
|                      | Bill Transparency                                 | ESB Data Strategy:<br><a href="https://www.datocms-assets.com/32572/1630275857-esb-data-strategy-july-2021.pdf">https://www.datocms-assets.com/32572/1630275857-esb-data-strategy-july-2021.pdf</a><br>ESB Consultation Paper – Billing Transparency:<br><a href="https://www.datocms-assets.com/32572/1688619055-esb-billing-transparency-consultation-paper-final-july-2023.pdf">https://www.datocms-assets.com/32572/1688619055-esb-billing-transparency-consultation-paper-final-july-2023.pdf</a>   |
|                      | Network Transparency                              | ESB Data Strategy:<br><a href="https://www.datocms-assets.com/32572/1630275857-esb-data-strategy-july-2021.pdf">https://www.datocms-assets.com/32572/1630275857-esb-data-strategy-july-2021.pdf</a><br>ESB Consultation Paper – Benefits of increased visibility of networks:<br><a href="https://www.datocms-assets.com/32572/1688618798-esb-network-visibility-consultation-paper-final-july-2023.pdf">https://www.datocms-assets.com/32572/1688618798-esb-network-visibility-consultation-paper-final-july-2023.pdf</a><br>AER Consultation webpage:<br><a href="https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/network-visibility">https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/network-visibility</a>   |