RELIABILITY PANEL AEMC

2020 Annual Market Performance Review

The Reliability Panel's Annual Market Performance Review (AMPR) provides observations and commentary on the reliability, security and safety performance of the power system. This review is required under the National Electricity Rules and covers the period of 1 Jul 2019 to 30 June 2020. The annual review is becoming increasingly relevant as the power system faces a period of rapid transition, with the impacts of this transition already being noticed around the market.

Purpose of the report

The final report sets out the Panel's findings for its annual market performance review for 2019-20. The review is conducted in accordance with the requirements of the NER and standing terms of reference issued by the AEMC. The purpose of the report is to:

- Provide stakeholders with consolidated information and expert commentary about the performance of the power system and market in a single publication.
- Highlight emerging trends to help inform the policy and investment decisions of governments, policymakers, market institutions and market participants.
- Identify the issues for attention relevant to the frameworks or mechanisms used to deliver reliability, security and safety.

The final report compiles information collected from a number of public sources including the Australian Energy Market Operator, the Australian Energy Regulator, jurisdictional regulators and market participants. The value of the report comes from the Panel, with its diverse membership, collating and interpreting the data to make sense of what is happening across the power system and market.

As was the case last year, the Panel developed a data portal so that stakeholders can easily access the key data sets used in the report.

The final report builds on the key issues identified in the Panel's first Market Performance Update published in December 2020. The Reliability Panel's Market Performance Updates were introduced in 2020 to provide market participants more timely information about power system performance and about emerging trends in the areas of security, reliability and safety as early as possible. The next market update is scheduled for the second half of 2021.

Key findings

The physical power system and the operating environment have changed materially in recent years, with changes to the generation mix and market dynamics, as well as numerous severe weather events and other global disruptions occurring. These changes have been happening at a rapid pace and these trends are likely to continue over the next two decades. The Panel has noted a number of security, reliability and safety challenges and opportunities that are occurring or emerging due to the transition currently underway. The Panel also acknowledges the work underway by the ESB to ensure the market framework is fit for purpose for future operations, and the Panel will continue to work closely with the ESB to influence this work.

Reliability

A reliable power system has enough generation, demand response and network capacity to supply consumers with the energy that they demand with a very high degree of

confidence.

What happened in 2019-20?

The Panel have found that the reliability performance of the NEM has been satisfactory during 2019-20. The regulatory framework, including the ability for AEMO to intervene in the market, were leveraged to support the reliable supply of electricity to consumers. The key reliability outcomes included that:

- The reliability standard of 0.002% unserved energy (USE) was not breached in any region, and there was no USE in any region across the NEM.
- AEMO has forecast that without additional action, the interim reliability measure (IRM) of 0.0006% USE would be breached in New South Wales in 2023-24, and that the reliability standard would be breached in New South Wales in 2029-30.
    - These issues are arising due to the forecast withdrawal of thermal generation capacity from the NEM over the next ten years.
    - AEMO have noted in the 2020 Integrated System Plan (ISP) that the completion of actionable ISP projects is likely to address some of these concerns.
- There were no reliability events (actual LOR3 conditions) where supply was interrupted due to a shortfall of available capacity and reserves.
- AEMO issued 17 actual lack of reserves (LOR) notices, and the number of LOR2 conditions increased significantly compared to historical trends. There was a higher concentration of forecast lack of reserve conditions in the shoulder periods.
- The Reliability and Emergency Reserve Trader (RERT) was activated on four occasions, and RERT costs were slightly higher in 2019-20, at $40.57 million, than in 2018-19 at $34.5 million.
- The Cumulative Price Threshold was not breached for energy in 2019-20. The Cumulative Price Threshold was breached once for Frequency Control Ancillary Services (FCAS) on 1 February 2020, leading to the administered price cap being introduced for approximately 10 days.
- AEMO issued six directions to market participants for reliability reasons, which was an increase from historical trends.
- The accuracy of forecasting for demand and intermittent generation was similarly accurate compared to 2018-19. Some participants in the NEM have begun self-forecasting.
- Transmission unsupplied minutes increased across all regions, and this increase was most notable in Victoria.

Panel insights and implications

The Panel notes that while the reliability standard was met in each region in 2019-20, the system operator faced significant challenges maintaining operational reliability during the reporting period. This was due to the number of extreme environmental events, such as the bushfires, that impacted the power system during this period. The difficulty in managing reliability is evidenced by the increased number of occasions when interventions were necessary, as well as the increase in actual LOR2 conditions in 2019-20. Furthermore, there was an increase in the number of tight supply-demand forecasts in non-peak periods that have traditionally not presented challenges of this manner.

The Panel notes that a large proportion of the significant trends in reliability metrics in 2019-20 were caused by extreme weather events such as storms, bushfires and extreme heat. These events may interrupt the normal functions of the market and present rapid changes to reliability performance. The impact that these events have on the power system will need to be considered in future planning and policy considerations as the power system operating environment continue to change, and the conditions that are conducive to these events arise more frequently. Additionally, as the NEM continues to transition to higher penetrations of variable generation capacity, the importance of forecasting will continue to grow in regard to managing reliability in relation to day-to-day management of variable generation. The Panel also considers that the increasing variability of supply and demand may be leading to changing reliability dynamics, with a higher concentration of low reserve conditions occurring in traditionally stable shoulder periods.

The Panel also believes that it is important to consider the impending challenges that are forecast to emerge in the coming two decades. The forecast exit of thermal generation capacity may lead to significant reliability challenges if steps are not taken to address this issue in a timely and coordinated manner. There is already work underway to address these issues by the ESB, however the Panel notes that this will be an important trend to monitor as thermal generation retirements continue to approach.

The Reliability Standard and Settings Review will commence in mid-2021, following the completion of the current review of the Guidelines which guide the review. This review must be undertaken in accordance with the requirements under the NER and completed by April 2022. The RSS review will consider and provide an in-depth assessment of reliability outcomes in the NEM.

Security

Power system security involves maintaining the numerous components within their allowable equipment ratings, maintaining the system as a whole in a stable condition within defined technical limits and returning the power system to operate within normal conditions following a disturbance.

What happened in 2019-20?

The Panel has noted security outcomes in 2019-20 are reflective of the increasing challenges that AEMO are facing when managing power system security. As the power system continues to transition towards one characterised by smaller and more geographically dispersed generators with different characteristics to what the power was designed around, these challenges are likely to continue to occur.

Key security outcomes include:

- There were three incidents in which the power system was not in a secure operating state for more than 30 minutes in 2019-20. Two of these events were the result of bushfires, highlighting the challenges that the power system faces from extreme environmental events.
- There was an increase in the number of reviewable operating incidents in 2019-20 compared to 2018-19, however the amount of reviewable operating incidents was not unusually large compared to historical trends.
- There was a large increase in the number of directions issued by AEMO to manage power system security. The vast majority of these directions were issued in South Australia. The South Australian separation event in January 2020 contributed to this increase, however the high penetration of inverter-based generation in South Australia is also a factor.
- There were approximately 15,000 constraint changes in the NEM dispatch engine (NEMDE) in 2019-20. The number of constraint changes is likely to reflect the increasing complexity of power system management, and while 2019-20 saw a decrease compared to 2018-19, the number of constraint changes is higher than the historical average.
- Frequency performance of the NEM generally improved on both the mainland and in Tasmania in the 2019-20 financial year compared to 2018-19. AEMO remains concerned about increasing risks presented by aspects of frequency control that the frequency operating standard (FOS) does not directly address.
- There was an increase FCAS costs in 2019-20 compared to 2018-19. The South Australian separation event contributed to this increase. AEMO also implemented increases to the base volume of regulation FCAS procured in quarter two 2019 to improve frequency performance.

Panel insights and implications

The Panel notes that 2019-20 saw an increase in challenges and complexity in managing power system security. These security challenges were caused in part by extreme environmental events, and the rate at which the power system is undergoing the change to higher penetrations of inverter-based resources. The separation of South Australia from the remainder of the NEM in late January and February 2020 forced AEMO to operate the power system in an extended island formation what had not been done before.

As the power system continues to transition towards higher penetrations of inverter-based resources, the Panel expects many of the issues currently occurring, such as those created by minimum system load, to continue as operating techniques are adapted to the

new operating conditions. Given the pace of change is faster than has previously been forecast, a number of security issues continue to present challenges for operating the power system and to accurately forecast future trends. Issues include those associated with minimum system load, such as system strength, inertia and voltage control. Furthermore, these developments are contributing to increasing variability and frequency of minimum system load conditions. The ability for AEMO to accurately forecast and account for the increasing impact of rooftop PV will be an important issue as penetrations of rooftop PV continue to increase.

Safety

The safety of the power system, and associated equipment, power system personnel and the public is covered in general terms under the National Electricity Law (NEL). There is however no national safety regulator specifically for electricity. Instead, state and territory legislation governs safety generally which includes the safe supply of electricity and the broader safety requirements associated with electricity use in households and businesses.

The Panel notes that its safety role for the purposes of this report is narrow, and relates primarily to the operation of assets and equipment within their technical limits and not to the broader safety requirements governed by jurisdictional legislation.

AEMO have noted that there were no incidents in 2019-20 where AEMO's management of the power system has resulted in a safety issue with respect to maintaining the system within relevant standards and technical limits.

There were also no instances in 2019-20 where AEMO issued a direction and the directed participant did not comply on the grounds that complying with the direction would be a hazard to public safety, or materially risk damaging equipment or contravene any other law.

The Panel notes that there have been changes made in terms of safety in the NEM, both in terms of power system management and individual plant management, which may lead to improvements in safety outcomes moving forward.

Work underway

The Panel acknowledges the significant body of work underway considering the ongoing security and reliability of the NEM. The current work underway to address security and reliability challenges includes:

- The ESB post-2025 Market Design work, developing advice on the long-term, fir for purpose market design that could apply from the mid-2020s. The Panel is collaborating with the ESB and will have regard to the policy proposals out forward in the context of its 2021-22 Reliability Standard and Settings Review and other work.
- The AEMC system security work program, addressing immediate concerns around key areas of power system security.
- AEMO Engineering Framework, aiming to identity future operational conditions and bridging the gap between current work and future operational conditions.

The Reliability Panel

The Reliability Panel's core functions relate to the security, reliability and safety of the national electricity system. The focus of the Panel's work is on determining standards and guidelines which are part of the framework for maintaining a secure and reliable power system.

The Panel is chaired by AEMC Commissioner, Charles Popple. Its members are broadly representative of all stakeholders interested in the operation of the power system and the electricity market including consumer groups, generator, network service providers, retailers and the power system and market operator.

For information contact:
Senior adviser, **Lisa Shrimpton,** 02 8296 7876
Adviser, **Tom Meares**, 02 8296 1674

Media: Media and Content Manager, Kellie Bisset 0438 490 041

20 May 2021