The new frontier for Australia's power systems

CIGRE Australia

Nicola Falcon, EGM System Design

2 September 2025

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

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

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

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

Read our RAP

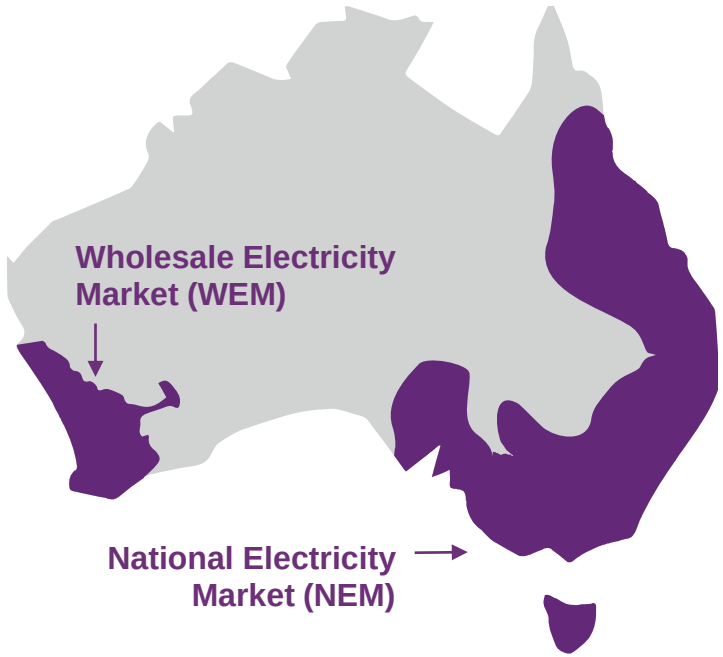
Today's discussion

1. About AEMO
2. A view from the control room
3. Planning for the new frontier

About AEMO

- AEMO is a member-based, not-for-profit organisation.
- We are the independent energy market and system operator for the National Electricity Market (NEM) and the WA Wholesale Electricity Market (WEM), and system planner for the NEM.
- We also operate retail and wholesale gas markets across south-eastern Australia and Victoria's gas pipeline grid.

Electricity



Gas

Declared Wholesale Gas Market (DWGM)

Short Term Trading Market (STTM)

and

Gas Supply Hub (GSH)

What we do

Operate energy systems:

Ensuring secure and reliable energy supply on Australia's main electricity systems, and the Victorian gas transmission system.

Operate energy markets:

Operating the National Electricity Market (NEM) and Wholesale Electricity Market (WEM) which dispatch energy and essential system services every 5-minutes, as well as wholesale gas markets and trading hubs in Eastern Australia.

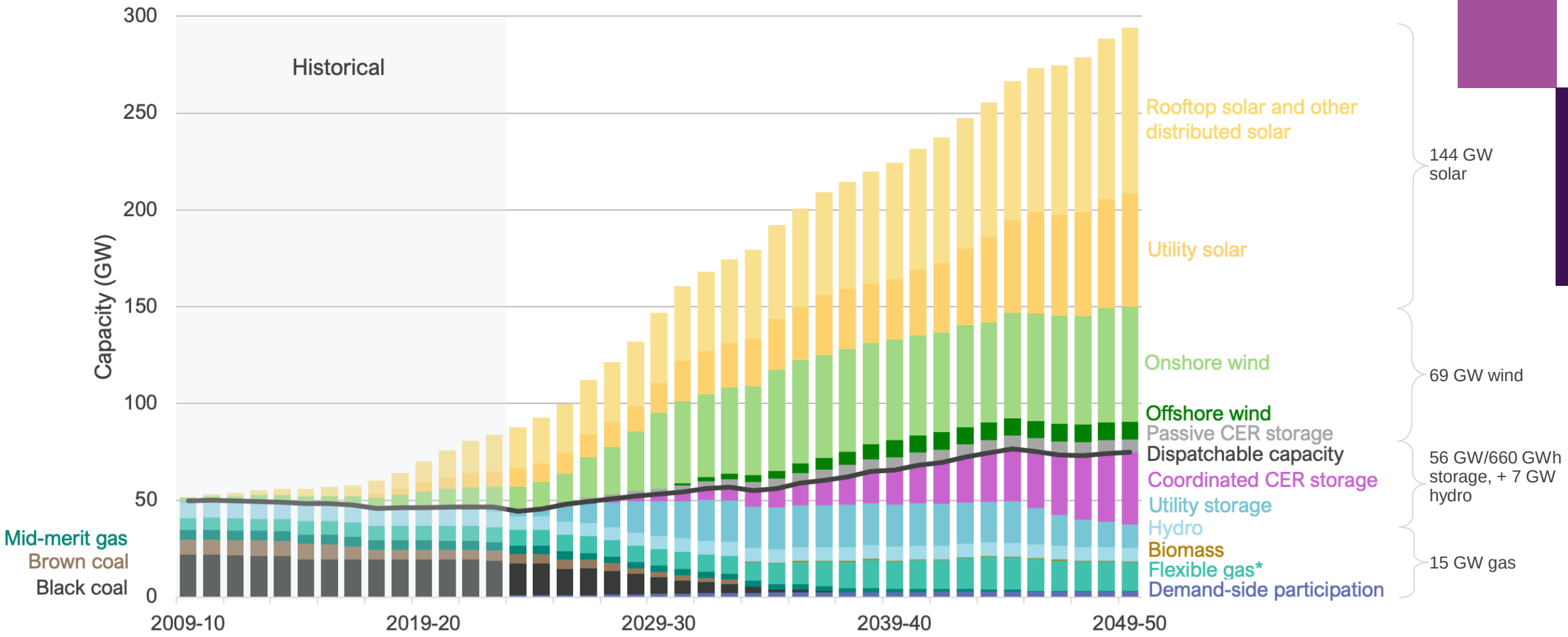
Plan and enable future energy systems:

Identifying the investments needed to ensure secure and reliable electricity and gas to Australian consumers and meet Government energy and emissions targets into the future.

Support new investment:

Provide information to inform decision making, and deliver tenders for energy infrastructure for federal and state energy investment schemes.

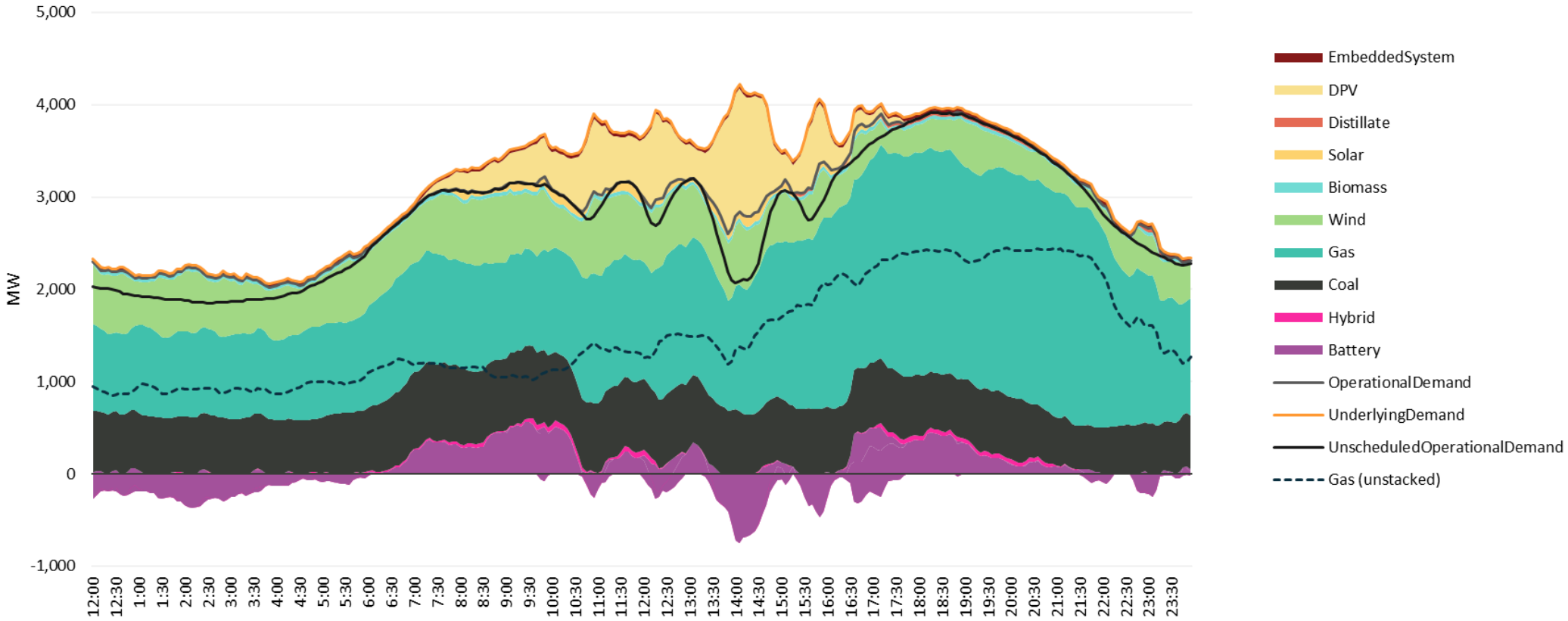
The transition is well underway



Source: Integrated System Plan 2024

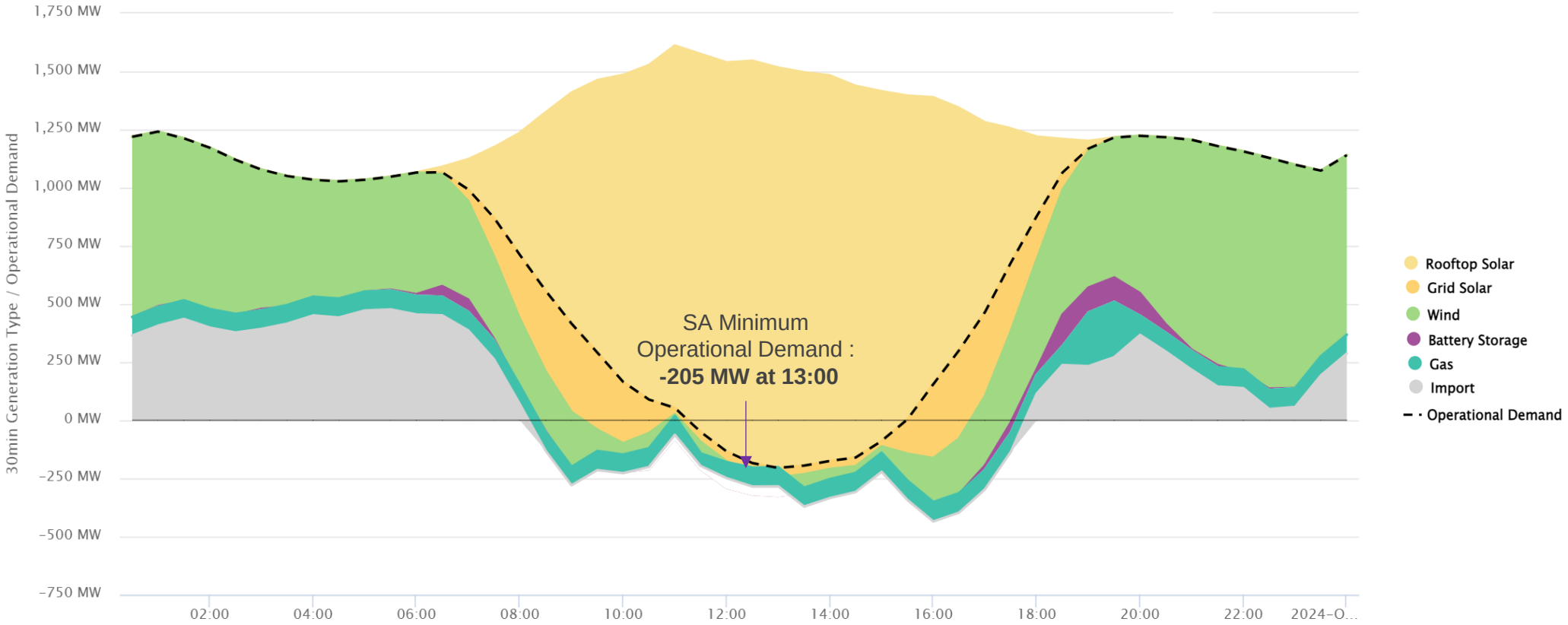
Transition challenge – storage coordination and ramping

Western Australia 25 August 2025



Transition challenge – negative operational demand

South Australia 19 October 2024



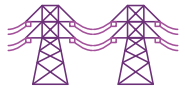
2025 GPSRR priority risks

AEMO's annual General Power System Risk Review (GPSRR) of the current and emerging risks in the NEM have identified four priority risks.

Inverter-based resource (IBR) response to remote frequency events.

Minimum system load (MSL).

Unexpected operation and interaction of protection systems and control schemes.



Increasing risks of non-credible contingencies.

Insights from Iberian Peninsula

International collaboration provides key learning opportunities to understand the increasing system complexity as it transitions

Voltage & Reactive Power Control

Adequate Levels of dynamic reactive power control are required to manage voltage.

Protection Coordination

Insufficient coordination can lead to simultaneous actions on the power system

Oscillations

Operator responses to manage oscillations can create exposure to other system events

Criticality of Compliance

Appropriate performance standards and compliance frameworks are essential to pre–empting events

Defence Schemes

A vital control in preventing cascading failure

Restoration

System Operator must have visibility and co-ordinate effectively to enable an efficient system restart

Combining AEMO security reports

TPSS

Transition plan for system security

AEMO's understanding of how to keep the power system secure through the energy transition. Now to 10+ years

Preparation for upcoming transition points. Outlining work to define capabilities and progress understanding across three time-horizons

Network security planning reports

NSCAS report

Assessment of NSCAS needs for a 5-year outlook (plus system strength & inertia over 3-years)

Identifies security investment needs and gaps

System strength report

System strength requirements for a 10-year outlook, including minimum fault levels, and the efficient level of system strength.

Identifies system strength requirements and project VRE for 10 years.

Inertia report

Inertia requirements for a 10-year outlook, for use when planning for both normal and islanded operation

Identifies inertia requirements and project inertia for 5-year outlook

Four system security planning functions will be combined into one report for release in December 2025

System security investment options

Synchronous plant is needed – particularly for fault current and can be configured to provide multiple services for efficiency

Contracts with existing synchronous units (hydro, coal, gas)

New synchronous condensers – with fly wheels for inertia

Gas turbines fitted with clutches, and/or the retrofit units to operate as synchronous condensers when needed and include system restart capability

Inverter based resources will also help – trials to confirm capability and improving technology

Grid forming technology

Coordination of consumer energy resources

National CER Roadmap

Workstreams with AEMO contribution

[T1] Nationally consistent standards

Objective: Identify device requirements for interoperability standards, relevant candidate standards and gaps in standards

[T2] National regulatory framework for CER

Objective: Identify and develop legislation to implement a regulatory framework that incorporates setting CER technical standards.

[M2] Data sharing arrangement

Objective: Identify the practical underpinning of Data required across devices, actors and between actors to perform their roles.

[M.3, P.5] Redefine roles for market and power system operations

Objective: Define and assign clear roles, expectations, and accountabilities for distribution system and market operations in a high CER future.

AUSTRALIAN ENERGY MARKET OPERATOR

For more information visit

aemo.com.au