THE NATIONAL ELECTRICITY MARKET RELIABILITY & SECURITY REPORT

FY2025

21 MAY 2026

RELIABILITY PANEL AEMC

Inquiries

Reliability Panel
Australian Energy Market Commission
Level 15, 60 Castlereagh Street
Sydney NSW 2000
E aemc@aemc.gov.au
T (02) 8296 7800

Reference: REL0096

About the Reliability Panel
The Reliability Panel (the Panel) is a specialist body within the Australian Energy Market Commission (AEMC), and it comprises the Australian Energy Market Operator (AEMO), industry and consumer representatives. It is responsible for monitoring, reviewing and reporting on the reliability, security and safety of the national electricity system, and advising the AEMC on these matters. The Panel's responsibilities are specified in section 38 of the National Electricity Law.

Acknowledgement of Country

The AEMC acknowledges and shows respect for the traditional custodians of the many different lands across Australia on which we all live and work. We pay respect to all Elders past and present and the continuing connection of Aboriginal and Torres Strait Islander peoples to Country. The AEMC office is located on the land traditionally owned by the Gadigal people of the Eora nation.

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Reliability Panel members

Rainer Korte (Chair), Commissioner, AEMC
Sally McMahon (Acting Chair), Commissioner, AEMC
Stewart Bell – Transmission Network Service Provider Representative
Suzanne Falvi – Market Customer Representative
Joel Gilmore – Discretionary Representative, Large Renewable Generators
Ken Harper – AEMO Representative
Craig Memery – End use customer Representative
Melissa Perrow – Discretionary Representative, Large Energy Users
Damien Sanford – Generator Representative
Mark Vincent – Distribution Network Service Provider Representative

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EXECUTIVE SUMMARY

KEY INSIGHTS & IMPLICATIONS

The Reliability Panel's (the Panel) National Electricity Market (NEM) Reliability & Security Report (RASR) covers the period from 1 July 2024 to 30 June 2025.[1] The Panel has found that the NEM has continued to maintain adequate levels of reliability and security during this period and has identified four key insights & implications arising from its analysis.

1 **The NEM has continued to maintain high levels of reliability. However, timely investment in new generation capacity, storage, networks and essential system services is needed before coal generation retirements.**

2 **Recent regulatory reforms to strengthen system security appear to be addressing immediate challenges. Ongoing focus is required to keep pace with evolving system security requirements.**

3 **CER is a growing factor in delivering a reliable and secure power system. Effectively leverageing CER is essential if we are to efficiently maintain a reliable and secure power system.**

4 **Varying wholesale prices, including intraday price swings, mean we need a range of different technologies and business models to meet power system needs.**

1. The National Electricity Market Reliability & Security Report has previously been known as the Annual Market Performance Review. It fulfils the Panel's obligations under the AEMC's terms of reference.

1 The NEM has continued to maintain high levels of reliability. However, timely investment in new generation capacity, storage, networks and essential system services is needed before coal generation retirements.

The Panel found that the NEM has continued to maintain high levels of reliability. Despite one instance of unserved energy (USE) in FY2025 resulting from a load-shedding event in Northern NSW on 8 July 2024, the reliability standard was still met.2

Timely entry of new assets is crucial

At the end of FY2025, there was a total of 25.94 GW of committed and anticipated projects.3 AEMO's Integrated System Plan (ISP) provides guidance on the transmission projects needed to support the transition.4

However, these projects face challenges progressing from proposed to anticipated to committed and finally reaching commissioning. For example, challenges can include planning and approval delays and supply chain and construction constraints.

Delays in the construction of key generation and transmission infrastructure may result in the delay of coal exits, primarily to ensure power system security can be maintained until adequate replacement assets are complete.

Coordination of key assets will support both reliability and security

- Along with ensuring there are sufficient total resources for reliability, there must also be sufficient system security services to support the energy transition.
- System security often relies on specific assets to meet specific system security needs. Delays to these key assets can have significant flow-on effects for other projects and power system outcomes, and may require delaying coal exits until there is sufficient system security services. Work being done on this is discussed in the next slide.

Work is underway to support timely investment in new assets

- The ISP, supplemented by the Transition Plan for System Security (TPSS), continues to provide a clear roadmap for the transition of the NEM over at least the next 20 years and is continually evolving to better reflect power system realities.
- The NEM review final report made several recommendations, agreed to in-principle by Energy Ministers, to promote investment in firmed, renewable generation and storage capacity in the NEM.[5]
- Jurisdictions are investing in REZ schemes to support new wind generation and the transmission infrastructure to enable that generation access to the market.

For further information, see:

- Slide 19 on expected USE.
- Slide 22 on the investment pipeline.
- Slide 23 on the planned coal generator exits.

2. The reliability standard in the NEM is a measure that expresses the efficient level of unserved energy given the trade-off between the cost of investing in power system resources and the value that customers attach to a more reliable power system. See Reliability Panel, *RASR FY2025 – Explanatory Statement*, May 2025.
3. For scale, all of the 21.3GW of existing coal generation in the NEM is scheduled to close before 2050.
4. AEMO, Draft 2026 Integrated System Plan, December 2025.
5. The NEM final report identified a coordinated set of supporting reforms that governments, energy ministers and market bodies should pursue, including recommendations 10, 11 and 12, which look at establishing an Electricity Services Entry Mechanism (ESEM) to facilitate investment in the NEM. See NEM review final report. DCCEEW, *National Electricity Market wholesale market settings report*, December 2025.

2 Recent regulatory reforms to strengthen system security appear to be addressing immediate challenges. Ongoing focus is required to keep pace with evolving system security requirements.

The Panel found that regulatory reforms (some implemented only recently), investment in key assets, and enhanced technical understanding of the power system have improved system security outlook in the NEM. The focus on these issues should continue as the transition continues.

Changing generation mix

- The transition away from a thermal-dominated, synchronous system towards an inverter-based variable renewable energy (VRE) and battery-dominated system continues to accelerate. With 8.3 GW of renewable generation added to the NEM in FY2025, it now represents ~65% of the total installed capacity in the NEM.
- As well as new replacement capacity, timely investment in critical system services is necessary to maintain system security throughout the transition.

Regulatory reforms have improved system security

- System security requirements are now better understood and pressing issues relating to frequency control, system strength and inertia, are being addressed by a series of reforms that are at different stages of implementation and maturity.[6]
- Further improvements to the frameworks for system security are being considered by the AEMC as part of two rule change requests from AEMO and the AEC and CEC.[7] The problems raised concern how the frameworks are operating to date, particularly with respect to their experiences implementing updates to the system strength and inertia frameworks over the last five years.

Minimum system load (MSL) is a growing challenge

- Rising residential solar photovoltaics (PV), which continue to generate even when there is limited demand, is causing low operational demand conditions to grow in most regions. Active operational management is increasingly required to maintain system security. Frameworks to effectively manage MSL conditions are being formalised and refined to mitigate future risks and costs.
- As part of its latest Reliability Standard and Settings Review (RSSR) the Panel submitted a rule change request to the AEMC proposing that the market automatically *clear* at the market price floor during MSL3 conditions.[8] The AEMC has also received a rule change request to introduce an MSL reserve service.[9]

System security must be actively maintained during the transition

- Ongoing management of essential system services is needed to ensure the power system remains secure throughout the energy transition.

For further information, see:

- Slides 23-24 on installed capacity of generation and batteries.
- Slide 38 on MSL.
- Slide 58 on frequency performance.
- Slide 63 on security interventions.

6. These include Efficient management of system strength on the power system, Mandatory primary frequency response, Primary frequency response incentive arrangements, Fast frequency response market ancillary services, Improving security frameworks for the energy transition, Efficient provision of inertia, and a range of other reforms to improve system security frameworks in recent years.
7. Australian Energy Council (AEC) and Clean Energy Council (CEC) Rule change proposal: *Clarity and transparency in security frameworks*; and AEMO Rule change proposal: *Security framework enhancements*.
8. Reliability Panel, *2026 Reliability Standard and Settings Review*, April 2026.
9. CEC Rule change request: *Minimum system load reserve service*.

3 CER is a growing factor in delivering a reliable and secure power system. Effective leverage of CER is essential if we are to efficiently maintain a reliable and secure power system.

The Panel found that distributed solar and batteries are a growing factor when considering the reliability and security of the power system, and that leveraging consumer energy resources (CER) to align with system needs is now fundamental to achieving efficient outcomes.

Distributed solar and battery uptake is accelerating

- FY2025 saw the continued uptake of solar PV and largest increase in distributed battery storage with 402 MW installed in up from 285 MW in FY2024.[10]
- Battery storage will help to manage minimum demand. However, Rooftop PV is still growing faster than distributed battery storage.
- Distributed battery storage uptake has accelerated with the introduction of the Cheaper home battery scheme in July 2025.[11]

CER continues to challenge reliability and security

- Regional demand continues to feature more variation between daily minimum and maximum demand and steepening duck curves. Low-demand conditions driven by solar PV generation in the middle of the day, are increasingly requiring active operational management to maintain system security.
- This indicates that despite increased battery capacity and emerging attempts to leverage CER, this is not yet aligning with power system needs at a scale necessary to support reliability & security.
- Increasing uptake of CER is also competing with large-scale investments in firmed renewables that respond to system needs through energy and FCAS markets.

Leveraging CER is essential for reliability and security

- Incentivising or actively coordinating the use of CER to align with power system needs can provide system and consumer benefits.
- However, the uptake of CER has been faster than the regulatory reform needed to support widespread coordination of CER (for example, through virtual power plants (VPPs) or the development of incentives and tools to leverage them in other ways). Limited availability and consumer awareness and trust in the products and services available mean that many potential benefits are not yet being captured.
- Work is underway through the National CER Roadmap and other industry and jurisdictional government initiatives to improve coordination and integration of CER into the market and power system.[12]
- The Panel emphasises that incentivising CER use to be aligned with power system needs is now a fundamental part of maintaining a reliable, secure but also efficient power system. Work to effectively leverage CER to achieve consumer and power system benefits is a high priority and must be progressed at speed.

For further information, see:

- Slide 21 on CER.
- Slides 24-27 on diurnal demand curves.
- Slide 38 on MSL.

10. The Panel has used data from AEMO's distributed energy resources (DER) register to inform reporting. The register does not distinguish between community batteries and small-customer batteries if both types of batteries meet the NER definition of a 'small bidirectional unit', which our reporting data does. For the purpose of this report, DER includes CER.
11. The cheaper home batteries program commenced on 1 July 2026, funded by the Federal Government and delivered as part of the small-scale renewable energy scheme (SRES). This has significantly increased distributed battery installations. The latest data indicates that 1652.4 MW of distributed battery storage has been installed to date in FY26 (figures reported in March 2025).
12. For further information, see Department of Climate Change, Energy, the Environment and Water, National CER Roadmap, 19 July 2024 and the implementation plan update published in August 2025.

4 Varying wholesale prices, including intraday price swings, mean we need a range of different technologies and business models to meet power system needs.

The Panel found that increased wholesale prices in FY2025 reflect a return to tighter market conditions driven by coincident demand, supply and network stresses. This provides opportunities for investment in new capacity to support ongoing reliability and security.

Prices act as an investment signal

- High prices act as a critical investment signal, indicating when and where the system needs new generation or network capacity or investment in system services to meet power system needs.
- The drivers of price increases were different in each region, indicating investment opportunities for a range of different technologies and business models. For example:
  - Peak price events encourage investment in fast response generation technologies like battery storage and gas.
  - Intraday price swings largely caused by variable renewable energy are a key investment driver for batteries and energy storage.
  - Higher average prices encourage investment in generation that can provide consistent output across the day and night like firmed renewables or portfolios of generation in diverse geographical locations.
  - High prices driven by high demand encourage investment in CER and other technologies that can help reduce or manage demand, especially during hot or cold weather events.

Extreme prices decreased but price variation remains

- Extreme price events continued to decline in FY2025, with fewer market price cap (MPC) and market price floor (MPF) events occurring.
- However, more moderate price variation remains, with the frequency of high price periods and negative price periods increasing compared to FY24.
- The combination of low daytime prices and higher peak-period prices is one reason we are seeing investment in storage technologies that can shift energy supply.
- We will continue to monitor these impacts.

For more information, see:

- Slide 21 on CER.
- Slides 42-45 on the volume weighted average price.
- Slide 46 on the market price cap and market price floor.
- Slide 47 on negative pricing periods.

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1

INTRODUCTION

THE PANEL ASSESSES THE SAFETY, SECURITY & RELIABILITY OF THE NATIONAL ELECTRICITY SYSTEM

The functions and powers of the Panel are set out in section 38 of the National Electricity Law (NEL). Among other things, the Reliability Panel (Panel) is required to:

- Monitor, review, and report on, in accordance with the National Energy Rules (NER), the safety, security and reliability of the national electricity system
- At the request of the AEMC, to provide advice in relation to the safety, security, and reliability of the national electricity system
- Undertake any other functions and powers conferred on it under the NEL and the NER.

Consistent with the functions of the NEL, clause 8.8.3(b) of the NER requires the Panel to conduct a review of the performance of certain aspects of the market, at least once every financial year and at other times as the AEMC may request.

The Panel must conduct its annual review in terms of:

- Reliability of the power system
- Power system security and reliability standards
- The system restart standard
- The guidelines referred to in clause 8.8.1(a)(3) of the NER[13]
- The policies and guidelines referred to in clause 8.8.1(a)(4) of the NER[14]
- The guidelines referred to in clause 8.8.1(a)(9) of the NER.[15]

The Panel must conclude each annual review no later than the financial year following the financial year to which the review relates.

13. The guidelines referred to in clause 8.8.1(a)(3) of the NER govern how AEMO exercises its power to issue direction in connection with maintaining or re-establishing the power system in a reliable operating state.
14. The policies and guidelines referred to in clause 8.8.1(a)(4) of the NER govern how AEMO exercises its power to enter into contracts for the provision of reserves.
15. The polices and guidelines referred to in clause 8.8.1(a)(9) of the NER identify, or provide for the identification of, operating incidents and other incidents that are of significance for the purposes of the definition of 'reviewable operating incident' in clause 4.8.15 of the NER.

THE RASR IS CONDUCTED UNDER TERMS OF REFERENCE ISSUED BY THE AEMC

The Panel's National Electricity Market Reliability & Security Report (RASR) responds to the Panel's annual review requirements. It is published annually and provides analysis on the reliability and security of the power system across the financial year.

The AEMC may provide the Panel with standing terms of reference for the review.[16] These terms of reference set out the purpose, scope and timing for the annual review.

This report covers the 2024-25 financial year (FY2025). The Panel has undertaken the FY2025 RASR in accordance with the NER requirements and the terms of reference issued by the AEMC.[17]

The terms of reference requested that the Panel:

- review the performance of the market in terms of reliability and security of the power system; and
- provide advice in relation to the reliability and security of the power system.

In December 2025, the RASR terms of reference were updated to include the requirement to monitor and report on metrics that affect the potential economic benefits of operationally procuring inertia.[18] The requirement to report on safety was removed.

16. Clause 8.8.3(c1) of the NER.
17. The current terms of reference from the AEMC in relation to this review can be found at: AEMC, Reliability & security report, *AEMC Terms of reference to the Reliability Panel,* 3 December 2025.
18. This followed a decision by the AEMC in October 2025 not to introduce a new operational procurement mechanism for inertia. More information can be found on slides 64-69.

AN EXPLANATORY STATEMENT ACCOMPANIES THE RASR

The Panel also annually publishes an explanatory statement to accompany the RASR, titled: Reliability, Security and Safety Frameworks in the NEM — an explanatory statement.

The explanatory statement sets out the:

- Role of the Panel and RASR process
- Frameworks used to deliver power system reliability, security and safety in the NEM
- Set of metrics used by the Panel to monitor and report on reliability and security outcomes in the NEM for the purposes of RASR reporting.

The explanatory statement is intended to be a companion document and should be read in conjunction with the RASR. It also serves as an explanatory report for those interested in understanding more about the current frameworks.[19]

19. The explanatory statement can be found at: https://www.aemc.gov.au/sites/default/files/2026-05/rasr_fy2025_-_explanatory_statement.pdf

THE RASR FY2025 IS DIVIDED INTO THREE MAIN CHAPTERS

As noted, the Panel has undertaken this review in accordance with the requirements in the NER and the terms of reference issued by the AEMC. The AEMC requested that the Panel review the performance of the NEM in terms of reliability and security of the power system.

In this report, the Panel has considered the following definitions of reliability and security in relation to the power system:[20]

- **Reliability** — There is enough capacity (generation, demand response and networks) to supply customers
- **Security** — It is able to operate within defined technical limits, even if there is an incident such as the loss of a major transmission line or large generator.

For more exhaustive definitions of the above, please refer to the explanatory statement.

This report is divided into three main chapters, which consider:

- **Reliability**: The Panel has reviewed the reliability performance of generation and bulk transmission (i.e. interconnection), including:
  - Current and historic NEM reliability performance
  - Forward-looking reliability risks
  - NEM Reserve level events and constraint impacts
  - AEMO interventions for reliability, and Reliability and Emergency Reserve Trader (RERT)
  - Market price signals and investment incentives.
- **Security**: The Panel has reviewed the performance of the power system against the relevant technical standards. In particular, the Panel has had regard to:
  - Power system security incidents/risk management
  - Management of power system security risks
  - Frequency performance
  - AEMO interventions for security
  - System services procurement and use.
- **Key market events**: The Panel has considered key events relevant to FY2025.

Taken together, this report provides key insights and observations on the reliability and security of the power system throughout the reporting period.

20. For more exhaustive definitions, see the explanatory statement.

2

RELIABILITY PERFORMANCE

2.1

INVESTMENT TRENDS AND IMPLICATIONS FOR RELIABILITY

- There was no breach of the reliability standard or interim reliability measure in FY2025; however, the ESOO forecasts future reliability gaps from FY2030 without more investment.
- FY2025 saw a significant increase in both utility-scale and distributed renewable generation and battery storage.
- Generation, storage and transmission projects face delays and other challenges transitioning from proposed and anticipated stages to committed. This could impact future reliability.

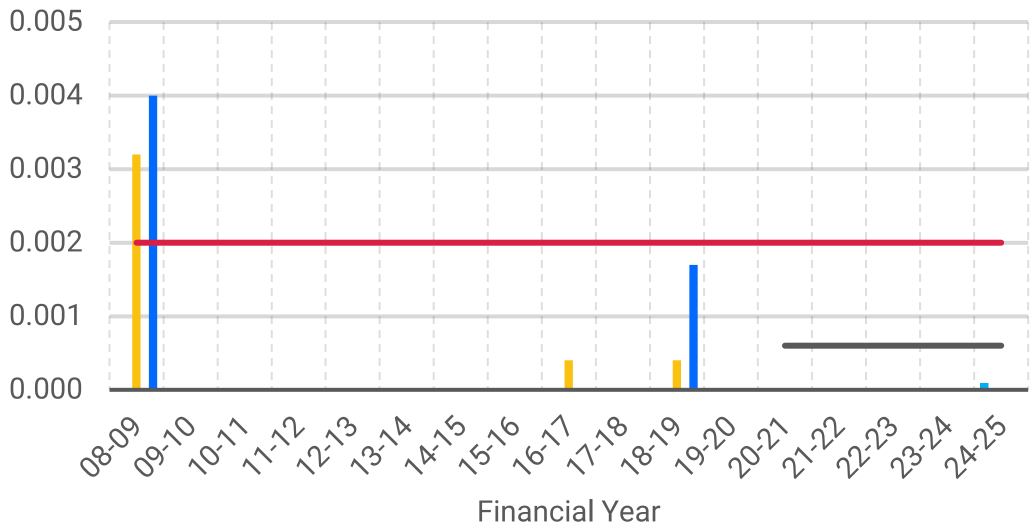
THE NEM CONTINUES TO DELIVER HIGH LEVELS OF RELIABILITY

More investment is needed in advance of coal exits to support long-term reliability goals.

- There was a small amount of actual USE (0.000094%) that occurred from a load shedding event in Northern NSW on 8 July 2024; this is the only USE recorded since 2019. All other regions had no USE.[21]
- Expected USE is modelled from AEMO's 2025 Electricity Statement of Opportunities (ESOO), based on the current committed and anticipated projects (allowing for historically observed commissioning delays).[22] While reliability gaps are shown from 2029-30, the purpose of publishing this information is to incentivise additional investment in time to address these gaps.
- AEMO uses data available at the time of ESOO reporting to highlight opportunities for new investments to address these gaps. [23]

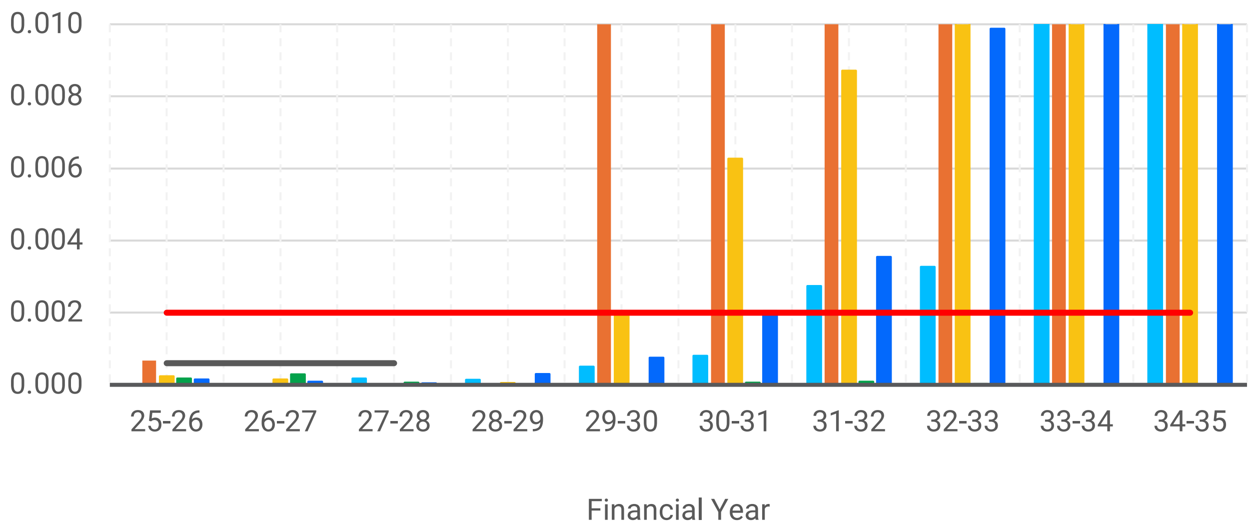
Actual USE

Actual unserved energy (%)



Expected USE based on committed and anticipated projects

Expected unserved energy (%)



Source: Panel analysis of AEMO data.

21. Unserved energy is defined as the amount of wholesale unserved energy that is relevant for the purposes of reporting on the reliability standard. For more information on the definition, see: The Reliability Panel, *Definition of Unserved Energy*, August 2019.

22. The ESOO forecast USE data provides a long-term (10-year) outlook and will typically differ from the MT PASA, which uses different modelling inputs and captures short-term operational risks (3-year outlook).

23. Following an October update to the 2025 ESOO, the forecast reliability risks in SA in 2026-27 are now lower and within the relevant reliability standard, due to the advised extension of three units of Torrens Island B. See AEMO, *October 2025 Update to the 2025 ESOO*, October 2025.

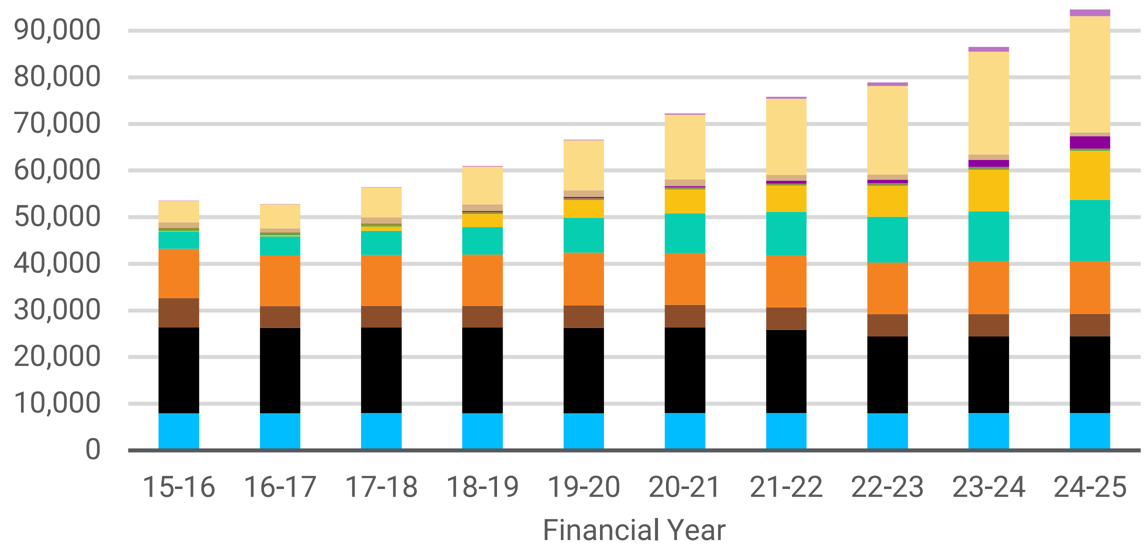
FY2025 SAW A SIGNIFICANT INCREASE IN UTILITY SCALE RENEWABLES

While utility-scale generation accounted for a greater proportion of new capacity in FY2025, investment in distributed solar continues to dominate over time with distributed battery investment expected to follow suit.

- Total capacity in the NEM continued to grow in FY2025 to 94.6 GW. This represents a 9.32% increase from FY2024.
- Utility-scale renewable generation contributed 5 GW (59%) of new capacity. This included 1.6 GW of solar, 1.08 GW of batteries, and 2.4GW of wind, representing a 14.4% increase in total renewable utility-scale capacity, above the 10.5% average over the past 5 years.
- Distributed solar and batteries contributed 3.3 GW (39%) of new capacity and continues to play an increasingly significant role
- At the end of FY2025, renewable energy sources comprised approximately 65% of the total installed capacity in the NEM.

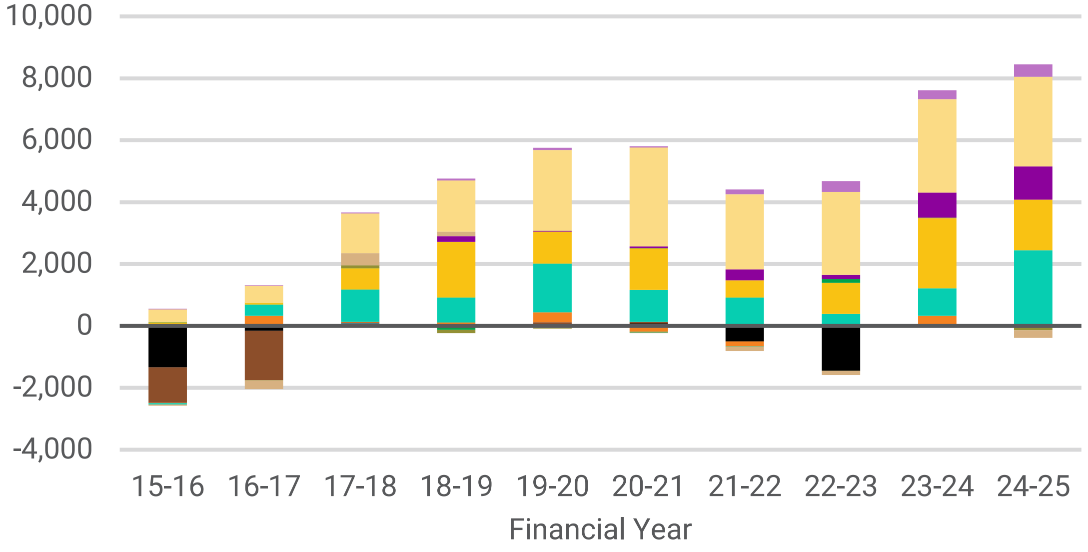
Installed capacity by financial year

Installed capacity (MW)



Installed generation changes by financial year

Installed capacity (MW)



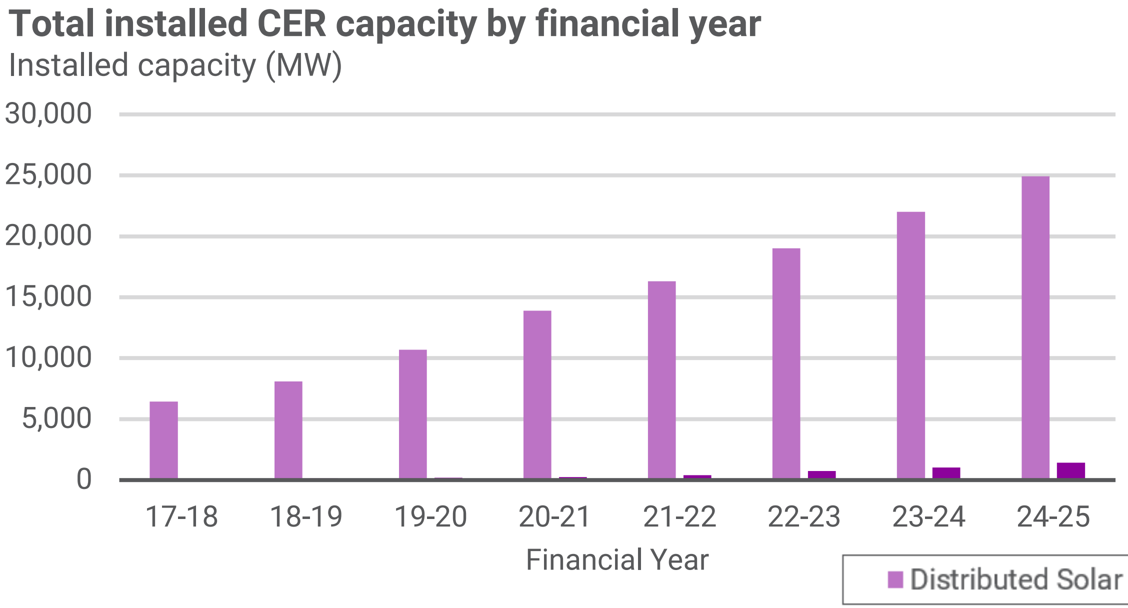
Hydro, Black Coal, Brown Coal, Gas, Wind, Solar, Biogas, Biomass, Battery, Other, Distributed Solar, Distributed Battery

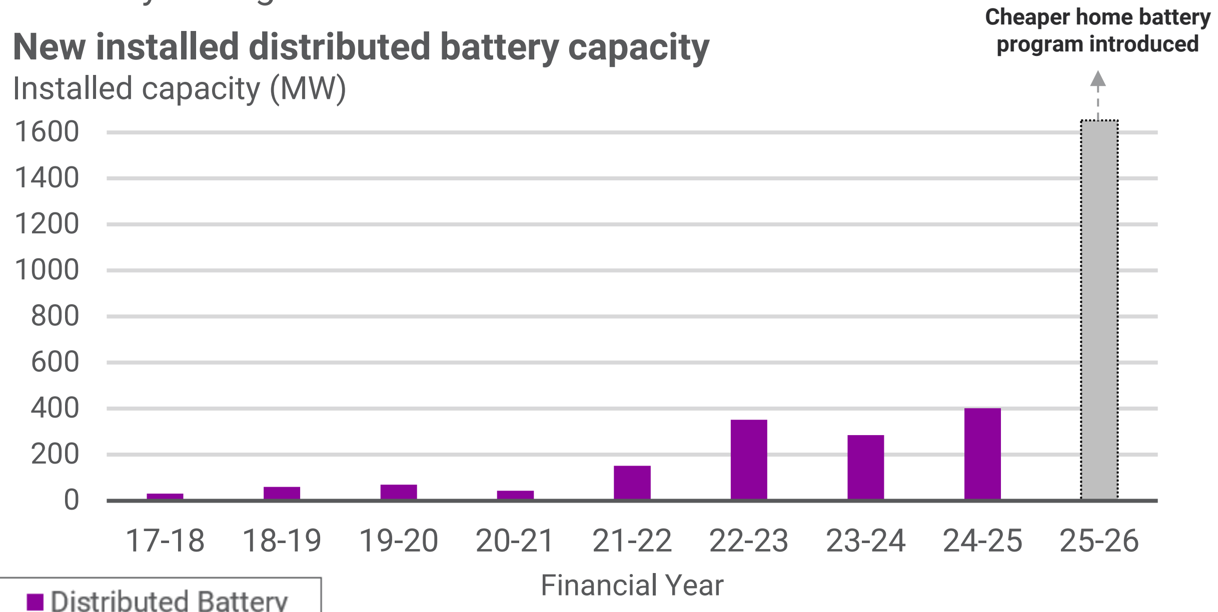
Source: AEMO, NEM Generation Information, July 2025.

DISTRIBUTED BATTERY INSTALLATIONS INCREASED FROM FY2024 AND THIS TREND IS EXPECTED TO ACCELERATE

The customer relationship with reliability is evolving as an increasing number of customers can use CER to partly offset their reliance on grid-scale resources, potentially reducing those customer's implied value of customer reliability.

- 402 MW of distributed battery storage was installed in FY2025, up from 285 MW in FY2024.[24] This is the largest increase in distributed battery storage to date, bringing the total distributed battery capacity to 1,432 MW.[25]
- The increased number of distributed batteries has the potential to reduce strain on the system during times of high and low operational demand. However, they are not currently being coordinated at scale through VPPs or otherwise incentivised to support efficient system outcomes or to maximise consumer benefits.
- Together, this represents a 14% increase in total installed CER capacity compared to the previous year.
- The panel notes that the cheaper home batteries program was introduced in FY26; this has significantly increased distributed battery installations. The latest data indicates that 1652.4 MW of distributed battery storage has been installed to date in FY26.[26]





Source: Clean Energy Regulator, Small-scale installation postcode data (distributed solar), July 2025; AEMO, DER data downloads, July 2025 (distributed batteries).

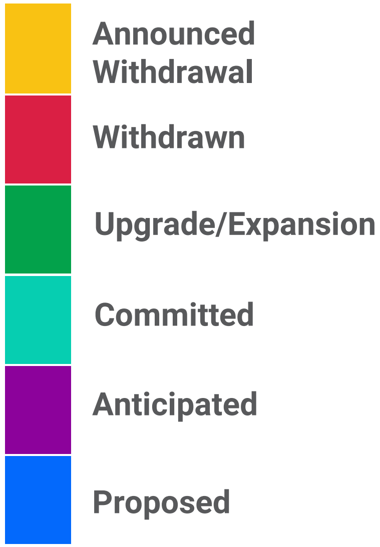
24. The 'New installed distributed battery capacity (change)' graph contains revised data for the FY2024 year. The previous report included an error in the reported figures/graph.
25. The Panel has used data from AEMO's Distributed Energy Resources (DER) register to inform reporting. The register does not distinguish between community batteries and small-customer batteries if both types of batteries meet the NER definition of a 'small bidirectional unit', which our reporting data does. For the purpose of this report, DER includes CER.
26. This figure includes installation between 1 July 2025 and 31 March 2026. See AEMO, DER data downloads, March 2026.

THERE IS A SIGNIFICANT PIPELINE OF GENERATION AND STORAGE PROJECTS

To achieve expected reliability and security outcomes, we need to focus on facilitating a continuous flow of investment with projects moving from the proposed to the committed stage without unnecessary barriers or delays.

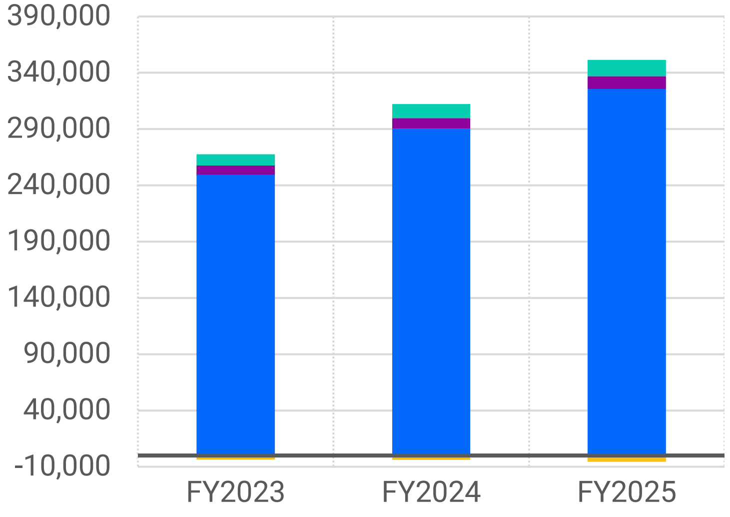
- At the end of FY2025, there was a total of 296.4 GW of proposed utility-scale wind, solar and battery developments. However, only a small proportion of new developments progress from the proposed stage to committed or anticipated.[27]
- FY2025 saw an increase in planned battery storage with an additional 122.9 GW of proposed and 6.2 GW of committed projects.
- The Panel notes that 19 projects, representing a total of 6.4 GW, were approved under the first Capacity Investment Scheme (CIS) tender. An additional 4 projects, totalling 654 MW, were approved in the second-round tender.[28]
- The Panel acknowledges that the *NEM wholesale market settings review* was made, and Energy Ministers agreed in principle to 12 recommendations focused on boosting investment in renewables and storage to ensure system reliability after the CIS ends in 2027. The Panel will continue to monitor the progress of the recommendations, including undertaking any actions assigned to it.

KEY



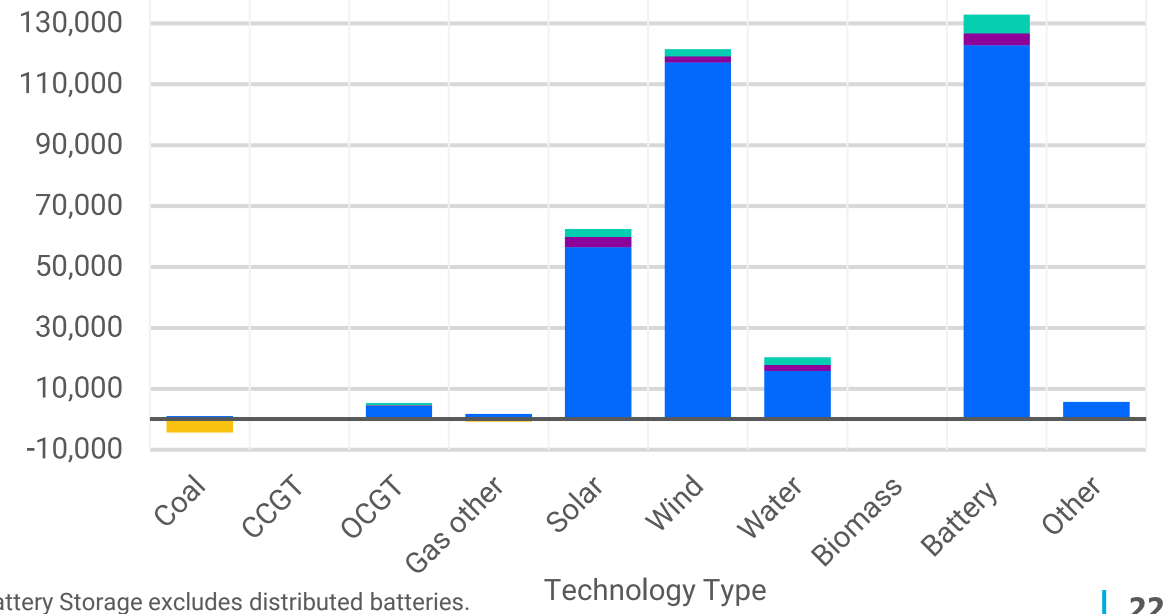
Total planned generation by FY

Capacity (MW)



Planned generation in FY25

Capacity (MW)



Source: AEMO, NEM Generation Information, July 2025. Note that Solar excludes rooftop photovoltaics (PV), and Battery Storage excludes distributed batteries.

27. For further information on the planned generation stages, see AEMO, *2025 Electricity Statement of Opportunities*, August 2025.

28. For further information on the Capacity Investment Scheme, see Department of Climate Change, Energy, the Environment and Water, *Capacity Investment Scheme*, February 2025

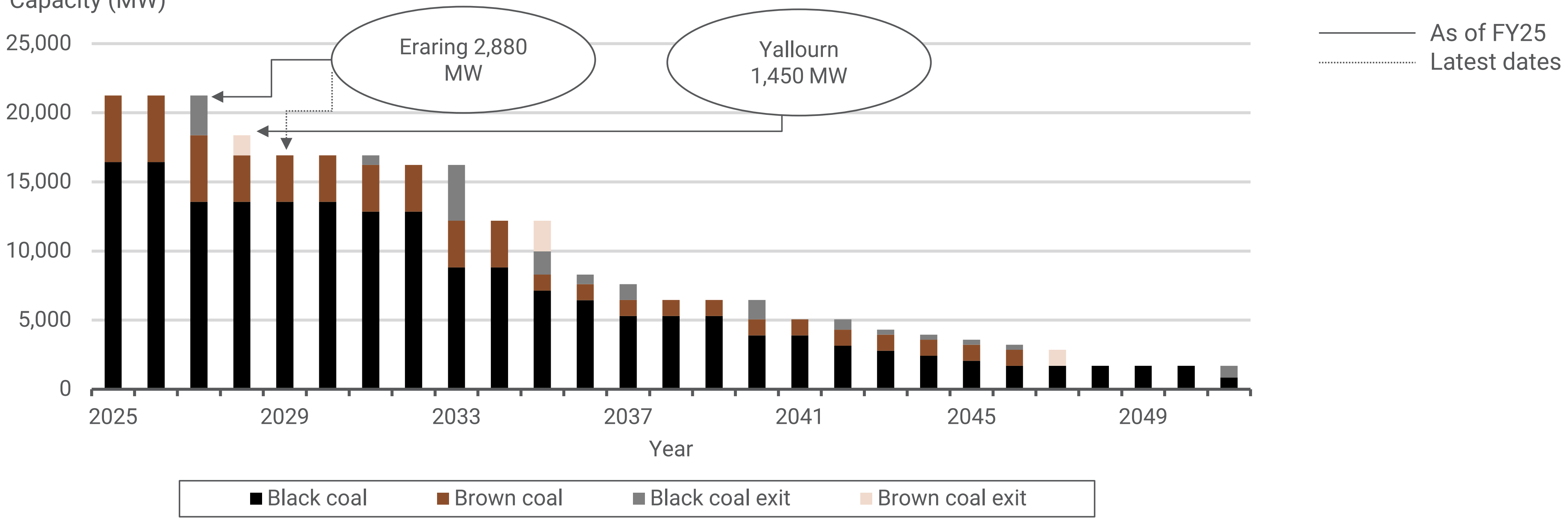
COAL GENERATION RETIREMENTS HAVE BEEN DELAYED DUE TO DELAYS IN THE CONSTRUCTION OF REPLACEMENT ASSETS

Delays in the construction of key generation and transmission infrastructure are delaying coal retirements. Delays are primarily intended to ensure power system security until key replacement assets are in service.

- Coal-fired power stations are retiring and being replaced with a combination of renewable energy, storage and gas-powered generators.[29]
- The pace of generator exit is dependent on the availability of renewable generation, storage, firming generation and system services.
- The Queensland government has announced it may delay the closure of the state's coal-fired power stations until at least 2046.[30]
- Origin revised the closing date for Eraring coal-fired power station from 19 August 2027 to 30 April 2029.[31]

Planned coal generator exits

Capacity (MW)



Source: AEMO, NEM Generation Information, July 2025.

29. For further information on the NEM's future system security requirements, see AEMO, *2025 Transition Plan for System Security*, December 2025.

30. For further information on Queensland's delayed coal closure dates, see QLD Government Energy Roadmap 2025, *Queensland Energy Roadmap*, October 2025.

31. For further information on Eraring Power Station closure dates, see Origin, *Origin Energy media release*, January 2026.

2.2

DEMAND SIDE TRENDS

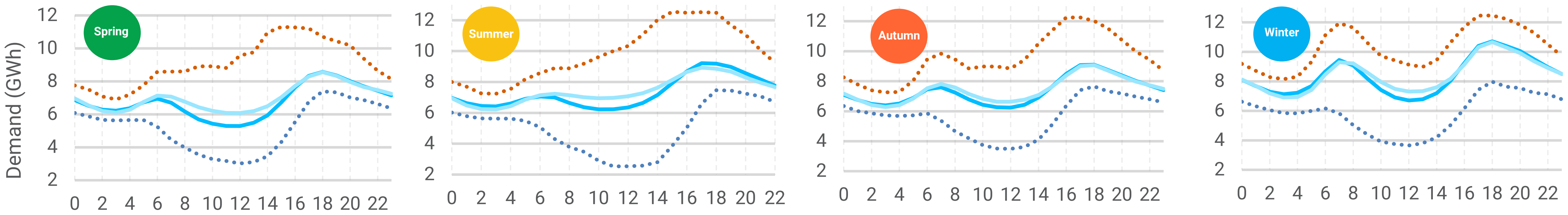
- NSW and VIC are experiencing steepening duck curves as midday grid demand continues to decrease.
- There is a large variation in the minimum and maximum hourly demand compared to the average, creating continued operational challenges
- Morning and evening peaks remain consistent with previous years in all NEM regions.
- NSW continued to be a net importer of energy from QLD and VIC.

NSW AND VIC ARE EXPERIENCING A STEEPENING DUCK CURVE

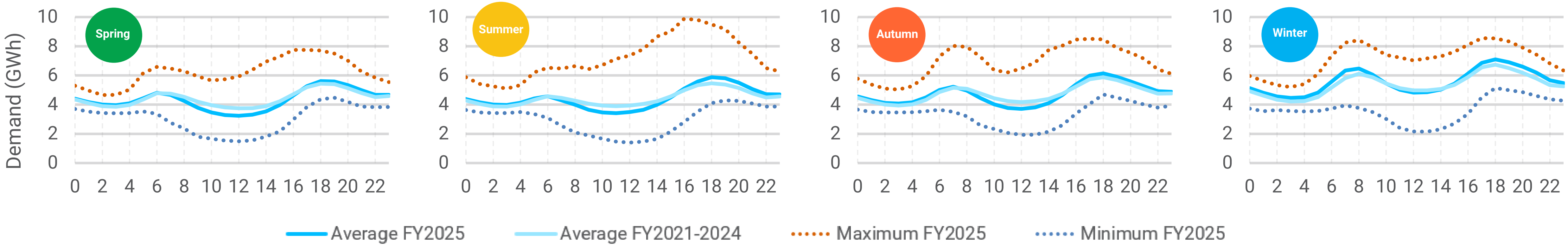
Distributed solar has grown rapidly compared to batteries; this continues to reshape daytime demand and create operational challenges.

- In NSW, average demand has fallen between 7 AM and 2 PM across all seasons. In VIC, average demand has fallen slightly during the day across all seasons, while evening peak demand has increased in summer and winter.
- Both regions feature higher average daily demand peaks in winter.
- The maximum/minimum demand trendlines show a large hourly variation compared with the average demand values in both regions.[32]

New South Wales Demand



Victoria Demand



Source: Panel analysis of AEMO MMS data.

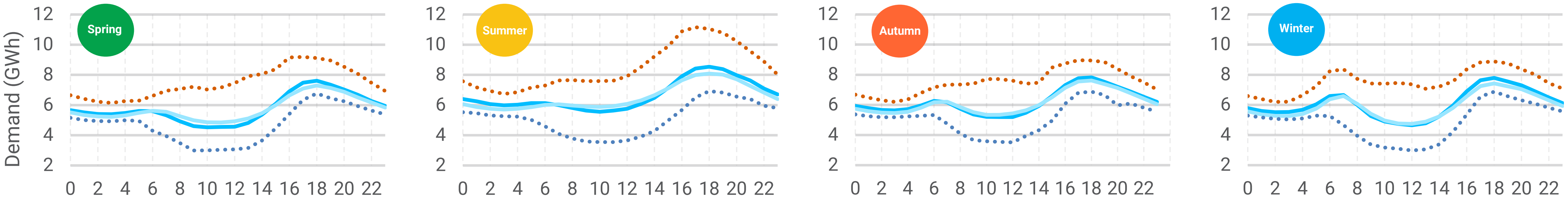
32. The maximum/minimum demand is calculated per hour. This indicates that these max/min demand curves would not have occurred on a single day but rather show the highest and lowest hourly demand figures.

QLD AND SA DEMAND REMAINED CONSISTENT WITH PREVIOUS YEARS

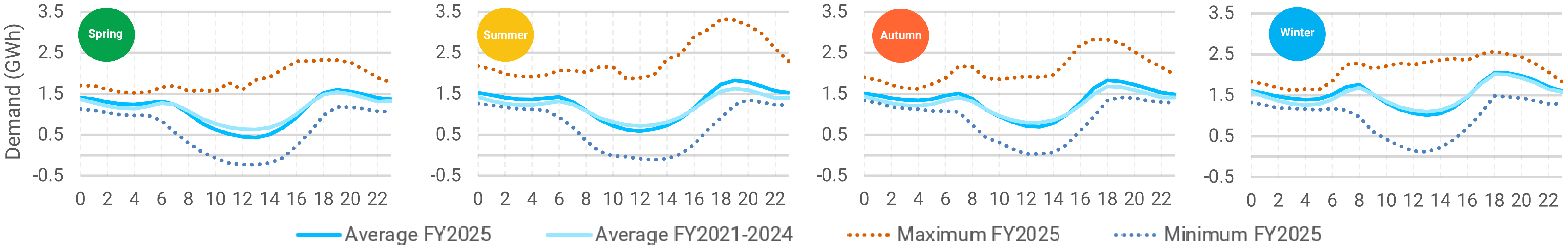
Distributed solar has grown rapidly compared to batteries; this continues to reshape daytime demand and create operational challenges.

- Average demand profiles in QLD and SA have mostly remained relatively consistent with previous financial years.
- However, QLD experienced a slight increase in the average summer and winter evening peak.
- In SA, there was a slight increase in average demand at midday in autumn, and a greater drop in demand during spring and summer. The evening peak has increased in summer and autumn.
- The maximum/minimum demand trendlines, particularly in SA, show a large hourly variation compared with the average demand values.[33]

Queensland Demand



South Australia Demand



Source: Panel analysis of AEMO MMS data.

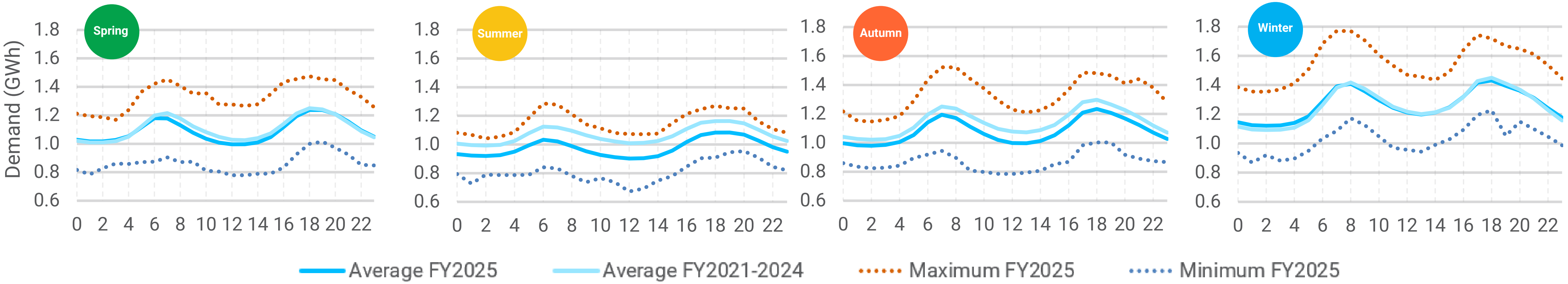
33. The maximum/minimum demand is calculated per hour. This indicates that these max/min demand curves would not have occurred on a single day but rather show the highest and lowest hourly demand figures.

TAS DEMAND SAW CHANGES IN THE SUMMER AND AUTUMN SEASONS

Distributed solar has grown rapidly compared to batteries; this continues to reshape daytime demand and create operational challenges.

- The demand profiles in TAS for Spring and Winter have remained consistent with previous years.
- The average demand has decreased in summer and autumn across the entire day due to reductions in some major industrial loads.
- The year-on-year variations in demand are due to several factors, including the weather and periodic decreases in demand for larger commercial and industrial customers.
- The maximum/minimum demand trendlines show a large hourly variation compared with the average demand values, though not as large as in other states.[34]

Tasmania Demand



Source: Panel analysis of AEMO MMS data.
34. The maximum/minimum demand is calculated per hour. This indicates that these max/min demand curves would not have occurred on a single day but rather show the highest and lowest hourly demand figures.

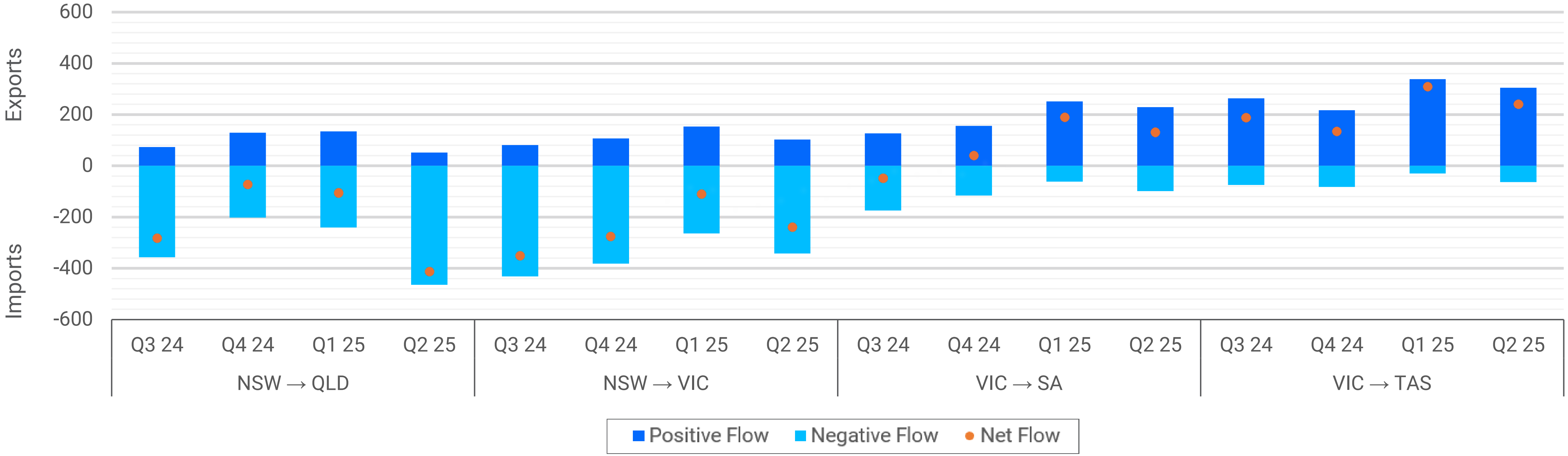
NSW REMAINED A NET IMPORTER OF ENERGY FROM QLD AND VIC IN FY2025

Interregional flows are becoming increasingly important to maintain system resilience as regional supply conditions change.[35]

- In FY2025, NSW was a net importer, with 9% of operational demand supplied by imports from QLD and VIC. TAS was a net importer from VIC, primarily due to lower-than-usual rainfall, resulting in the lowest hydro generation in the last 20 years.[36]
- The volume of inter-regional trade is limited (constrained) by the amount and size of interconnectors between regions. Such constraints can lead to higher prices and create reliability risks.
- The Panel notes that, when it becomes operational, the SA-NSW interconnector Project EnergyConnect Stage 2 should encourage inter-regional trade and reduce reliability risks in the medium to long term. Additionally, future interconnector projects such as VNI West (VIC-NSW) and Marinus Link (TAS-VIC) will increase regional price alignment, improve security and support increased renewable generation.

Average daily inter-regional flows FY25

Average flows (MW)



Source: AEMO, *Quarterly Energy Dynamics (QED),* July 2025.

35. This uses actual flows based on SCADA data. The direction of positive/negative flow is indicated from the first state listed (i.e. NSW-QLD looks at net flows from the perspective of NSW).

36. To read more about Tasmania's increased level of imports, see *Energy in Tasmania Report 2024 -25*, February 2026.

2.3

FORECASTING ACCURACY AND FUTURE FORECASTS

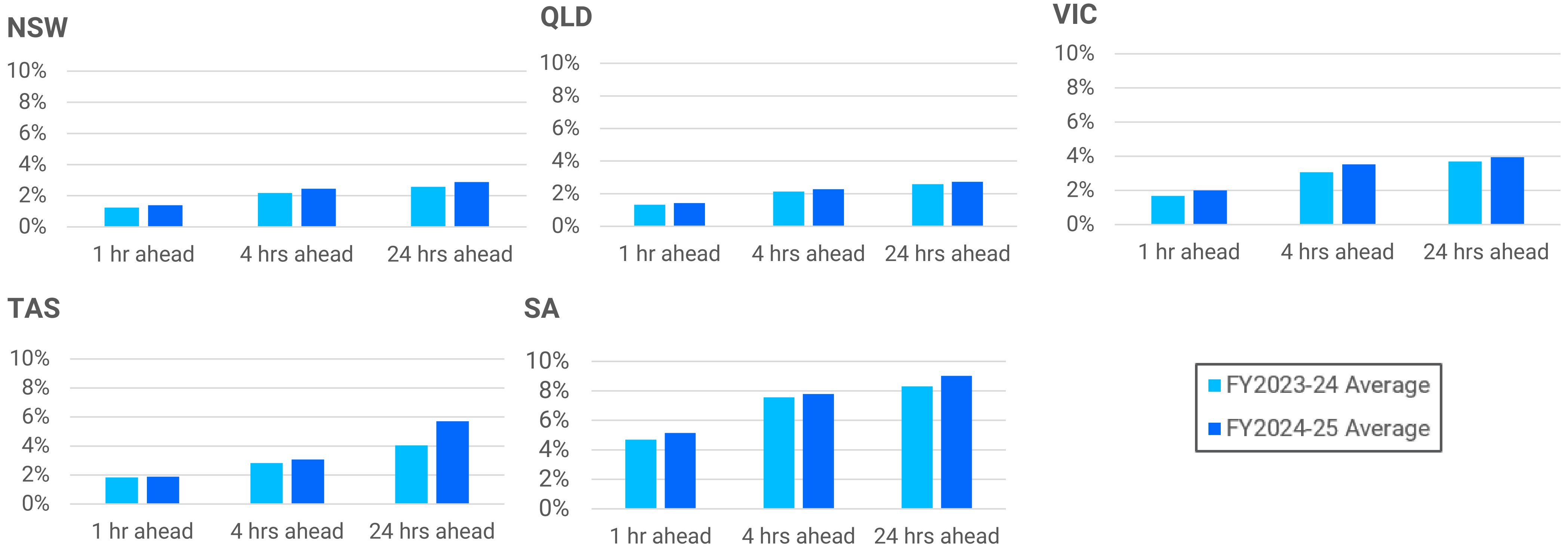
- Across FY2025, load forecasting errors were higher in every region compared to FY2024.
- In most NEM regions, solar and wind self-forecasts were more accurate than ASEFS and AWEFS.
- Minimum demand forecasts are expected to fall faster than maximum demand forecasts rise.

LOAD FORECASTING ERRORS INCREASED IN EVERY NEM REGION

Increasing levels of uncertainty may reflect harder-to-predict demand drivers in the NEM

- The measure used for load forecasting errors is mean absolute percentage errors (MAPE). Forecast accuracy outcomes are increasingly sensitive to low-demand periods and distributed PV growth.
- Load forecasting errors were higher in every region in FY2025 compared to FY2024. The forecasting errors in TAS are due to unforeseen production outages of an influential large industrial load (LIL), whereas SA and VIC have the largest residuals or unexplained variances.
- SA continues to have the highest percentage of load forecasting errors. SA generally experiences larger forecasting errors due to a higher penetration of renewables (including rooftop PV) compared to other NEM regions.

Mean load forecasting errors FY24/FY25 (%)



Source: Panel analysis of AEMO data.

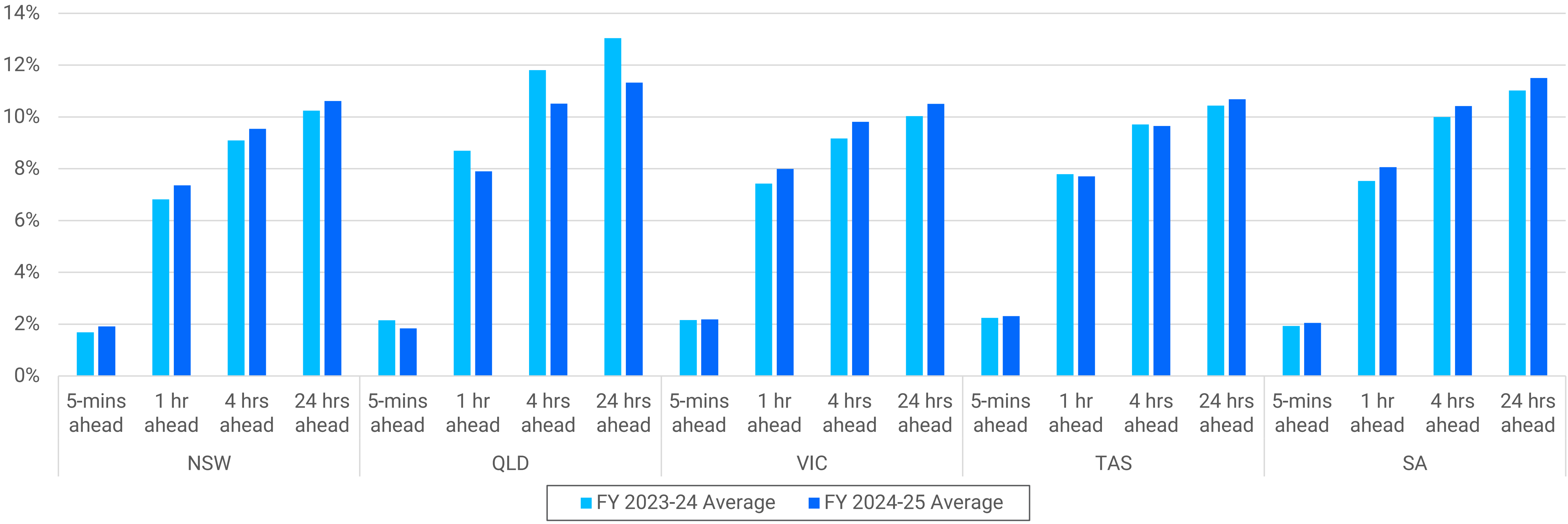
WIND FORECASTING ERRORS INCREASED IN NSW, VIC AND SA

Declining wind forecasting accuracy may increase operational uncertainty in the regions most reliant on wind

- In FY2025, the Australian Wind Energy Forecasting System (AWEFS) was less accurate in NSW, VIC and SA than in FY2024.
- The forecasting accuracy in QLD improved significantly compared with values in FY2024. This is due to more wind farms being commissioned, causing some geographic smoothing that has reduced errors.
- NSW, VIC and SA experienced an increase in wind forecasting errors across all periods. TAS was consistent with FY2024.

Comparison of FY2024 to FY2025 AWEFS mean errors for wind generation

Normalised mean absolute error (%)



Source: Panel analysis of AEMO data.

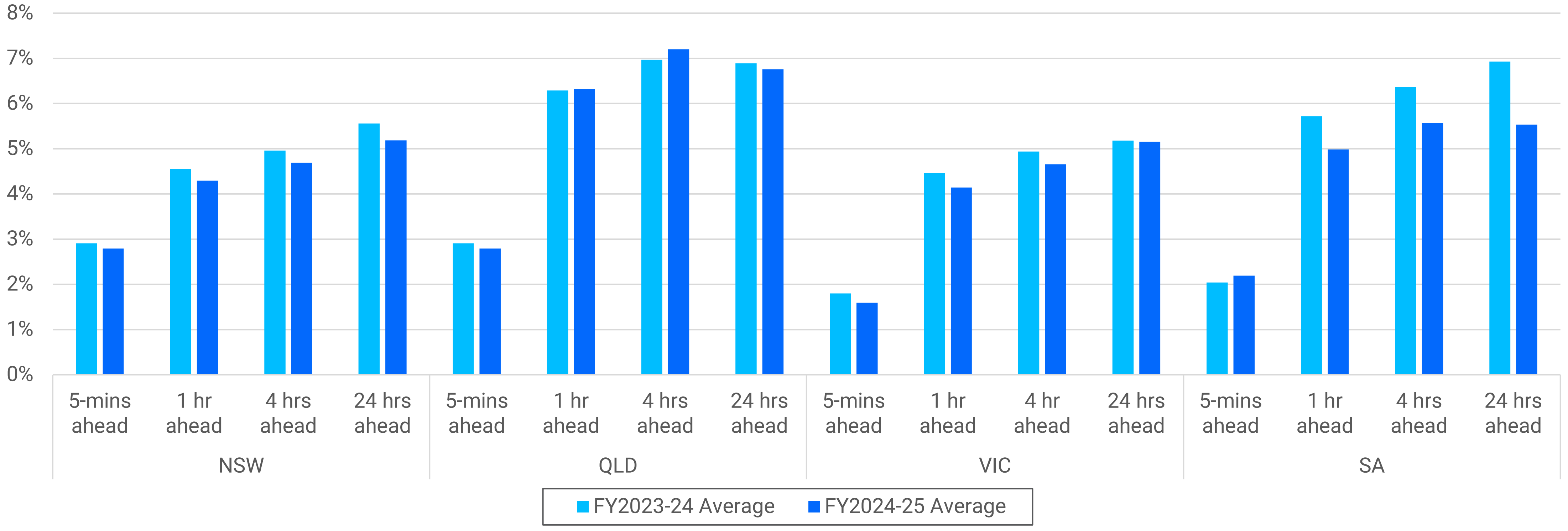
SOLAR FORECASTING ACCURACY IMPROVED IN MOST REGIONS

Improvements to solar forecasts are helping to strengthen operational decision-making, even as solar variability increases.

- In FY2025, the Australian Solar Energy Forecasting System (ASEFS) was more accurate across most periods than in FY2024.
- In NSW, forecasting errors decreased across all timescales. SA and VIC also had decreased forecasting errors across most time scales.
- Forecasts that were 1-hour and 4-hour ahead improved in all regions except QLD. 24-hour ahead forecasts improved in all regions.
- NSW, QLD and VIC forecast errors in FY2025 remain similar to FY2024.

Comparison of FY2024 to FY2025 ASEFS mean errors for solar generation

Normalised mean absolute error (%)



Source: Panel analysis of AEMO data.

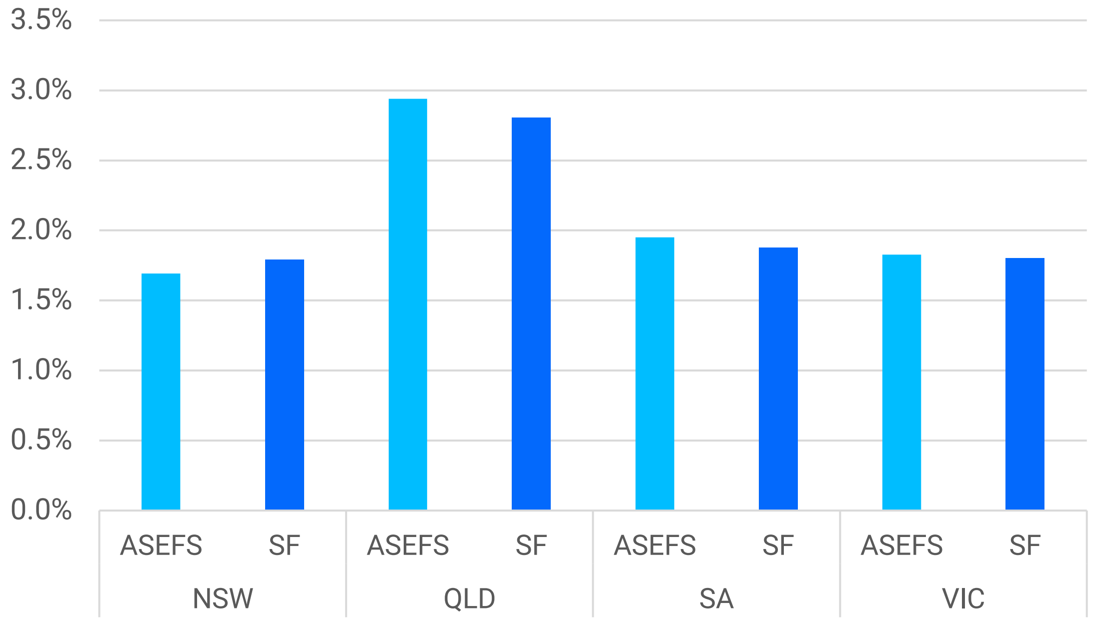
PARTICIPANT SELF FORECASTS FOR WIND OUTPERFORMED THE AWEFS IN ALL REGIONS

Participant self-forecasts have outperformed central estimates, highlighting the value of local information in a real-time market.

- Self-forecasts for wind were, on average, more accurate than AWEFS forecasts in all regions.
- Self-forecasts for solar were similar to ASEFS forecasts, with small discrepancies in NSW and QLD.
- While solar forecasting errors sit between 1.5% to 2% in most periods, QLD experiences slightly above-average forecasting errors at roughly 3%.

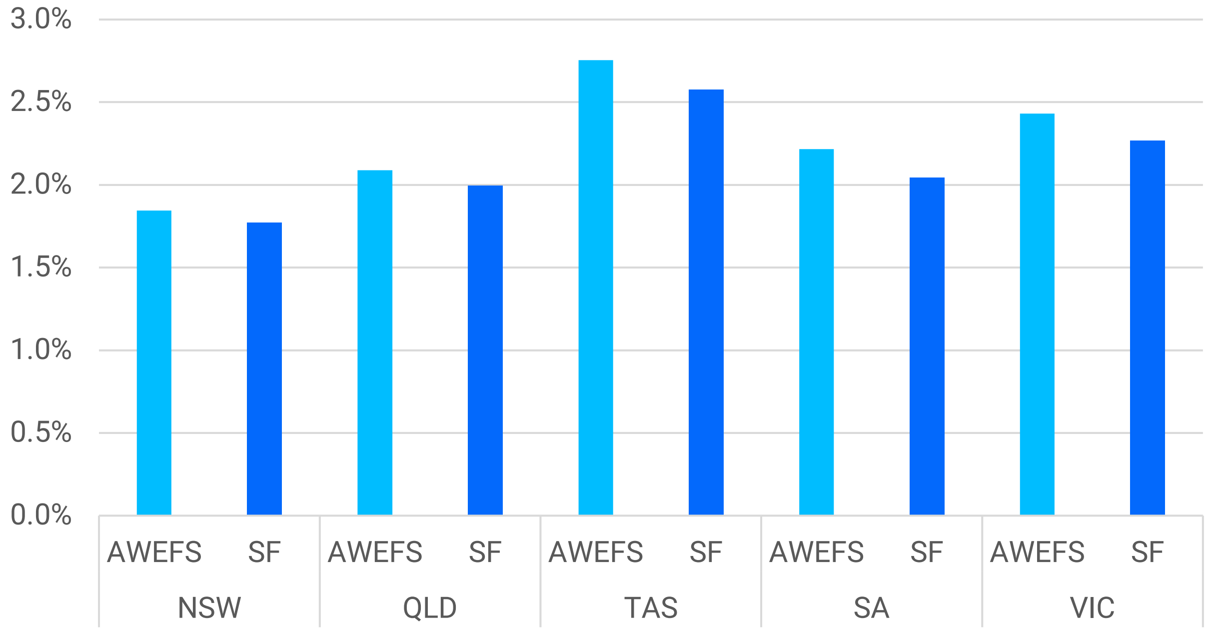
Solar forecasts

Normalised mean absolute errors (%)



Wind forecasts

Normalised mean absolute errors (%)



Source: Panel analysis of AEMO data.

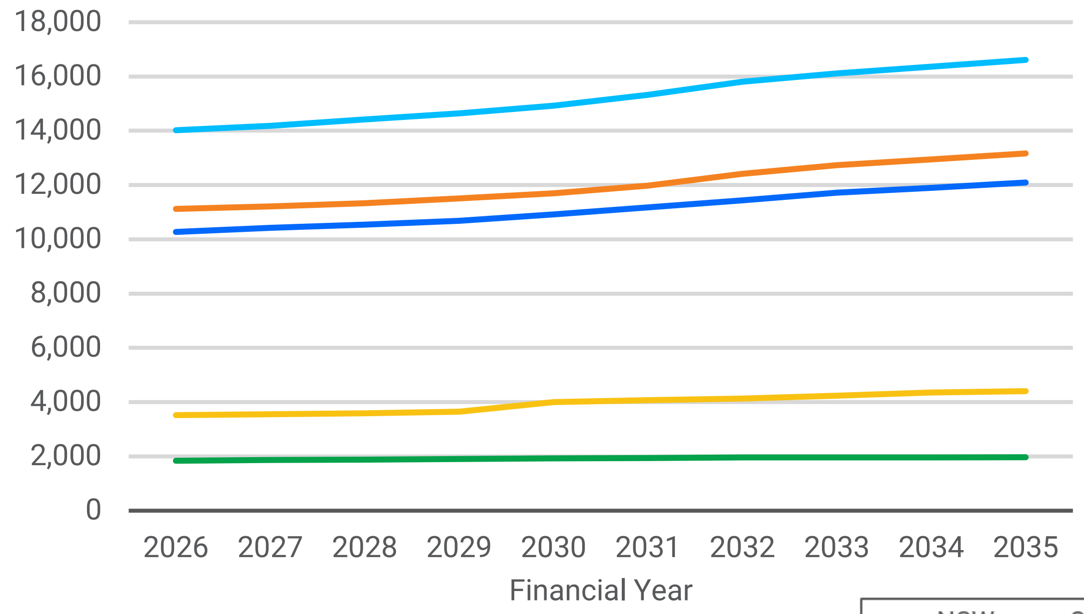
MINIMUM DEMAND IS FORECAST TO DECREASE IN MOST REGIONS

Falling minimum demand is emerging faster than rising maximum demand, reshaping the primary operational risk facing the NEM.

- Minimum operational demand is often measured by a "POE90" forecast – the daily level of demand that would be exceeded 90% of the time.[37] Conversely, a "POE10" forecast measures maximum demand – the daily demand that would be exceeded 10% of the time.
- Minimum demand forecasts are expected to fall faster than maximum demand forecasts rise.
- VIC and NSW are expected to experience minimum demands below 0 MW later than forecast in the 2024 ESOO, as data centre loads and electrification growth increases. VIC and NSW minimum demand is expected to fall below 0 MW around 2028 and 2034, respectively.
- Minimum demand plateaus in Qld, SA and Tas approaching 2035 due to an expected balance in factors that place downward pressure on demand (distributed solar PV, energy efficiency) and upward pressures (electrification, large industrial loads, batteries)"

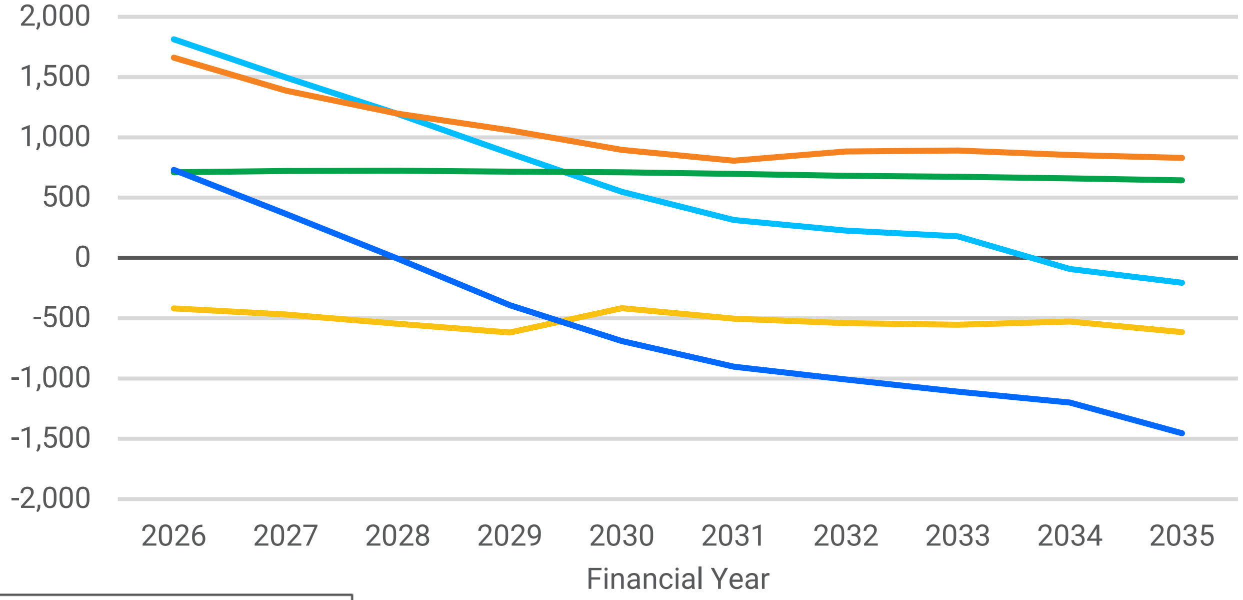
ESOO maximum demand forecast POE 10 scenario

Demand (MW)



ESOO minimum demand forecast POE 90 scenario

Demand (MW)



NSW QLD SA TAS VIC

Source: AEMO, *2025 Electricity Statement of Opportunities (ESOO),* October 2025. The data is from the ESOO Central Scenario, using operational (sent-out) demand.

37. POE stands for 'probability of exceedance'.

2.4

RELIABILITY EVENTS AND MARKET INTERVENTIONS

- There were 19 declarations in FY25, but it is too early to identify a trend given that the MSL framework is evolving to keep pace with changing market conditions.
- RERT was only activated once in FY2025, indicating that other market signals were generally effective in managing reliability risks.
- Wind and solar availability increased in FY25 compared to the lowest three-year average.

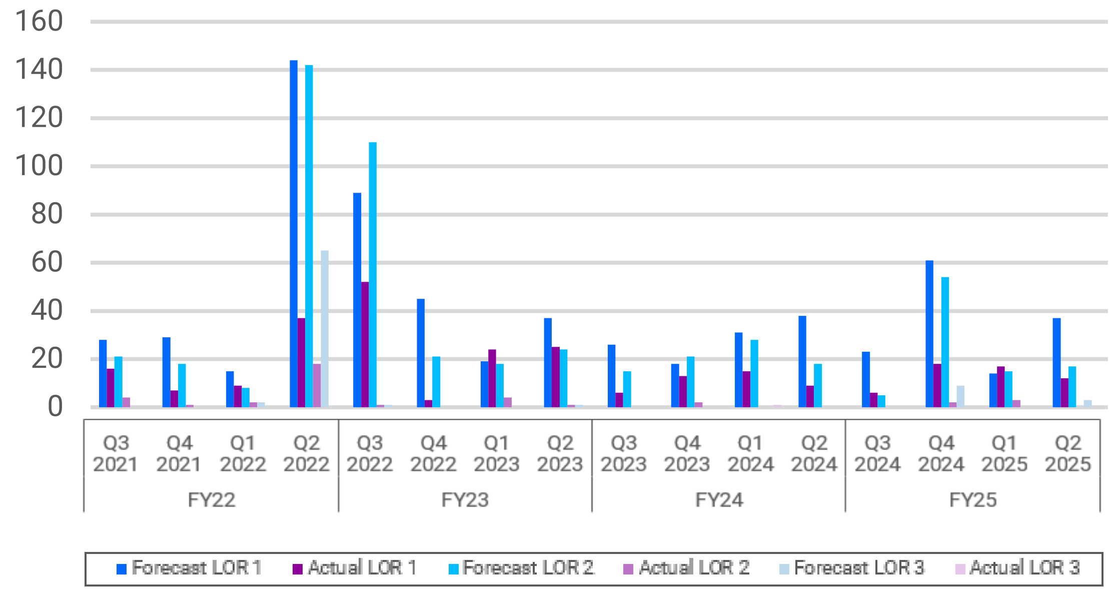
LACK OF RESERVE NOTICES HAVE STABILISED IN RECENT YEARS

Fewer LORs are being driven by forecast uncertainty as reserve assessments evolve to reflect the changing power system.[38]

- 22% of Lack of Reserves (LORs) were caused by the forecast uncertainty measure (FUM) in FY2025 compared to 32% in FY24.[39] The Panel notes that this lower proportion may be due, in part, to a change in the FUM model and inputs that came into effect June 2024.
- Q4 2024 saw the largest number of forecast LOR 1 and 2 notices since Q3 2022, however actual LOR 1 and 2 notices remained consistent with previous years.
- A quarterly average of 60 forecast and 15 actual LOR notices were issued across FY2025 compared to a quarterly average of 49 forecast and 12 actual LOR notices in FY2024.

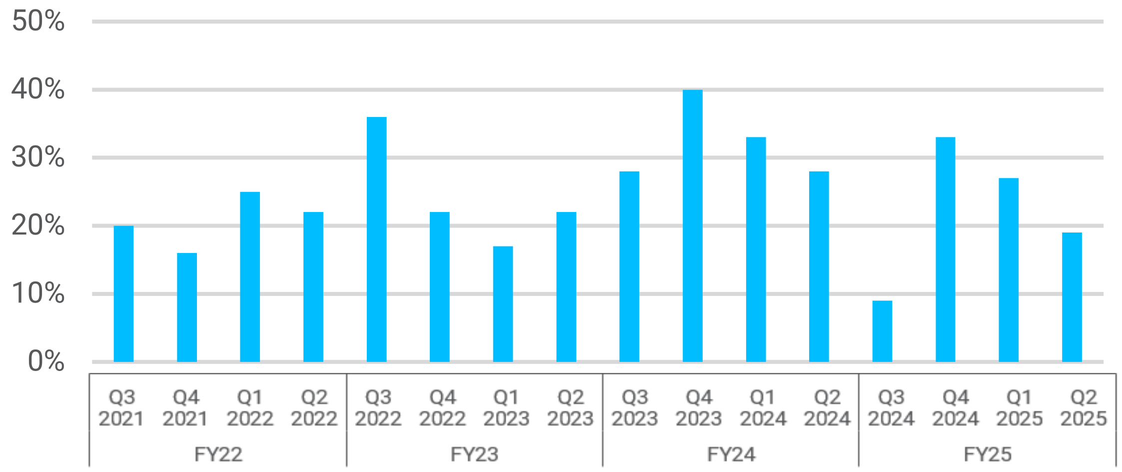
LOR notices by quarter

Number of LOR notices



Percentage of LOR declared set by the FUM by quarter

LOR set by the FUM (%)



Source: AEMO, *NEM Lack of Reserve Framework Quarterly Reports*, June 2025.

38. The updated Reserve Level Declaration Guidelines came into effect on 26 June 2024. The updated guidelines included replacing the Bayesian Belief Network model with an alternative in-house Machine Learning mode. The update also included the inclusion of a single input variable (time-of-day) to calculate the FUM. For further information, see AEMO, Reserve Level Declaration Guidelines, 26 June 2024.

39. LOR1 and LOR2s are issued if reserve levels fall below the higher of: the largest credible contingency, or the forecast uncertainty measure (FUM).

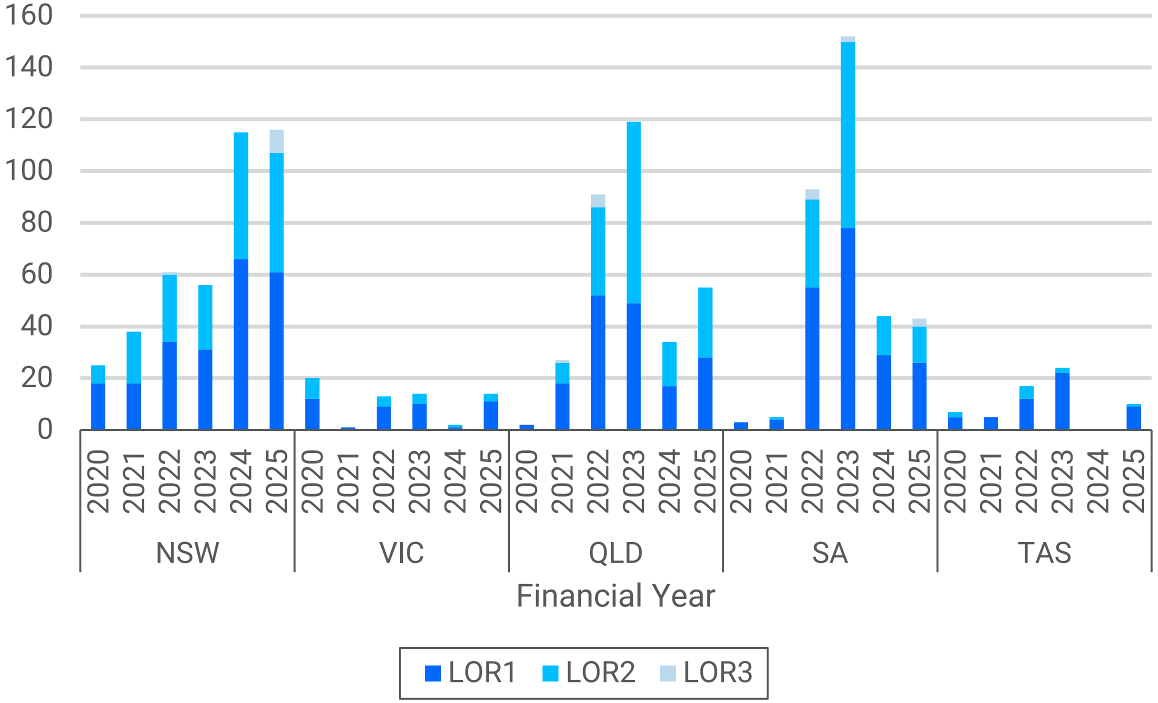
FORECAST LOR INCREASED BUT ACTUAL EVENTS REMAINED LOW

The market responded to forecast LOR notices as it should so that the number of actual LOR events was low, consistent with previous years.

- All regions, except SA, saw an increase in forecast lack of reserve (LOR) notices from previous years.
- NSW saw an increase in actual LOR 1 and 2 events compared to previous years. VIC, QLD and TAS saw a slight decrease in the number of actual LOR events compared with previous years.
- No regions experienced an LOR3 in FY25.
- NSW is continuing to see higher forecast and actual LOR events than other states, with 116 forecast and 42 actual LOR events. These LOR conditions were mainly driven by decreased generation availability, increased demand and network outages.

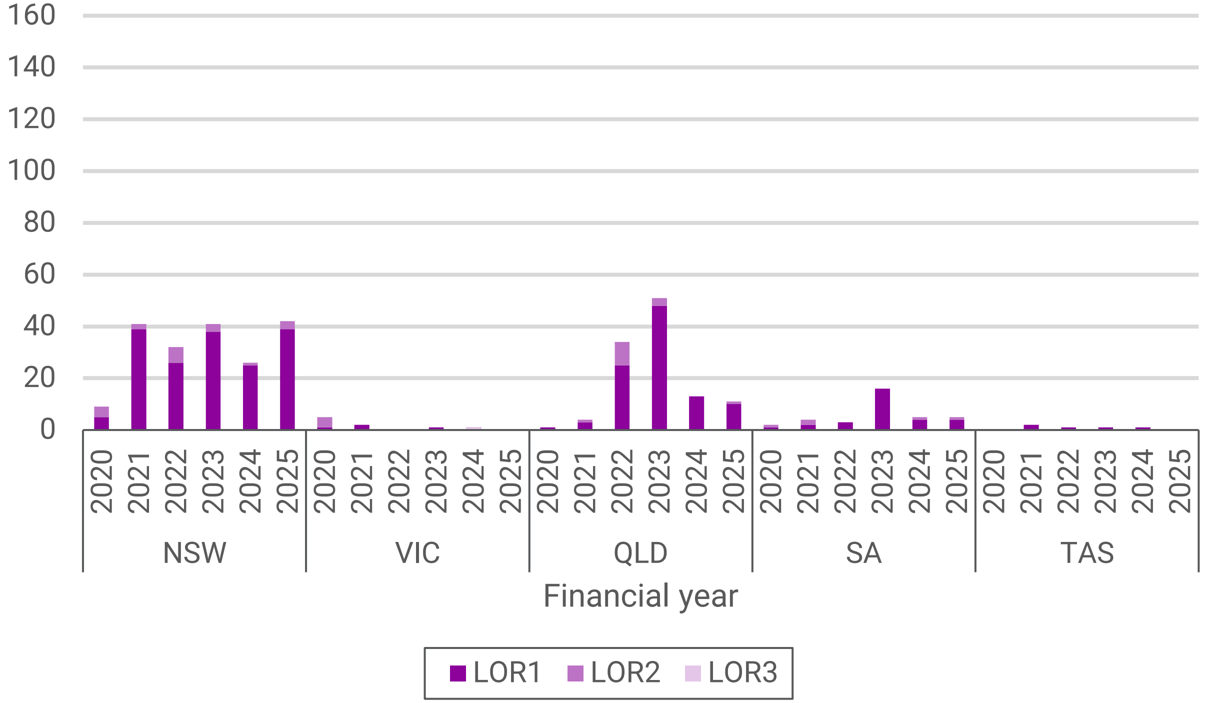
Forecast LOR notices by region

Number of LOR notices



Actual LOR notices by region

Number of actual LOR events



Source: AEMO, *NEM Lack of Reserve Framework Quarterly Reports*, June 2025.

THERE WERE 19 MINIMUM SYSTEM LOAD DECLARATIONS IN FY2025

Low-demand conditions are increasingly requiring active operational management to maintain system security.

- Minimum system load (MSL) refers to periods when low-demand conditions, often driven by high volumes of rooftop solar, reduce the need for grid-scale electricity generation. MSL conditions can pose risks to grid system security.[40]
- The MSL framework is an evolving approach to managing these conditions. AEMO provides indicative ranges for MSL thresholds in each region and outlines the definition and action for MSL 1, 2 and 3 events.[41]
- MSL procedures are activated on a regional basis (i.e. VIC and SA maintain separate MSL procedures and protocols). AEMO is currently working with Networks Service Providers (NSPs) to align MSL procedures with the Victorian procedure.
- In FY2025, there were 12 forecast MSL 1 events and two forecasted MSL 2 events. Meanwhile, five actual MSL 1 events occurred.
- Looking ahead to FY26, we can already see an increase in MSL 1 and 2. This likely reflects an increase in the number of MSL events, as well as the evolving framework that enables MSL conditions to be monitored and reported on in a structured way.

MSL Declarations

Number of MSL notices

		FY2024				FY2025				FY2026		
		Q3 2023	Q4 2023	Q1 2024	Q2 2024	Q3 2024	Q4 2024	Q1 2025	Q2 2025	Q3 2025	Q4 2025	Q1 2026
MSL1	Forecast	-	1	-	-	1	10	1	-	-	20	10
	Actual	-	-	-	-	1	3	1	-	-	20	10
MSL2	Forecast	-	-	-	-	-	2	-	-	-	6	3
	Actual	-	-	-	-	-	-	-	-	-	4	2
MSL3	Forecast	-	-	-	-	-	-	-	-	-	-	-
	Actual	-	-	-	-	-	-	-	-	-	-	-
	Total	**-**	**1**	**-**	**-**	**2**	**15**	**2**	**-**	**-**	**50**	**25**

Source: AEMO, *NEM Lack of Reserve Framework Quarterly Reports*, June 2025.

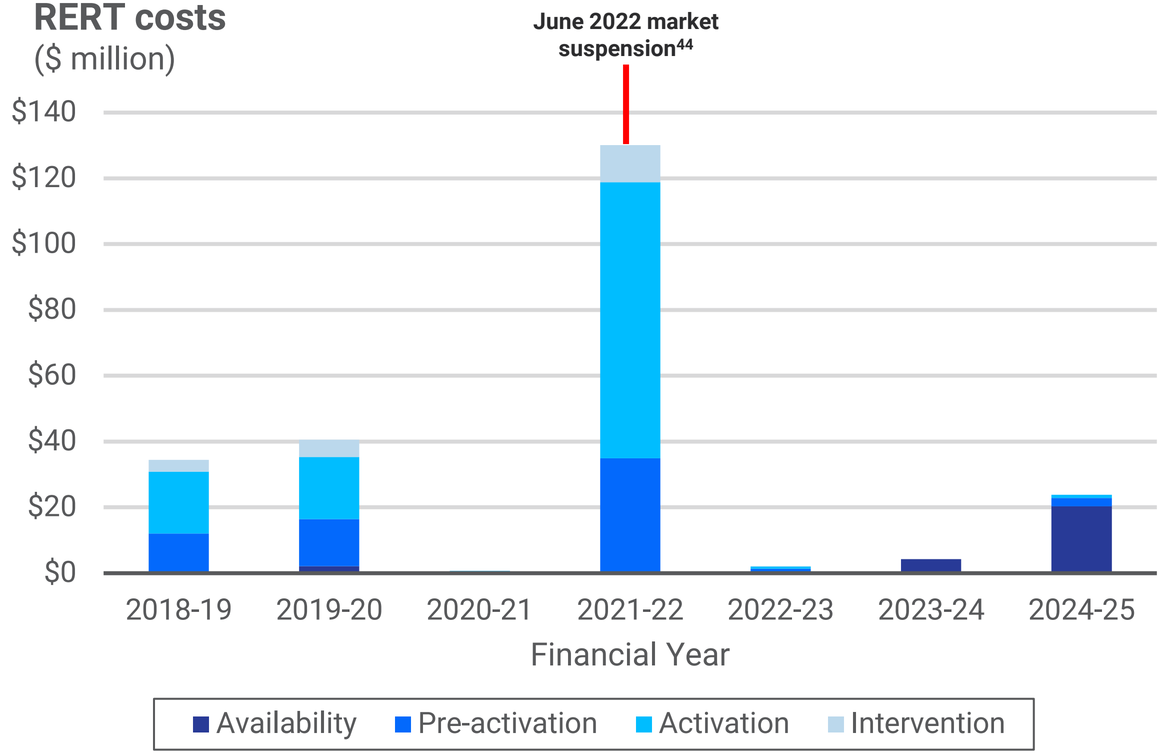
40. For further information on the MSL framework, see AEMO, *Managing Minimum System Load (MSL)*, 2025. The Panel notes that AEMO only began publishing MSL events in Q3 2024 as part of AEMO's NEM Lack of Reserve Quarterly Reports.

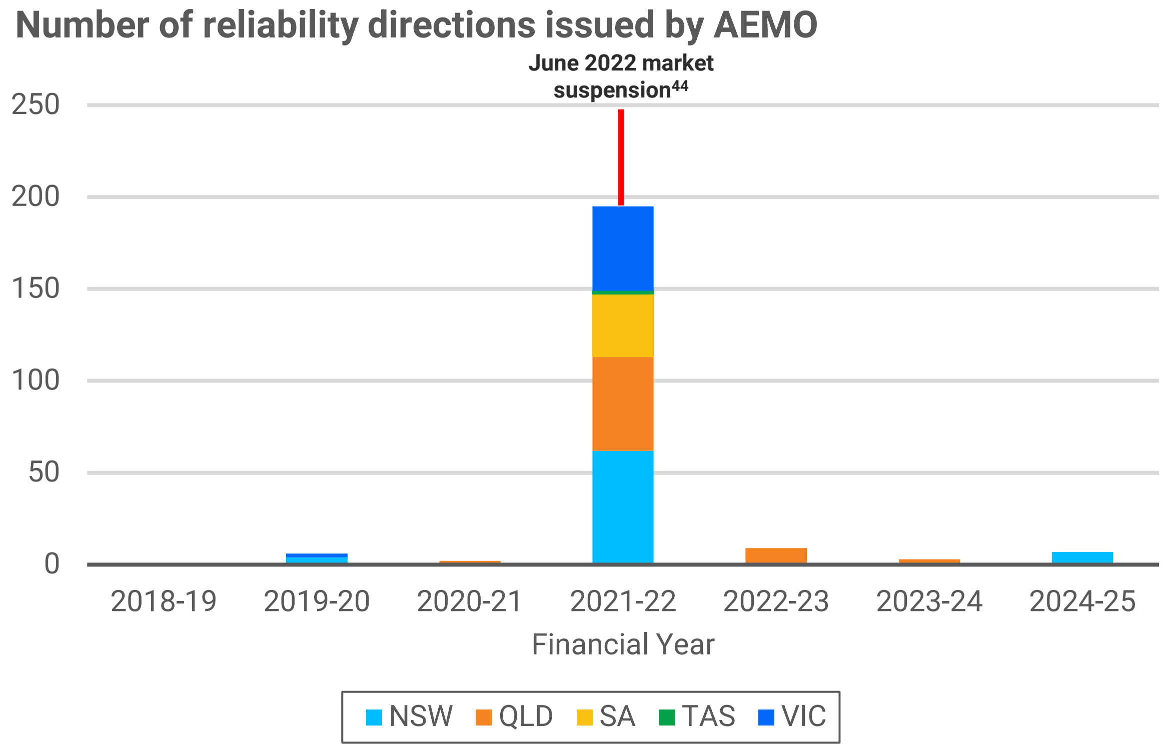
41. An MSL3 event is declared when demand is too low to maintain a secure operating state. MSL2 and MSL1 events occur when the system is one or two credible load contingencies away from reaching MSL3.

RERT WAS ACTIVATED ONCE IN FY2025

While reliability interventions were regionally concentrated, high-demand events highlight the value of preventative system measures.

- AEMO activated the reliability and emergency reserve trader (RERT) on one occasion during the reporting period in response to a forecast LOR 2 condition in NSW, which subsequently developed into an actual LOR 2.[42]
- The total RERT cost in FY2025 was $23,881,046. This was higher than FY2024 and FY2023, as RERT was not activated in either year.
- There were 6 reliability directions issued in FY2025, all of which were in NSW, primarily to maintain power system reliability during high-demand periods on 27 November 2024.[43]
- RERT and directions were used as last resort measures to manage potential high-cost reliability events.





Source: AEMO, Reliability and Emergency Reserve Trader (RERT) Report and Panel analysis of AEMO data.

42. For further information on RERT activations, see AEMO, *Reliability and Emergency Reserve Trader (RERT) End of Financial Year 2024-25 Report*, August 2025.
43. For further information on these directions, see AEMO, *NEM Event Directions Report 22 and 27 January 2024*, March 2024.
44. In June 2022, the NEM market was suspended due to a series of events associated with low reserve conditions. See: AEMO, NEM market suspension and operational challenges in June 2022, August 2022.

WIND AND SOLAR AVAILABILITY WAS ABOVE THE THREE-YEAR AVERAGE

Improved wind and solar availability have supported stronger renewable supply conditions.

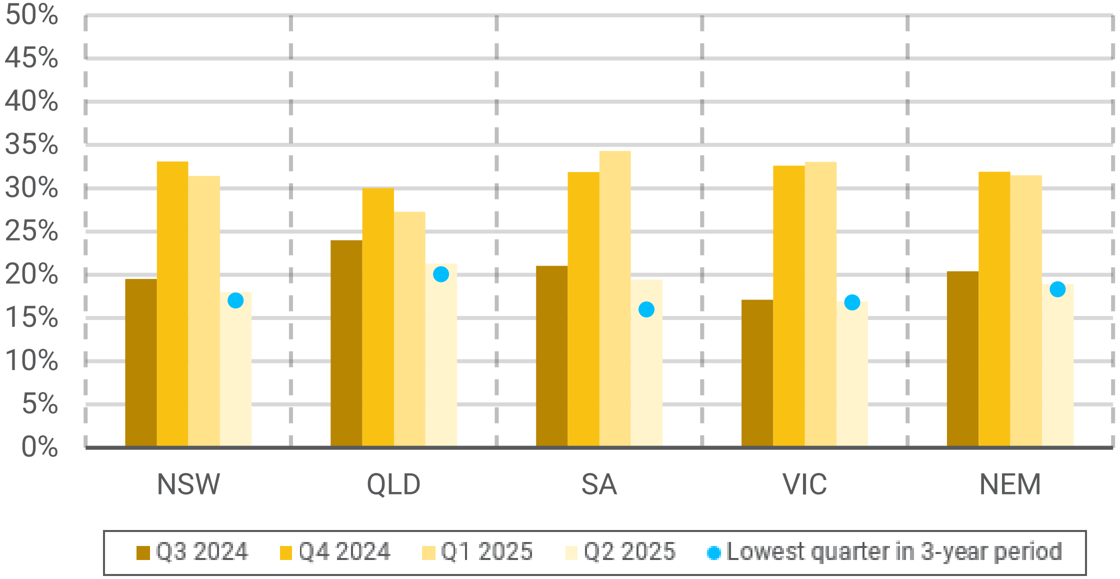
- FY25 has seen an increase in the average yearly wind and solar availability across all regions compared to the past three-year average.
- The NEM average yearly volume-weighted wind availability capacity factor was higher in FY25 (33.95%) compared to the three-year average (33.38%). VIC had the largest increase in average yearly wind availability (+1.03%) compared to the three-year average.
- In FY2025 Q2, wind availability increased by 3.4% compared to Q2 2024, when a wind drought in the NEM reduced wind generation.
- The NEM average yearly volume-weighted solar availability capacity factor was higher in FY25 (25.69%) compared to the three-year average (24.58%). SA had the largest increase in average yearly solar availability (+1.57%) compared to the three-year average.

Quarterly volume weighted wind available capacity factors

Capacity factor (%)

Quarterly volume weighted solar available capacity factors

Capacity factor (%)



Source: AEMO, *Quarterly Energy Dynamics Q2 2025*, July 2025.

2.5

MARKET PRICE SIGNALS AND INVESTMENT INCENTIVES

- Average wholesale prices increased over FY2025 from a low in FY2024.
- The number of market price floor events stayed low in FY2025, and the number of market price cap events decreased.
- FY2025 saw an increase in the proportion of negative prices in the NEM, driven by an increase in rooftop and utility-scale solar generation.

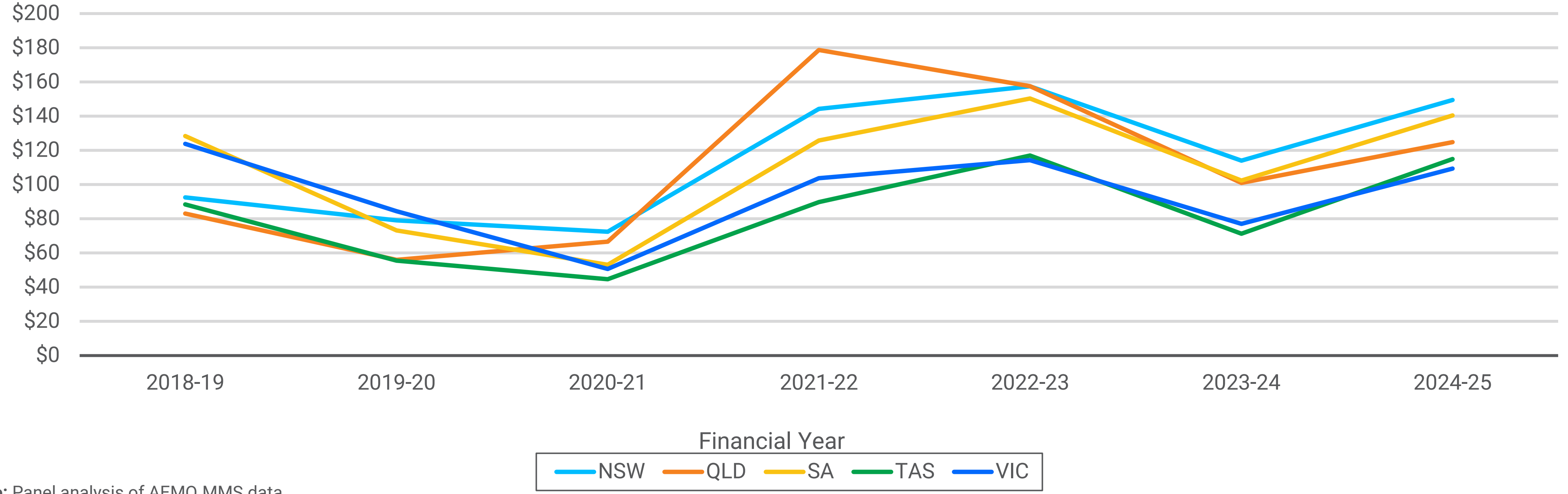
AVERAGE WHOLESALE PRICES INCREASED FROM A 2024 LOW

Increased prices reflect a return to tighter market conditions driven by coincident demand, supply and network stresses. They provide a clear signal for new investment in generation and network assets that can relieve these stresses.

- Volume-weighted average prices (VWAP) increased in FY2025. Prices across all regions increased, with the NEM VWAP increasing by 28% from $102.12/MWh in FY2024 to $130.44 in FY2025.
- The high prices occurred due to a combination of contributing factors, including high demand, low wind output, network limitations, planned and unplanned baseload outages and participant rebidding.[45]
- FY2025 had the third-highest average NEM volume weighted average price (VWAP) ever recorded.[46]
- Despite the upward turn, wholesale prices in FY2025 remain below the FY2023 peak levels.

Wholesale volume weighted average price (VWAP) by region

Wholesale volume weighted average price ($/MWh)



Source: Panel analysis of AEMO MMS data.

45. For further information about wholesale prices, see AER, *AER reports on Q2 2025 high electricity price events*, August 2025.
46. FY2023 had the highest recorded NEM VWAP prices, partly caused by the flow-on impacts of the June 2022 market suspension.

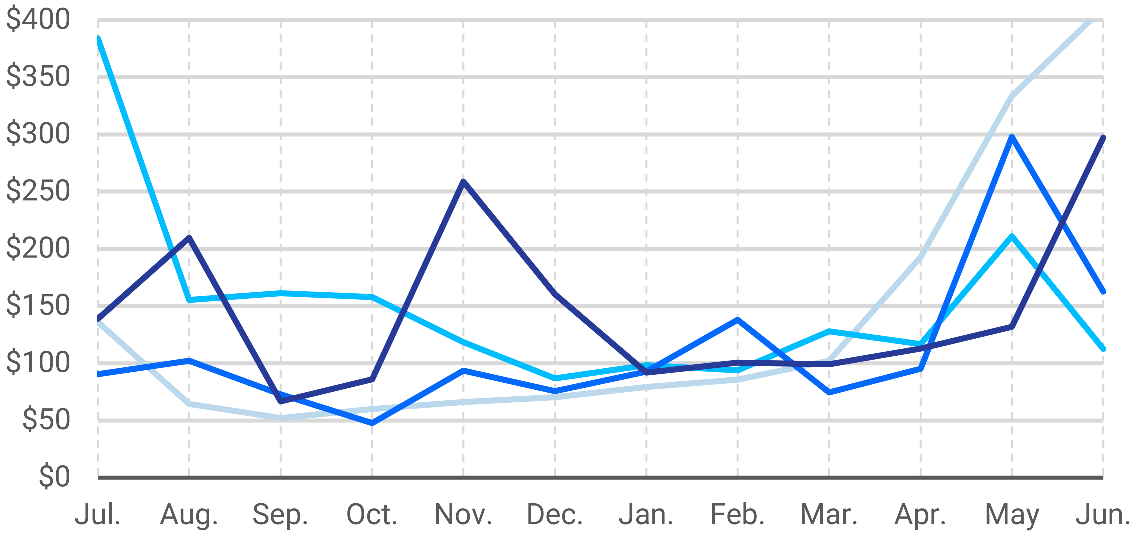
WHOLESALE PRICES IN NSW AND QLD INCREASED IN FY2025

Prices in NSW and QLD increased but remained below recent highs, indicating region-specific events rather than structural price pressure.

- VWAP increased in FY2025 for both states from the previous year – up 31% to $146.12/MWh in NSW and 25% to $123.91/MWh in QLD.
- In NSW, prices remained lower than FY2023 ($151.95/MWh). In QLD, prices remained lower than, FY2022 ($178.55/MWh) and FY2023 ($156.77/MWh).
- In NSW, prices peaked during Q4 of 2024, due to high demand, coal generation unavailability, and transmission constraints limiting northern flow of lower-cost energy. The price rise in Q2 2025 is consistent with seasonal trends but exacerbated by network and generator outages and variability in wind and solar output.[47]
- In Q4 2024, QLD experienced high price volatility. This was driven by supply-demand imbalances, coal generation outages and weather-related events. The state experienced the warmest spring temperatures on record.

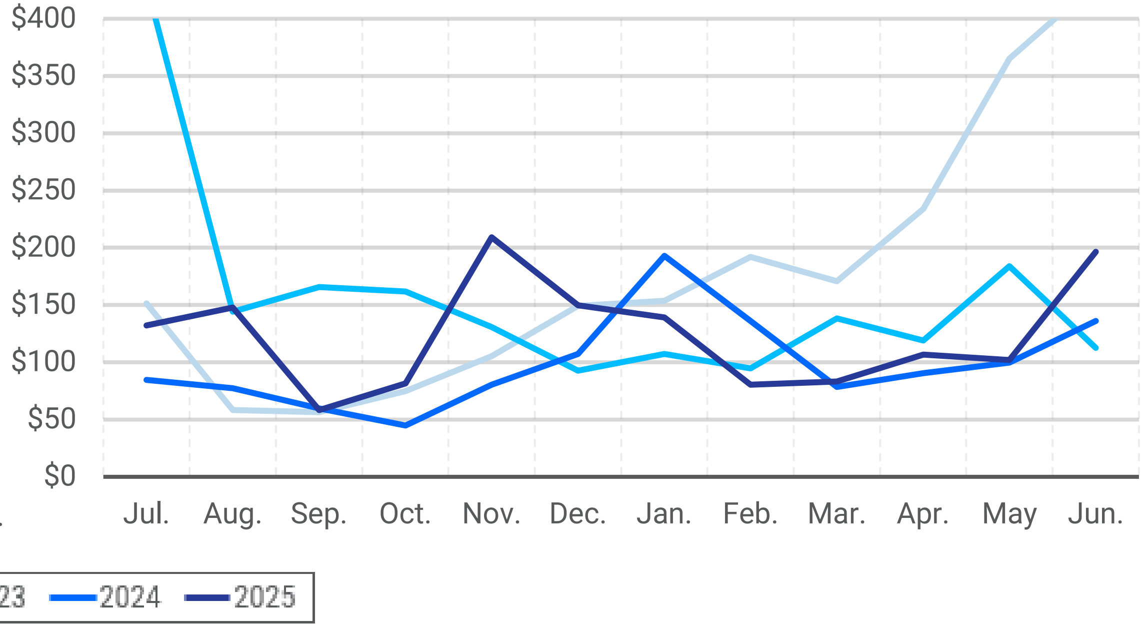
New South Wales monthly average dispatch price

Regional price ($/MWh)



Queensland monthly average dispatch price

Regional price ($/MWh)



Source: Panel analysis of AEMO MMS data.

47. AER, *Wholesale Electricity Market Performance Report 2024*, 20 December 2024.

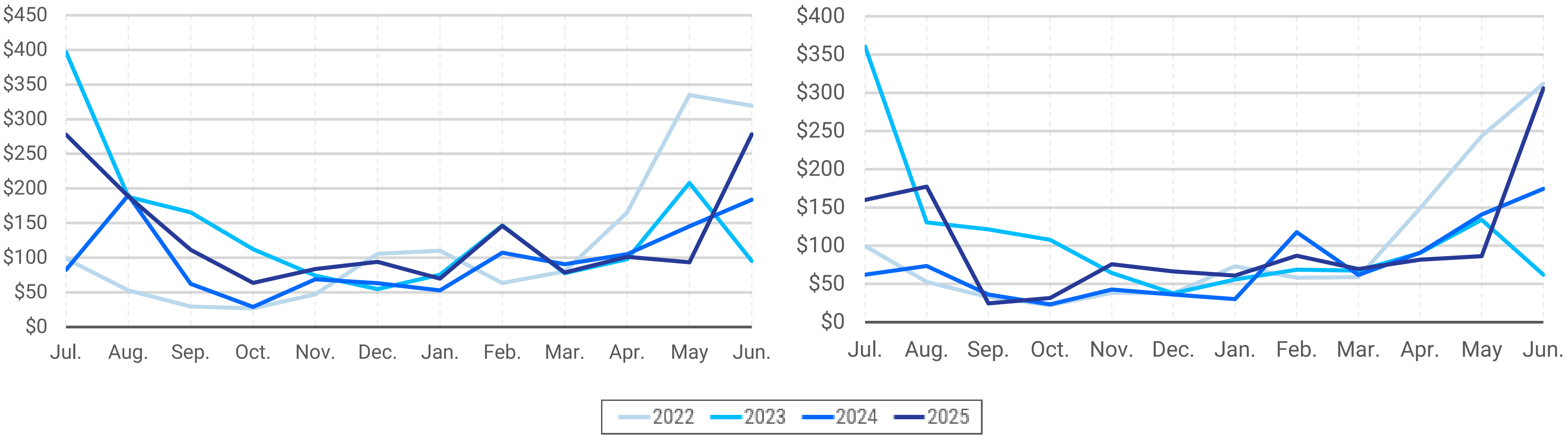
WHOLESALE PRICES IN SA AND VIC INCREASED IN FY2025

Price increases in SA and VIC highlight sensitivity to renewable variability during high-demand periods.

- VWAP in SA and VIC increased, with the yearly average increasing 34% in SA to $132.26/MWh and 38% in VIC to $102.27/MWh.
- SA prices remain above long-term average dispatch prices, with the FY2025 average exceeding the FY2018–24 average of $102.02/MWh.
- VIC is more consistent with long-term average prices, with FY2025 prices slightly higher than the FY2018–24 average of $90.68/MWh.
- In Q2 2025, SA and VIC recorded higher prices, primarily due to a combination of high demand, low wind output, and significant coal generation outages. This is consistent with other regions that experience higher demands with colder weather.

South Australia monthly average dispatch price
Regional price ($/MWh)

Victoria monthly average dispatch price
Regional price ($/MWh)



Source: Panel analysis of AEMO MMS data.

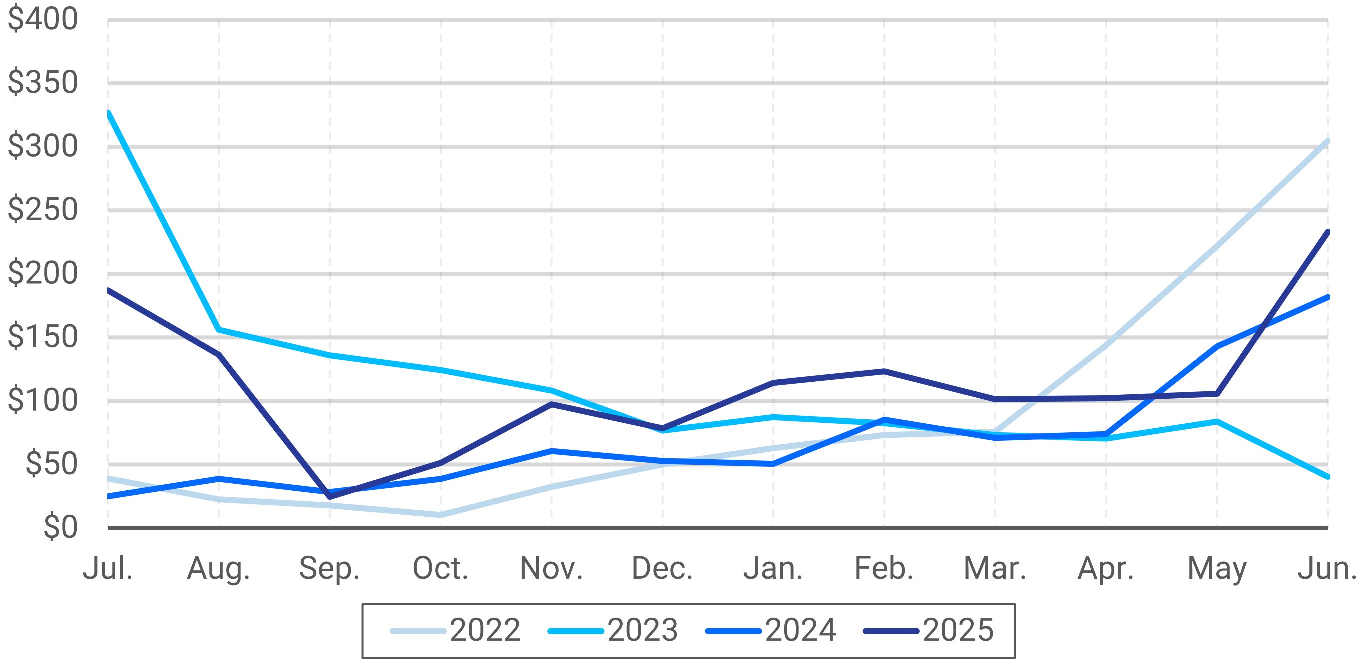
WHOLESALE PRICES IN TAS SAW THE LARGEST INCREASE IN FY2025

The price increase highlights Tasmania's sensitivity to water availability and renewable conditions.

- Tasmanian prices increased 59% in FY25 compared to FY24. This is the largest regional price increase and follows the largest regional price decrease in FY2024.
- The VWAP over FY2025 was $112.94/MWh, above the FY2018-24 long-term average of $78.48/MWh.
- Tasmania experienced higher wholesale electricity prices in FY2025 primarily due to low water storage levels, reduced wind output, and increased reliance on higher-priced, flexible generation like gas.

Tasmania monthly average dispatch price

Regional price ($/MWh)



Source: Panel analysis of AEMO MMS data.

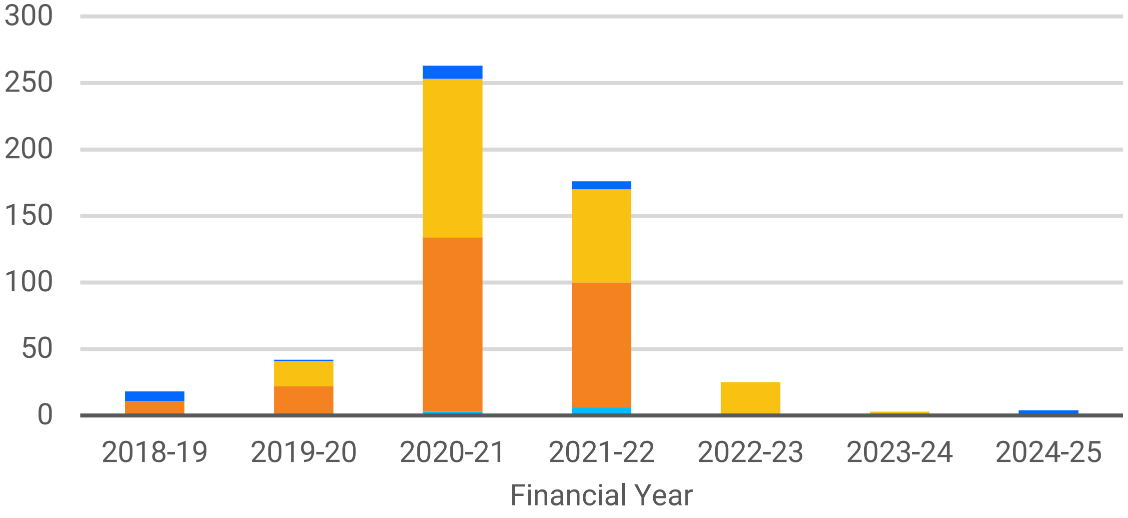
FY2025 SAW A DECREASE IN MPC EVENTS

A decrease in MPC and MFP events indicates that supply side capacity in 2024/25 was relatively well matched to consumer demand and willingness to pay.[48]

- There was a large decrease in market price cap (MPC) events from 69 in FY2024 to 36 in FY2025 - the lowest count in the 7-year period.
- 13 of the 36 MPC events occurred in November 2024. This occurred because demand was high and supply was tight, leading to a price squeeze that triggered several market cap events. AEMO managed outages at coal-fired generators in NSW and QLD.
- All regions except NSW saw a decrease in MPC events. The NSW increase was driven by a convergence of supply-side constraints, surging demand, and structural changes in the energy market.
- Market floor price (MFP) events remained low in FY2025, with only 4 recorded events occurring in Victoria, slightly up from 3 in FY2024.

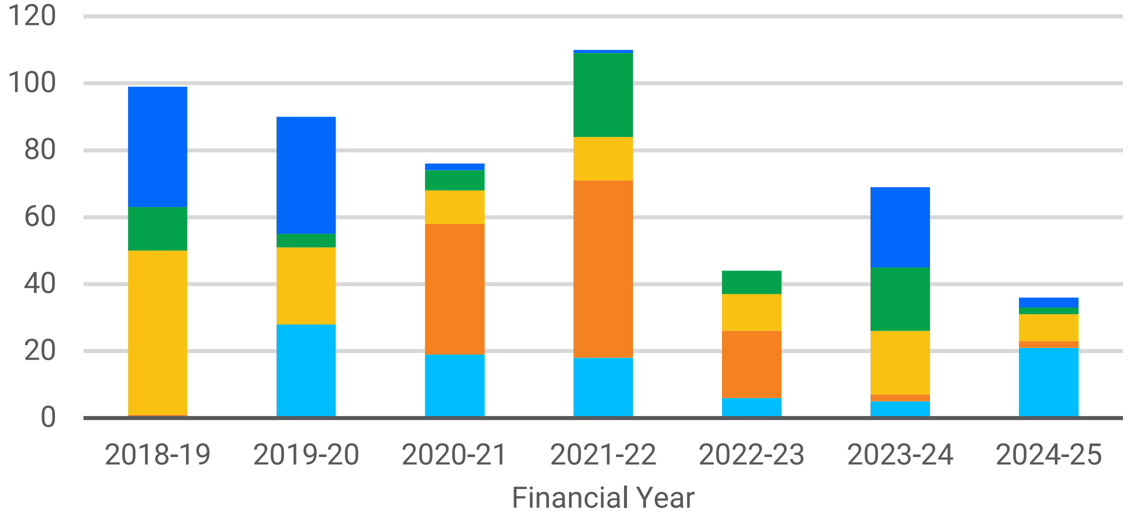
Market price floor events by region

Market floor events



Market price cap events by region

Market cap events



NSW QLD SA TAS VIC

Source: Panel analysis of AEMO MMS data.

48. The market price settings for FY2025: MPF = -$1000/MWh, MPC = $17,500/MWh, CPT = 1,573,700/MWh and the APC = $600/MWh. For more information on the market price settings, see AEMC, *2024-25 market price cap now available*. February 2024.

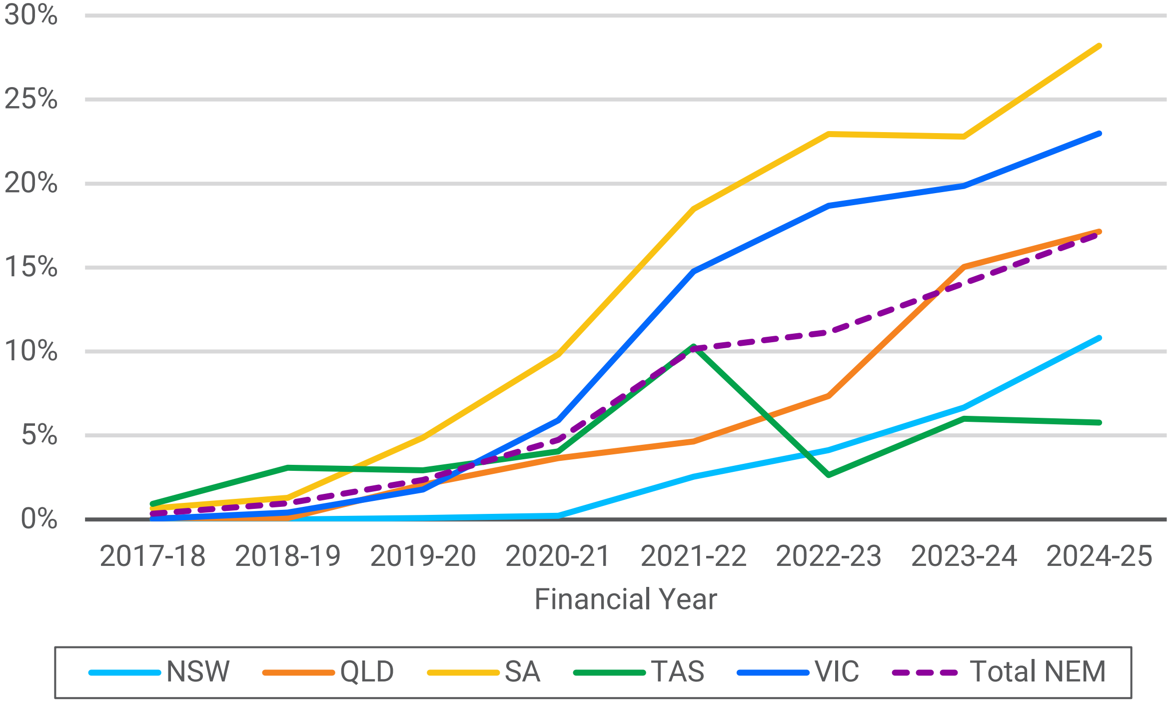
THE PROPORTION OF NEGATIVE PRICE PERIODS CONTINUED TO INCREASE

An increase in the proportion of negative price periods means renewable generation and batteries are setting the price in the NEM more often.

- Negative prices occurred in 17% of all dispatch periods compared to 14% in FY2024.
- This was largely driven by an increase in rooftop PV and utility-scale solar generation during low operational demand periods.
- The increase in negative price intervals came primarily from NSW, with a 61.9% increase compared to FY2024.
- SA, VIC and QLD saw increases of 23.4%, 15.4% and 13.7% respectively, compared to FY2024 levels. SA and VIC continue to account for the greatest proportion of negative price periods in the NEM. TAS saw a 4.0% decrease in negative price periods.
- In FY2025, there was moderate price variation with an increased frequency of higher prices ($100-200 per MWh) compared to last year.

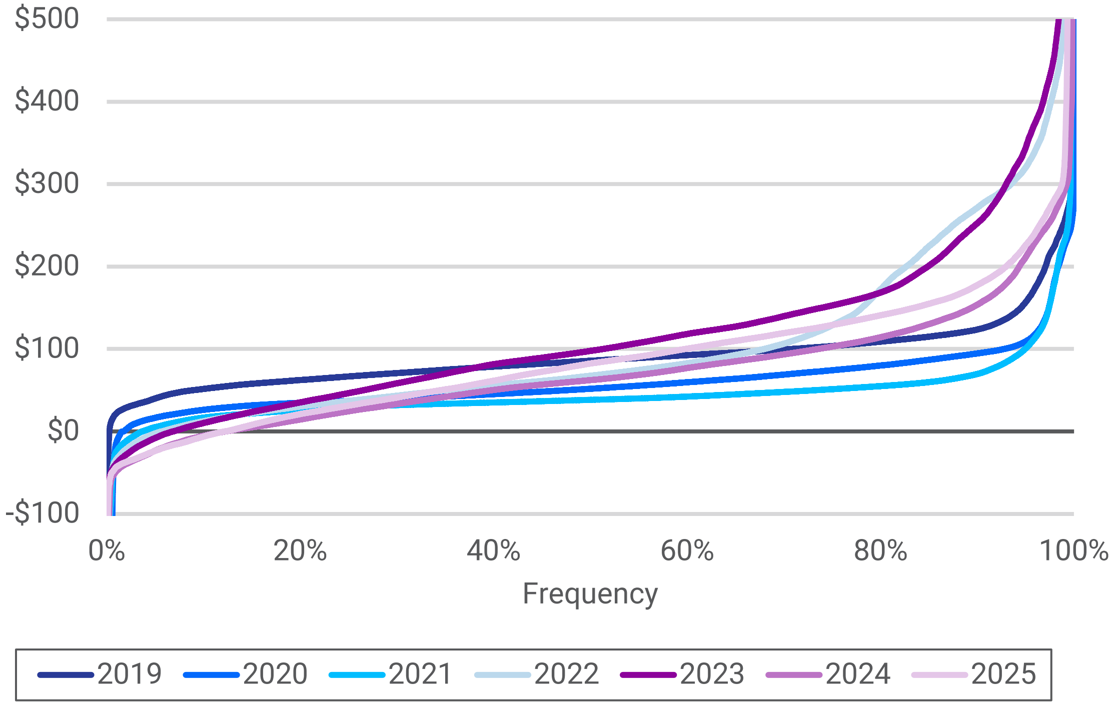
Negative pricing periods

Regional proportion of intervals at a negative price (%)



Average price duration curve by financial year

Price ($/MWh)



Source: Panel analysis of AEMO MMS data.

2.6

TRANSMISSION AND NETWORK PERFORMANCE

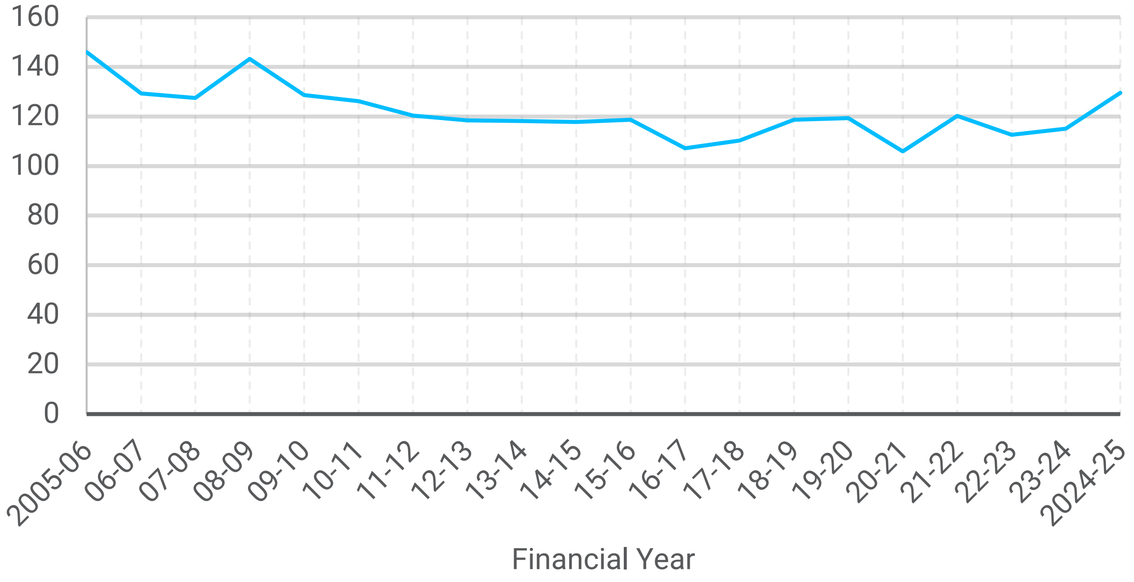
- Distribution Network Service Provider (DNSP) performance remains consistent with previous years.
- Outages in the distribution network continue to account for most of the total supply interruptions in the NEM.
- Consistent with previous years, the total number of NEMDE constraints continued to increase in FY2025, reflecting an increasingly complex NEM.

SAIDI AND SAIFI REMAIN CONSISTENT WITH PREVIOUS YEARS

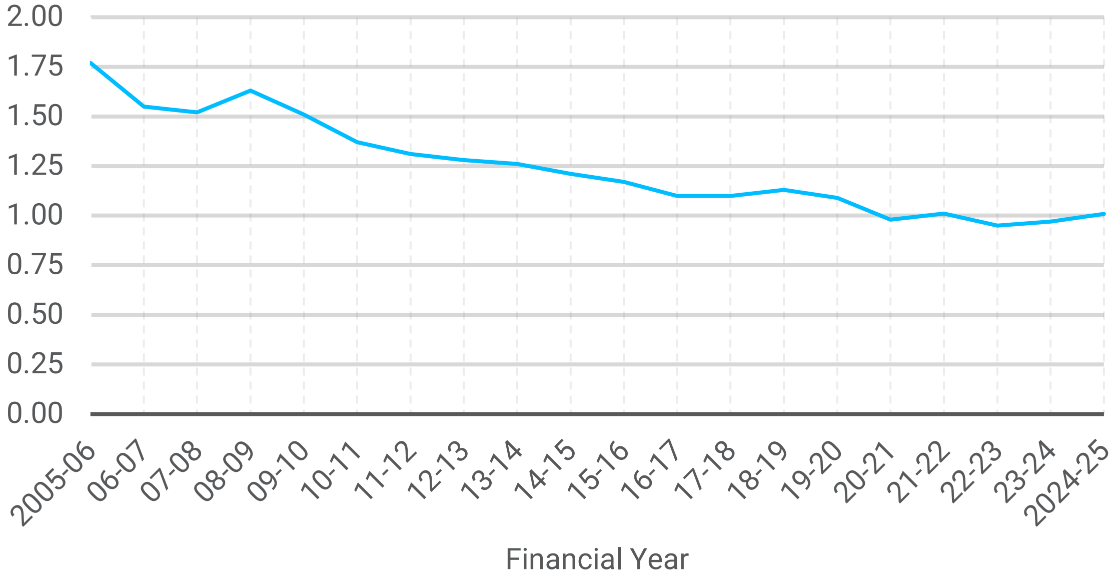
Network performance has steadily improved over the last 20 years, however a slight deterioration in recent years may suggest a new trend.

- System average interruption duration index (SAIDI) indicates the average number of *minutes* of outages that each customer served by the DNSP experiences. System average interruption frequency index (SAIFI) indicates the average *number* of outages for each customer. [49]
- The past 20 years has seen a steady improvement in network SAIFI performance as network businesses have increasingly segmented and automated their networks to reduce the number of customers impacted by network faults. SAIDI has modestly improved over that time.
- In contrast to the long-term trend, both SAIDI and SAIFI performance deteriorated slightly in FY2025. SAIDI increased to 129 minutes of outages per customer from 115 minutes in FY2024. SAIFI increased from 0.97 outages per customer to 1.01.
- This does not yet indicate a trend, the fact that SAIDI improvement has not matched that of SAIFI may suggest that underlying fault rates have increased and/or that those faults occurring are taking longer to repair.

System average interruption duration index (SAIDI)
Weighted average outage duration (minutes)



System average interruption frequency index (SAIFI)
Weighted average number of outages per customer



Source: AER, Operational Performance Data 2025, December 2025; AER, Annual Information Order, January 2026.

49. The SAIDI and SAIFI data exclude outage events and Major Event Days. The Panel notes that version 6 of the Service target performance incentive scheme was published on 17 April 2025.

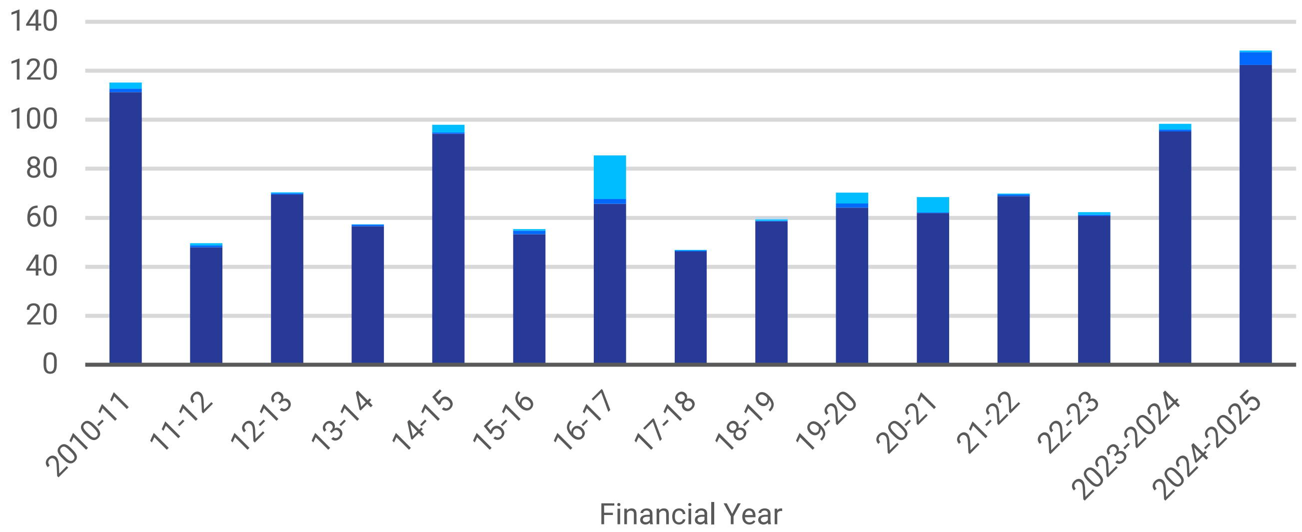
SUPPLY INTERRUPTIONS ROSE DUE TO UNPLANNED DISTRIBUTION OUTAGES

The increase in supply interruptions in FY2025 reflects distribution-level challenges rather than system reliability or security issues.

- Following a five-year period of relative stability, the energy not supplied to customers increased from 98.35 GWh in FY2024 to 128.27 GWh in in FY2025. This is the highest level of energy not supplied in the 15-year outlook.
- Distribution-related interruptions remain the dominant cause, accounting for 94.8% (122.4 GWh) of total energy interrupted in FY2025.
- Unplanned outages in QLD (23.3 GWh) and NSW (11.5 GWh) were the primary contributors to the increases in supply interruptions.
- Compared to FY2024, transmission-related interruptions increased slightly but remained relatively low in FY2025. There was also a decrease in security-related interruptions.[50]

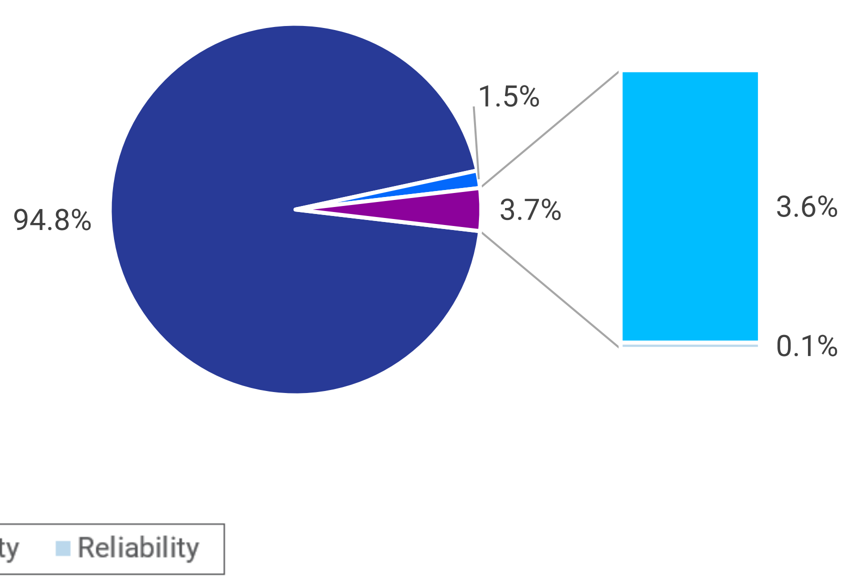
Sources of supply interruptions

Energy not supplied (GWh)



Proportion of energy supply interruptions by cause

(FY2011 - FY2025)



Source: Panel analysis and estimates based on AEMO, AEMO's incident operating reports, July 2025; the AER's Annual Information Order spreadsheets and Transmission Network Service Provider (TNSP) data.

50. The Panel notes that the tower failures in SA and NSW on 16 and 17 October 2024 are not included in these graphs, due to the inability to access data on the duration of these supply disruptions. The customer load impact was 34 MW in NSW and 157.5 MW in SA. For further information on the tower failures in SA and NSW events, see AEMO, Tower failures in South Australia and New South Wales on 16 and 17 October 2024. April 2025.

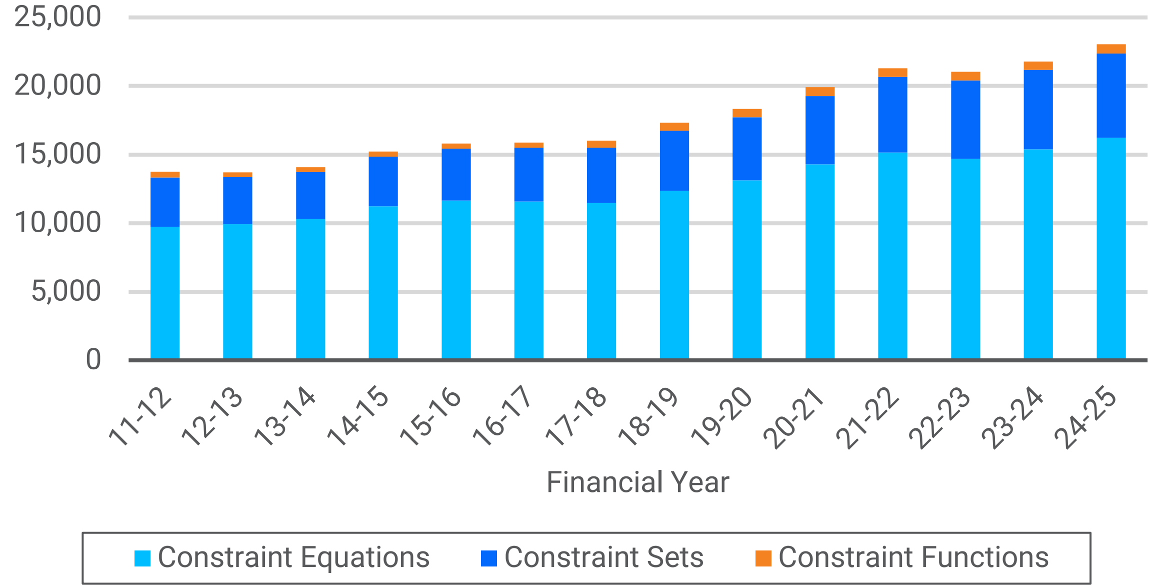
MORE CONSTRAINTS REFLECT AN INCREASINGLY COMPLEX NEM

The number of constraints continues to grow, highlighting the operational challenges of a more complex power system.

- Constraints are used in the NEM dispatch engine to keep the NEM within the system's physical capabilities and help manage risks to supply disruptions in response to credible contingencies. As the system becomes more dynamic and complex, with more units, more constraints are required in the dispatch engine to reflect the physical limits of the power system.
- The number of binding constraint hours increased in FY2025 but remains lower than the FY2022 peak and the total number of constraints has been trending upwards over the last decade.
- This reflects an increasingly complex NEM, with the system transitioning from one dominated by a small number of large synchronous generators located in areas with strong transmission connections, to one dominated by inverter-based resources connecting in weaker parts of the network.
- Drivers for binding constraints are highly dependent on market conditions.

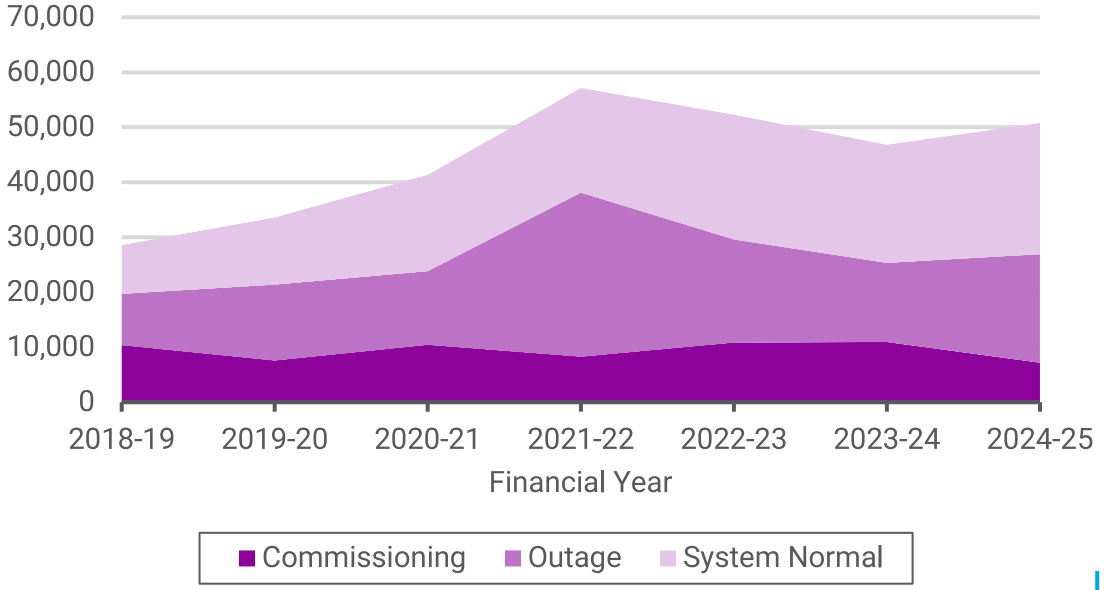
Total number of constraints by financial year

Number of constraints



Binding hours of constraints

Number of hours



Source: Panel analysis of AEMO data.

3

SECURITY PERFORMANCE

3.1

POWER SYSTEM SECURITY INCIDENTS AND RISK MANAGEMENT

- Reviewable operating incidents were primarily caused by transmission-related incidents and busbar trips, consistent with previous years.
- There is a trend of increasing reclassification events, primarily caused by lightning.
- The number and causes of scheduling errors in FY2025 remain consistent with previous years.

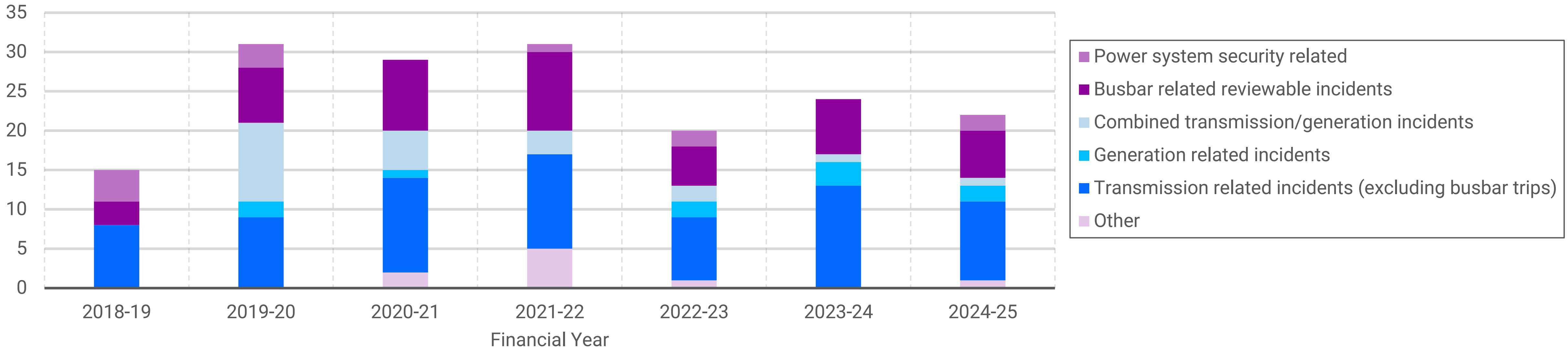
THE NUMBER AND CAUSE OF OPERATING INCIDENTS WAS CONSISTENT WITH PREVIOUS YEARS

The Panel has not identified any trends or necessary changes to procedures, systems, or NER frameworks to prevent or manage similar operating incidents in the future.

- There were 22 reviewable operating incidents in FY2025, primarily caused by transmission-related incidents and busbar-related reviewable incidents, which was consistent with the previous two years.[51]
- There were two instances where the power system was not in a secure operating state for more than 30 minutes. The first was the Load shedding event in Northern NSW on 8 July, as described on slide 75. The other was on 15 January 2025 in Muswellbrook, where the number of online inverters/turbines at six inverter-based resource plants exceeded the secure limits (for up to 76 minutes) required to maintain power system security following an unplanned outage of the two lines.[52]
- The Reliability Panel updated the reviewable operating incident guidelines on 29 September 2022. The Reliability Panel understands that AEMO will ask it to review this guideline again in 2027.

Reviewable operating incidents, by financial year

Number of incidents



Source: Panel analysis of AEMO data. Incidents that cannot be classified into a specific category are classified in the 'Other' category.

51. AEMO publishes its incident reports on its website, see AEMO, *Power system operating incident reports*, 2025.

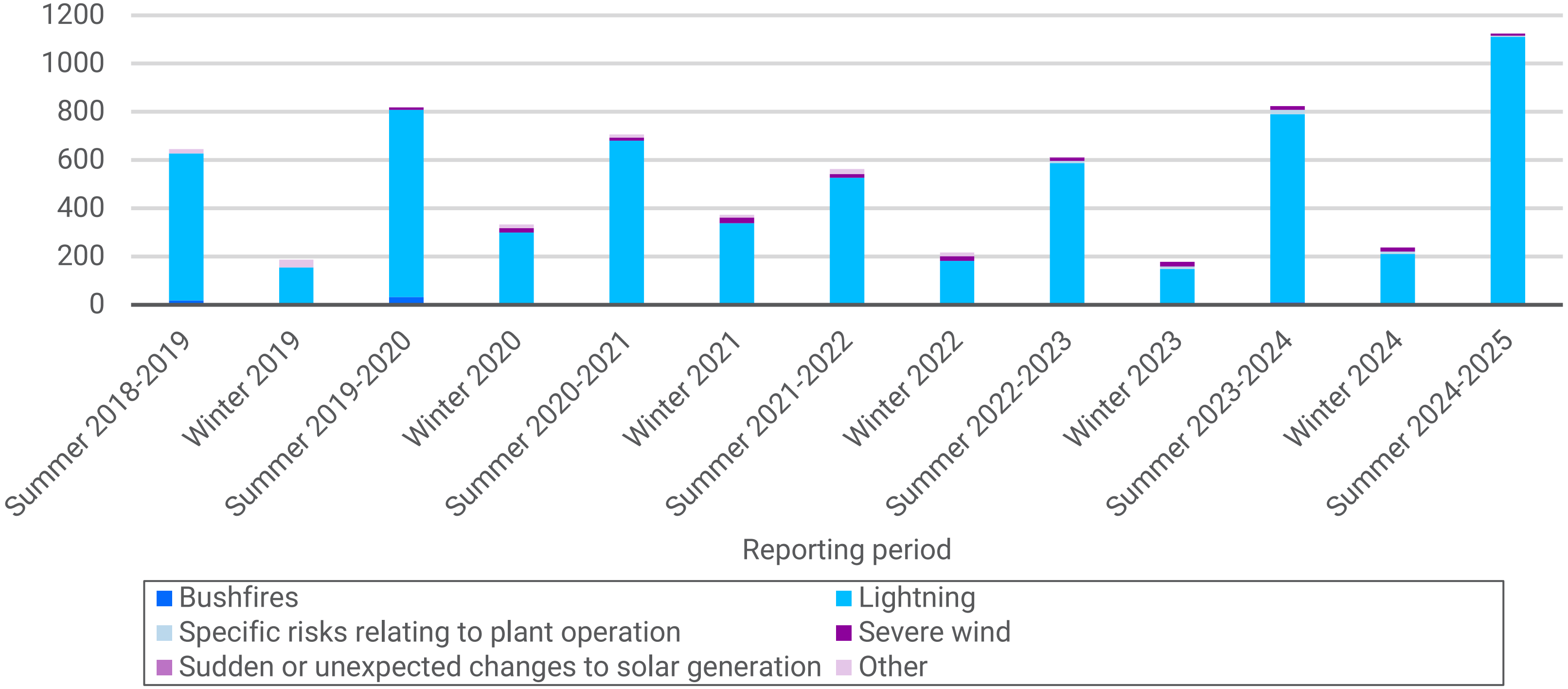
52. For further information, see AEMO, *Power system not in a secure operating state following an unplanned 330 kV line outage at Muswellbrook on 15 January 2025*, September 2025.

RECLASSIFICATION EVENTS CONTINUE TO SPIKE IN SUMMER

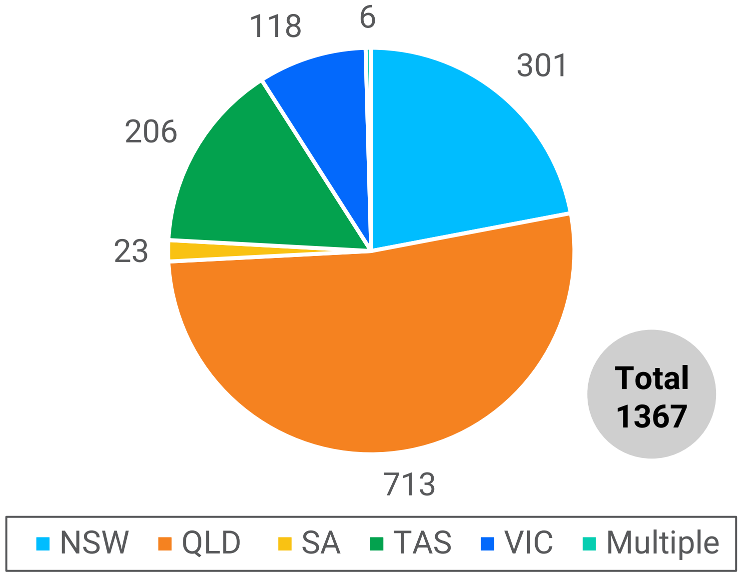
Reclassification events may require AEMO to temporarily revise constraint equations, which, when binding, may have market and cost implications.

- There has been a trend of transmission lines being increasingly impacted by lightning storms over the last three summers.[53]
- Most of the reclassification events between 1 May 2024 and 30 April 2025 were caused by lightning (1317, which primarily in QLD and NSW), followed by severe wind (26), specific risks relating to plant operation (14) and bushfires (5).[54]

Number of reclassification events by category



Reclassification events in the NEM



Source: AEMO, Review of Power System Reclassifications.

53. AEMO's reporting period for reclassification events differs from the Panel's review year. The winter reporting period is set 1 May to 31 October each year, and the summer reporting period is set to 1 November to 30 April the following year.

54. AEMO, *Review of Power System Reclassifications – 1 November 2024 to 30 April 2025*, September 2025.

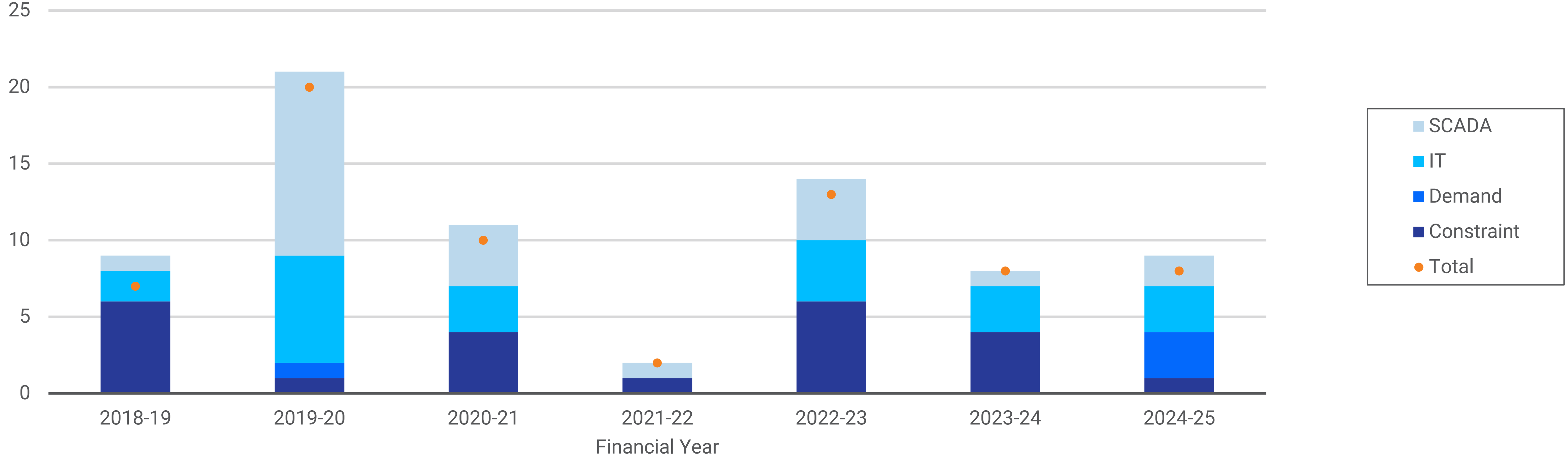
THE NUMBER AND CAUSES OF SCHEDULING ERRORS WAS CONSISTENT WITH PREVIOUS YEARS

Scheduling errors can cause inefficient market operation and may require participant compensation.

- There were 8 scheduling errors in FY2025, consistent with the seven-year historical average.
- There were 3 IT-caused scheduling errors, consistent with the historical average.[55]
- There were 3 demand-caused scheduling errors, greater than the historical average of 0.3 occurrences.
- There was 1 constraint-caused scheduling error and 3 Supervisory Control and Data Acquisition (SCADA) caused scheduling errors. Both were below the historical averages of 3.3 and 4, respectively.

Causes of scheduling errors by financial year

Frequency of cause



Source: AEMO, *Scheduling Error Reports*. Some scheduling errors have multiple causes, meaning that the total number of scheduling errors will be less than or equal to the total number of causes.
55. The Panel notes that one of the IT failures caused the market to be suspended on 5 September 2024. For information, see AEMO, *Preliminary Report: NEM Market Suspension on 5 September 2024*, June 2025.

3.2

FREQUENCY PERFORMANCE

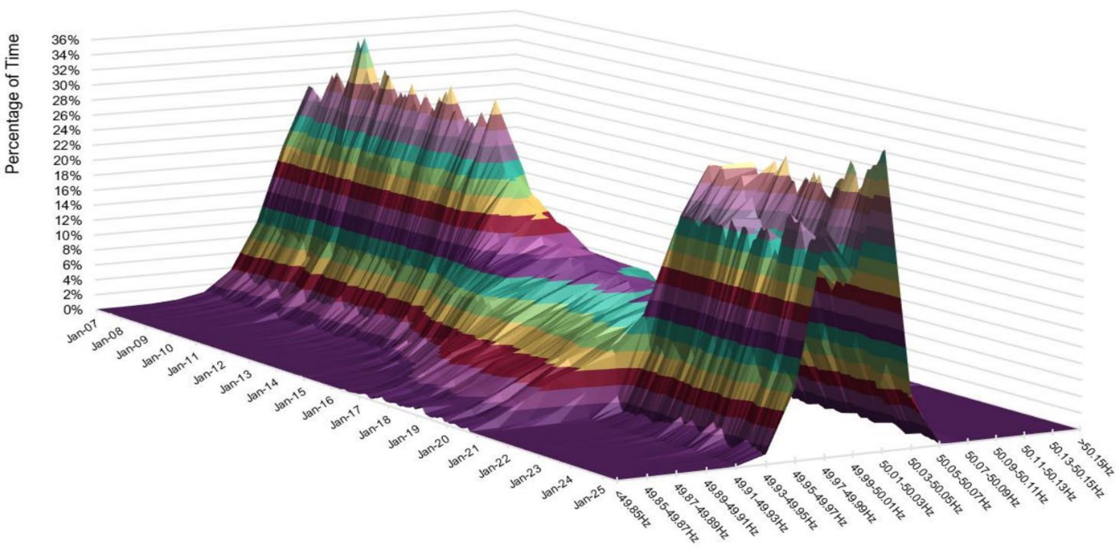
- The mainland continued to operate within the normal operating frequency band (NOFB).
- Tasmania spent 0.412% of the year outside the NOFB. This is broadly consistent with the previous two years but more than the mainland, largely due to flow reversals and import limitations on the Basslink interconnector.
- Bimodal peaks within the mainland frequency distribution continue to be a trend.

TASMANIA CONTINUES TO SPEND MORE TIME OUTSIDE THE NOFB THAN THE MAINLAND

Frequency performance continues to be adequate as a result of reforms to primary frequency response frameworks.

- The mainland operated within the normal operating frequency band (NOFB) for 99.998% of FY2025, consistent with the last 3 years.
- Tasmania operated within the NOFB for 99.533% of FY2025, consistent with its FY2024 performance.
- Basslink interconnector operations continued to be the primary cause of extended frequency excursions in Tasmania, with events attributed to flow reversals and import limitations.[56]
- The Panel is monitoring bimodal peaks within the mainland frequency distribution, which continue to be a trend since the introduction of mandatory primary frequency response (PFR) rule in 2020.[57] The Panel intends to review the frequency operating standard, including these trends, in a review commencing in 2027.

Monthly mainland frequency distribution

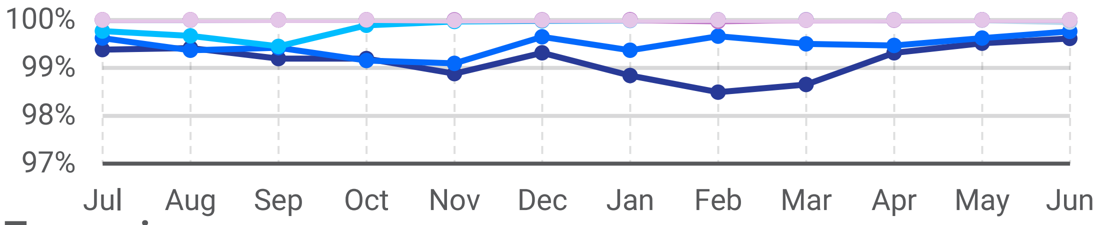


Source: AEMO, *Frequency Monitoring – Quarter 2 2025*, August 2025.

Average time spent within the NOFB by month

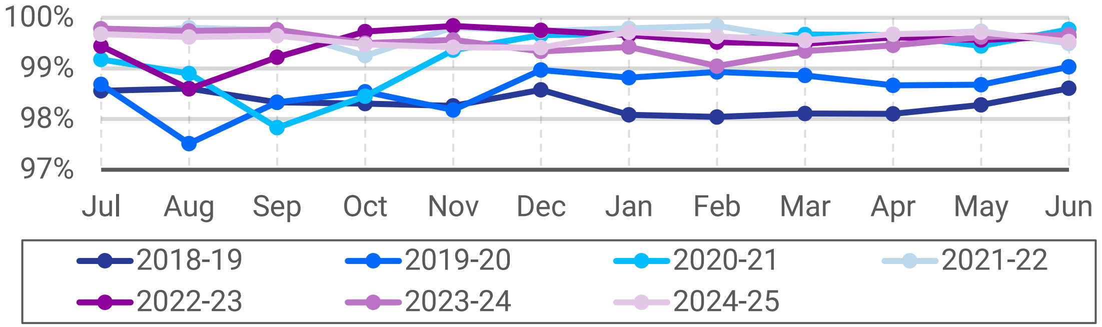
Mainland

Percentage of time in NOFB (%)



Tasmania

Percentage of time in NOFB (%)



Source: Panel analysis of AEMO data.

56. For further information, see AEMO, *Frequency and time deviation monitoring – quarterly reports*, 2025.

57. Frequency control has improved significantly since the introduction of the *mandatory PFR rule* in 2020. Before this, frequency often wandered widely across the NOFB; now, it is tightly contained, even if it creates a bimodal distribution. New Frequency Performance Payments (FPP) framework went live on 8 June 2025. The reform includes financial incentives and penalties to encourage facilities' helpful contributions to frequency stability, which may help reduce bimodality. For more information, see: AEMO, *Primary frequency response*, accessed March 2026.

3.3

SYSTEM SERVICES PROCUREMENT AND UTILISATION

- Frequency control ancillary services (FCAS) costs continue to fall with increased market competition.
- Falling FCAS costs had the largest contribution to reducing system operating costs in FY2025.
- The overall system operating cost structure is slowly shifting, with AEMO revenue requirements comprising a larger share of total costs.

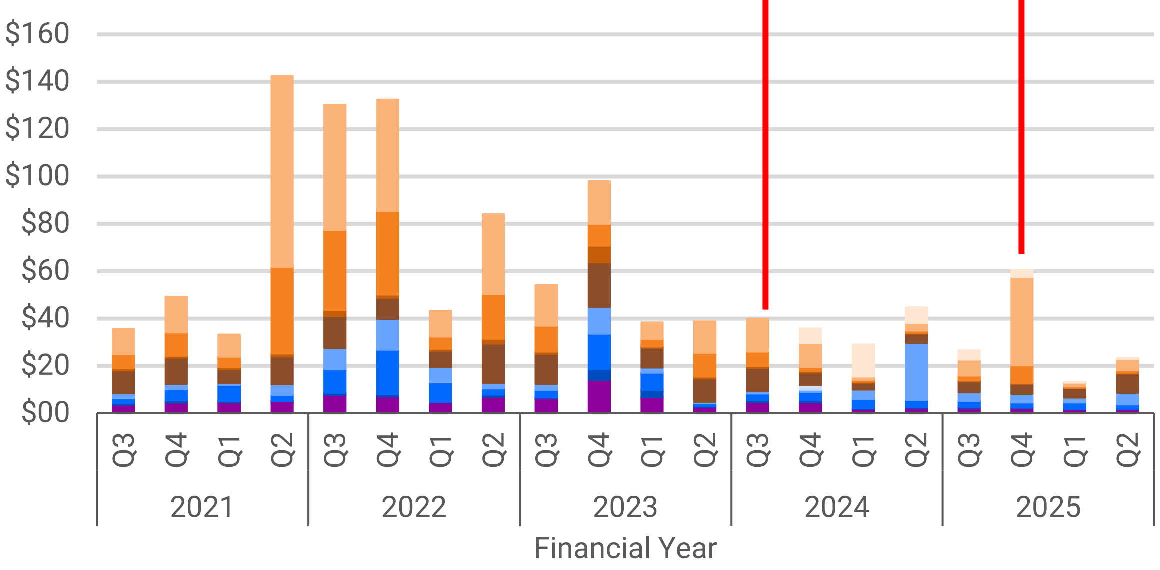
INCREASED MARKET COMPETITION PUT DOWNWARD PRESSURE ON FCAS COSTS

FCAS needs and costs vary significantly across regions and days in response to power system events.

- FCAS is a critical component of maintaining system security in a transitioning system.
- An increasing penetration of batteries in the NEM has increased competition in FCAS markets. Batteries provided 54% of the total enabled FCAS in Q2 2025 and were the sole supplier of the 1-second raise and lower FCAS markets.
- The NEM-wide quantity of FCAS enabled is on par with previous years, implying a lower average FCAS price. However, regional FCAS prices and quantities can vary substantially in response to market events such as islanding or the exit of a large generator.

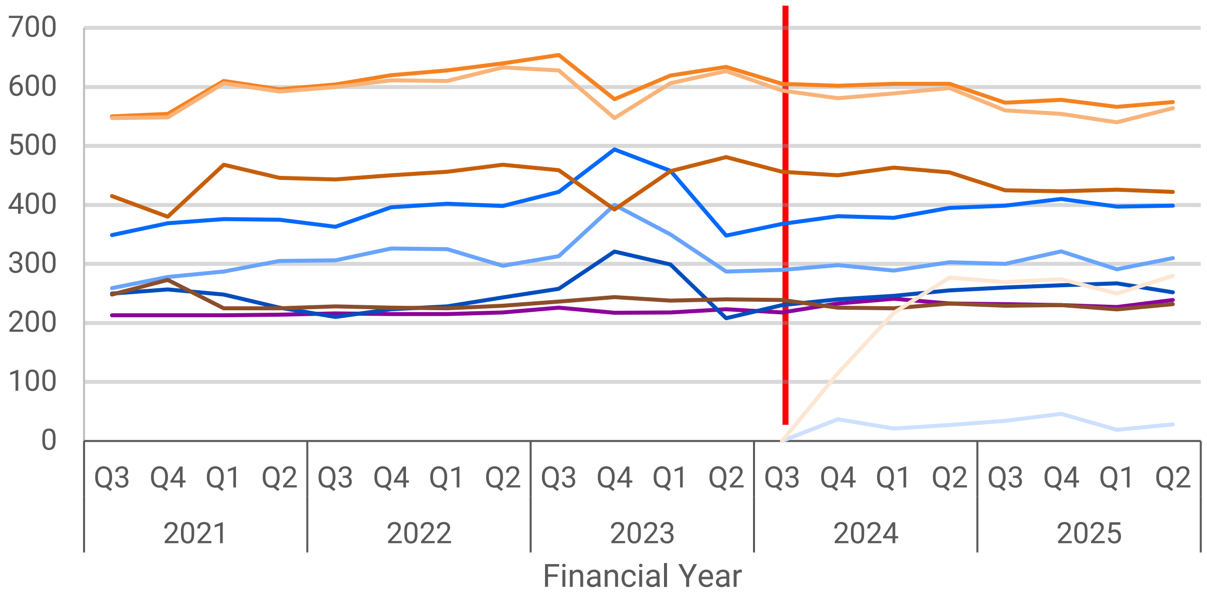
Quarterly FCAS costs[58]

FCAS cost ($ million)



Quarterly FCAS enabled

FCAS enabled (MW)



LOWERREG LOWER5MIN LOWER60SEC LOWER6SEC LOWER1SEC RAISEREG RAISE5MIN RAISE60SEC RAISE6SEC RAISE1SEC

Source: AEMO, *Quarterly Energy Dynamics Q2 2025*, July 2025; AER, *FCAS Quarterly average FCAS enablement by services*, accessed March 2026; Panel analysis of AEMO MMS data.

58. The 'Quarterly FCAS costs' graph has been revised this year to correct for a reporting error. Previously, 'global' FCAS data was reported as opposed to 'total' FCAS data. Global FCAS data includes only inter-regional FCAS data, meaning that regional FCAS cost data was excluded.

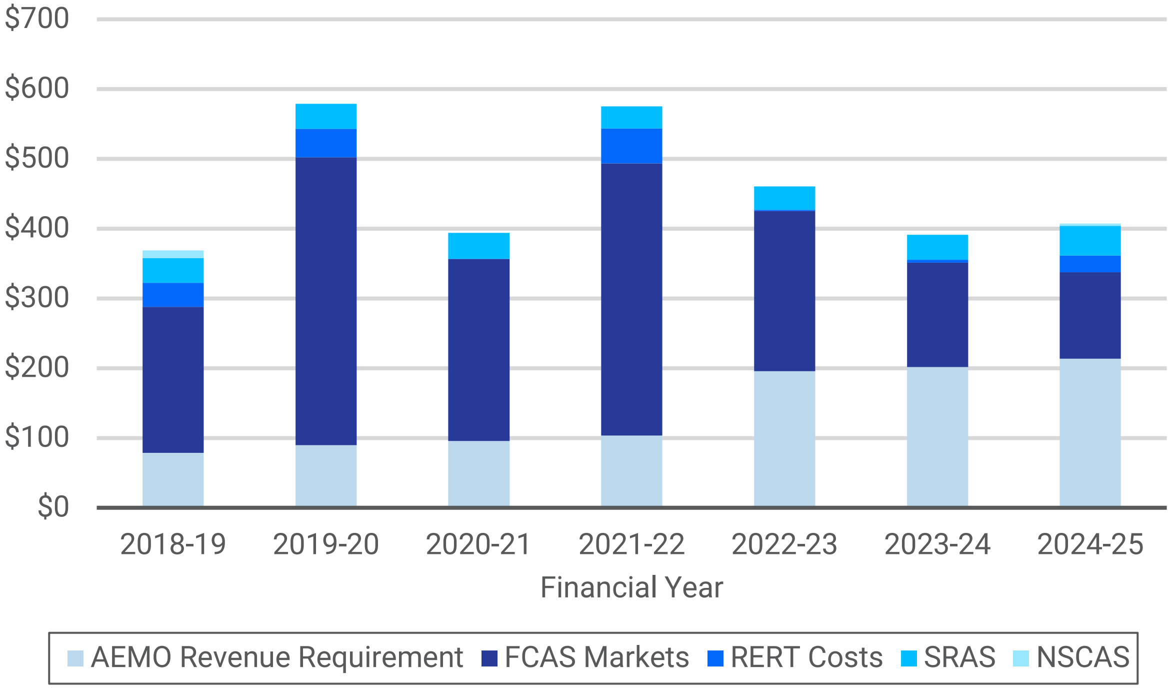
59. Planned network outages affecting QNI on 11 October 2024 required local enablement of FCAS, driving the local price for the contingency raise 6-second service to the market price cap.

THE STRUCTURE OF SYSTEM OPERATING COSTS IS CHANGING

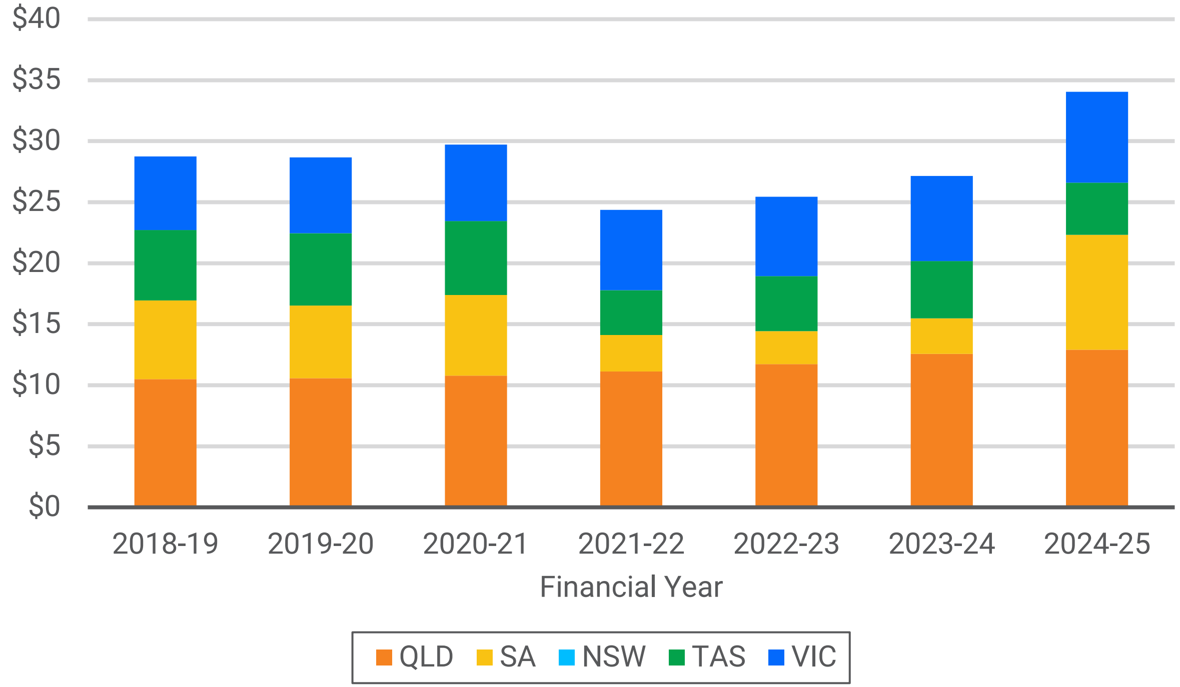
Total system operating costs are consistent with previous years and represent only 1.6% of the $25.4 billion of energy traded in FY2025.[60]

- The overall structure of operating costs has shifted since 2022, with AEMO's revenue requirement (the total amount it must recover through fees to cover its costs) making up a larger share of operating costs, and FCAS costs making up a smaller share. AEMO's cost increases are primarily due to the complexity of the energy transition, implementation of major market reforms, and a structured recovery of past deficits.
- SRAS costs have increased, consistent AEMO's identification of several challenges in providing SRAS and system restart planning due to ongoing changes in the power system as it transitions.[61] The revised system restart standard aims to address these challenges.[62]

Cost of operating the system (excl June 2022)



SRAS costs



Source: AEMO, *Non Market Ancillary Services (NMAS) report 2024-25*, October 2025.
60. AEMO, *Annual report FY25*, September 2025.
61. Reliability Panel, *Review of the system restart standard 2025*, *Information sheet*, 12 December 2024.
62. Reliability Panel AEMC, *Final standard*, System restart standard, 11 December 2026.

3.4

AEMO INTERVENTIONS FOR SECURITY

- There were materially fewer security directions in FY2025 than there has been in recent years.
- Most security directions were issued in SA, which was also true for previous years.
- There were eight security directions issued outside of SA, with one in NSW and seven in VIC.

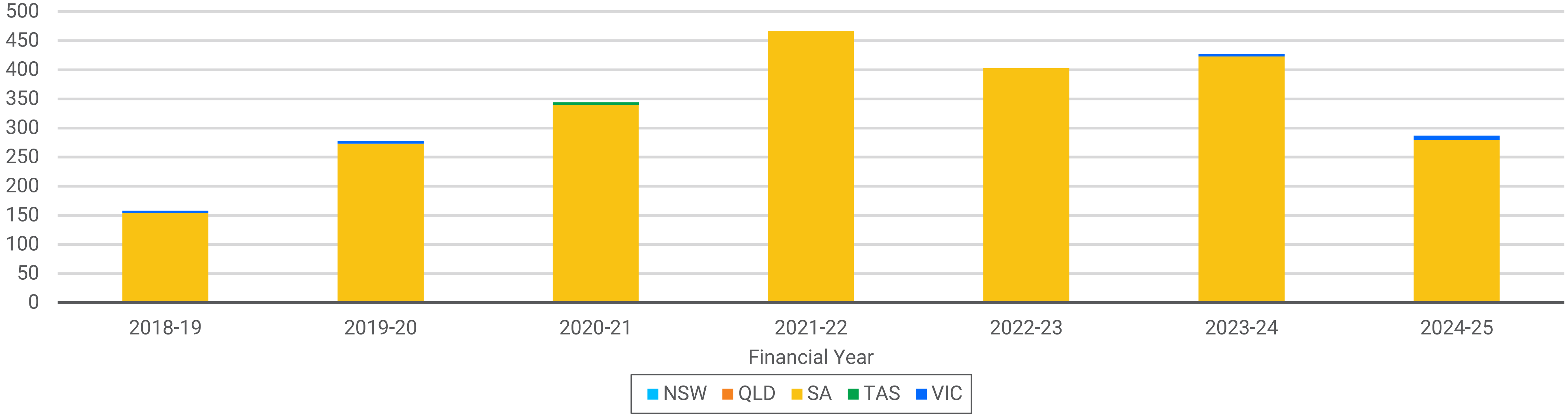
SECURITY DIRECTIONS REACHED A FOUR-YEAR LOW IN FY2025

The significant decrease in security directions in SA is the culmination of many years of regulatory reforms, the installation of four high-inertia synchronous condensers, the completion of Project Energy Connect (PEC) stage 1 and a range of other technical work. FY2025 saw the number of SA security directions issued decrease from 427 in FY2024 to 287.

- The number of security directions is expected to decrease in FY2026, now that SA has the ability under some conditions to operate securely with one synchronous generator online and following a determination by the AEMC that provides AEMO a new function to enable and use system security services in place of directions.[63,64]
- 1 security direction was issued for NSW and 7 for VIC. This is above-average for non-SA regions in a single year.

Number of security directions

Number of directions



Source: Panel analysis of AEMO data.

63. SA has a high penetration of inverter-based generation and limited grid connections to the broader power system. Previously, AEMO required at least two synchronous generators to ensure that if one tripped (a "credible loss"), the other would still be online to provide essential services. Now, when SA is interconnected to the rest of the NEM, protection is adequate with one large synchronous generator and four synchronous condensers in service. See: AEMO, *Reduction of Minimum Synchronous Generators in South Australia*, August 2025.

64. AEMO, *Improving Security Frameworks for the Energy Transition*, accessed March 2026; NER rule 4.4A.

3.5

INERTIA-RELATED METRICS

- The panel will now monitor and report on metrics that affect the potential economic benefits of operationally procuring inertia.
- These metrics include: the costs of minimum inertia procurement, minimum inertia requirements, FCAS market prices and the marginal value of rate of change of frequency (RoCoF) constraints.
- The panel is seeking feedback on the use of these metrics, to refine reporting in future years.

THE PANEL WILL MONITOR AND REPORT ON METRICS RELEVANT TO THE POTENTIAL OPERATIONAL PROCUREMENT OF INERTIA

In the Efficient Provision of Inertia final rule determination, the AEMC determined that it is unlikely that there will be net benefits of introducing a new operational procurement mechanism for inertia in the near term.[65] The AEMC tasked the Panel with reporting on metrics that affect the potential economic benefits of operationally procuring inertia, to provide a basis for assessing if and when the introduction of a new operational procurement mechanism should be reconsidered.[66]

The RASR terms of reference suggest the Panel could report on the following factors:

- the inertia requirements specified by AEMO in its annual inertia reports
- the estimated cost to consumers from Inertia Service Providers meeting their inertia obligations
- the 1-second raise and lower contingency FCAS market prices
- the marginal value of any rate of change of frequency (RoCoF) dispatch constraints
- any other metrics that the Panel considers relevant to assessing benefits from the potential operational procurement of inertia.

FY2025 is the first year the Panel is reporting on inertia metrics. In this report the Panel has reported on three of the factors suggested in the terms of reference: inertia requirements, FCAS market prices and the marginal value of RoCoF constraints. The fourth factor, the costs of minimum inertia procurement, will be reported on in future years when it becomes available as part of AEMO's reporting of enablement costs.[67]

We are seeking stakeholder feedback on the use and interpretation of these metrics, and if there are any other metrics relevant to assessing benefits from the potential operational procurement of inertia.

65. AEMC, *Efficient provision of inertia*, Rule determination, 9 October 2025.
66. AEMC, *Reliability & security report, AEMC Terms of reference to the Reliability Panel,* 3 December 2025.
67. Under new system security services reporting requirements set out in NER rule 4.4A.7, AEMO must (amongst other things) report on the total quantity and estimate of costs of each type of system security service (including inertia) that was enabled in the previous financial year. This reporting requirement on AEMO commenced in December 2025.

THE PANEL WILL USE THESE METRICS TO CONSIDER WHETHER THE NET BENEFITS OF OPERATIONALLY PROCURING INERTIA HAVE CHANGED

Minimum inertia requirements

- The minimum inertia requirements are the secure and satisfactory levels of inertia required in each sub-network and across the NEM, as specified and published annually by AEMO.[68]
- An increase in inertia requirements may lead to changes in the costs and benefits of meeting these needs under the current framework and/or a reason to consider alternative ways of meeting these needs.

Costs of minimum inertia procurement

- The costs of minimum inertia procurement are the estimated cost to consumers from Inertia Service Providers meeting their inertia obligations. These are reported annually by AEMO, which must publish a report on the total quantity and estimate of costs of each type of system security service that was enable in the previous financial year.[69]
- Monitoring for an increase in the expected costs to consumers of meeting inertia needs would help determine if there may be a benefit in establishing a real-time inertia market.

FCAS market prices

- The FCAS market prices relevant to inertia are the 1-second raise and lower contingency FCAS market prices.
- The provision of inertia is intrinsically linked with the ability to control the frequency performance of the power system. While not completely interchangeable, 1-second raise and lower frequency response can act as a partial alternative to inertia.
- A sustained increase in FCAS prices may support a change in the net benefits of a real-time inertia market.

Marginal value of RoCoF constraints

- The marginal value of any RoCoF dispatch constraints, is the value of constraints which impact when inertia becomes binding and must be procured.
- The operational procurement of inertia could help relieve RoCoF dispatch-related constraints. Monitoring for an increase in the value of RoCoF-related constraints, including the value of any new constraints that AEMO may formulate to maintain secure operation, will help determine when the operational procurement of inertia may become more likely to deliver net benefits to consumers.

68. NER rule 5.20.5 and 5.20B.1.
69. NER rule 4.4A.7.

MINIMUM INERTIA REQUIREMENTS REMAIN LIKELY TO BE MET

Inertia requirements refer to the secure and satisfactory levels of inertia required in each sub-network and across the NEM.[70]

AEMO has identified in the TPSS that, over a three-year assessment horizon:[71]

- **NSW:** Inertia deficits are forecast from 2027-28. Synchronous condensers currently being procured will alleviate these deficits.
- **QLD:** Two emerging inertia needs have been identified, with remedial measures underway.
- **SA:** No inertia deficits have been identified.
- **TAS:** Inertia deficits have been identified. Contracts are being explored alongside system strength remediation.
- **VIC:** An inertia deficit has also been confirmed from 2027-28. VicGrid may need to take additional measures to ensure that sufficient inertia is available in Victoria from December 2027.

The forecast inertia deficits in some states from 2027-2028 can be addressed using current planned arrangements, with the support of remedial measures and contracts for services. This indicates that there is no need for an inertia market currently.

The Panel also notes that the minimum inertia requirements released in December 2025 are consistent with the prevailing inertia requirements at the time the Efficient provision of inertia rule determination was made in October 2025.[72]

Inertia requirements

2 December 2025 to 1 December 2035

Region	Satisfactory inertia level (MWs)	Secure inertia level (MWs)	Inertia sub-network allocation (MWs)	Likelihood of islanding
NSW	10,000	12,500	9,600	Unlikely
QLD	13,000	14,700	10,500	Likely
SA	4,100	5,600	4,300	Likely
TAS	3,200	3,800	-	Likely (continuous)
VIC	13,700	15,400	11,800	Unlikely

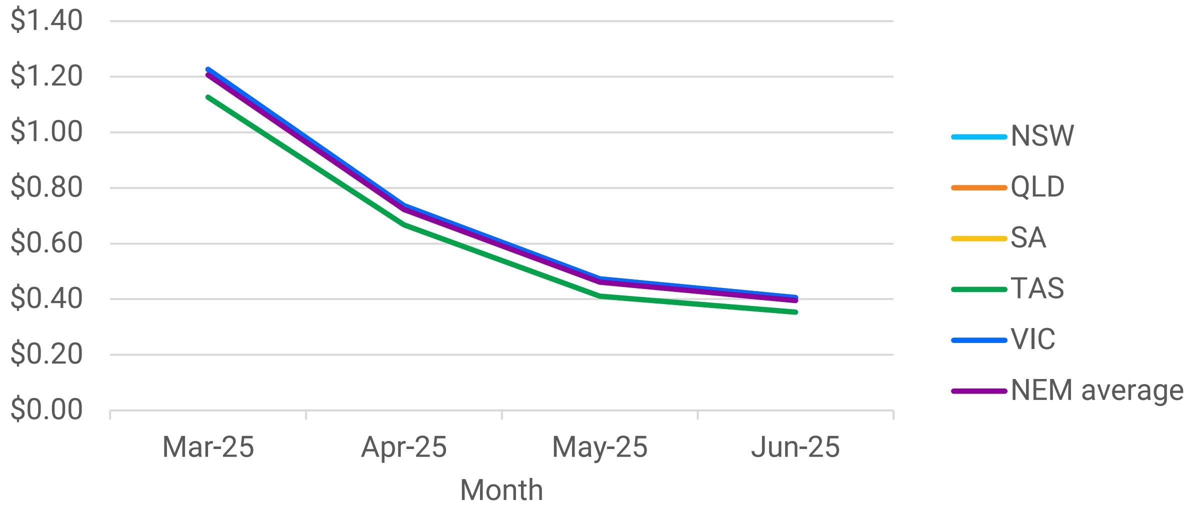
Source: AEMO, *Appendix to the Transition Plan for System Security*, *Appendix A2 – Network Requirements*, 2025.
70. These are published annually by AEMO. See: NER rule 5.20.5.
71. AEMO, *Appendix to the Transition Plan for System Security*, *Appendix A2 – Network Requirements*, 2025
72. See: AEMO, *Appendix to the Transition Plan for System Security*, *Appendix A2 – Network Requirements*, 2025.

MARKET PRICES FOR 1-SECOND RAISE AND LOWER FCAS ARE LOW

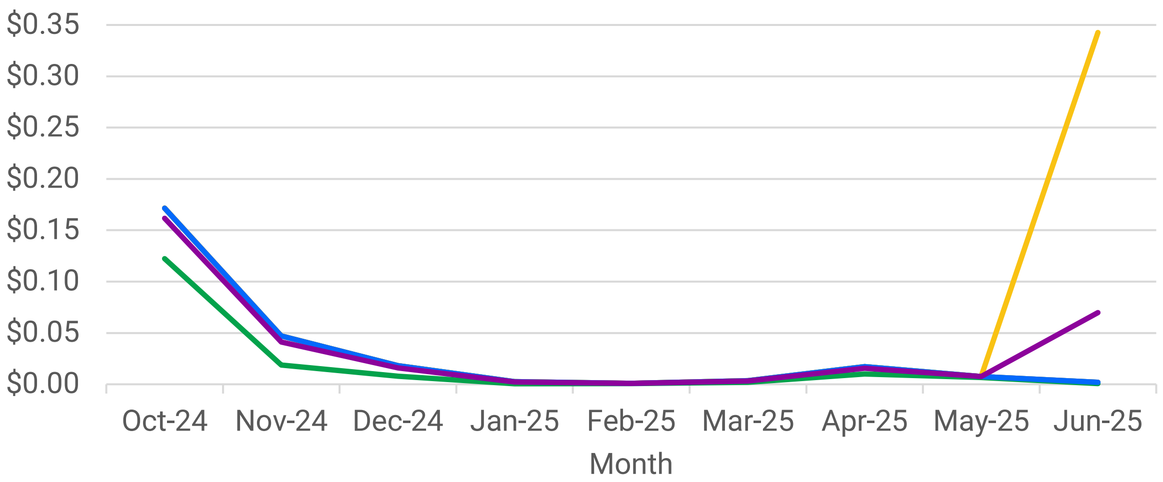
There is limited benefit of investing in an inertia market to put downward pressure on prices, given that they are already low.

- The provision of inertia is intrinsically linked with the ability to control the frequency performance of the power system.
- A sustained increase in 1-second raise and lower FCAS prices may support a change in the net benefits of a real-time inertia market.
- The tables below show that the average monthly 1-second raise and lower FCAS prices are low.[73] This is consistent with the increasing penetration of batteries in the NEM.
- The Panel will continue to monitor for any sustained increase in 1-second raise and lower FCAS prices, as these might indicate increased net-benefits of a real-time inertia market.
- However, the Panel notes that increases in 1-second raises and lower FCAS prices are unlikely, as demand for FCAS tends to be stable in aggregate, and market supply is only increasing.

1-second raise market prices (monthly average)



1-second lower market prices (monthly average)



Source: Panel analysis of AEMO data.

73. There is limited historical data because the 1-second raise and lower data markets were introduced with market limits. Market limits can distort market values; as a result, we can only reliably use market prices after any limits have been removed (in February 2025 and September 2024 for the raise and lower markets, respectively). See AEMO, Very Fast FCAS Market Transition; AEMO electricity market notice 124615; and AEMO electricity market notice 118145.

COST OF ROCOF CONSTRAINTS ESTIMATED TO BE LOW

The marginal value of RoCoF constraints does not indicate a need for a market for inertia at this time.

- The marginal value of a RoCoF constraint represents the effect of that constraint on the total clearing price.[74] These marginal values are used as estimates of the scale of magnitude of the potential benefits that a hypothetical inertia spot market could deliver.
- The cumulative marginal values over FY2025 are relatively small in comparison to the estimated cost of implementing a new market for inertia (between $5m and $10m).[75]
- For the Panel to consider implementing a market for inertia, the estimated scale of potential benefits would need to come significantly closer to the hypothetical implementation cost for an inertia market.

RoCoF-related constraint metrics[76]

FY2025

Constraint	T_ROCOF_1	T_ROCOF_2	T_ROCOF_3_1	T_ROCOF_3_2	T_ROCOF_3_3	V_S_NIL_ROCOF	S_V_NIL_ROCOF
Cumulative marginal value over FY2025	$1,327	$1,644	$4,167	$306	$61,119	$9,172	$0
Average marginal value when binding in FY2025	$51	$97	$102	$76	$61	$43	$-
Percentage of dispatch intervals in FY2025 binding	0.02%	0.02%	0.04%	0.00%	0.95%	0.20%	0.00%

Source: Panel analysis of AEMO data.

74. The marginal value of the constraint is the dollar value of relaxing the constraint right-hand side by 1 unit. If the constraint right-hand side directly translated 1:1 into a limit on Interconnector flow, then this is the dollar value of 1 MW of increased interconnector flow.

75. An estimate of $7.5 million was developed to support the Efficient provision of inertia rule change. See: HoustonKemp, *Evaluating market designs for inertia services*, December 2024.

76. '*S_V_NIL_ROCOF*' did not bind in FY2025. The Panel understands that the commissioning of PEC Stage 2 later in FY2026 may impact the extent of the VIC-SA and SA-VIC constraints, such that AEMO may review and potentially remove these constraints.

4

MARKET EVENTS

TIMELINE OF MAJOR NEM EVENTS IN FY2025

The timeline below highlights a range of events in the NEM in FY2025 that the Panel considers noteworthy, each for various reasons.

The Panel has assessed the Reviewable Operating Incidents (ROI) that occurred in FY2025 and selected four that it considers significant and diverse, from which we may learn. These four events are included in the timeline below, distinguished by solid blue outlines, and are described in more detail on the following slides.[77]

FY2025

8 July 2024
Load shedding event in Northern NSW.[78]

5 September 2024
NEM market suspension due to NEMDE and EMMS failure.

6 September 2024
Trip of Loy Yang power station busbar (no load or generation lost)

16 & 17 October 2024
39 transmission structures failed, causing five power system incidents across NSW and SA. The AER has since instituted proceedings against Transgrid relating to the Broken Hill islanding.

26 November 2024
The Federal Government announced an independent review into wholesale market reform (the Nelson review).

4 December 2024
A class action against QLD government-owned generators for alleged market manipulation was dismissed by the federal court.

16 December 2024
NEM-wide market demand reaches a four-year high of 33,716 MW, driven by extreme hot temperatures across the mainland.

22 January 2025
QLD breaks its record for market demand, exceeding a record set the year prior.

8 March 2025
Tropical Cyclone Alfred downgraded to a tropical low before making landfall near Brisbane. It caused 337,000+ properties on Energex's network to lose power.

Beginning March 2025
A weather system across parts of Australia contributes to unusual patterns in solar farm yields and has temperature-related impacts on demand over the following months.

77. The 8 July 2024 Load shedding event in Northern NSW was reported on in the FY2024 RASR. See: the AEMC, *NEM Reliability & Security Report FY2024*, 26 June 2025.
78. Other events listed on this slide are not necessarily ROIs.

REVIEWING MAJOR NEM EVENTS IS IMPORTANT

- Reviewable operating incidents are unusual or 'significant' power system events. These types of power system incidents involve significant deviations from normal operating conditions which impact the operation and security of the power system.
- Under the NER, AEMO is required to conduct a review of every 'reviewable operating incident' in the power system and publicly report on its findings.[79]
- The Panel considers the overarching objective of reviewing operating incidents is to promote the secure operation of the power system.[80]
- AEMO's reporting on reviewable operating incidents allows it to evaluate procedures, systems, and responses to such events and any potential improvements that could be made following a reviewable operating incident.[80]
- These reports provide highly valuable information to policy-makers, market bodies, market participants, jurisdictions and the Panel to understand system security risks in the NEM.
- AEMO's reports form an essential part of the Panel's RASR, as a key indicator of power system security performance of the NEM over time.
- The Panel monitors reviewable operating events to assess:
  - if the power system and response of facilities and services are effective in maintaining power system security
  - if the regulatory framework governing the power system and responses is enabling the secure operation of the power system in line with the National Energy Objectives.

The Panel did not find any systemic trends or patterns in the FY2025 reviewable operating events, nor any distinct events or responses warranting action beyond what has been taken or recommended by AEMO. The Panel is satisfied that the framework for monitoring and responding to learnings from reviewable operating incidents contributes to a culture of continuous improvement in the NEM, which is increasingly important as the power system transitions.

79: Reliability Panel, Final report, *2022 Reviewable operating incident guideline review*, 29 September 2022.
80. Clauses 4.8.15(b) and 4.8.15(c) of the NER.

LOAD SHEDDING IN LISMORE, NORTHERN NSW – 8 JULY 2024

Overview

- Equipment failure caused supply outages in Lismore.
- The power system was not operating in a secure state for multiple periods over 30 minutes.
- Manual load shedding of 40 MW was required to restore system security and 84MW of load was momentarily inturrupted.
- 27 MW of embedded generation was lost.

Event summary

- Worn out insulation on the Coffs-Lismore 330kV line allowed water to get inside, causing it to trip, thereby limiting the flow to Lismore.
- Computer communication failures between the primary control site and the data center for the Terranora Interconnector caused the power flowing from Queensland to the Lismore area to fall to approximately 0 MW.
- The Armidale – Lismore 132 kV subsystem became the main source of power to Lismore. Contingency analysis violations arose on this line during the evening peak, requiring AEMO to instruct Transgrid to shed 30 MW of load to resolve them.
- Subsequent busbar splitting operations to manage network loading triggered the Armidale – Metz – Koolkhan 132 kV No. 966 line to trip, causing the tripping of multiple lines and a cogeneration plant, momentarily islanding of the Lismore area and interrupting 84 MW of load.
- To restore the system to a state, AEMO ordered an additional 10 MW of load shedding before progressive restoration.

Significance of the event

- The power system was not in a secure operating state for periods of 28, 30 and 48 minutes.
- Manual load shedding was required twice by AEMO under clause 4.8.9 of the NER.
- Affected ~28,000 customers in the Lismore area over a 3-hour period.
- Several recommendations to improve system operation were made after the incident.

Source: AEMO, *Final report – Load shedding event in Northern NSW on 8 July*, March 2025. This event was also covered in the FY2024 RASR, based on AEMO's preliminary report.

NEM MARKET SUSPENSION – 5 SEPTEMBER 2024

Overview

- An information technology (IT) failure impacted AEMOs dispatch process and other critical systems, such that market participants (including generators) were not receiving dispatch instructions for approximately two hours.[81]
- AEMO had to suspend the spot market in all NEM regions and compensate market participant's ex-post.
- This was the only market event that occurred in FY2025.
- No load or generation was lost.

What happened

- An IT failure impacted the entire dispatch process from shortly before 1:25 pm, including preventing the NEM dispatch engine from solving and AEMO's electricity market management system from sending dispatch instructions to market.
- It also impacted AEMO's ability to manage power systems constraints, issue market notices, and view the network outage schedule.
- AEMO also had to issue a direction to Snowy Hydro (which was later cancelled).
- AEMO restored the online market systems and dispatch processes by 2:26 pm.

Significance of the event

- The failure meant the power system was not being automatically dispatched to remain in a secure operating state. AEMO was able to assess that it was in a satisfactory operating state but could not confirm if it was in a secure operating state.[78]
- The IT failure did not include any cyber security issues and no load or generation was lost.
- The spot market was suspended in all NEM regions from 1:55 pm to 3:10 pm, and AEMO had to revise the prices for the period in accordance with AEMO's published Market Suspension Pricing Methodology and make compensatory payments.
- This was the only market event that occurred in FY2025.

Source: For further information, see: AEMO, *Final report: NEM market suspension on 5 September 2024*, July 2025.
81. Frequency was falling in the mainland NEM because demand was increasing, but generators were not changing output. Frequency remained in the normal operating frequency band.
82. This failure meant that generators did not receive dispatch instructions. Standard practice from industry in these circumstances is to hold the last good quality dispatch target.

TRIP OF LOY YANG POWER STATION 500 KV BUSBAR – 6 SEPTEMBER 2024

Overview

- An internal fault caused a 500 kV No.4 busbar at Loy Yang Power Station (LYPS) to trip. The busbar was returned to service later the same day.
- Throughout the incident, the power system remained in a secure operating state and the Frequency Operating Standard was met.
- There was no material impact on the broader power system, and no load or generation was lost.
- Post-incident investigations revealed further defective equipment and prompted updates to relay standards.

Sequence of events

- Defective isolator motor insulation on the Hazelwood–Loy Yang 500 kV line caused a direct current earth fault, which led to a discharge of capacitive coupling of the secondary cables, which led to spurious energization of the relay input of the 500 kV No. 4 busbar protection relay.
- Although an Active Burden Module (ABM) had been installed to suppress such induced charges, the relay input contact debounce time was set to 0 milliseconds, in line with AusNet Services' standard settings. Due to longer-than-typical cable runs at the site, this setting did not allow sufficient time for the ABM to operate effectively. As a result, the protection relay interpreted the transient signal as a genuine fault and operated as designed, tripping all circuit breakers connected to the 500 kV No. 4 busbar at 1222 hrs.
- At 2005 hrs the LYPS 500 kV No. 4 busbar was returned to service.

Significance of the event

- Trips are a common cause of ROIs. This specific trip involved a critical high-voltage asset at a major generator, with the potential for significant system consequences.
- Post-incident investigations triggered a broader audit of similar equipment, identifying further isolators with defective motor insulation, leading to network-wide remediation actions and updates to relay standards.

Source: AEMO, *Trip of Loy Yang Power Station 500 kV No.4 busbar on 6 September 2024*, February 2025.

TOWER FAILURES IN SA AND NSW – 16-17 OCTOBER 2024

Overview

- Damaging winds and large hail across NSW and SA caused the failure of 39 transmission structures, resulting in five power system incidents occurring in NSW and SA.
- 192 MW of customer load and 183 MW of generation was lost. Multiple areas were islanded and/or experienced power disruptions.

The incidents

Broken Hill incident

- The sole line connecting Broken Hill to the main grid tripped, islanding the town and disconnecting 34 MW of customer load and 140 MW of generation output.
- Temporary, intermittent generation supplied the area until the line was returned to service on 1 November.
- The AER has instituted proceedings against Transgrid for multiple alleged failings.

Olympic Dam incident

- A SA line tripped, disconnecting 155 MW of load and leaving a mining area without grid supply.
- BHP's site generation provided temporary backup for the duration of the outage until 1 November.

Mount Gunson incident

- A SA line tripped, disconnecting 2 MW of load at Pimba substation until 2 November.

Leigh Creek incident

- A SA line tripped, disconnecting 0.5 MW of customer load and isolating the Leigh Creek and Neuroodla areas from the grid. Temporary mobile generators supplied the area until 12 February.

Redhill incident

- A SA line tripped, disconnecting a wind farm that was generating 43 MW at the time for two days.

Significance of the events

- All incidents were considered as credible contingencies.
- Constraints were invoked to manage some of these incidents.
- There were no significant impacts on power system security.
- The magnitude and severity of the event triggered AEMO to conduct a review of these incidents. AEMO intends to assess the longer-term power system security impacts based on info from TNSPs.

Source: AEMO, *Tower failures in South Australia and New South Wales on 16 and 17 October 2024*, April 2025.

ABBREVIATIONS

TABLE OF ABBREVIATIONS (SLIDE 1 OF 3)

ABM	Active Burden Module
AUD	Australian dollars
AC	Alternating Current
ACT	Australian Capital Territory
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
APC	Administered Price Cap
ASEFS	Australian Solar Energy Forecasting System
AWEFS	Australian Wind Energy Forecasting System
CA	Contingency Analysis
CCGT	Comibend Cycle Gas Turbine
CEC	Clean Energy Council
CER	Consumer Energy Resources
CIS	Capacity Investment Scheme
Commission	See AEMC

CPT	Cumulative Price Threshold
DC	Direct Current
DER	Distributed Energy Resources
DNSP	Distribution Network Service Provider
ESOO	Electricity Statement of Opportunities
FCAS	Frequency Control Ancillary Services
FFR	Fast Frequency Response
FPP	Frequency Performance Payments
FOS	Frequency Operating Standard
FUM	Forecast Uncertainty Measure
FY	Financial Year
GW	gigawatt
GWh	gigawatt-hour
IBR	Inverter Based Resources
ICCP	Inter-control centre communications protocol
IT	Information Technology

TABLE OF ABBREVIATIONS (SLIDE 2 OF 3)

IRM	Interim Reliability Measure
ISP	Integrated System Plan
LIL	Large Industrial Load
LNG	Liquified Natural Gas
LOR	Lack of Reserve
LYPS	Loy Yang Power Station
MFP	Market Floor Price
MMS	Market Management System
MPC	Market Price Cap
MPFR	Mandatory Primary Frequency Response
MSL	Minimum System Load
MSPS	Market Suspension Pricing Schedule
MT-PASA	Medium Term-Projected Assessment of System Adequacy
MW	megawatt
MWh	megawatt-hour
NEL	National Electricity Law

NEM	National Electricity Market
NEMDE	National Electricity Market Dispatch Engine
NEO	National Electricity Objective
NER	National Energy Rules
NERL	National Energy Retail Law
NERO	National Energy Retail Pbjective
NGL	National Gas Law
NGO	National Gas Objective
NOFB	Normal Operating Frequency Band
NSCAS	Network Support and Control Ancillary Services
NSP	Network Service Provider
NSW	New South Wales
NT	Northern Territory
OCGT	Open Cycle Gas Turbine
The Panel	The Reliability Panel
PEC	Project Energy Connect

TABLE OF ABBREVIATIONS (SLIDE 3 OF 3)

PFR	Primary Frequency Response
POE	Probability of Exceedance
PV	Photovoltaics
Q	Quarter
QED	Quarterly Energy Dynamics
QLD	Queensland
QNI	Queensland - New South Wales Interconnector
RASR	Reliability & Security Report
RERT	Reliability and Emergency Reserve Trader
RET	Renewable Energy Target
REZ	Renewable Energy Zone
RoCoF	Rate of Change of Frequency
ROI	Reviewable Operating Incident
The rules	National Electricity Rules
SA	South Australia
SAIDI	System Average Interruption Duration Index

SAIFI	System Average Interruption Frequency Index
SCADA	Supervisory Control and Data Acquisition
SF	Self-forecasting
SRAS	System Restart Ancillary Services
ST-PASA	Short Term-Projected Assessment of System Adequacy
TAS	Tasmania
TNSP	Transmission Network Service Provider
TPSS	Transmission plan for system security
USE	Unserved Energy
VIC	Victoria
VNI	Victoria - New South Wales Interconnector
VPP	Virtual Power Plant
VRE	Variable Renewable Energy
VWAP	Volume Weighted Average Price
WA	Western Australia

RELIABILITY
PANEL AEMC

Office address
Level 15, 60 Castlereagh Street
Sydney NSW 2000

ABN: 49 236 270 144

T (02) 8296 7800