

AEMO End of Year Review 2020

Presented to WA Electricity Consultative Forum

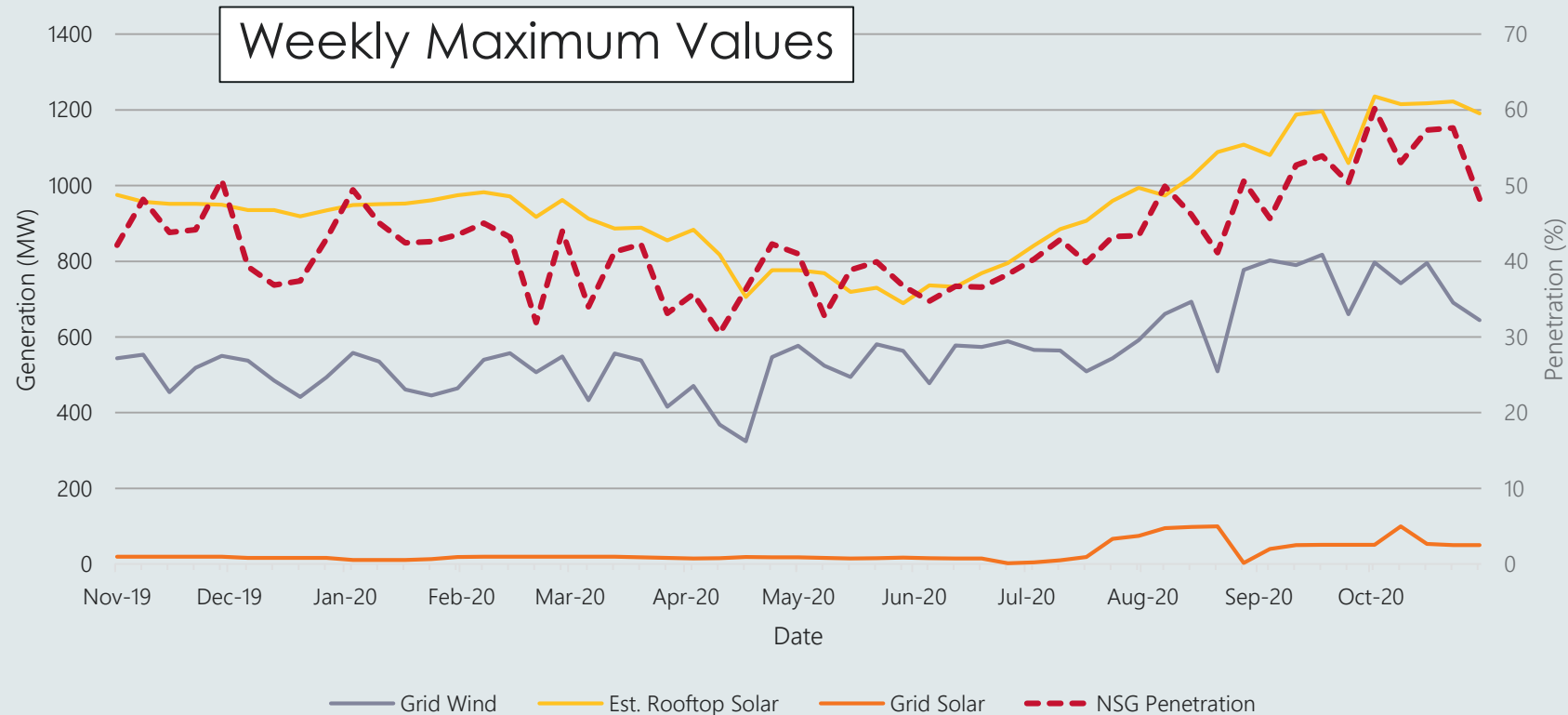
By Teresa Smit, Manager, Power System and Market Planning, Lauren Ashby, Analyst, Market Operations and Manus Higgins Senior Analyst Reserve Capacity

25 November 2020

Abundance of New Records

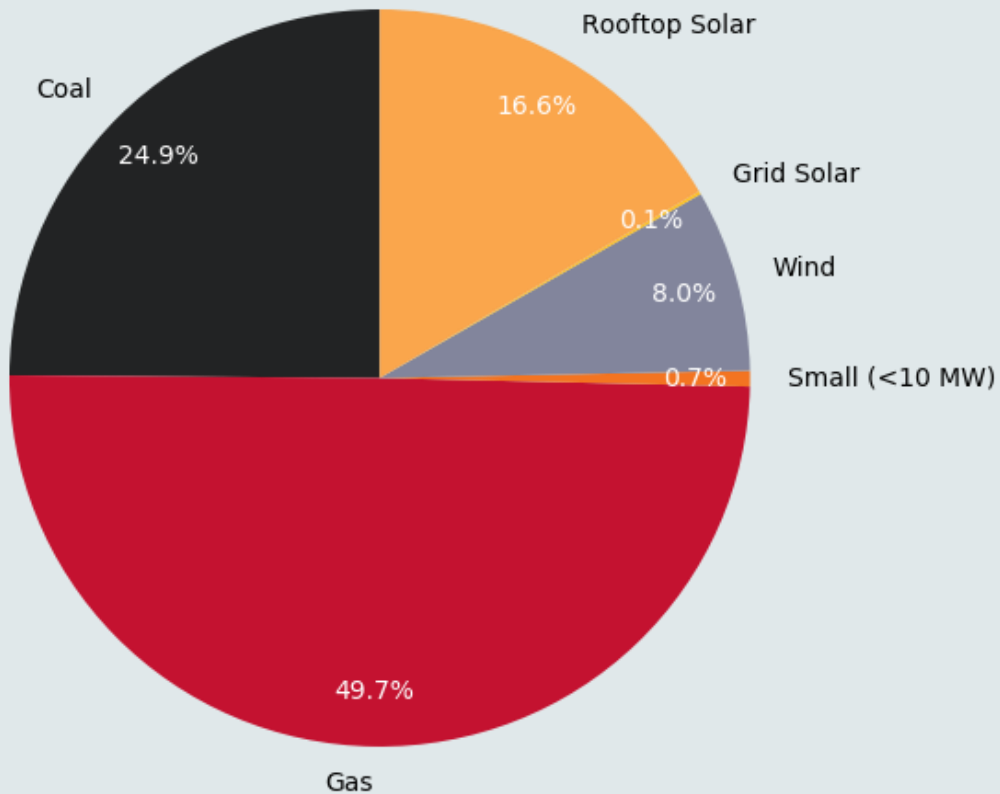
Commissioning of multiple grid-scale wind and solar projects has set new record levels of grid solar and wind

- Since November 2019, continued uptake of rooftop solar and the new grid-scale facilities have led to the estimated Non-Synchronous Generation (NSG) penetration breaking above 50% of total underlying load
 - More recently, NSG penetration reached 61.52% on 3rd October this year

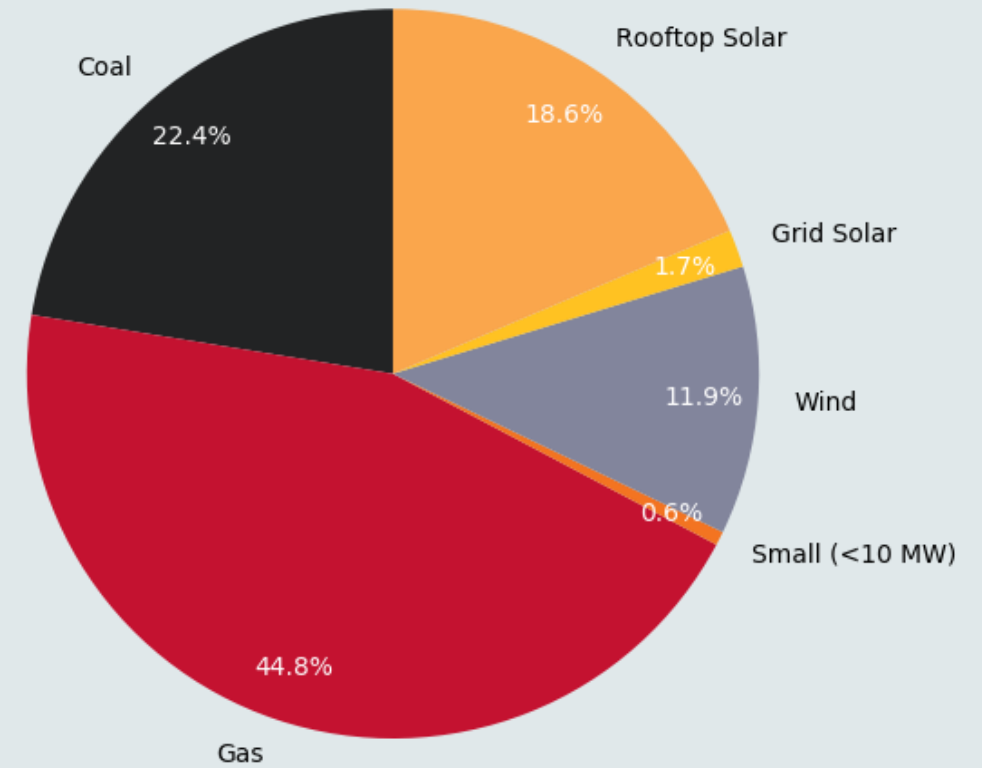


Changes to the Generation Mix

November 2019 Generation Installed Capacities



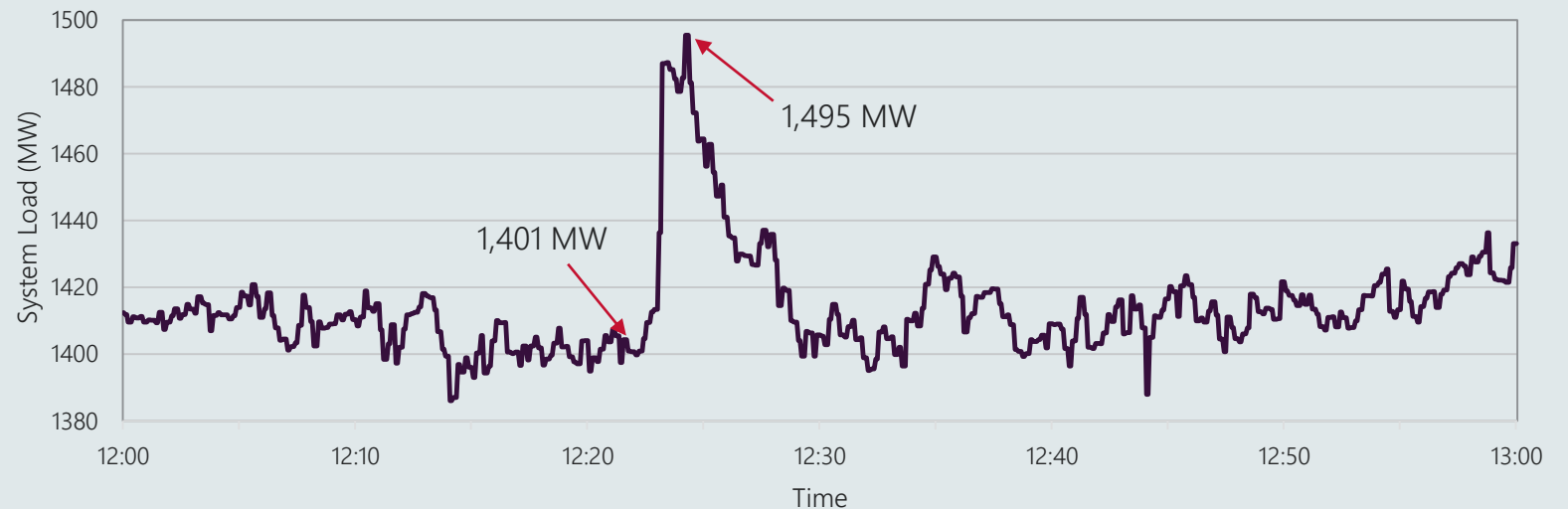
November 2020 Generation Installed Capacities



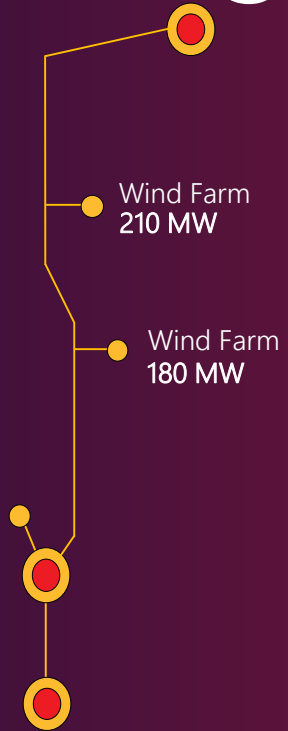
Rooftop PV performance during faults

- A number of network disturbances have resulted in a noticeable increase in the system load
 - This happens when the amount of rooftop solar inverters near a network disturbance (under-voltage) which trips off exceeds the amount of load which trips off during the same fault.
 - Investigations are underway to better understand the performance of rooftop PV during fault conditions on the SWIS.

Network Disturbance on 18th September 2020



Managing largest network contingency



- At times the two new wind farms connected on a single 330 kV line set the single largest contingency in the SWIS.
 - AEMO provides WP a number indicating the maximum contingency size which can be accommodated while carrying 70% of Spinning Reserve.
 - Where the limit is reached, the two wind farms may be constrained via GIA.
 - This has occurred on a couple of occasions during low system load and high wind.
- A trip of this line and connected generation occurred on Saturday 17th October at 14:51
 - A frequency nadir of 49.17 Hz was reached following the loss of these generators and a net loss of generation across the system of 349 MW.

Operational focus areas

- Managing reactive power:
 - There has been significant operational focus between AEMO and Western Power on ensuring a coordinated approach to managing reactive power.
 - High distribution voltages are caused by lower loads on transmission lines exacerbated by increasing DER
 - This is mitigated by de-energising a lightly loaded transmission line and the installation of a number reactors on the network over the last year.
- Frequency management:
 - There is increasing volatility on the system due to increasing penetration of non scheduled generation and roof top PV.
 - Reducing load results in fewer synchronous generators available on the system to respond to this.
 - At low loads, the generator outputs are typically lower and hence the largest contingency that the system has to respond to is smaller.
 - A Real Time Frequency Stability (RTFS) tool has been operationalised in the control room to provide an indication of the amount of spinning reserve required for prevailing conditions to manage the largest contingency.
 - Cycling of thermal plant is becoming more common as the number of units required during the minimum demand is less, but still required to be on line to meet peak demand.

Focus areas for 2021

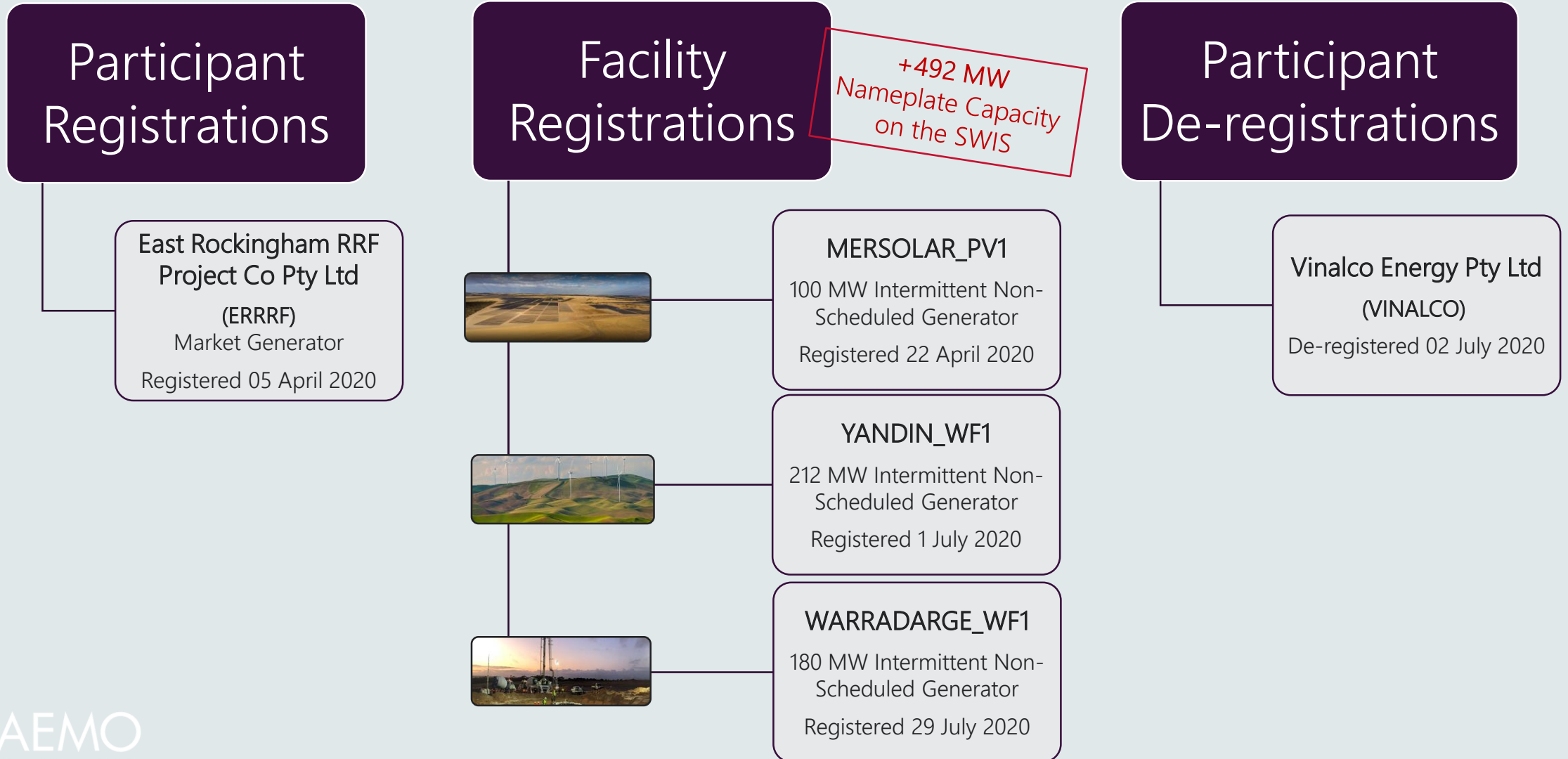
As well as supporting EPWA's ETS through the Foundational Regulatory Frameworks and the DER Roadmap, AEMO will continue to assess system security risks and ensure mechanisms are in place to manage these.

- Managing minimum demand
 - Ongoing analysis is considering the various challenges introduced through a reducing minimum day time demand.
 - If specific risks are identified, operational actions may be required to manage these until more permanent solutions are implemented.
- System Strength
 - An initial System Strength risk assessment will be done, to be followed later in the year by a more comprehensive study
- Rooftop PV disturbance ride through
 - Based on SWIS experience to date and supported by further in depth analysis, studies are being undertaken to estimate the amount of PV that will trip off the system following a disturbance.

Questions and Feedback

wa.sm.operations@aemo.com.au

WEM Registrations



WA Markets Operations Projects

Reduction of Prudential Exposure in the RCM (RoPE)

- Improved prudential framework reducing risk of shortfalls for Participants
- Lower support costs
- More efficient system operability
- Improved clarity for participants
- Foundation reform work
- Delivered within approved allowable revenue 5 budget

STEM Fortran Replacement

- Reduced non-compliance risk
- Reduced IT support risk
- Improved system performance and efficiency
- Foundation reform work
- Delivered within approved allowable revenue 5 budget

POMAX Metering Upgrade

- Reduced non-compliance risk
- Reduced IT support risk
- Improved system performance and efficiency
- Foundation reform work
- Delivered within approved allowable revenue 5 budget

Settlement Enhancements

- Lower support costs
- More efficient system operability
- Improved clarity for participants
- Foundation reform work

Rule Changes

- RC_2017_02: Implementation of 30-Minute Balancing Gate Closure
- RC_2019_04: Administrative Improvements to Settlement
- RC_2020_01: Market Participant Fee calculation manifest error

WEMS Releases

WEMS 3.34

29 January 2020

- Automated publication of NCS Dispatch and Total Sent out Generation data on the Public Data Website.
- Performance improvements to the Balancing Load, Prices and Spare Capacity Report.
- Extension of the Outages visualisation on the WEM Data Dashboard.

WEMS 3.35

29 April 2020

- Automated publication of LFAS Data to the Public Data Site.
- User management improvements.

Prudential Service 1.4

19 August 2020

- Final Release for Reduction of Prudential Exposure (RoPE) project:
 - System changes required for AEMO Procedure Change AEPC_2020_06.
- New dynamic Outstanding Amount Calculation based on latest operational data and new User Displays - "Prudential Monitoring" and "Credit Support".

WEMS 3.36

2 September 2020

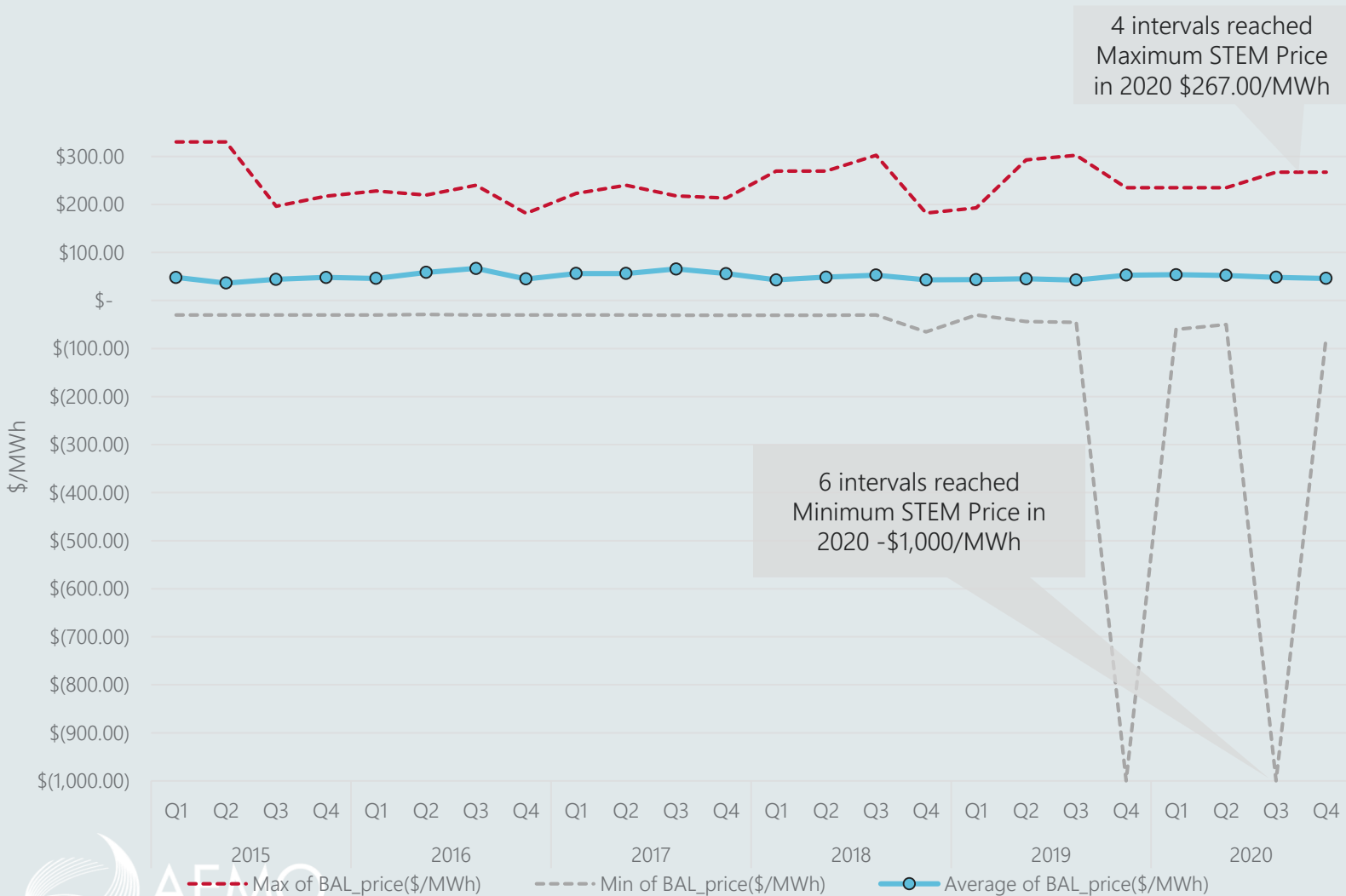
- New web services to return IRCR PIRs and Logs in CSV format.
- Improvements to the WEM Data Dashboard -> Fuel Mix visualisation.
- Replacement of the codebase for the STEM (STEM Fortran Replacement)

WEMS 3.37

25 November 2020

- System changes required to support RC_2017_02.
- Balancing and LFAS submission validations and warning have been updated.
- 90-Minute Balancing Gate Closure will be effective from 8.00am Tuesday, 01 December.

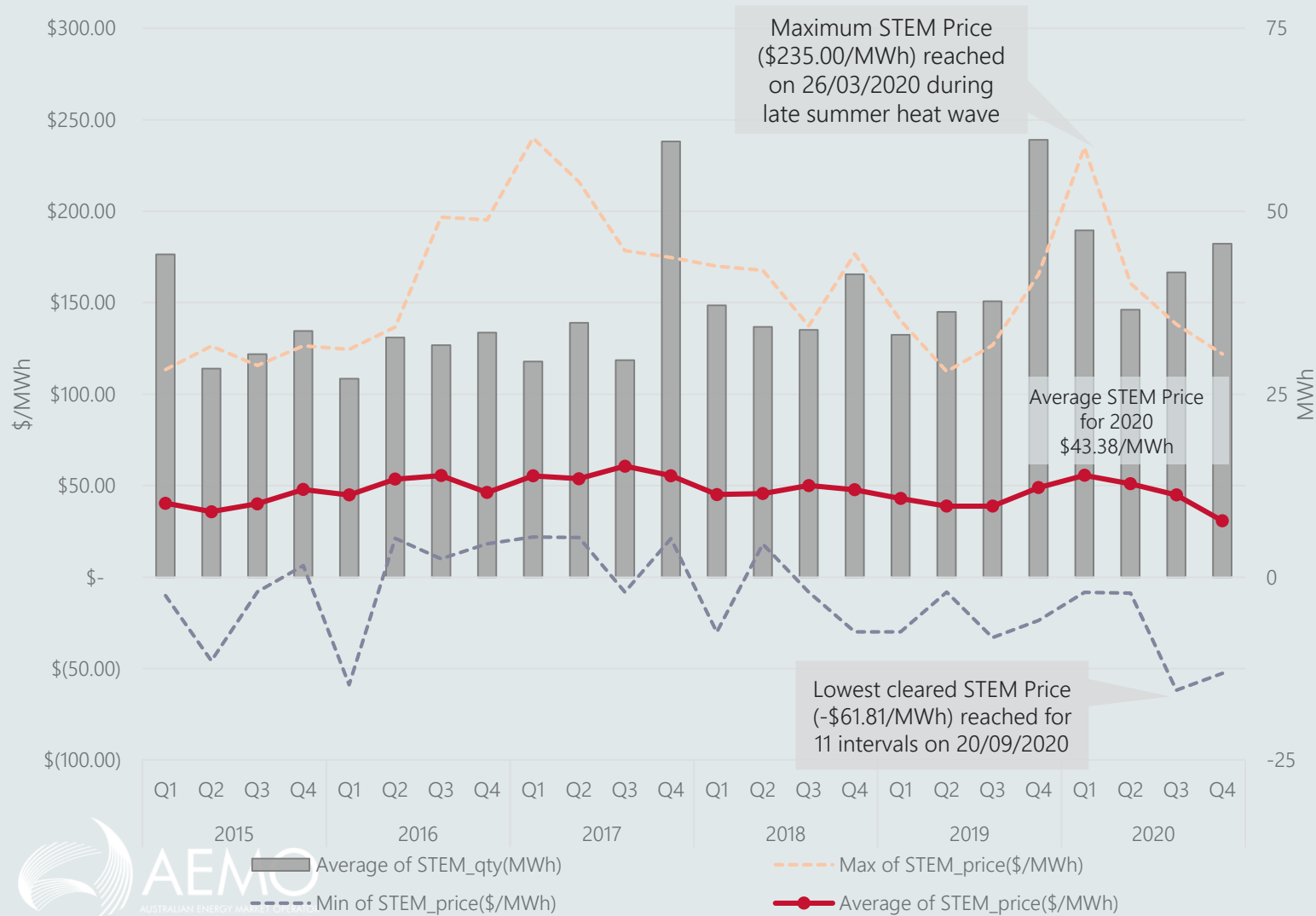
Average Balancing Prices



Summary

- A The average Balancing Price increased by 10% compared to last year. Lower average prices during the middle of the day were not enough to offset the higher overnight prices and the significantly higher prices during evening peaks.
- B Increased occurrences of negative prices, including 6 intervals at - \$1,000/MWh, has been driven by a combination of growing renewable generation and changing demand profiles in the SWIS.

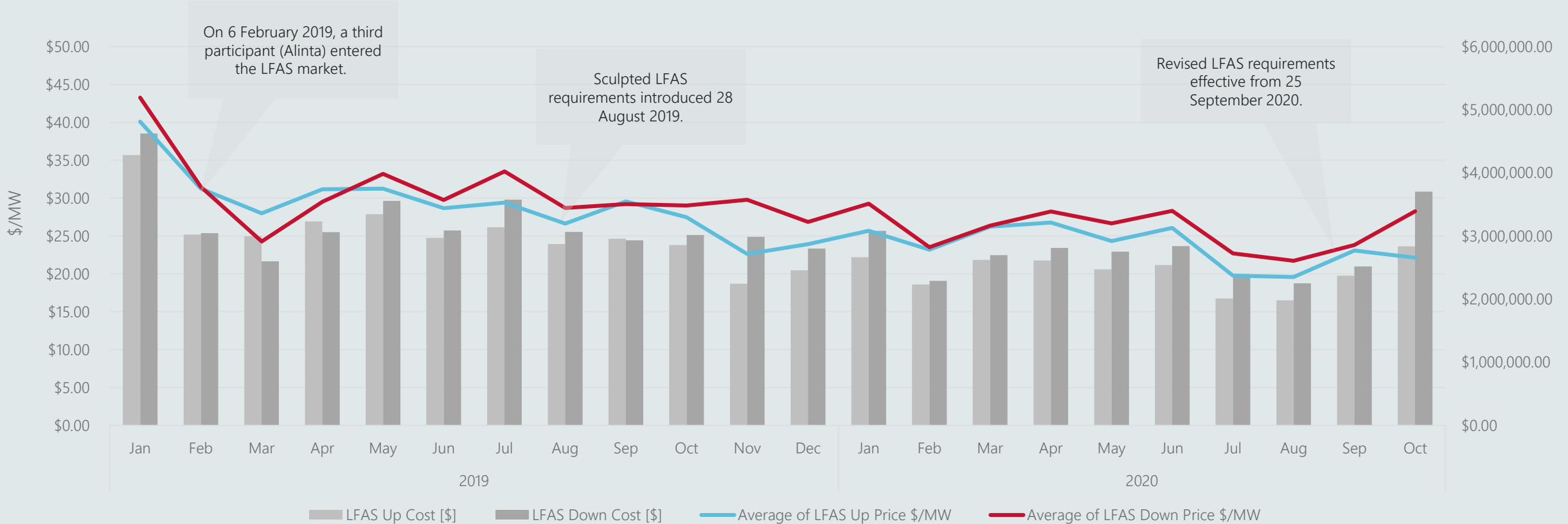
Average STEM Prices



Summary

- A Market Participants may have anticipated higher prices in the Balancing Market and chose to hedge higher quantities in STEM.
- B Low negative prices in the Balancing Market and increased supply in STEM caused lowest cleared price in STEM since the Balancing Market was introduced in 2012. Negative priced intervals increased by 170% compared to 2019.

Average LFAS Prices for 2020 YTD

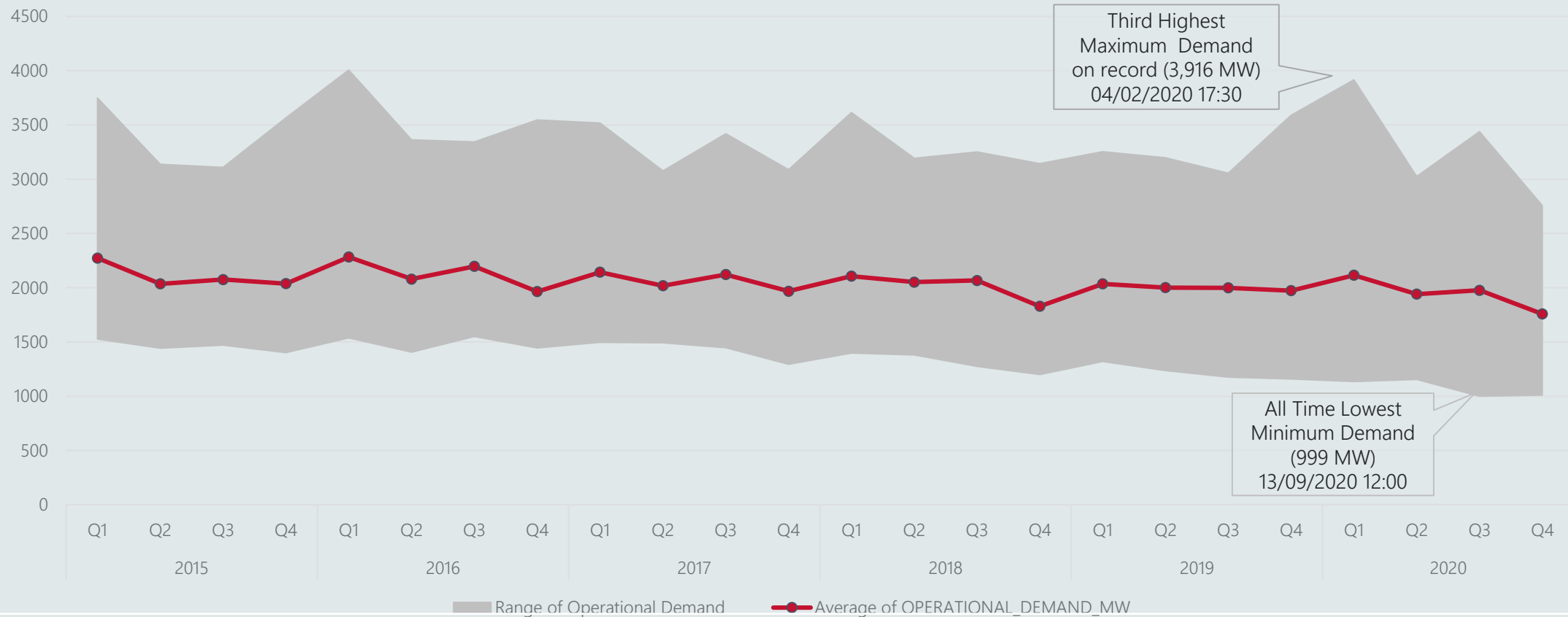


Summary

A The total cost of LFAS services increased from September 2020 to October 2020 following the introduction of the revised LFAS requirements, increasing to 95 MW for LFAS Up/Down between 5:30AM and 7:30PM, and 70 MW for LFAS Up/Down between 7:30PM and 5:30AM.

B Average LFAS prices for 2020 are lower than 2019 as the LFAS market, which may be driven by increased competition.

Operational Demand



Summary

- A Increased solar PV generation contributed to a new all-time lowest Operational Demand record.
- B The third highest Maximum Demand day on record was set in February 2020 and was driven by cooling-related demand.
- C The steady decline in Average Operational demand is caused by increased penetration of Distributed Solar PV.

WA Market Operations – The Year Ahead

Analytics & Insights

- QED Reports for 2021:
QED - Q4 2020 in February 2021
QED – Q1 2021 in April 2021
QED – Q2 2021 in July 2021
QED – Q3 2020 in October 2021
- Analysis of forecast accuracy in the Balancing Market in Q1 2021 for WA ECF.

If you have any focus areas of analysis that you'd like included in the report, please get in touch with the WA Market Operations team to let us know.

System and Procedure Updates

- WEMS updates will be released approximately one per quarter, to address improvements and fixes that have been identified in WEMS.
- Review if changes to the Credit Limit methodology can be progressed under Procedure Change in first half of 2021

We welcome system improvement suggestions from Market Participants. If you have an idea you'd like to see implemented in WEMS, contact the WA Market Operations team to discuss.

Continued WEM Training

- AEMO provide a number of training courses on the WEM for Market Participants, governments and industry stakeholders.
 - WEM Introduction
 - Reserve capacity Mechanism
 - Power Systems & Energy Markets

In 2020 the Power Systems & Energy Markets course was revamped. For more information about the training and how to register, visit the [Industry Courses](#) page on AEMO's website.

Projects

- Significant focus on providing SME support to implementation projects in the WEM Reform and DER Roadmap programs.

Other projects include:

- Delivery of Settlement Enhancements project
- Support the delivery of RCM Pricing project
- Delivery of energy sector governance reforms

Contact the WA Market Operations team

Call: 1300 989 797, Option 1

Email: wa.operations@aemo.com.au

Questions and Feedback

Market Operations

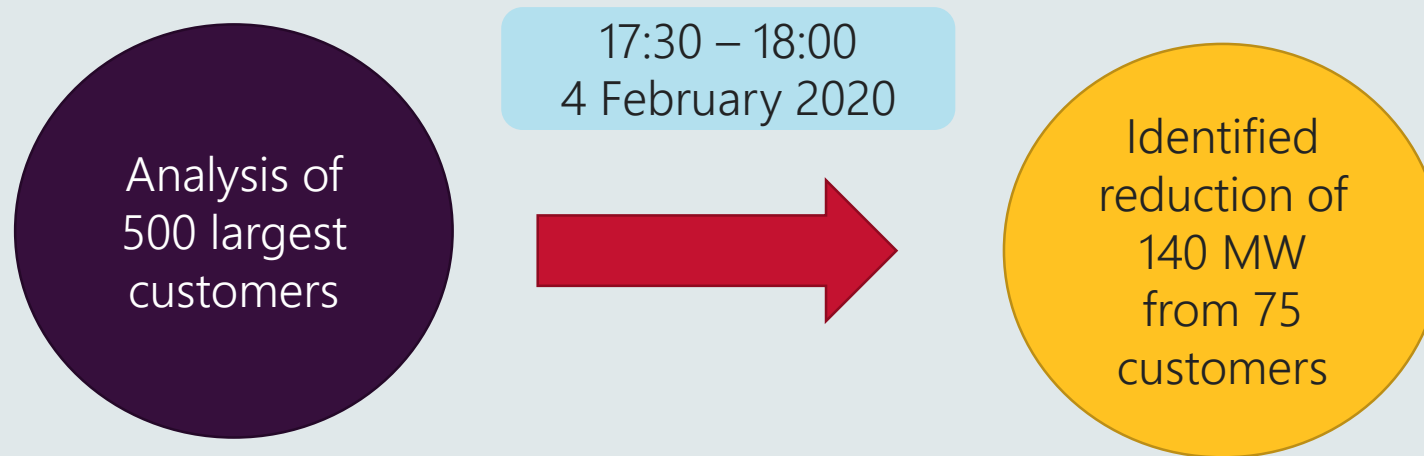
wa.operations@aemo.com.au

1300 989 797

2020 WEM ESOO

- Despite challenges of COVID-19 and WFH, this was one of the most comprehensive WEM ESOOs to date, incorporating:
 - In-house peak demand and energy forecasts for the first time.
 - Presented minimum demand forecasts for the first time, also completed in-house.
- Key outcomes:
 - RCR of 4,421 MW set for the 2022-23 Capacity Year.
 - 10% POE peak demand is forecast to fall for the first time - average annual rate of 0.2% (average annual growth of 0.4% in the 2019 WEM ESOO).
 - Operational consumption is forecast to fall at an average annual rate of 0.4% over the outlook period, in line with the 2019 WEM ESOO.
 - The DSM RCP for 2020-21 Capacity Year is \$16,730/MW.

2020 WEM ESOO – IRCR supplementary analysis



The ability of a Customer to target reduced consumption during periods of high demand is dependent on their ability to predict such periods

Changes to 2020 Reserve Capacity Cycle timeline

- 2020 Reserve Capacity Cycle was extended by 2 months after formal consultation process with stakeholders in response to COVID-19.
- CRC submission window opened on 1 May 2020 and closed four months later on 1 September.
- CRC workshop held prior to CRC submission window closure.

2020 Reserve Capacity Cycle – Certifying Facilities in a new landscape

- Assigned Capacity Credits: 4,807.237 MW
 - Net decrease of 120.771 MW for SG compared with 2019 Reserve Capacity Cycle due to MUJA_G5 retirement (195 MW) which was partly offset by TIWEST_COG1 (36 MW) and ERRRF_WTE_G1 (25.134 MW).
 - Net increase of 2.932 MW for INSG (198.143 MW) compared with 2019 Reserve Capacity Cycle.
- Total excess capacity: 386.237 MW (~8.7%)
- A solar-battery hybrid facility was assigned Capacity Credits for the first time.

2020 Reserve Capacity Cycle

INSG trends:

- Continuing decline (up to 20%) in Relevant Level for solar Facilities compared to 2019 Reserve Capacity Cycle
- Decrease in Relevant Level for wind farms located north of Perth
- Increase in the Relevant Level for wind farms located south and east of Perth

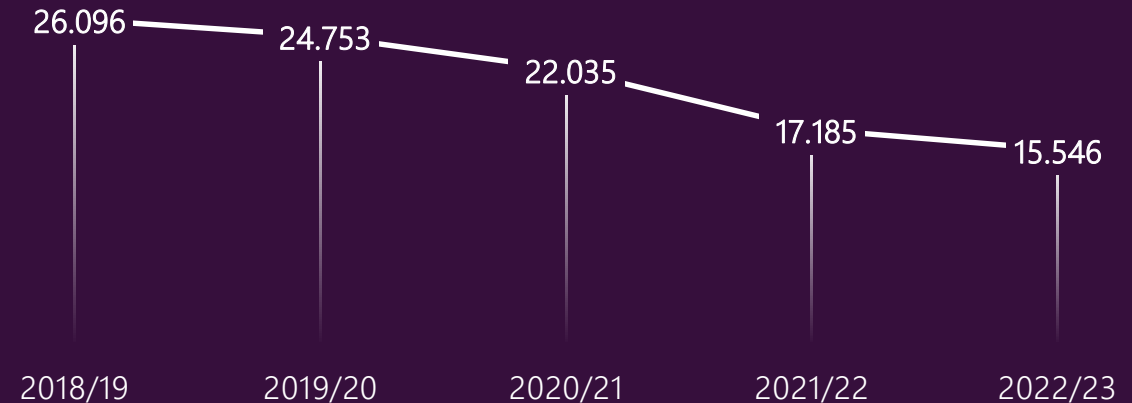
NORTHAM SOLAR



ALBANY WIND



WALKAWAY WIND FARM



RCM pricing and 2021 BRCP

- The RCM portal was re-built to incorporate the changes to RCM pricing and accommodate DSM Reserve Capacity Security.
- Price outcomes for the 2020 Reserve Capacity Cycle:
 - Reserve Capacity Price (RCP): \$85,294.19 (associated with 114.134 MW of Capacity Credits)
 - Transitional Reserve Capacity Price: \$ 115,425.00 (4,663.103 MW of Capacity Credits)
- Currently closing out RC Pricing Project
- 2020 BRCP published and 2021 BRCP underway.
 - WACC used in the calculation of 2021 BRCP amended following ERA's Procedure Change.
 - Replacing Real Value with Nominal Value (which accounts for inflation)

Updates to RC Market Procedures

Market Procedure: Certification of Reserve Capacity

- Updated and Published: 15 June 2020
- Rules Related: 4.9.3, 4.9.10, 4.11.1, 4.28C.15

Market Procedure: Declaration of Bilateral Trades and the Reserve Capacity Auction

- Updated and Published: 16 Oct 2020
- Rules Related: 3.2.6, 4.14.11, 4.17.9

Market Procedure: Reserve Capacity Security

- Updated and Published: 1 July 2020
- Rules Related: 2.1A.2, 4.13.8, 4.13A.23

Market Procedure: Reserve Capacity Testing

- Updated and Published: 1 Aug 2020
- Rules Related: 2.1A.2(h), 2.9.7, 2.9.7A, 2.9.8, 4.25.14

New RCM Educational Collateral

In addition to market training (WEM Introduction and RCM) we have developed the following documents to broaden stakeholders understanding of the RCM:

RCM FAQ

- Great starter document – internal and external application
- Q&As distilled from RCM training sessions & stakeholder queries over the last number of years
- More advanced 'Not So Frequently Asked Questions' in production

RCM FAQ: https://aemo.com.au/-/media/files/electricity/wem/reserve_capacity_mechanism/fact-sheets/faq.pdf?la=en

New Facility Fact Sheet

- Overview of how a new Generation Facility can participate in the RCM
- Q&As distilled from new participant difficulties over the last number of years

New Facility Fact Sheet: https://aemo.com.au/-/media/files/electricity/wem/reserve_capacity_mechanism/fact-sheets/fact-sheet.pdf?la=en

Contact the Reserve Capacity Team @ wa.capacity@aemo.com.au

Questions and feedback

wa.capacity@aemo.com.au