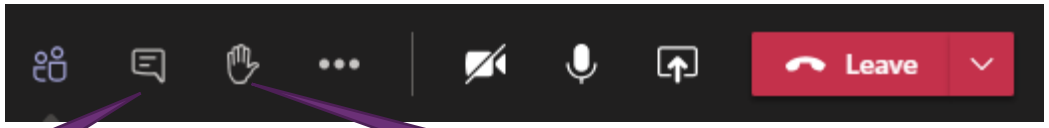
WA Electricity Consultative Forum

23 August 2023

We acknowledge the Traditional Owners of country throughout Australia and recognise their continuing connection to land, waters and culture.

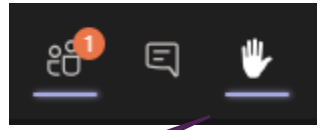
We pay respect to Elders past and present.

Join the discussion and teams

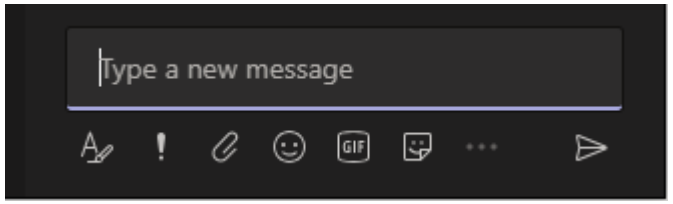


1. Click the chat icon to open the chat window

1. Click the hand icon to raise your hand



2. Type your question in the chat window



2. Keep your hand raised until you're called upon

3. Lower your hand after

Agenda

Item	Time	Item	Speaker
1.	1pm – 1:05pm	Welcome and Minutes (28 June 2023)	Chair
2.	1:05pm – 1:50pm	Managing the Energy Transition Together - 2023 WEM Electricity Statement of Opportunities - WEM Reform - Managing the power system in a time of rapid change - WA Roadmap to engineering the low-emissions power system of the future	Kate Ryan
3.	1:50pm – 2:10pm	AEMO Operational Update	
		3.1 Reserve capacity update	Neetika Kapani
		3.2 WEM Reforms: Credit limit reviews	Nicholas Nielsen
4.	2:10pm – 2:15pm	Other Business	
5.	2:15pm	Next Meeting – 18 October 2023	Chair

***Please note this meeting will be recorded for minute production**

Managing the energy transition together

Presented to WA Electricity Consultative Forum

by Kate Ryan, Executive General Manager – Western Australia & Strategy 23

23 August 2023

Agenda | Working together to enable the energy transition

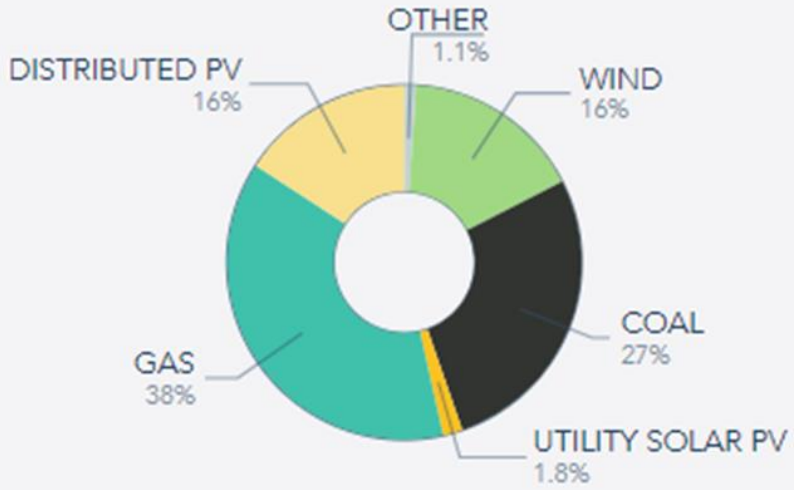
1. 2023 WEM ESOO overview
2. WEM Reform
3. Managing the power system in a time of rapid change
4. WA Roadmap to engineering the low-emissions power system of the future

SWIS energy transition is well underway

A decade ago, coal and gas supplied over 90% of all electricity generation in the SWIS.

Today, renewables account for around one-third of annual electricity supply, and up to 84% of supply within a trading interval.

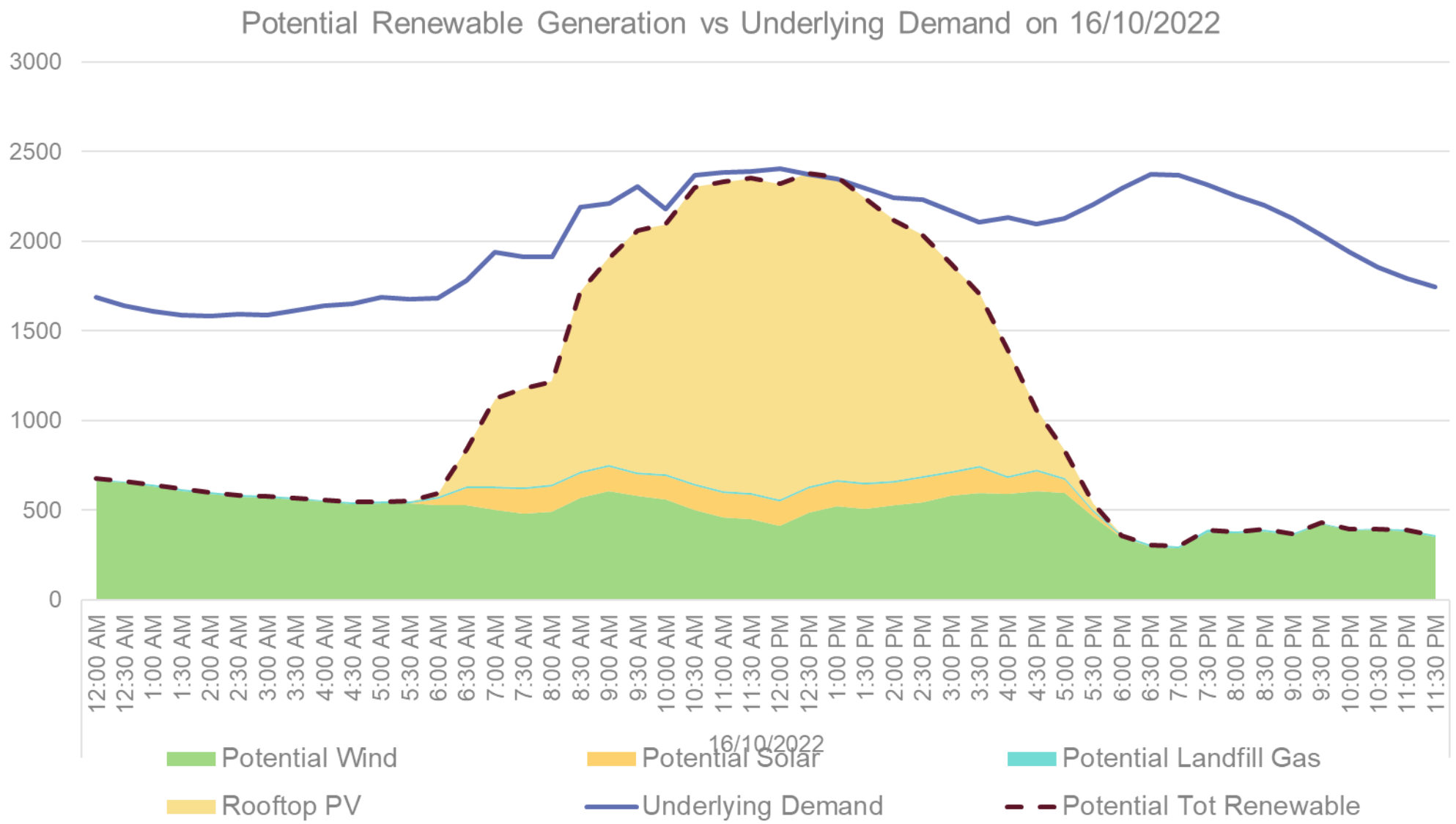
SWIS fuel mix – last 12 months



The future SWIS electricity supply will be built on four pillars:

1. Low-cost renewable energy, taking advantage of the abundant wind and solar resources.
2. Firming technology like batteries, and gas generation, to smooth out the peaks and fill in the gaps from that variable renewable energy.
3. New transmission and modernised distribution networks to connect these new and diverse low-cost renewable sources of generation to our towns and cities.
4. A power system capable of running, at times, entirely on renewable energy.

SWIS energy transition is on the way to 100%



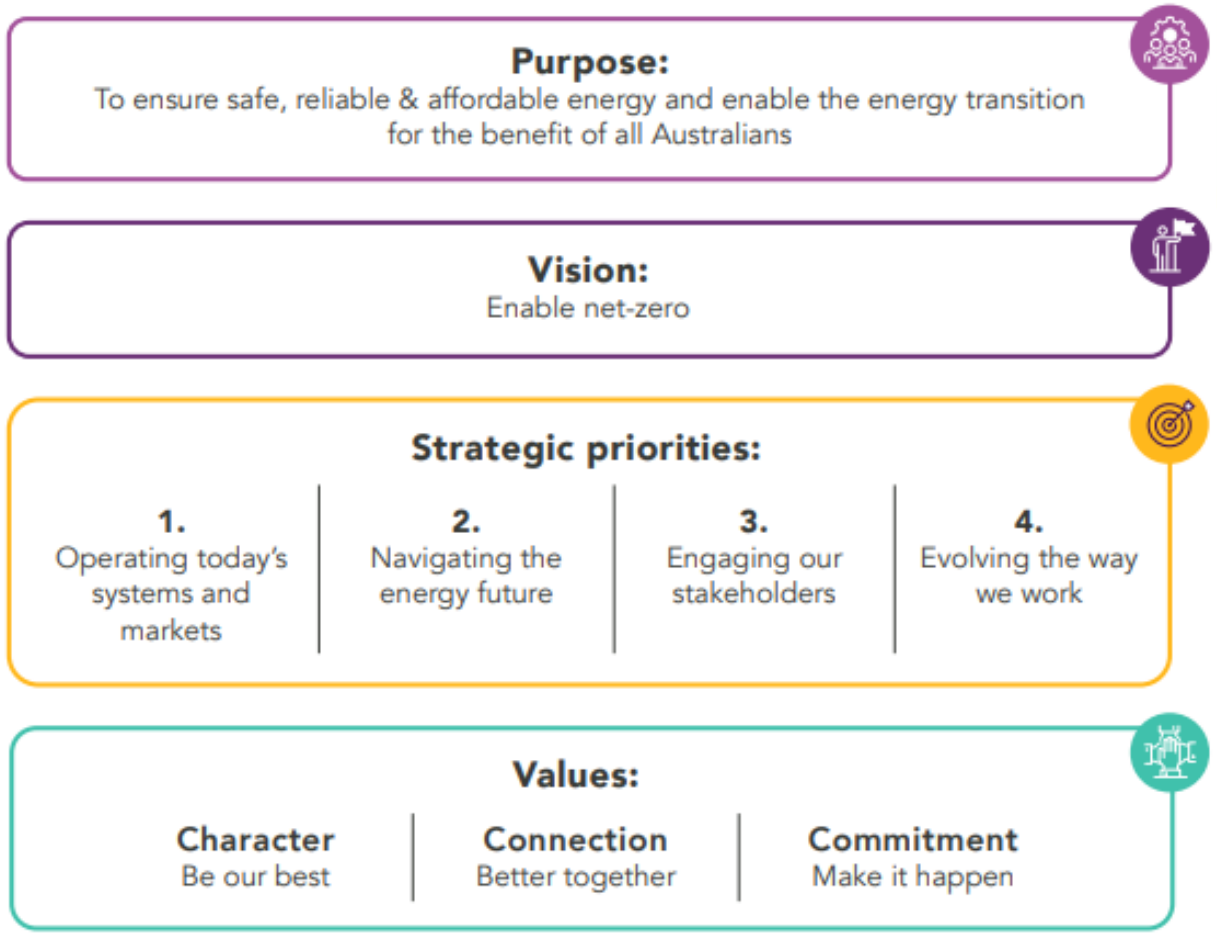
Working together to enable the energy transition | AEMO Strategic Corporate Plan

"We recognise that no one organisation can possibly handle all the complications in this energy transition.

It requires a group effort between AEMO, governments, industry, market bodies and communities.

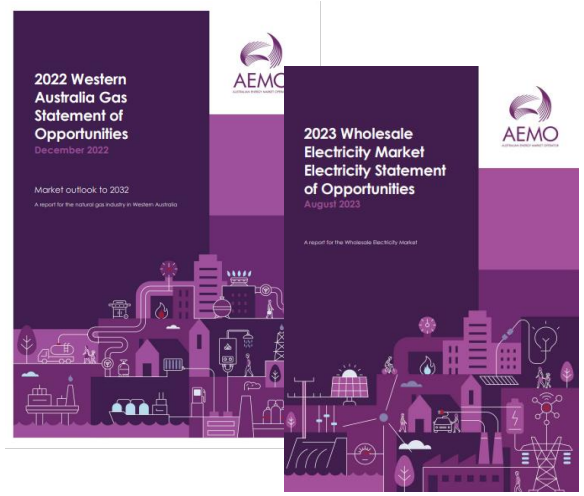
We all have a stake in an orderly transition, and the quest for cleaner, more affordable, reliable energy is upon us."

AEMO's Strategic Corporate Plan | FY24



Working together to enable the energy transition | AEMO's role includes…

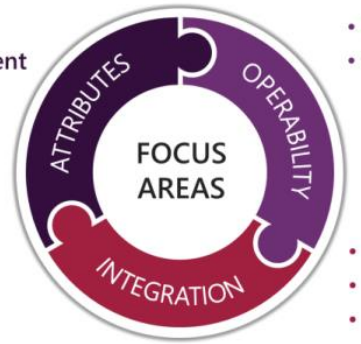
Identifying investment needs to meet future energy demand and procuring generation, storage and demand-side capacity through market mechanisms.



Operating the power system as it transitions to a lower-emissions power supply to enable net-zero.

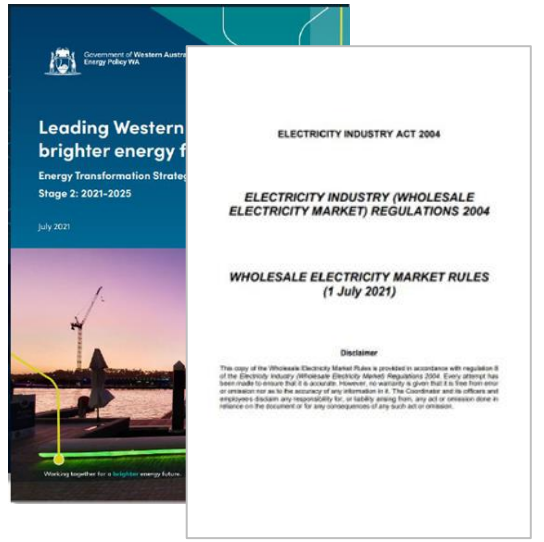
Addressing engineering challenges to operating the power system with high levels of variable renewable generation and designing the 'control room of the future'.

- Resource Adequacy
- Frequency Management
- Voltage Control
- System Strength
- System Restoration



- Control Room and Support
- System Analysis
- Resilience
- Performance Standards
- Distributed Energy Resources

Supporting government reforms to ensure a secure, reliable, affordable and lower emissions energy supply.



WEM 2023 Electricity Statement of Opportunities overview

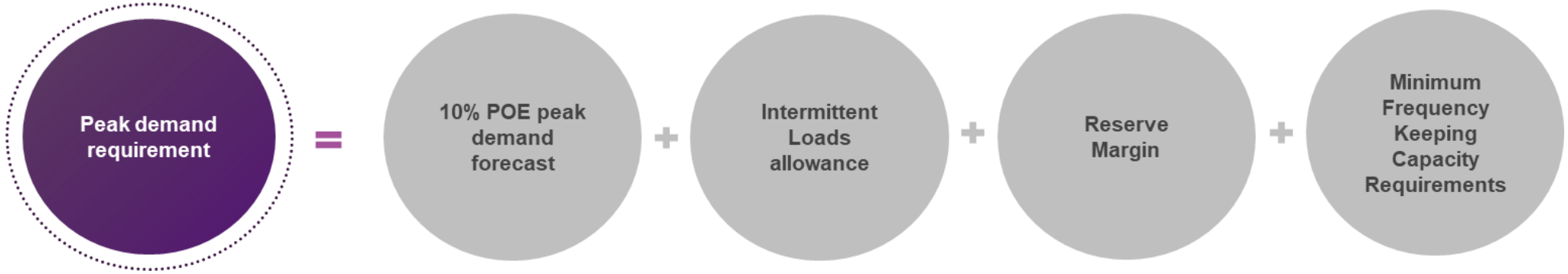
2023 WEM ESOO | Purpose

- The 2023 WEM ESOO sets the Reserve Capacity Requirement (RCR) for the 2025-26 Capacity Year based on the Long Term Projected Assessment of System Adequacy (PASA) for the outlook period (2023-24 to 2032-33 Capacity Years).

- The Long Term PASA study identifies the investment in capacity from generation, storage and demand-side management (DSM) to ensure a secure and reliable system over the outlook period:

Planning Criterion

1. Peak demand capacity requirement:



2. Expected unserved energy (EUE) capacity requirement: annual EUE ≤ 0.002% of annual energy consumption.

2023 WEM ESOO | Key findings

2023 WEM ESOO findings highlight a need for significant investment in capacity to supply the SWIS.

- The RCR for 2025-26 of 5,543 MW with a capacity investment gap of 945 MW indicates that expedited progress of a robust pipeline of projects is necessary
- Procurement of additional capacity (underway through SRC/NCESS) is required to address near-term reliability gaps projected for 2023-24 and 2024-25
- 10% POE peak demand is forecast to increase at an average annual rate of 4.4%, higher compared to 0.9% reported in 2022 WEM ESOO, driven by increase in cooling load and electrification
- Operational consumption is forecast to increase at an average annual rate of 5.6%, higher compared to -0.3% reported in 2022 WEM ESOO driven by increase in business electrification and EV uptake
- Updated assumptions to reflect increase momentum in energy transition and strong government and industry commitments to carbon emission reductions
- Minimum demand is forecast to decline over the coming five years at an average annual rate of 13.4% and the reverse to upward trend after 2027-28 as growth in demand exceeds growth in DPV generation at the time of minimum demand

Note: All data in the 2023 WEM ESOO and this presentation is based on Capacity Years unless otherwise specified. A Capacity Year commences in the Trading Interval starting at 08:00 on 1 October and ends in the Trading Interval ending at 08:00 on 1 October of the following calendar year.

2023 WEM ESOO | Scenarios

2023 WEM ESOO scenario	Low	Expected	High
2023 IASR Scenario mapping	*Progressive Change*	*Step Change*	*Green Energy Exports*
Australian economic and demographic drivers	Lower	Moderate	High (partly driven by green energy)
Energy efficiency	Lower	High	Higher
DER	Lower	High	Higher
Storage aggregation and coordination (e.g. VPP)	Lower	High	Higher
Uptake of coordinated EV charging	Moderate	Faster	Faster
Electrification	Lower	High	Higher
Hydrogen	Low production for domestic use with no export hydrogen.	Medium-low production for domestic use with minimal export hydrogen.	High production for domestic and export use.
Decarbonisation target	At least 43% emissions reduction by 2030, Net zero by 2050		
Supply chain barriers	More challenging	Moderate	Less challenging

Inclusion of business, residential electrification, and green hydrogen industry

Increased emission reduction target

The 2023 WEM ESOO considers three demand growth scenarios, consistent with WEM Rules 4.5.10(a) and uses a selection of scenarios, assumptions, and supporting forecasts from AEMO's *Inputs, Assumptions and Scenarios Report* (IASR) published in July 2023.

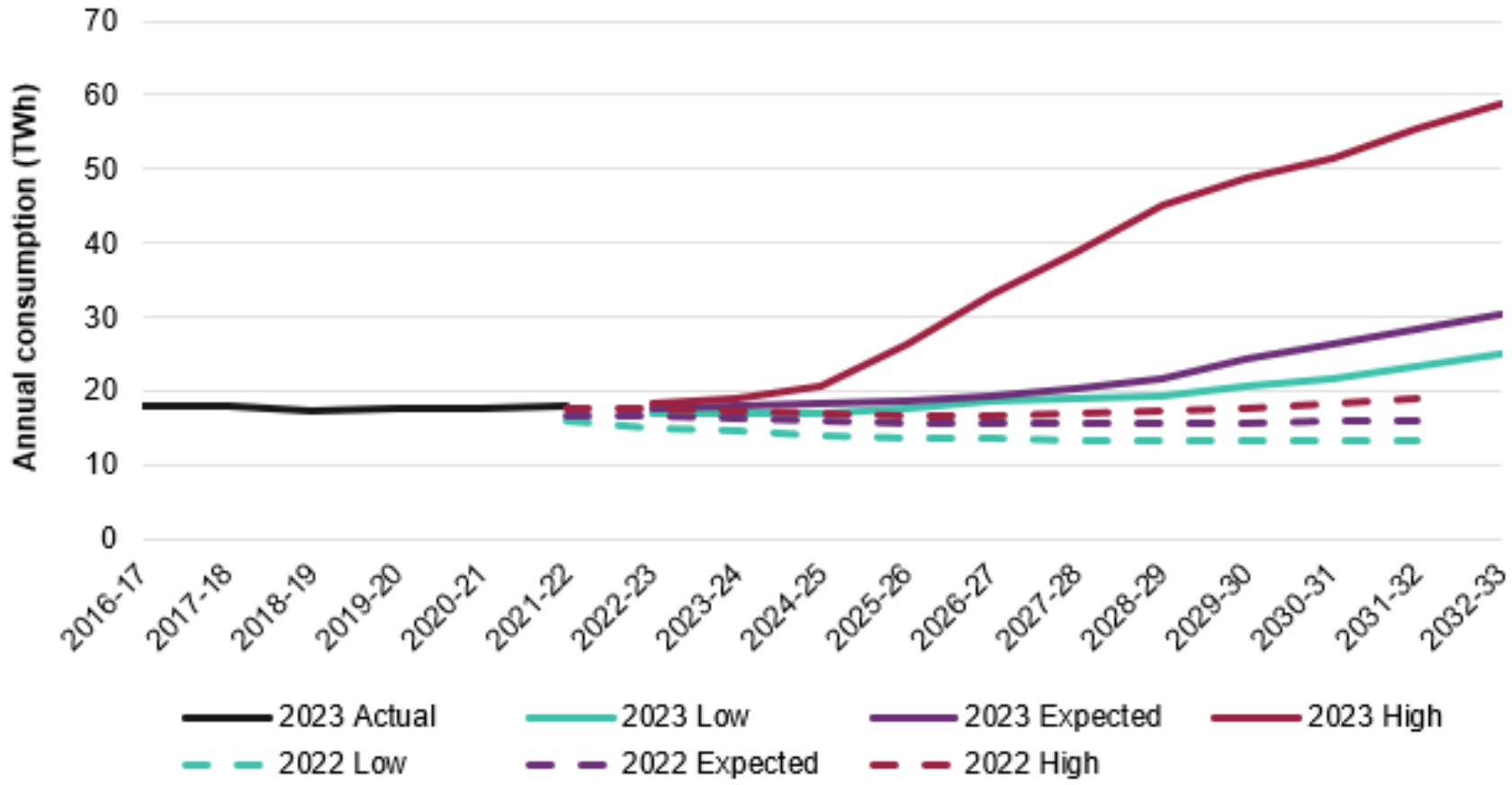
Improved information about electrification has enabled adoption of the *Step Change* scenario as the expected scenario for the 2023 WEM ESOO (*Progressive Change* from the 2021 IASR was the expected scenario in the 2022 WEM ESOO, with *Slow Change* the low scenario and *Strong Electrification* for the high scenario).

2023 WEM ESOO | Consumption and demand methodology improvements

- Inclusion of electrification and electricity consumed by Hydrogen sector.
- Improved methodology for considering demand from existing and new Large Industrial Loads (LIL), with more detailed Western Power's input and new evaluation criteria to account for industrial decarbonisation.
- Refreshed DER and energy efficiency forecasts.
- Improved segmentation of historical consumption due to recalibration of the residential and business split.
- Retraining the generalised extreme value (GEV) model using a complete set of 2022 data.

2023 WEM ESOO | Operational consumption outlook

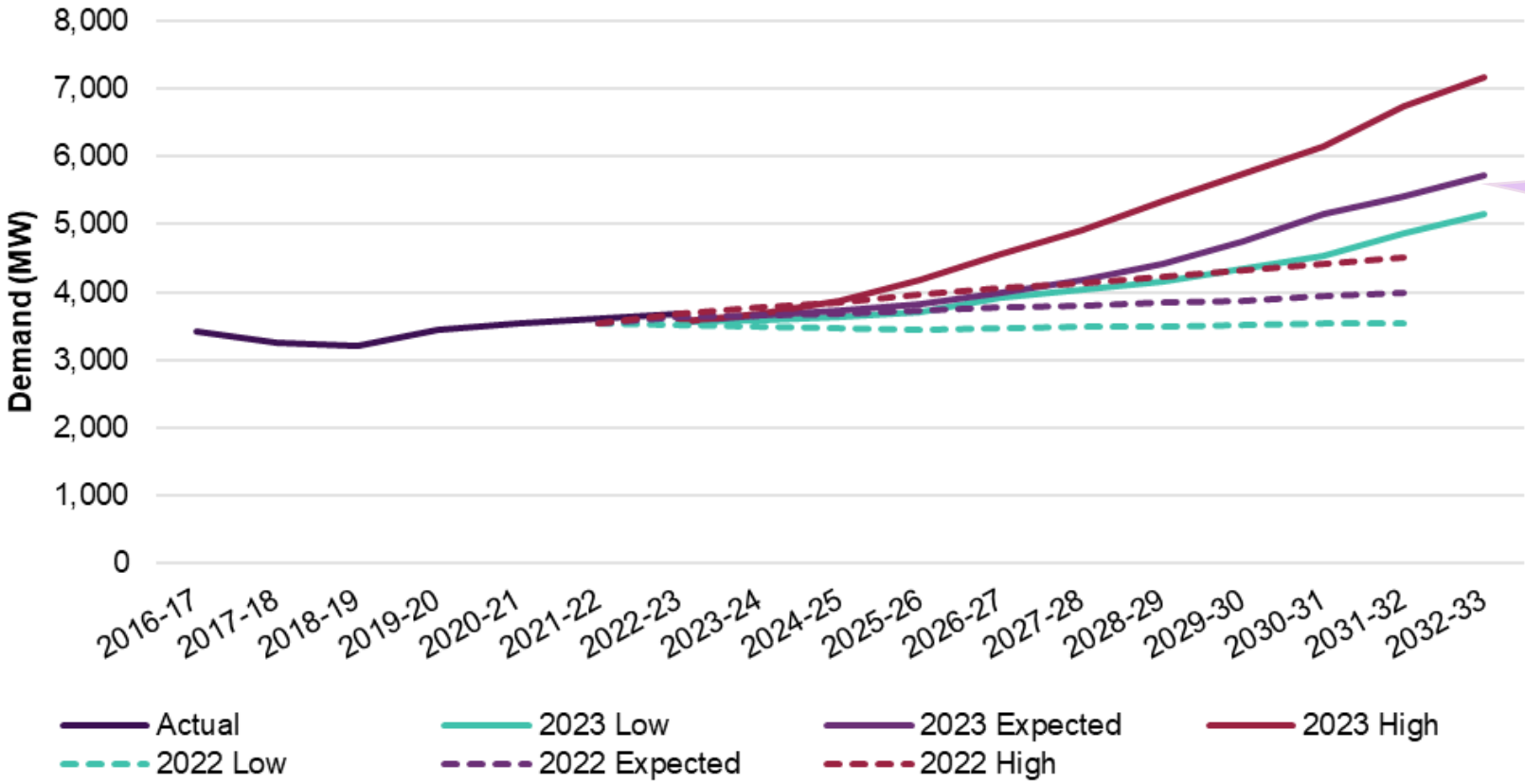
Overall, compared to the 2022 WEM ESOO, the consumption forecasts are significantly higher for the entire outlook period for all scenarios, heavily driven by business sector electrification and, in later years particularly in the high scenario, hydrogen production.



Annual average growth of 5.6%

2023 WEM ESOO | Operational peak demand outlook

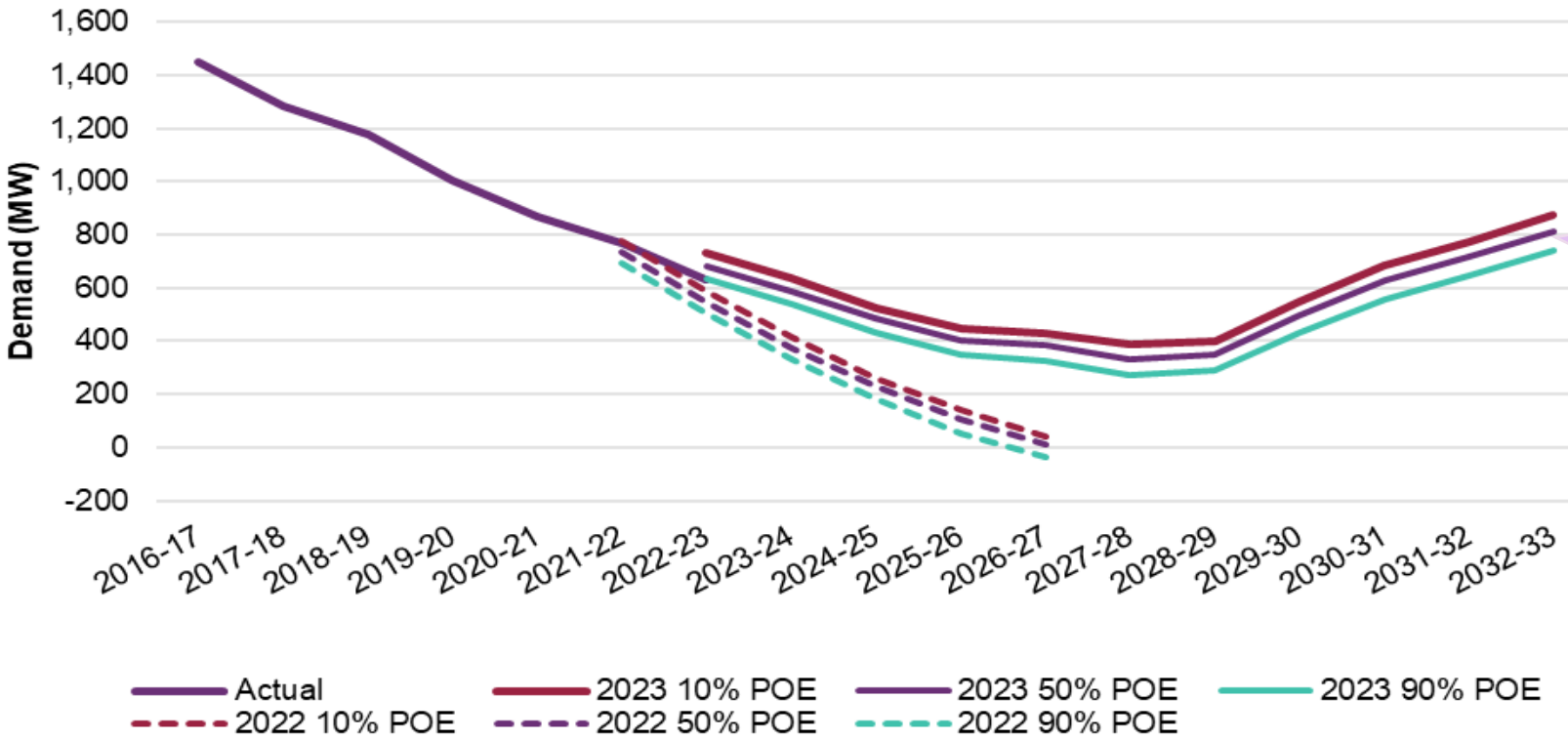
Overall, compared to the 2022 WEM ESOO, the demand forecasts (10%POE) are significantly higher for the entire outlook period for all scenarios primarily driven by introduction of electrification and projected increase in cooling load. Hydrogen load is also a notable contributing factor under the high scenario.



Annual average growth of 4.4%

AEMO has determined the **Electric Storage Resource Obligation Intervals** as the period between the start of the 16:30 Trading Interval and end of 20:00 Trading Interval for 2025-26.

2023 WEM ESOO | Operational minimum demand outlook (expected scenario)



The 50% POE minimum demand is forecast to decline at an average annual rate of 13.4%, from 683 MW in 2022-23 to 322 MW in 2027-28, then increase to 814 MW by 2032-23.

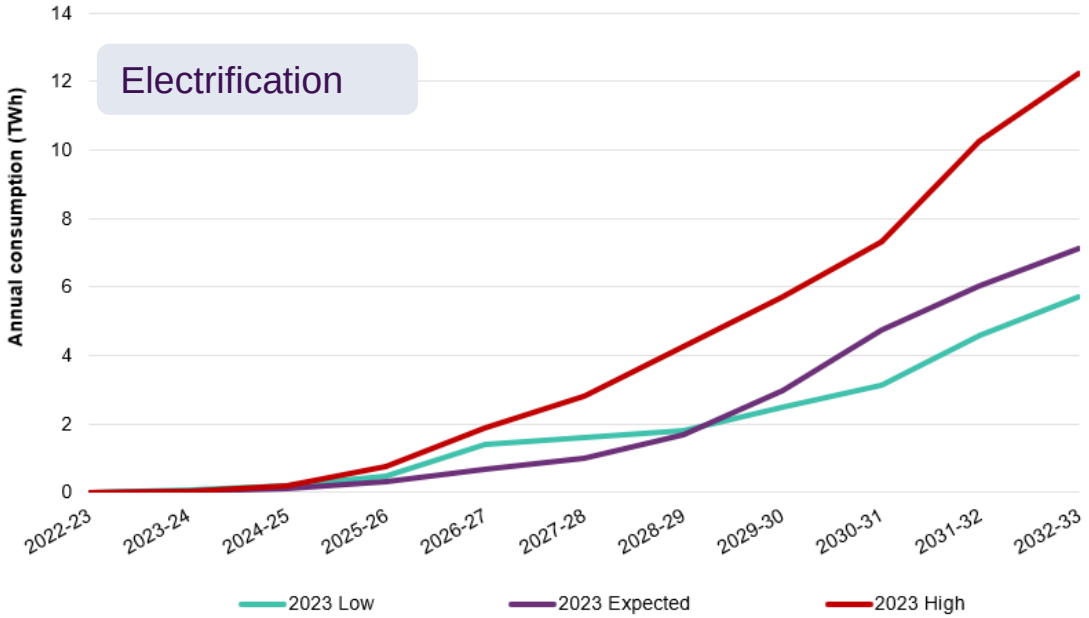
AEMO is currently undertaking a Non-Co-optimised Essential System Service (NCESS) procurement process for a minimum demand service in 2023-24 to ensure sufficient operational demand can be maintained to manage power system security and reliability. An NCESS procurement is also being finalised for peak and minimum demand service for 2024-26.

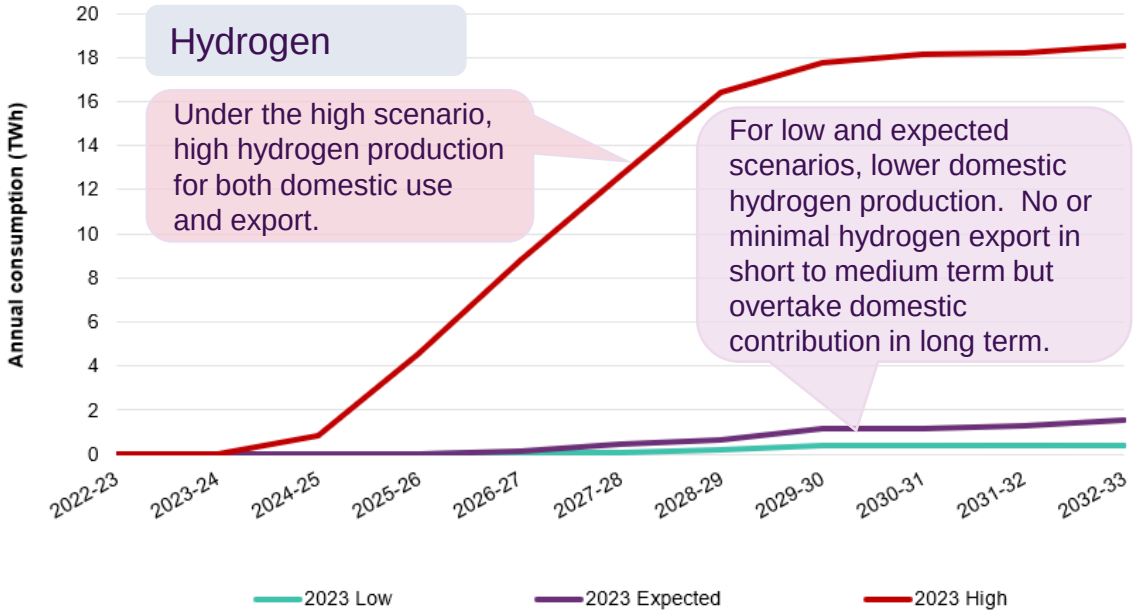
Minimum demand forecast represents uncontrolled or unconstrained demand, free of market-based solutions that might increase or reduce operational demand.

2023 WEM ESOO | Consumption forecasts for electrification and hydrogen loads

Under all three scenarios, business electrification is projected to be significantly higher than residential electrification, dominated by industrial fuel-switching opportunities.

Hydrogen highly uncertain, influenced by opportunities for export.





Low scenario surpasses the expected scenario in short and medium term because electrification is projected to play a greater role in reducing carbon emissions while other scenarios are forecast to rely more on alternative approaches such as improving energy efficiency and switching to low-emission fuels such as hydrogen and biomethane.

Rate of increase in consumption from hydrogen loads is lower in the later years due to gradual transition of electricity sourced from the SWIS to onsite renewable generation.

2023 WEM ESOO | DER forecasts

EV uptake

- Increased EV uptake compared to 2022 WEM ESOO forecasts due to increase in federal and state government policies supporting EV uptake, including EV sales target and subsidies for EVs and stronger climate policy settings.
- EV fleet share projected to make up ~30% of all cars, commercial vehicles, buses, and trucks by 2032-33.

2032-33	No of EVs (000s)	EV annual consumption (TWh)
Low	332	1.0
Expected	801	2.6
High	1151	4.1

DPV

- DPV forecasts reflect a slowdown influenced by post-pandemic spending habits and supply chain constraints.
- Owner occupied houses currently have around 39% PV uptake in the SWIS, which increases to between 60-65% by 2032-33.

2032-33	DPV degraded (MW)
Low	3,957
Expected	5,325
High	5,959

DESS

- Increased Distributed Energy Storage Systems (DESS) uptake.
- Higher compared to 2022 WEM ESOO forecasts due to increase in DPV installations and DESS's ability to shift DPV generation to later in the day when electricity is more valuable.

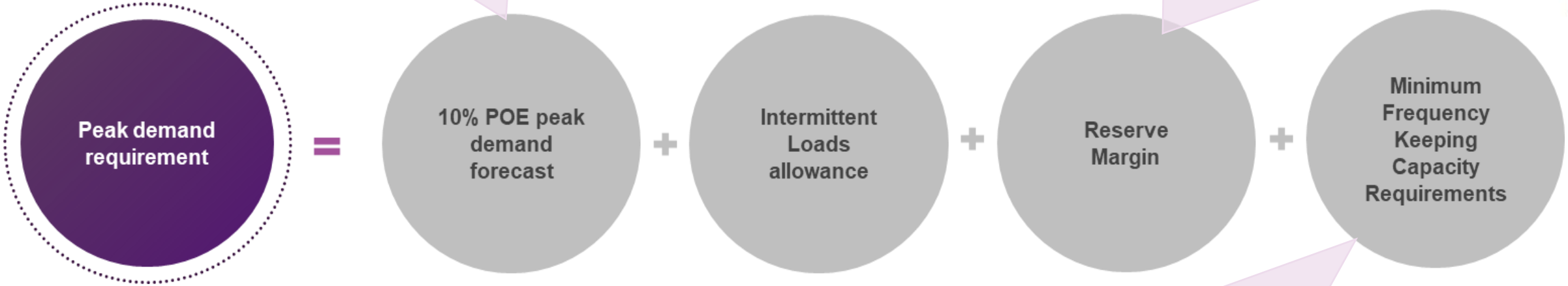
2032-33	Distributed battery capacity (GWh)
Low	0.5
Expected	3.7
High	4.6

AEMO sourced DER forecasts from CSIRO and Green Energy Market (GEM).

2023 WEM ESOO | Reliability assessment

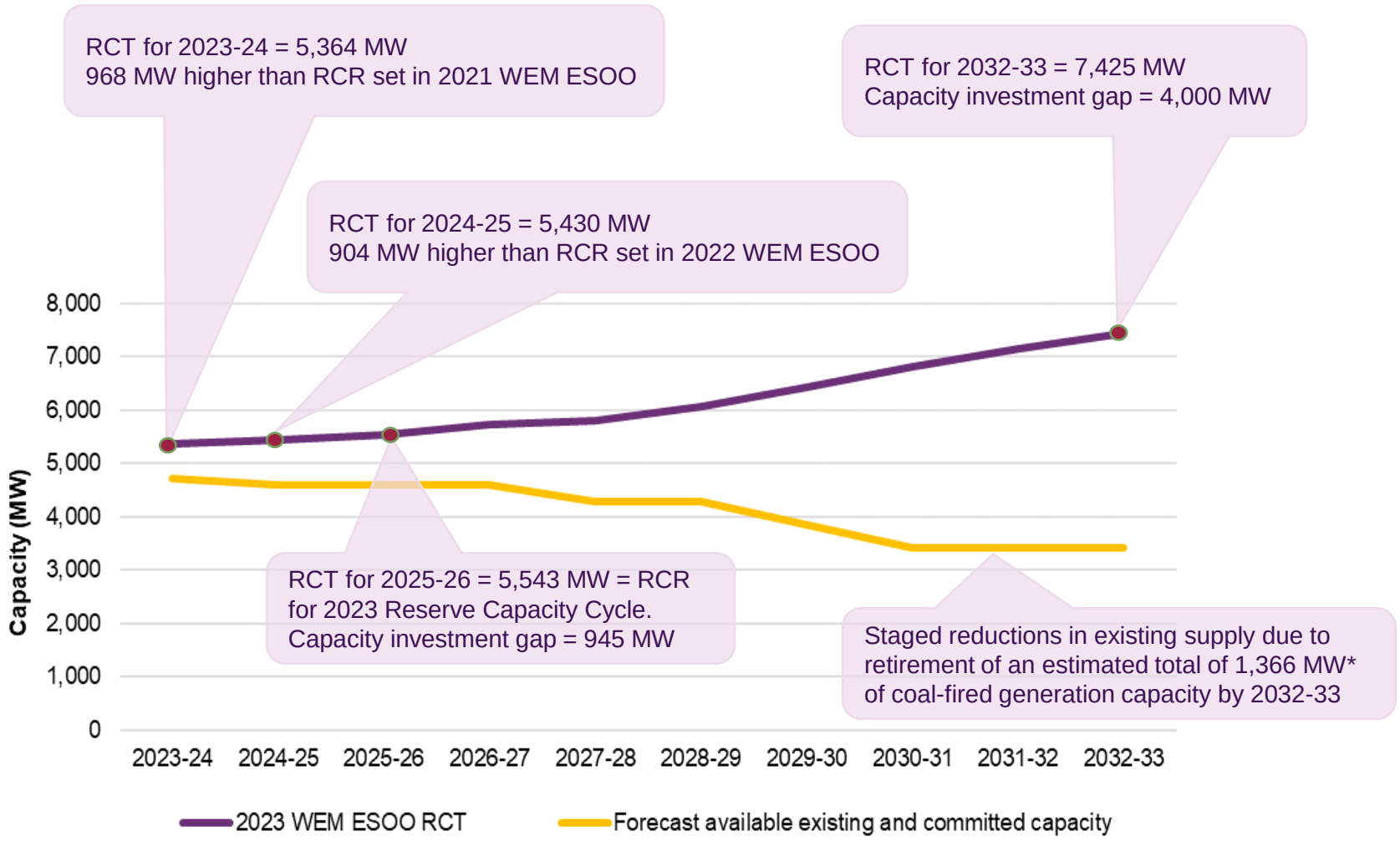
Significant increase driven by introduction of electrification and projected increase in cooling load.

WEM Rules amendment allows AEMO to consider broader range of supply risks for determination of reserve margin. AEMO has undertaken analysis of five-years of historical facility outage records of Non-Intermittent Generating Systems and identified the largest contingency as the three largest generation units.



AEMO improved the estimation of minimum Regulation Raise requirements under the future Essential System Service framework to account for the impacts of increasing penetration of intermittent generation in the power system.

2023 WEM ESOO | Supply-demand balance



Additional capacity is projected to be required for each Capacity Year due to higher RCTs, and a reduction in forecast capacity, signalling strong investment opportunities.

RCT forecast to grow at an average annual rate of 3.7% compared to 0.8% reported in 2022 WEM ESOO.

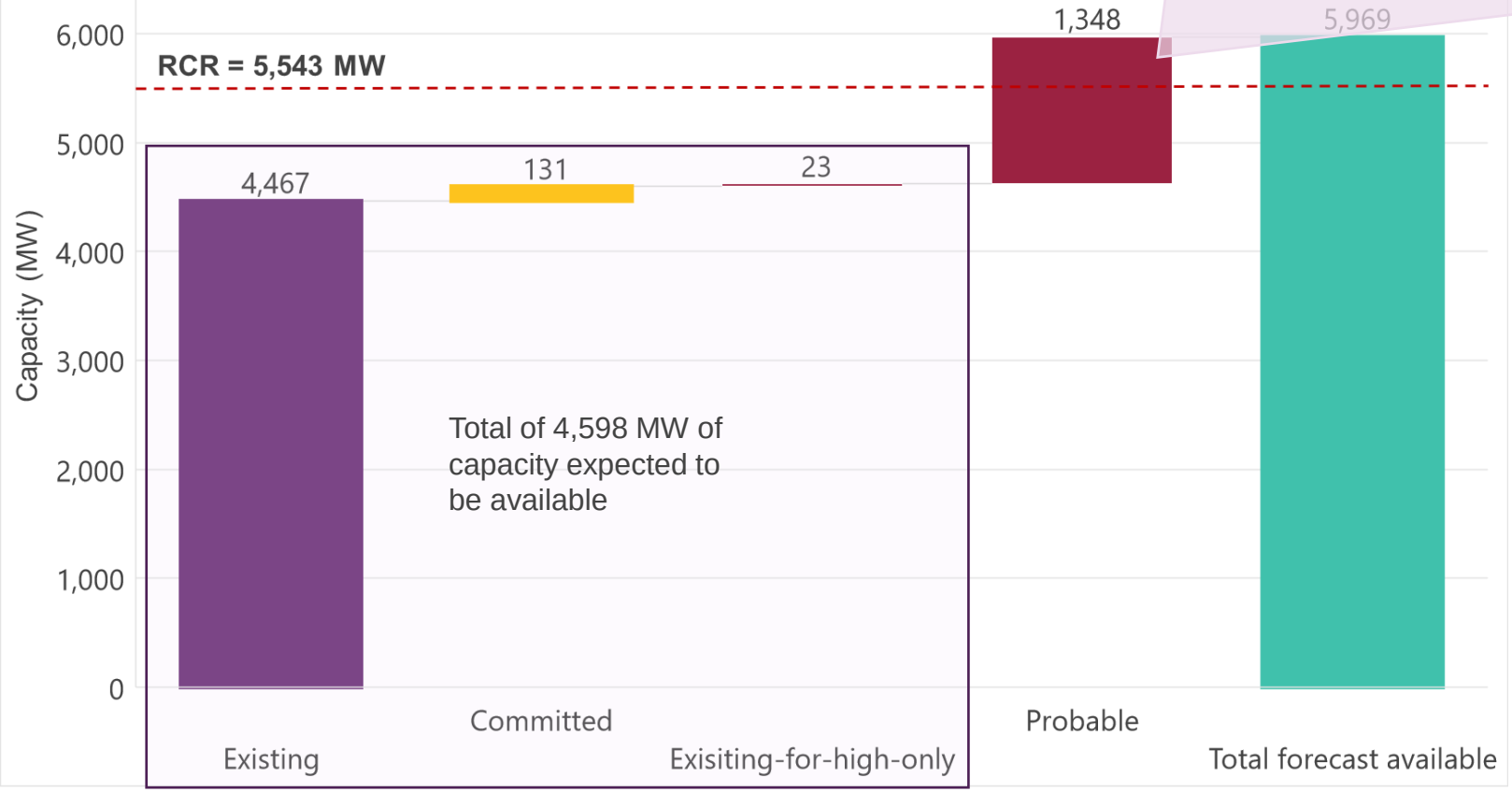
Procurements are underway to address near-term need for additional capacity:

- Supplementary Reserve Capacity for the 2023-24 Hot Season
- Peak demand NCESS for 2024-26

** Estimated total reduction of coal-fired generation include all publicly announced state-owned generators as well as the Bluewater Power Station which AEMO assumes to exit the WEM from 2030-31.*

2023 WEM ESOO | Forecast Reserve Capacity status for 2025-26

AEMO analysed new projects information from 2022 and 2023 EOIs, 2023 Long Term PASA formal information request, and 2024-26 peak demand NCESS process. Factors considered include network access, project financing status, environmental approvals, and progress in completing the necessary steps in AEMO's registration processes for certifying Reserve Capacity for the 2023 Reserve Capacity Cycle.



2024-26 peak demand NCESS likely to contribute significantly to RCR but is not considered committed until contracts are finalised and relevant contractual conditions precedent are achieved.

Probable projects are those projects which do not yet meet AEMO's criteria to be considered as committed, but could be developed within the time period.

Capacity refers to Reserve Capacity, which is generally lower than a facility's nameplate capacity as it is based on assessment of the facility's likely contribution at times of peak demand.

WEM reliability outlook and reforms

- The 2023 WEM ESOO is the first in many years to forecast a near-term need for capacity investment and shows that there are significant opportunities ahead for current and new investors to participate in the market.
- Recognising the emerging reliability challenges in the SWIS, AEMO has again triggered SRC for the 2023-24 summer peak period and in late 2022 triggered procurement of NCESS for the 2024-25 Capacity Year.
- In addition, the WA Government commenced a review of the Reserve Capacity Mechanism (RCM) in 2021, and has recently announced intended reforms to ensure the RCM procures the quantity and type of capacity required to ensure security and reliability in the WEM into the future.

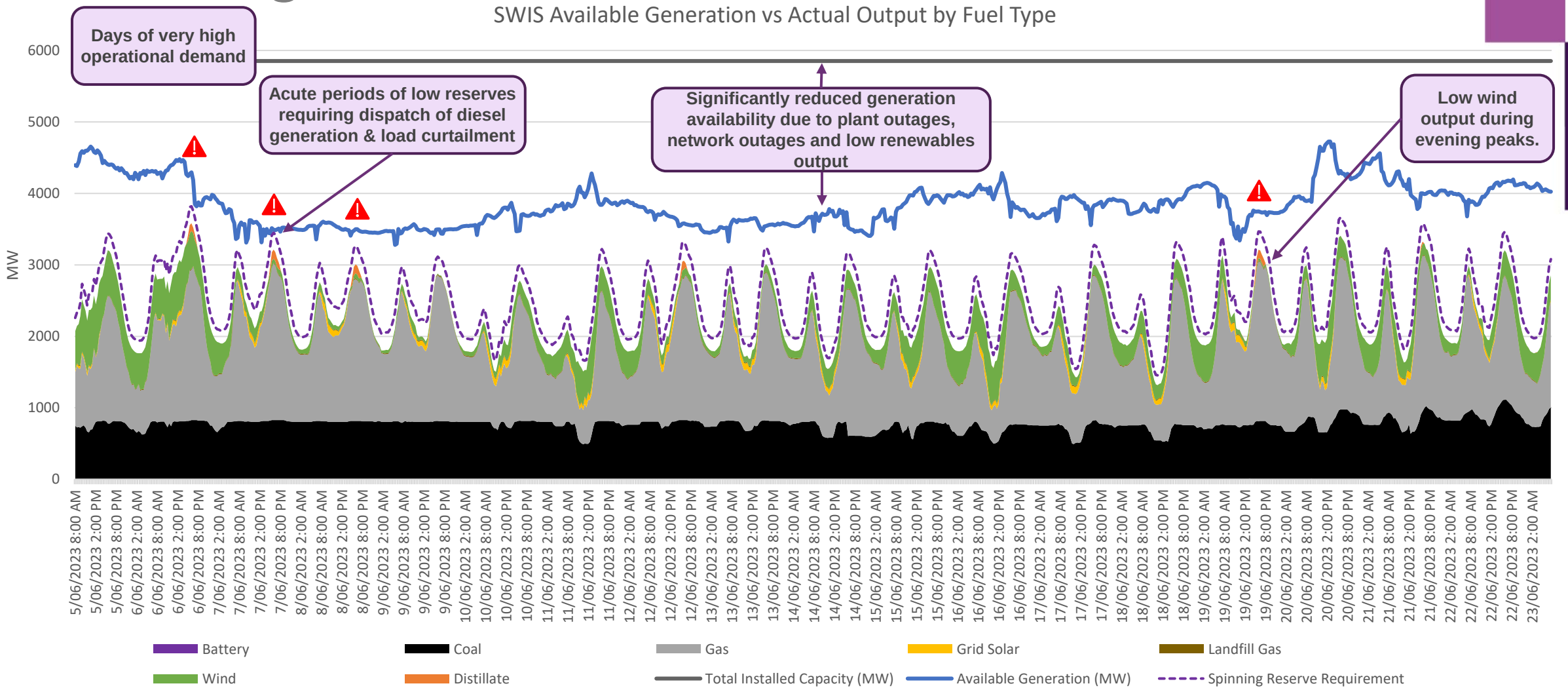
Delivery of the large investments in generation, storage and network infrastructure highlighted in the SWIS Demand Assessment and ESOO will **require a focused and coordinated effort** by AEMO, market participants, WA Government and other investors in the SWIS.

Managing the power system in a time of rapid change

Managing the power system | Recent market observations and insights

- The cold winter in Perth has seen ***higher demand*** combined with several major generating units experiencing forced ***outages*** or unplanned extensions to planned outages.
  - Consequential delays in planned outages also resulting in critical work needing to be done in sub-optimal periods.
- Driven by these very cold conditions, Perth's electricity system experienced ***all-time evening and morning winter peak demand records*** in June.
- Cold temperatures coincided with ***low wind*** periods, reinforcing the need for more ***firming capacity*** as soon as practicable as the energy transition accelerates.
- Balancing Prices have been ***significantly higher*** in June 2023 than in previous years, hitting the Maximum Short-Term Energy Market Price regularly and even hitting the Alternative Maximum STEM Price on a few occasions.
- As a result of the low spare capacity and the high prices, more participants than usual ***exceeded their Trading Limit*** – highlighting that the market may be ***becoming more volatile*** and this presents risks to participant viability.

Managing the power system | June observations and insights



⚠ Forecast LOR 2 Conditions: This condition exists when reserve levels are forecast to be lower than the single largest supply resource.

Available Generation (MW) = Total Scheduled Generation – Scheduled Generation Outages + Wind Generation + Grid Scale Solar Generation – Network Constraints (110 MW).

Managing the power system | Indicative spring to summer outlook

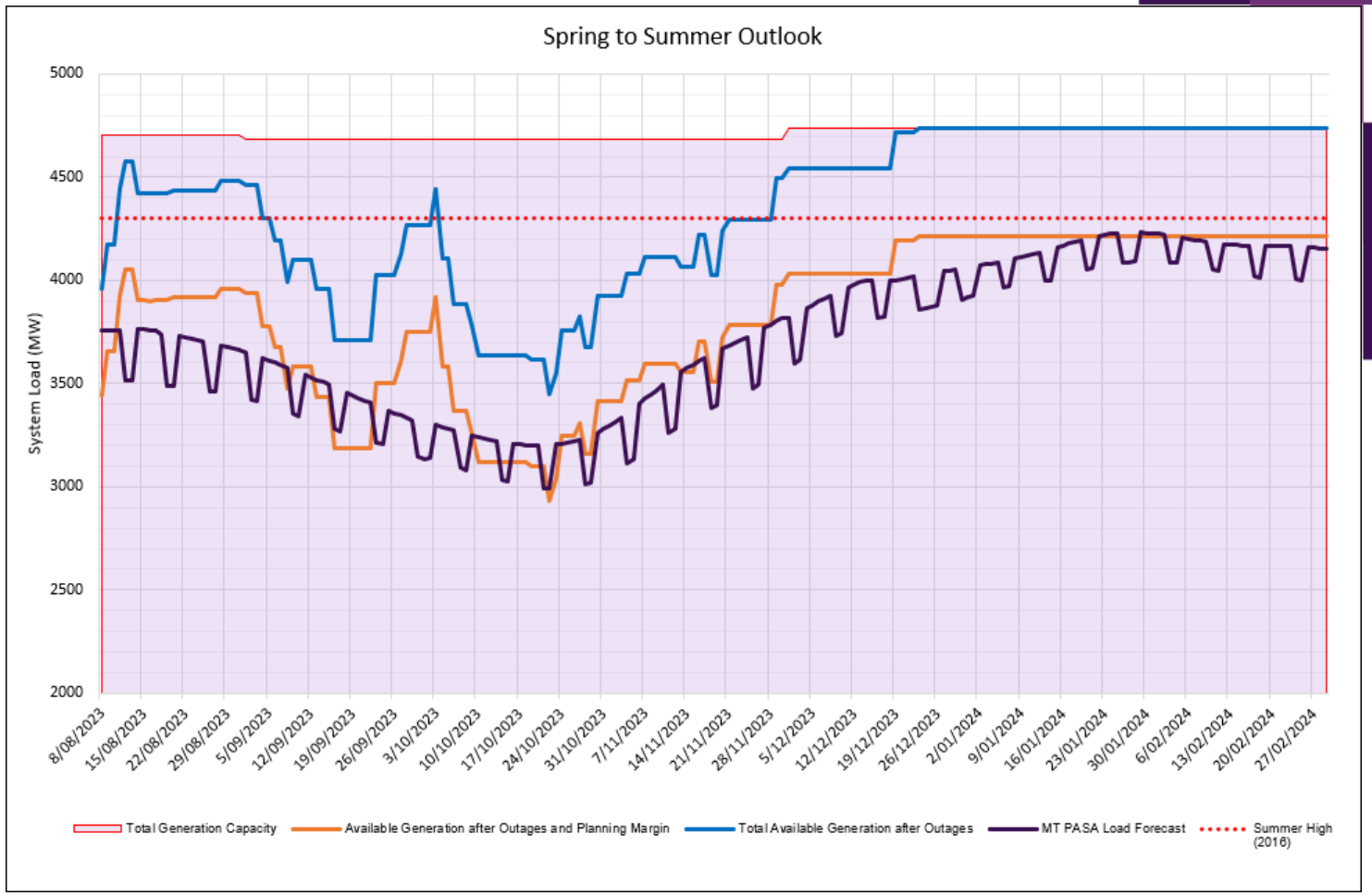
The supply-demand balance remains tight over the coming months.

Minimum demand management

AEMO called for 114 MW of minimum demand service NCESS. Tenders are currently being reviewed by AEMO.

Emergency Solar Management (ESM) remains as an emergency measure. The need for ESM will depend factors such as:

- Actual plant availability
- Large load outages
- Quantity minimum demand NCESS available



Notes:

- The outlook considers only known planned and forced outages.
- The demand forecast is based on statistical analysis based on historical data, and doesn't explicitly consider the impact of a possible El Nino summer.

Managing the power system | Ongoing key focus areas

While June was particularly tight on the power system, the risk of similar conditions remains going forward. To support this AEMO encourages industry to focus on:

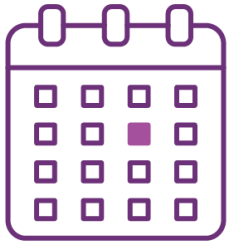
- Detailed outage coordination, with need for flexibility.
- Ensuring ongoing communication of risks related to outages and operational challenges.
- Ensuring adequate fuel availability.
- Staff mobilisation when required to ensure confidence in response.

AEMO has also identified a need for an additional ‘strategic reserve’ mechanism for utilising other available capacity during system stress events outside of the hot season (when SRC is available).

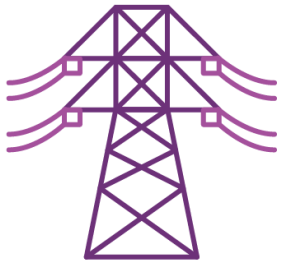
AEMO is exploring options to create a panel of providers willing to reduce load/provide additional capacity year round.

Managing the power system | Outage considerations

While demand is typically lower over shoulder periods, the tighter supply margins are limiting the available capacity for outages.

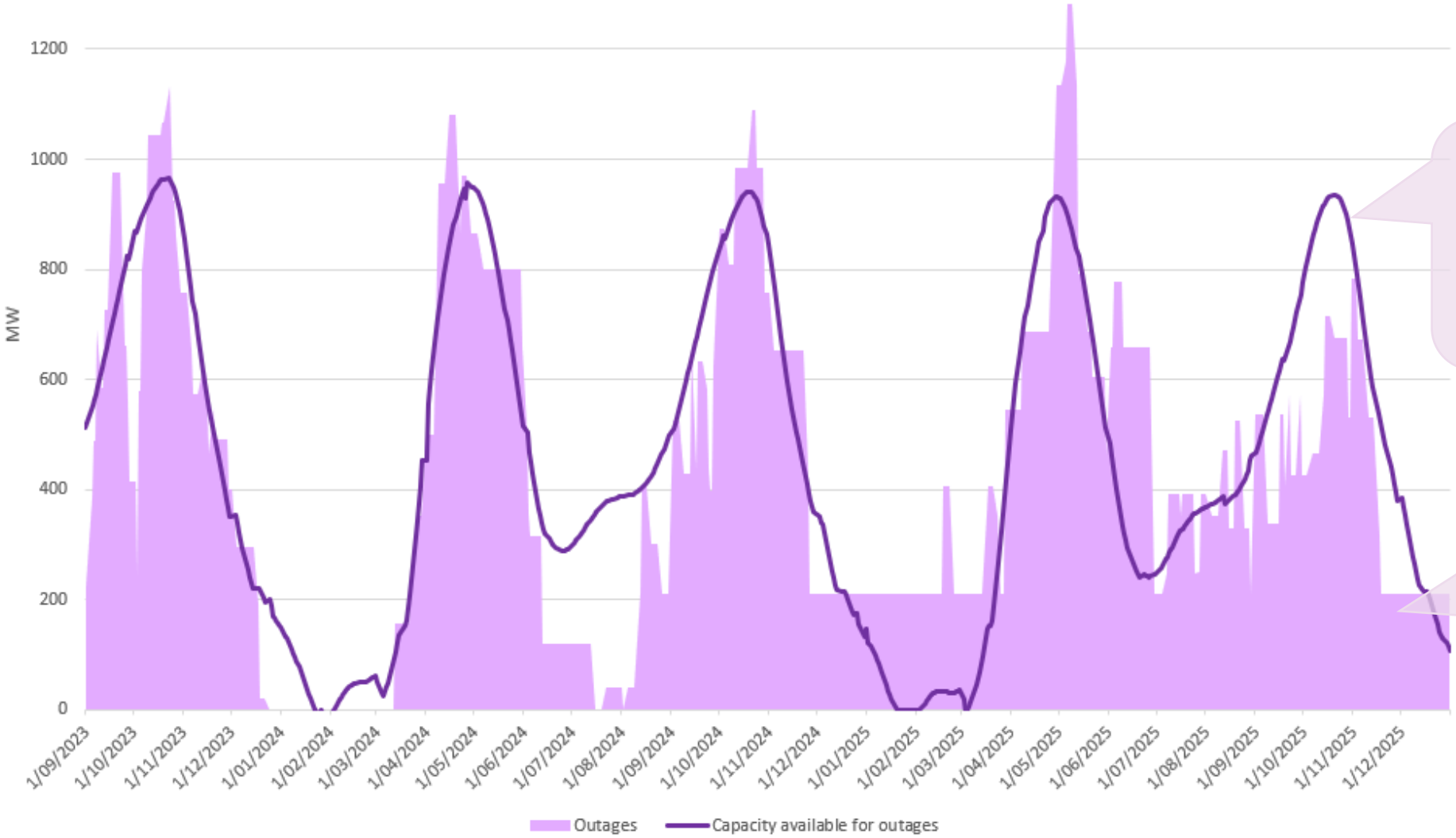


There is currently limited opportunity for any long term or large generator outages.



Network outages which impact generation export are also limited to periods where that unavailability of generation can be accommodated.

Managing the power system | Capacity of the system to accommodate generation outages



Dark line = amount of outages (MW's) that AEMO would normally allow to go ahead with representing no increased risk to the system.

light purple = all approved and requested outages currently in the outage system.

WEM Reform

Progressing to 1 October new market start

WEM Reform

- AEMO remains committed to implementing the new market on **1 October 2023**.
- There continues to be significant progress with the program, including:
  - Release of the systems for Market Participants to test in preparation for new market commencement.
  - Successful implementation of Registrations, RCM, Outage Management System, Settlements and STEM systems into production on 14 August.
  - Considerable headway on testing and defect fixes, SCADA commissioning with Generators and development of the Market Suspension framework.
- AEMO's view to proceed is made noting a number of risks that could lead to disruption at market commencement and for a period following, until processes and systems are stabilised.
- The decision to proceed balances these risks against the consequences of delay – including additional costs to the sector, disincentives to investment and impact to other initiatives enabling the energy transition.
- AEMO's risk framework for go live decision-making prioritises system security and participant solvency, noting the 14 August systems release for the new market meant an orderly deferral was effectively no longer possible.

AEMO acknowledges the timeframes for finalisation of systems and processes are tight, and thanks participants for continuing to undertake the activities necessary for the new market.

WA Roadmap

Engineering the low-emissions power system of the future

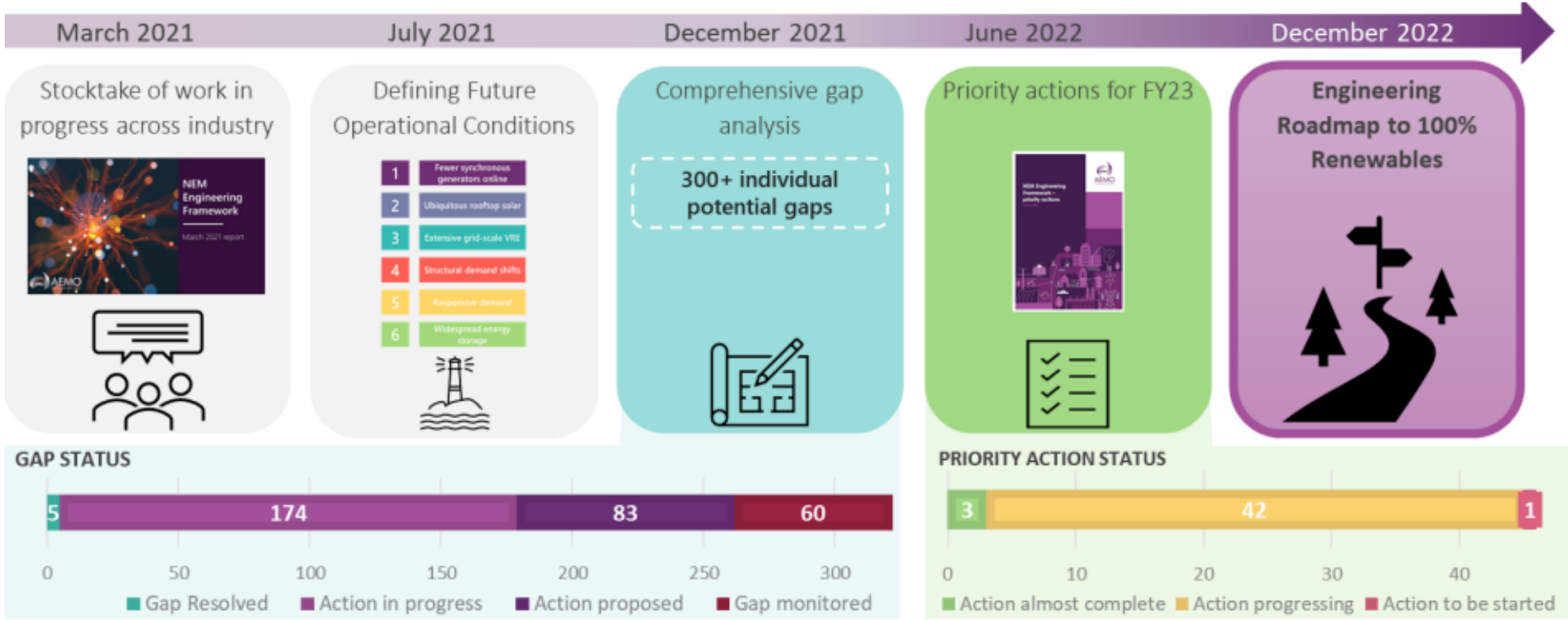
The purpose of WA Roadmap?

To tackle the question of what needs to be done, from an engineering perspective, to enable Western Australia's main interconnected power system to run securely and reliably and through the energy transition

WA Roadmap | Draws on AEMO's national work program

The energy transition presents significant challenges (with associated opportunities) as the energy system transitions to variable, renewable and distributed technologies. As part of its response, AEMO published a NEM Engineering Roadmap to 100% Renewables in December 2022.

While many elements and actions from this report are relevant/transferable to the WEM/SWIS, it was NEM focussed and **AEMO is developing a roadmap for the SWIS in 2023**.



WA Roadmap | … to what?

1. Coal and high emitting technologies will retire from the system over time

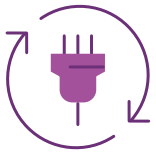
2. The majority of the energy needs will be directly served by Renewable energy sources

3. The system will be instantaneously operated at 100% renewables at times

4. DER will actively participate in the market alongside enhanced visibility and control of unregistered DER

5. Storage will play a key role in both providing Essential System Services and energy shifting

6. For the next 10+ years a level of “backup” generation from fossil sources will be required to manage dunkelflaute (sustained lull in wind and solar PV) and insufficient storage capacity



7. System demand will increase due to electrification and new industry development

WA Roadmap | Underway

What's involved?

- Undertaking initial analysis and defining the actions
- Engaging with stakeholders
- Publication of roadmap
- Progress actions, updates and ongoing engagement

To commence late 2023

Questions and feedback

waelectricityforum@aemo.com.au

For more information
please visit www.aemo.com.au

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Reserve Capacity update

Presented to WA Electricity Consultative Forum

by Neetika Kapani, Manager, Reserve Capacity (WA)

23 August 2023

Reserve Capacity | Announcements & reminders

- Supplementary Reserve Capacity (SRC) process for the 2023-24 Capacity Year
  - AEMO has triggered the requirement to procure up to 326 MW of SRC over the 1 December 2023 – 1 April 2024 period.
  - AEMO issued a call for tenders for SRC on 11 August 2023.
  - The Invitation to Tender can be found on the VendorPanel system - VendorPanel Public Tenders
  - Full details of the requirements to participate in this process, including the standard Supplementary Capacity Contract and tender form to be used is available here - AEMO | Supplementary Reserve Capacity
  - The WEM Procedure for Supplementary Capacity is available here - Supplementary Capacity Procedure
- Certified Reserve Capacity (CRC) for the 2023 Reserve Capacity Cycle
  - The CRC window for the 2023 Reserve Capacity Cycle (1 October 2025 - 1 October 2026) closes on Thursday, 24 August 2023.
  - Market Participants are encouraged to submit CRC applications as soon as possible for this cycle.

Questions and feedback

wa.capacity@aemo.com.au

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please visit www.aemo.com.au

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WEM Reform: Credit Limits Reviews

Presented to WA Electricity Consultative Forum

By Nicholas Nielsen, Manager, WA Prudentials & Settlements

23 August 2023

Purpose

Share AEMO's plans for updating Credit Limits during the transition from current to post-reform Market.

Credit limit reviews | Background

- A Participant's Credit Limit is based on their Anticipated Maximum Exposure (AME) over a 70 day period (MR 2.37.4)
- Generally, the AME is based on historical invoiced values, following a process described in the WEM Procedure:
  - AEMO determines historical STEM & Non-STEM ("NSTEM") invoiced values for each past Trading Day
  - For each day in the most recent 12 invoiced months (Credit Limit Window), determine:
    - The total Non-STEM exposure over the previous 70 Trading Days, plus
    - The total STEM exposure over the previous 15 Trading Days
  - The AME is the highest exposure determined in the Credit Limit Window
- Additionally, AEMO may account for any other factor it considers relevant when determining the AME, under MR 2.37.5(k) – or MR 2.37.5(d) under the new rules.
- MR 2.37.3 requires that AEMO review all Participants' Credit Limit at least once annually. In practice, AEMO normally reviews all Participants' Credit Limits twice, around February and August.

Credit limit reviews | Reform changes

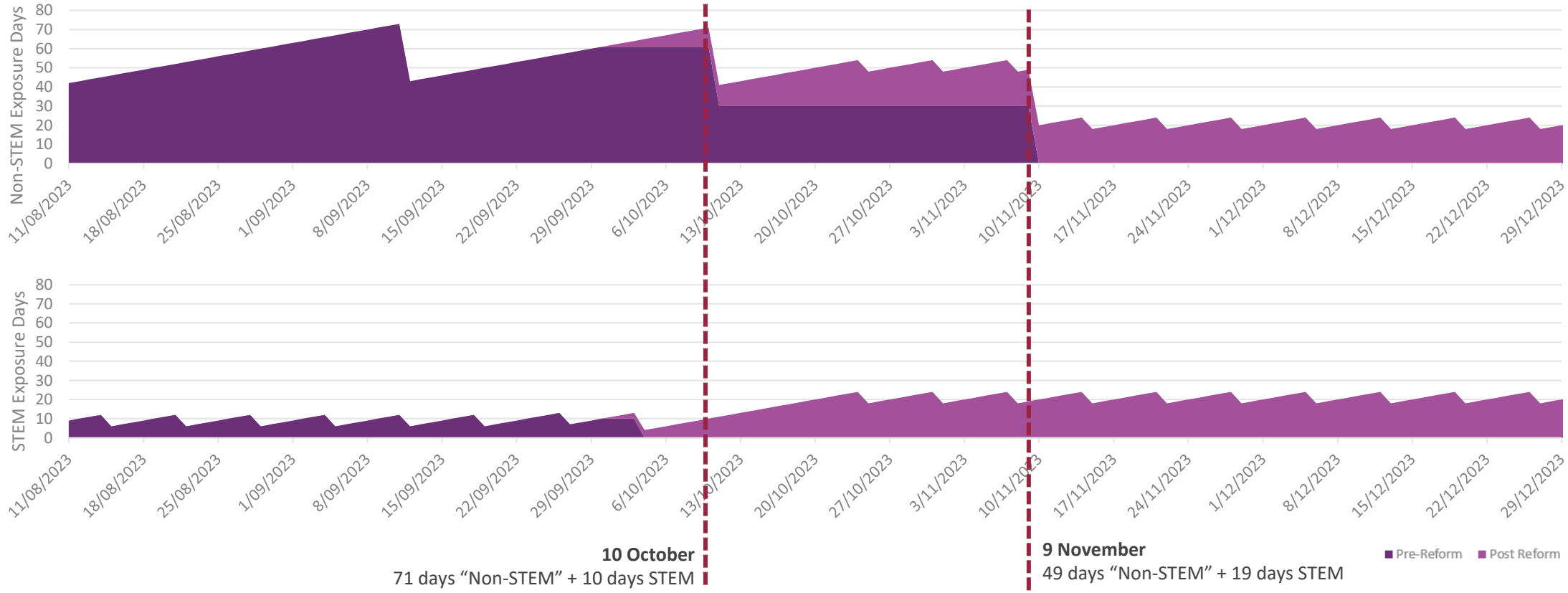
- The general approach to determining Credit Limits will remain the same, but with some minor changes.

Parameter	Current Market	Post-Reform
Credit Limit Window	12 months	→ 12 months
Exposure Period (MR 2.37.4)	70 days	↓ 35 days
STEM Exposure Period	15 days	↑ 35 days*
Non-STEM Exposure Period	70 days	↓ 35 days*

* While the STEM will continue to exist post-WEM Reform, there will no longer be separate STEM and NSTEM invoices. However they are separated here to illustrate that, for the purpose of Credit Limit determination, the exposure from the STEM will increase in the new Market while the exposure from all other Market segments decreases.

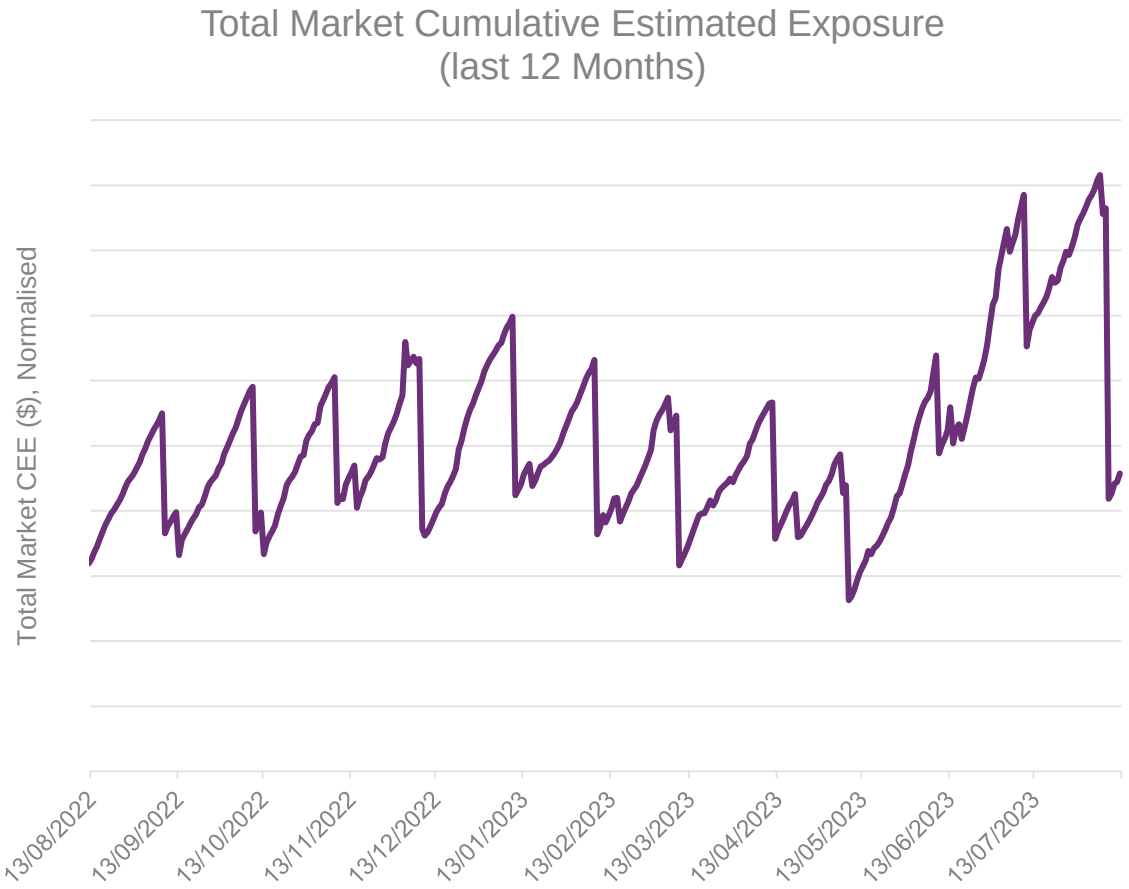
Credit limit reviews | Transitional considerations

While the post-reform exposure period will reduce, there is a transitional period where Participants will be exposed to both pre- and post-WEM Reform markets. The total # exposed days remains comparable to the pre-reform WEM until mid-November.



Credit limit reviews | Outlook

- The system was tight in June 2023, resulting in very high exposure in the WEM.
- Tight conditions are forecast to continue in the 2023/24 Hot Season, which commences shortly after reform go-live.
  - AEMO aims to procure up to 326 MW Supplementary Reserve Capacity to manage these conditions.
- Based on these considerations, AEMO considers it likely that high exposure will continue over the Hot Season.



Credit limit reviews | Other considerations

- The new WEM will include three new Markets (Contingency Reserve Raise/Lower and RoCoF Control Service), and totally overhauled Energy and Regulation markets.

- There is uncertainty around precise market dynamics, prices, and cost distribution in the new market. As such it is not possible to predict how the new Market will impact specific Participants' exposure and Credit Limits.

- Credit Limits must be based on a reasonable period of data to capture seasonal and other variations. If the period is too short, it is likely that the Credit Limits will frequently be exceeded. As such, the first Credit Limits set for the new Market must wait until a reasonable dataset is available.

New WEM Credit Limit Reviews

- AEMO will update all Participants' Credit Limits around 24 August (becoming effective 4 weeks later), based on the current WEM Rules and following AEMO's normal process.

- These Credit Limits **must** remain in place until at least mid-November to reflect the total pre- and post-WEM Reform exposure. However, at this point there will still be insufficient data on the new market (only ~21 settled days) to determine a Credit Limit based on the new Market.

- As such, AEMO will monitor settlement outcomes over the Hot Season and aim to revise Credit Limits around February 2024, when data will be available for ~four months' settled days.

- AEMO will consider additional information (under MR 2.37.5(k) or (d), as applicable) when reviewing these Credit Limits, but won't consider revisions based on the future reduction in Credit Limit Window.

Questions and feedback

For more information

please visit www.aemo.com.au

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Upcoming Forums and Working Groups

WEM Reform Implementation Group (WRIG)

1 September 2023

WA DER Market Participation Forum

13 September 2023

WA Electricity Consultative Forum (WAECF)

18 October 2023

For more information visit

aemo.com.au