AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Summer 2021-22 Readiness Plan

December 2021

A report for the National Electricity Market

PURPOSE

AEMO has prepared this document to provide information about its preparations for summer 2021-22. These preparations are designed to minimise the risk of customer supply disruption in the National Electricity Market during the periods of highest demand for electricity from the grid. This report is based on information available to AEMO as at November 2021.

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VERSION CONTROL

Version	Release date	Changes
1	03/12/2021	Initial release

Executive summary

AEMO operates the power system for the National Electricity Market (NEM) that serves the eastern and south-eastern regions of Australia, and the Western Australian South West Integrated System (SWIS). AEMO's key responsibility is to oversee the operations of the power system so electricity is supplied safely, securely, and reliably to Australian homes and businesses, and the power system operates in the long-term interests of consumers.

In summer, the power system must manage extra risk as it responds to high consumer energy demand, in the face of high temperatures and climatic events including bushfires and storms.

Annually, AEMO prepares a summer readiness plan for the NEM, collaborating with generation and transmission network providers, federal and state governments, and key agencies to actively manage heightened risks to power system operations.

The readiness plan to address risks and deliver reliable and secure power to consumers throughout summer 2021-22 builds on the strategies and actions which delivered reliable, secure supply during summer 2020-21 and is structured around these four pillars:

- Prepared resources.
- Continuing operational improvements.
- Contingency planning.
- Collaboration and communication.

Summer 2021-22 forecast

The Bureau of Meteorology (BoM) has declared a La Niña event during the summer of 2021-22[1]. Following the 2020-21 La Niña event, this is the first back-to-back event in a decade. Such conditions are expected to bring above-average rainfall for northern and eastern Australia during the summer season, while longer duration and less intense heatwaves are likely for southern Australia.

The outlook for summer 2021-22 forecasts potentially increased tropical cyclone activity in northern Australia and elevated bushfire risk for large parts of New South Wales. The increased moisture, both from increased rainfall and increased cyclone activity, can elevate humidity over major NEM demand centres, which can increase electricity demand. While La Niña conditions somewhat ease expectations for average maximum temperatures, extreme events, particularly if coupled with increased humidity, do not materially alter expectations for maximum demand forecasts or power system risk during the summer period.

Heightened risks in summer

The key focus areas of risk for summer 2021-22 are:

[1] For the latest BoM climate outlook, see http://www.bom.gov.au/climate/outlooks/.

- **Climatic conditions**, with potential impacts on both demand and supply. The severe weather outlook for summer suggests the following as compared to climate averages:
  - Widespread flooding, coastal flooding/erosion and tropical cyclones are more likely. Flooding may affect fuel supplies or disrupt power flow across the network by damaging infrastructure. In rare circumstances, cyclones can damage transmission or generator assets.
  - Drought and dust storms are less likely.
  - The risk of severe storms is neutral.
  - Bushfire risk is elevated for large parts of New South Wales that contain crop and high grass fuel loads. Bushfires can directly impact generators and transmission networks and limit the transmission networks' power transfer capability.

  While the climate outlook may in some parts reflect a reduced risk of high average temperatures, extreme hot days during summer create the highest stress on the electricity grid. The risk of extreme events is ever-present, and if multiple severe weather events were to coincide, significant challenges in maintaining power system security can still occur.
- **Maximum and minimum electricity demand.**
  - Despite the COVID-19 downturn in the economy, strong uptake of distributed photovoltaics (PV) by consumers continued in 2020-21, with approximately 2.6 gigawatts (GW) of new installations – much stronger than had been anticipated last year during the initial phases of the pandemic.
  - AEMO's 50% probability of exceedance (POE) forecast for summer 2021-22 predicts slightly increased annual maximum demand compared to summer 2020-21 across all NEM regions. Management of concurrent peak demand across multiple NEM regions remains a key operational risk, and a focus of AEMO's reserve management strategies.
  - Maximum demand is expected to occur at a similar time or slightly later in the day in all regions than it did last year. This continues an existing trend, as strong growth in distributed PV uptake sees consumers generating more of their own energy supply during daylight hours, before drawing on grid supply into the evening. The status of COVID-19 lockdown measures and subsequent transition back to workplaces may have an influence on this timing.
  - Periods of low demand may be observed in some regions during summer on mild weather days with conditions suitable for high distributed PV penetration.
- **Resource availability**
  - Large amounts of new generation capacity continue to connect in the NEM, with an additional 2,179 megawatts (MW) of new capacity compared to last summer. Continued rapid development of new large-scale and distributed renewable resources has helped improve the reliability outlook for summer 2021-22, however, very high demand concurrent with low Variable Renewable Energy (VRE) generation may present a risk of insufficient supply meeting demand.
  - AEMO has not identified any abnormal risks to the sufficiency of gas supply for gas-powered generation, storage water available for hydro generation, or supply of cooling water for thermal generation AEMO will continue to monitor refilling of Iona underground gas storage reservoirs over summer, ahead of winter 2022.
  - A number of significant scheduled generating units will be unavailable this summer, including Callide C Power Station unit 4 in Queensland and Mintaro Power Station in South Australia, as well as the mothballed Torrens Island A Power Station unit 3 and Torrens Island B Power Station unit 1.
  - Snapper Point Power Station in South Australia is partially available for the coming summer, with expected commercial operation in February 2022.
  - AEMO has been advised that under high rainfall conditions the Morwell River Diversion (MRD) could flood, greatly impacting availability at the Yallourn Power Station.

  - Other events that result in prolonged generation or transmission unavailability could also present a risk this summer.

- **Power system reliability in summer 2021-22**
  - AEMO's 2021 *Electricity Statement of Opportunities* (ESOO) for the NEM projects in the Central scenario that expected unserved energy (USE) will remain below the Interim Reliability Measure (IRM) – which is 0.0006% maximum USE in 2021-22 – for all NEM regions.
  - Expected USE, as forecast on 30 November 2021 by AEMO's Medium-Term Projected Assessment of Supply Adequacy (MT PASA), is highest in South Australia, with 0.00057% expected USE. AEMO's MT PASA forecast is updated weekly and includes the latest demand and supply forecasts, such as the unavailability of Mintaro Power Station in South Australia.
  - In the event of flooding impacting the Yallourn Power Station, expected USE would increase considerably, with material risks expected in Victoria and a slight increase in SA USE. Should such an event occur, AEMO forecasts a risk of between 150,000 and 500,000 customers in Victoria being without power for up to eight hours during an extreme heat event (that is, a one-in-10-year peak demand event) at least once this summer. While the probability of such an event is low, AEMO is working with the Victorian Government to explore options that could help mitigate this risk.
  - As part of its reserve management strategy and to manage supply shortfalls, AEMO has identified additional reserves which can be made available through AEMO's Reliability and Emergency Reserve Trader (RERT) panel function. These may be called on if AEMO assesses that the market response will not deliver enough supply or demand resources to meet the NEM reliability standard.

Managing system security is AEMO's focus year-round, not just during periods of peak summer electricity demand. The summer plan includes continued focus on management of frequency, voltage, system strength, and inertia to maintain a secure power system throughout summer. As the power system continues its transformation, security challenges will increasingly arise at times of low, as well as high, grid demand.

Four-pillar plan for summer

Prepared resources

The plan focuses on having appropriate resources available for AEMO, as system operator, to call on so:

- Supply is adequate to meet consumers' energy requirements, including at peak demand times, and to manage risks at times of extreme weather.
- Power system security can be maintained at all times, including when times of low grid demand make it more challenging to manage frequency, voltage, system strength and inertia.

Areas addressed in this key work stream include:

- Working with generators and transmission network service providers (TNSPs) to mitigate impacts of COVID-19 on maintenance and projects works, including relaxing its summer outage guideline to allow key network outages to be planned depending on security and reliability risks.
- Maximising the availability of existing generation in the NEM – working with generators to minimise planned outages during summer and identify and mitigate risks that could cause unplanned outages.
- Non-market generation and demand resources – establishing short notice RERT panel agreements. RERT reserves can be called on if needed to help manage risk when reserves are low or where power system incidents occur.
- Availability of fuel for generation – AEMO works with generators to identify and mitigate risks to the availability of fuel for generation (coal, gas, hydro and diesel).
- Maximising the availability of transmission networks – AEMO coordinates with TNSPs so transmission networks are available to carry the required levels of electricity supply.

Continuing operational improvements

- **Operator training –** since 2018, AEMO has added a summer readiness supplement to the annual training program for control room operators, delivering targeted training to prepare NEM and gas real-time operations staff for the above-normal risks they may experience during the summer period. For summer 2021-22, this training covered topics including reserve management, new processes for handling minimum system loads, bushfire arrangements, plant availability, enhancements to forecasting systems and other situational awareness tools.
- **Contingency planning –** AEMO has engaged with governments, generators, TNSPs, and other stakeholders to identify relevant summer risk scenarios and conduct extensive briefings and emergency exercises to test contingency plans, communication processes, and decision-making at all levels. From November 2021 to March 2022, AEMO will host weekly or as required briefings with governments and TNSPs regarding forecast weather and power and gas system conditions for the week ahead, with a view to identifying and mitigating risks before they materialise, where possible.

Collaboration and communication

AEMO has engaged with stakeholders across government and industry to establish working groups and share contingency plans, procure RERT, identify and manage gas and electricity outage plans, facilitate new generator connections, confirm fuel availability, undertake emergency exercises, identify and implement forecasting improvements, and improve network resilience.

AEMO has also identified opportunities to improve communication with businesses and households around supply risks, before and during summer. This includes utilisation of digital platforms such as AEMO's website and key social media sites.

COVID-19 impacts

AEMO and participants have worked together to minimise the impact of COVID-19 on preparations for summer operations. AEMO understands that rapid changes in pandemic progress and national and international response measures may have impacts on power system operation and maintenance, and on other industries that support the delivery of energy. AEMO has worked with industry to prepare contingency plans and will continue to adapt these as conditions change.

As part of this collaboration, AEMO has worked with industry to understand the evolving impact of COVID-19 on operations, maintenance and project work. COVID-19 has impacted operations to varying degrees through:

- The changing demand profile.
- Impacts on participants' ability to access distant resources and essential parts, conduct corrective and preventative maintenance, and implement planned project work.

Close ongoing coordination with participants[2] has enabled essential summer preparations to proceed and will remain important throughout the summer period as various impacts of the pandemic continue to evolve.

[2] Including under interim authorisation granted by the Australian Competition and Consumer Commission (ACCC), available at: https://www.accc.gov.au/public-registers/authorisations-and-notifications-registers/authorisations-register/australian-energy-market-operator.

Contents

1. Summer 2021-22

This section outlines the risks and challenges expected for the National Electricity Market (NEM) in summer 2021-22. It summarises weather forecasts, expected demand for electricity, uncertainties related to supply, and how these combine to deliver current power reliability assessments for summer. It also notes system security challenges in the changing power system.

1.1 Weather and climate

Weather forecasts are one of the most important inputs into forecasting demand and supply of generation for the NEM. As well as the impact of the increase in renewable resources, extreme temperatures and events including bushfires, lightning, storms, and high winds can reduce the output of all types of generation, impact transfer capacity of transmission lines, and result in loss of supply. Drought is also a factor in the output of hydro generation, which uses water as fuel, and thermal generation, which uses water in cooling.

AEMO is continuing to work closely with both the Bureau of Meteorology (BoM), Weatherzone and other members of the weather forecasting industry to ensure its operational planning and support is underpinned by the most accurate and up to date climatological forecasts available.

The BoM has advised the following outlook for the NEM in the summer of 2021-22[3]:

- The El Niño Southern Oscillation (ENSO) outlook for the summer of 2021-22 indicates that a La Niña event is occurring[4]. The event is expected to be relatively short-lived, persisting until late summer, or early autumn 2022. This La Niña event directly follows the 2020-21 La Niña event, making it the first back-to-back event in a decade. A La Niña event is expected to bring:
  - Above-average rainfall for northern and eastern Australia during the spring and summer seasons.
  - Increased chance of widespread flooding.
  - A more active tropical cyclone season for both Queensland and Western Australia.
  - Longer duration, less intense heatwaves in the south-east of Australia.
- Maximum temperatures are expected to exceed the long-term median in central Queensland, South Australia, most of Victoria, and Tasmania (see Figure 1).
- Minimum temperatures are expected to exceed the long-term average across the NEM, is in part due to increased cloud cover due to increased rainfall from the La Niña event. Increased cloud cover overnight can elevate minimum temperature expectations.
- The risk of extreme[5] maximum temperatures is 30% to 40% more likely than historical averages across the Adelaide-Melbourne corridor and western Tasmania, however, there is a decreased risk of extreme maximum temperatures along the New South Wales coast (see Figure 2).
- NEM-wide, the risk of extreme minimum temperatures is 40% to 80% more likely than historical averages.

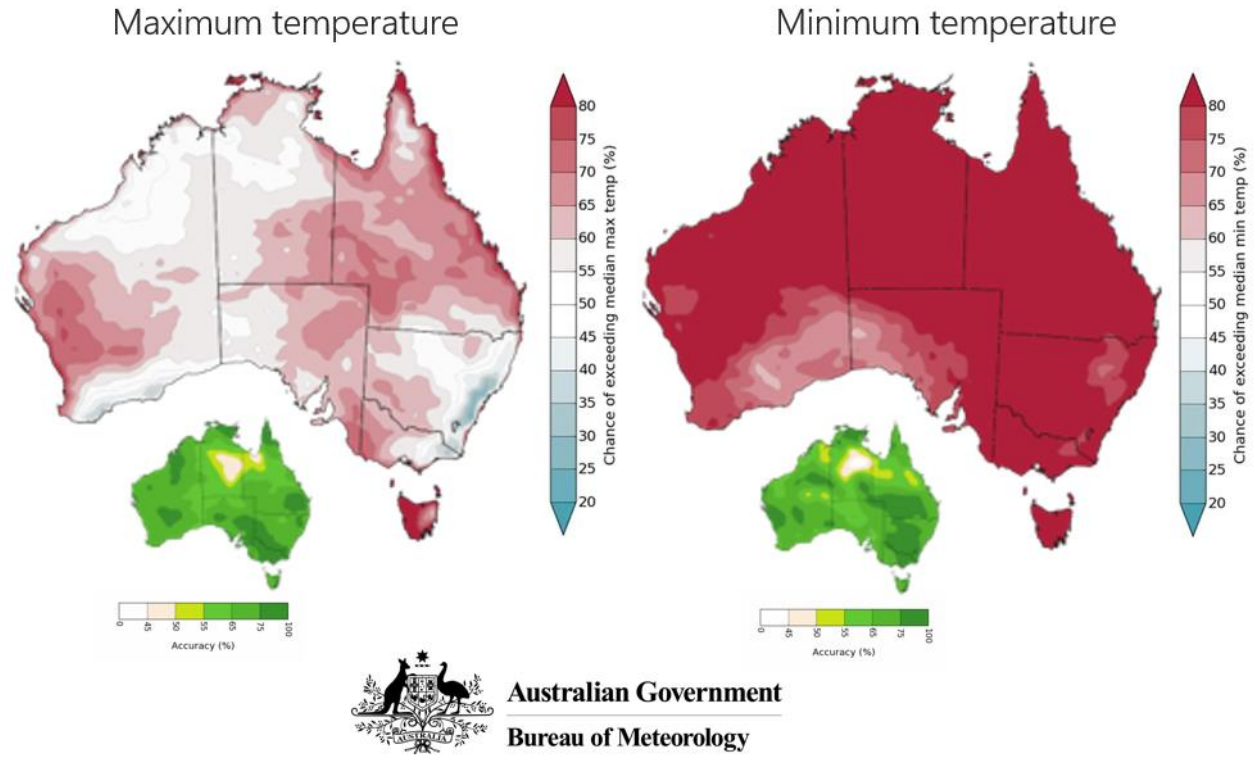
[3] For the latest BoM climate outlook, see http://www.bom.gov.au/climate/outlooks/.

[4] For information on the BoM ENSO climate driver update, see http://www.bom.gov.au/climate/enso/.

[5] An extreme maximum or minimum temperature is defined as being within the top 20% of historic temperatures.

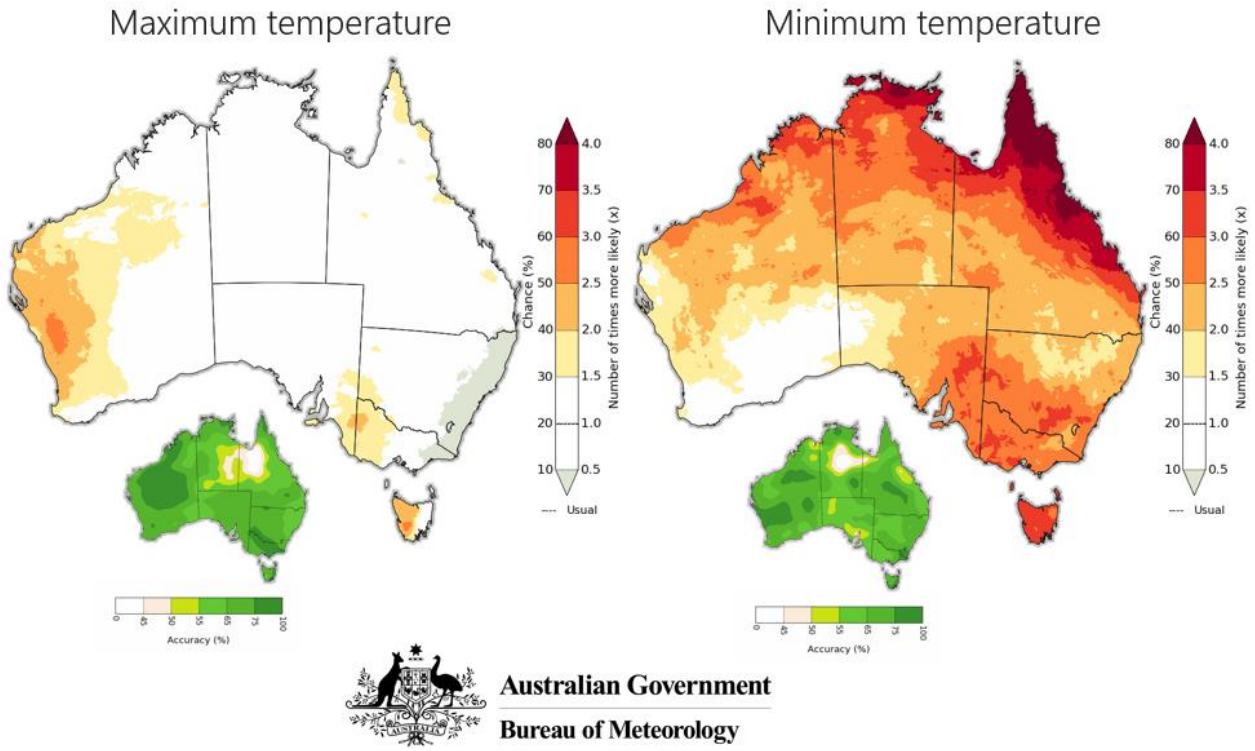
- High humidity levels are likely in both Brisbane and Sydney, with a possibility of high humidity extending into the southern parts of the NEM. Increased humidity can significantly elevate electricity demand.
- Above median rainfall is expected throughout southern Queensland, New South Wales, northern Victoria, eastern Tasmania, and eastern South Australia (see Figure 3). Higher rainfall expectations mean increased cloud cover, which can reduce the output of solar generation.
- Average-to-below median rainfall is expected across the west coast of Victoria and western Tasmania (see Figure 3).
- Tropical cyclones off the north-west shelf of Australia can result in increased risk of heatwaves for the southern NEM. Heatwaves have the potential to come with higher moisture levels (humidity) and, particularly across South Australia and Victoria, this can exacerbate increases in electricity demand.
- A positive Southern Annular Mode (SAM) is more likely until the end of 2021, reducing the incidence of storms, fronts, and wind events. A positive SAM typically brings cooler onshore winds to the east, increasing rainfall and cloud on the east coast, while increasing the risk of heatwaves in the south, however the La Niña event is dampening this risk.

Figure 1 Chance of exceeding median temperature for December 2021 to February 2022



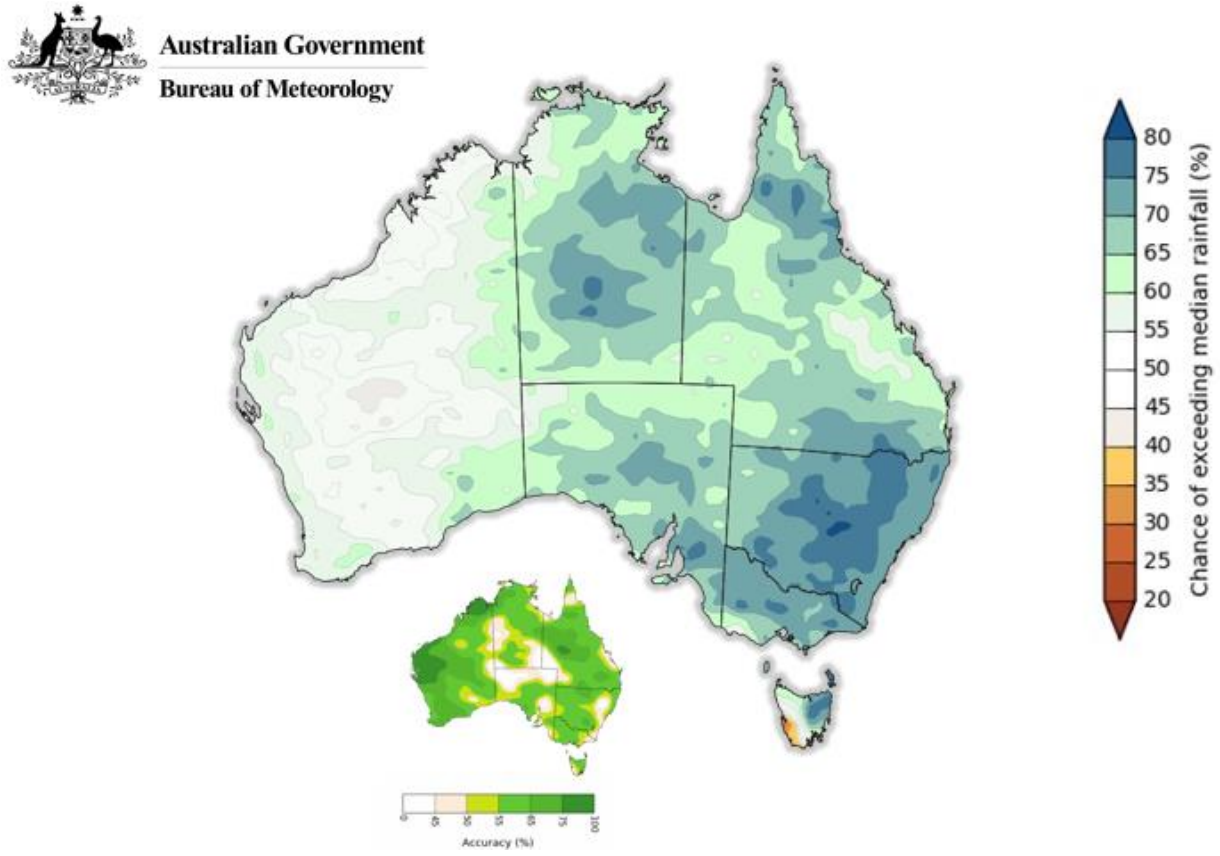
Source: BoM.

Figure 2 Chance of maximum (left) and minimum (right) temperatures being extreme (top 20% of historical range) for December 2021 to February 2022



Source: BoM.

Figure 3 Chance of exceeding median rainfall for December 2021 to February 2022



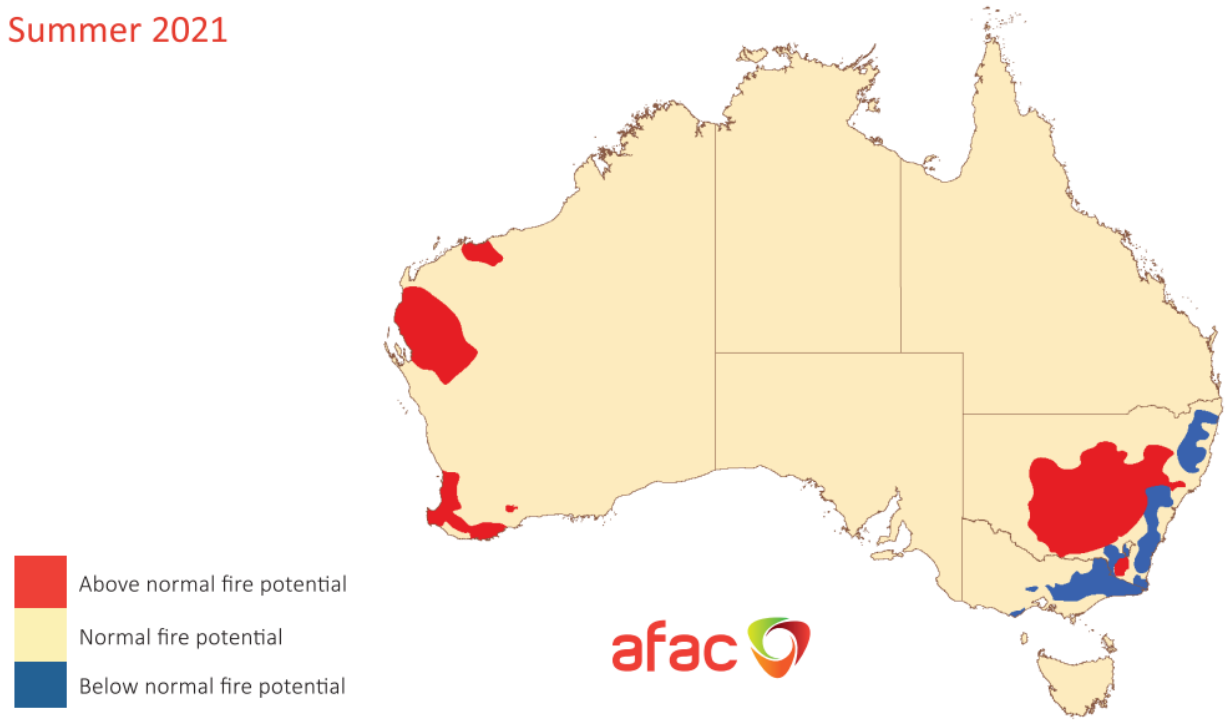
Source: BoM.

Although severe weather can occur at any time of the year, October to April is the peak period in Australia for bushfires, heatwaves, flooding, tropical cyclones, and severe storms. The severe weather outlook for summer, through April 2022, suggests the following compared to climate averages:

- Widespread flooding, coastal flooding/erosion and tropical cyclones are more likely.
- Drought and dust storms are less likely.
- The risk of severe storms is neutral.
- Bushfire risk is elevated for large parts of New South Wales (see Figure 4).

While the climate outlook may in some parts reflect a reduced risk of high average temperatures, extreme hot days during summer, particularly if coupled with high humidity, create the highest stress on the electricity grid. This outlook does not materially alter expectations for maximum demand forecasts. The risk of single, or multi-day extreme events is ever-present, and if multiple severe weather events were to coincide, significant challenges in maintaining power system security may still occur.

Figure 4 National Council for Fire and Emergency Services (AFAC) bushfire seasonal outlook, Summer 2021



1.2 Summer maximum and minimum demand expectations

Despite the COVID-19 downturn in the economy, strong uptake of distributed photovoltaics (PV) continued in 2020-21, with approximately 2.6 gigawatts (GW) of new installations – much stronger than had been anticipated last year during the initial phases of the pandemic. AEMO forecasts this strong growth of installations to be maintained in the medium term, and this is the most material driver impacting operational consumption forecasts. Accordingly, operational consumption is forecast to decline in the next few years, as distributed PV uptake continues.

Summer maximum demand expectations follow similar drivers to operational consumption, although these drivers – coupled with random weather-driven elements, co-incident consumer behaviours, and extent of co-ordination of consumer-owned energy devices – can impact extreme forecasts quite differently to annual consumption.

To represent the random weather- and non-weather driven elements, AEMO forecasts summer maximum demand as a distribution, from which three probability of exceedance (POE) forecasts are sampled:

- **50% POE**, meaning they are expected statistically to be met or exceeded one year in two, and are based on average weather conditions.
- **10% POE**, based on more extreme conditions that could be expected one year in 10.
- **90% POE,** based on less extreme conditions that could be exceeded nine years in 10.

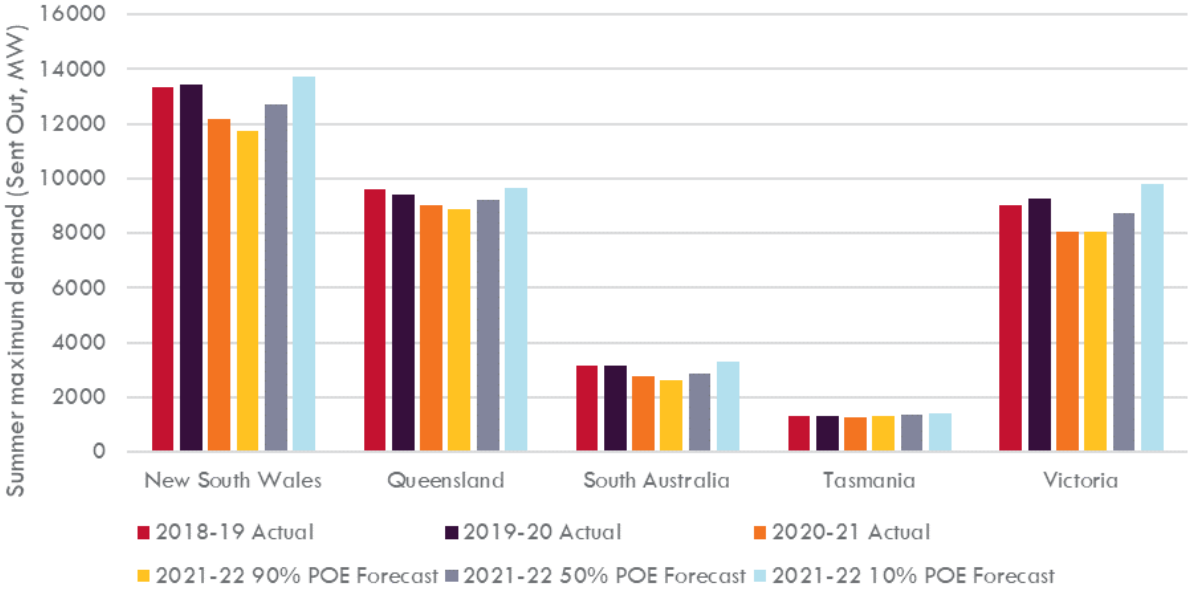
Except in Tasmania, maximum operational demand in NEM regions now frequently occurs around sunset in summer, when distributed PV uptake has little moderating impact on other fundamental drivers of growth, such as new connections or appliance uptake.

Figure 5 shows the three POE forecasts for each region, as published in the 2021 *Electricity Statement of Opportunities* (ESOO) for the NEM[6], compared to actual summer maximum demand from the last three years.

The comparisons show that:

- The actual demand observed in 2020-21 was towards the lower end of the historical record, which was due to the mild La Niña summer.
- The 90% to 10% POE forecast range captures the recently observed maximums in most regions,
- The 10% POE forecast is slightly higher than the recently observed range.

Figure 5 2021-22 Summer maximum demand forecast comparison



"Sent out" means demand supplied by scheduled, semi-scheduled, and significant non-scheduled generators (excluding their auxiliary loads, or electricity used by the generator).

Minimum System Load (MSL) Framework

Traditionally in summer, the Christmas and New Year holiday period has observed historically low minimum demand. It is possible that of periods of low demand may be observed in some regions during summer on mild weather days with conditions suitable for high distributed PV penetration.

[6] At https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/nem_esoo/2021/2021-nem-esoo.pdf.

AEMO has implemented an additional market notification framework[7] to increase transparency on actions taken to maintain power system security, and seek a market response where possible, during challenging system operating conditions coupled with high distributed PV exports.

These new market notifications will support market development and better communicate power system risks and the operational response, while industry also works on future solutions to better integrate Distributed Energy Resources and drive consumer participation in emerging and new markets.

AEMO's new framework, similar in concept to the Lack of Reserve (LOR) process, consists of three Distributed Photovoltaics (DPV) Contingency and / or Minimum System Load market notices:

1. Forecast potential Contingency or Minimum System Load event, seeking a market response.
2. Advise action has been taken to maintain system security.
3. Notify that curtailment of distributed PV is occurring as a last resort because preceding actions have not been sufficient to maintain power system security.

1.3 Supply for summer

Large amounts of new generation capacity continue to connect in the NEM, with an additional 2,179 MW of new capacity compared to last summer[8]. Continued rapid development of new large-scale and distributed renewable resources has helped improve the reliability outlook for summer 2021-22, however, very high demand concurrent with low Variable Renewable Energy (VRE) generation may present a risk of insufficient supply meeting demand.

Noteworthy scheduled generators unavailable in the coming summer include:

Queensland

- Callide C PS Unit 4 remains on extended outage after the operating incident in May 2021.

New South Wales

- Hunter Valley Gas Turbine remains on extended outage and has applied for exemption from notice of closure requirements to retire in January 2022[9].

South Australia

- Torrens Island A3 is unavailable in the coming summer as it is mothballed and scheduled to retire in September 2022.
- Torrens Island B1 is unavailable for the coming summer following the announced mothballing.
- Mintaro Power Station is unavailable for the coming summer due to an extended outage.
- Snapper Point Power Station (formerly Temporary Generation North) is partially available for the coming summer, with expected commercial operation in February 2022.

While the likelihood is relatively low, AEMO has been advised that under high rainfall conditions the Morwell River Diversion (MRD) in Victoria could flood, impacting availability at the Yallourn Power Station. Under damaging flood conditions, AEMO has been advised that Yallourn Power Station may be completely unavailable for a period of 18 months (see Section 1.4 for discussion of the impacts of this scenario).

The risk of other, unforeseen events impacting the power system and causing significant or prolonged generation or transmission unavailability is always present.

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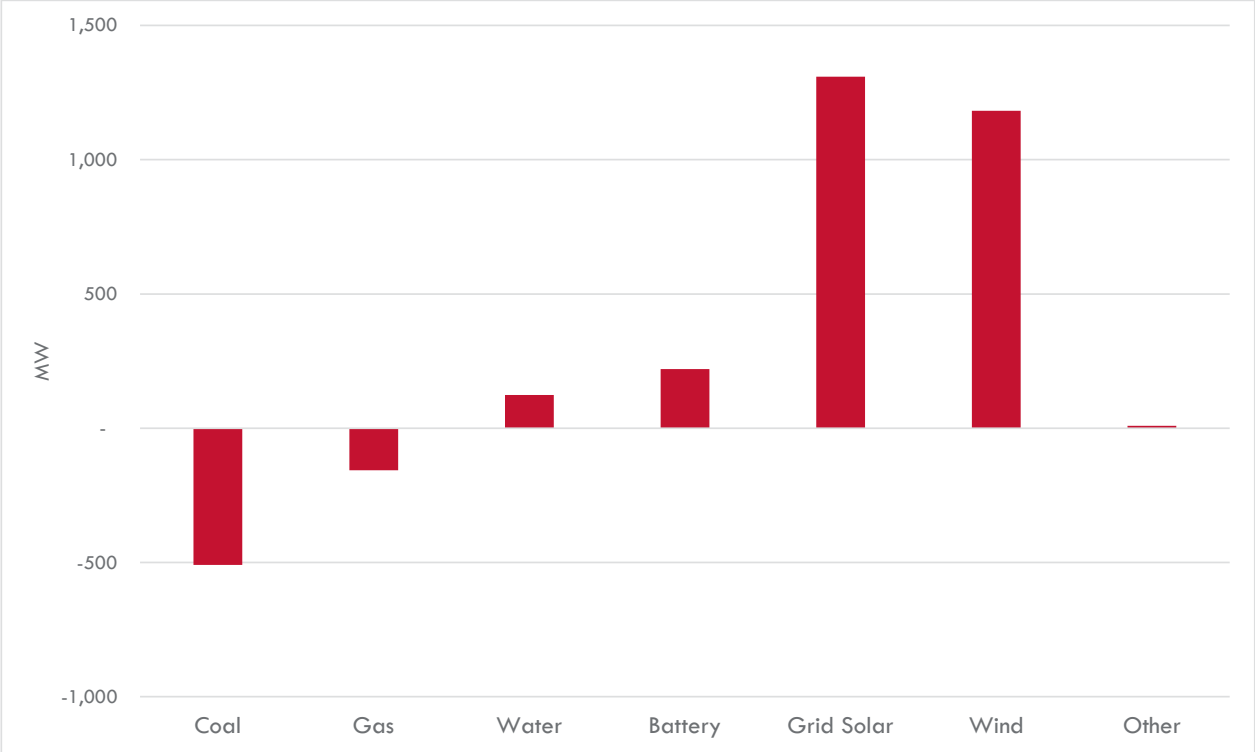
[7] The Minimum System Load market notice framework is available at https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/system-operations/power-system-operation.

[8] As at 30 November 2021: https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-planning-data/generation-information.

[9] https://www.aer.gov.au/wholesale-markets/notice-of-closure-exemptions/78567-agl-macquarie-pty-ltd-hunter-valley-gas-turbines-exemption

Figure 6 compares typical summer capacity (the assumed capability of generating units during average summer temperatures) for the coming summer compared to last summer, by generation type.

Figure 6 NEM typical summer capacity for summer 2021-22 compared to summer 2020-21



For context, the NEM's total current registered generation capacity is approximately 59,500 MW, of which wind and large-scale solar represents around 15,100 MW[10] (approximately 25%). For more information on supply capacity and availability, see Section 2.1.

1.4 Power supply reliability in summer 2021-22

AEMO assesses reliability – the ability of supply to meet demand – over forecast periods from the next 5-minute dispatch interval to the next 10 years, and provides information to the market to support generation capacity being available to supply consumers.

In the medium to longer term, AEMO forecasts power system reliability using probabilistic assessments, which are expressed as expected unserved energy (USE) as a percentage of energy demanded.

Figure 7 shows the expected USE forecast for summer 2021-22 for three forecasts:

- **ESOO Central scenario** – AEMO's 2021 NEM ESOO, published in August 2021, forecast power system reliability for the next 10 years, from 2021-22 to 2030-31. The ESOO Central scenario projected expected USE remaining below the Interim Reliability Measure (IRM)[11] of 0.0006% USE in all NEM regions in 2021-22. Reliability risks were, however, forecast to be higher in 2021-22 in South Australia compared to last summer, due to the announced mothballing of Torrens Island unit B1.
- **ESOO Yallourn sensitivity** – AEMO included a sensitivity in the 2021 ESOO to understand the impacts on power system reliability if flooding of the MRD in Victoria impacted the availability of Yallourn Power Station, as discussed in Section 1.3. Under this sensitivity, Yallourn Power Station was assumed to be

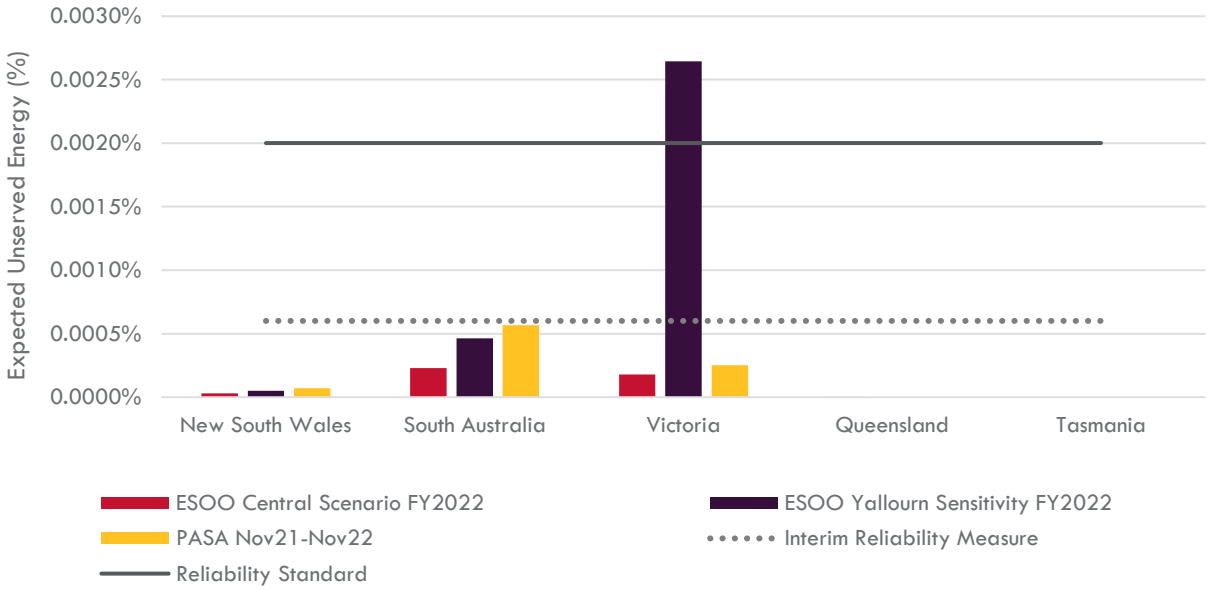
[10] As reported in the November 2021 update on AEMO's Generation Information web page, at http://www.aemo.com.au/Electricity/National-ElectricityMarket-NEM/Planning-and-forecasting/Generation-information.

[11] The IRM is an interim reliability measure, agreed to at the March 2020 COAG Energy Council and introduced by the National Electricity Rules (Interim Reliability Measure) Rule 2020, that sets a maximum expected USE of no more than 0.0006% in any region in any financial year.

entirely unavailable for 18 months starting October 2021, while other units including Torrens Island B1 and Snapper Point were assumed to be available to assist in mitigating emerging risks.

- **November 2021 PASA** – AEMO publishes a Medium-Term Projected Assessment of Supply Adequacy (MT PASA) forecast every Tuesday, capturing updated participant expectations of unit availability. Since the August 2021 ESOO publication, numerous units have adjusted summer availability, the most material being the summer unavailability of Mintaro Power Station in South Australia.

Figure 7 Summer 2021-22 expected unserved energy under three forecasts



The forecast comparisons show that:

- Under the ESOO Central scenario, all regions have expected USE within the IRM. Expected USE is highest in South Australia in the Central scenario, with 0.0003% expected USE (that is, 99.9997% of South Australia's energy demand is expected to be met by available generation, storage, demand side participation and inter-regional transfer capacity).
- In the Yallourn sensitivity, expected USE is considerably higher, with material risks forecast in Victoria and a slight increase in SA USE. Should such an event occur, AEMO forecasts a risk of between 150,000 and 500,000 customers in Victoria being without power for up to eight hours during an extreme heat event (that is, a one-in-10 year peak demand event) at least once this summer.
- The 30 November 2021 MT PASA forecast for summer 2022 shows similar trends to the August 2021 ESOO forecast, but higher risks in South Australia, reflect the reduced generation availability submitted by participants since the ESOO was published.

2. Prepared resources

2.1 Capacity and availability of resources in the market

A key focus of planning for every summer is confirming resources are available at times they are needed, especially times of peak demand during very high summer temperatures.

Initiatives to maximise availability and reduce supply uncertainty through the summer months include:

- AEMO will continue to monitor outages advised by generators and transmission network service providers (TNSPs) through MT PASA, Short-Term (ST) PASA, and Pre-Dispatch (PD) PASA[12]. If required during periods of potential low electricity reserves, AEMO may also ask generators or TNSPs to reschedule or cancel planned outages, where this does not increase any risk to future reliability of equipment or present a safety issue.
- AEMO will continue working with all generators to better manage risks to availability, particularly generators more susceptible to reduction at maximum power output or in increasing temperatures. AEMO has developed an understanding of this potential capacity reduction for all generation across the NEM and is addressing heightened risks with specific generators.
- AEMO will continue to coordinate with relevant generators and TNSPs as needed under interim authorisation granted by the Australian Competition and Consumer Commission (ACCC)[13] to assess and mitigate risks associated with COVID-19 restrictions, such as:
  - Delays to scheduled and/or emergency maintenance.
  - Backlog of maintenance since early 2020 increasing the risk of unplanned maintenance.
- AEMO continues to work closely with TNSPs to facilitate the conduct of preventative maintenance, bushfire mitigation, and planned network upgrade activities ahead of summer, as well as to implement ongoing coordination of planned outages to improve the resilience of the power system.
- To mitigate emerging risks to the system during low demand conditions as the generation fleet evolves, AEMO has continued working with TNSPs to develop voltage control, system strength, and minimum system load strategies.
- AEMO will continue to advise participants when high temperatures are forecast in NEM regions through use of location-specific temperature alerts.
- AEMO continues to work with NSPs and Market Participants to commission new generation assets to the NEM.
  - The Victorian Big Battery (VBB) increases generation availability in Victoria and also increases transfer through the Victoria – New South Wales interconnector (VNI) through use of the System Integrity Protection Scheme (SIPS). The VBB is expected to be operational in late 2021.

[12] The MT PASA looks ahead two years and is published weekly. Every day, AEMO publishes the ST PASA, looking two to seven days ahead, and the PD PASA for the following day.

[13] At https://www.accc.gov.au/public-registers/authorisations-and-notifications-registers/authorisations-register/australian-energy-market-operator.

2.2 Non-market generation and demand resources

The Reliability and Emergency Reserve Trader (RERT) is a function conferred on AEMO under the National Electricity Rules. Under RERT, AEMO can enter into reserve contracts with resources (generation or load) not otherwise available to the wholesale energy market, if needed to ensure reliability of supply meets the reliability standard.

RERT contracts can be entered into in advance of reserve shortfalls, with short (less than a week), medium (between one week and 10 weeks), and long (between 10 weeks and 12 months) notice periods.

The RERT process includes AEMO:

- Negotiating contracts.
- Developing, testing and implementing RERT management systems, to be operationally ready to manage RERT reserves.
- Consulting with jurisdictions (state governments in NEM regions), market participants, and other stakeholders.

In consultation with governments, AEMO has identified reserves under the RERT mechanism for the coming summer. Short notice RERT reserves have been identified across most NEM regions as a precautionary measure under AEMO's panel arrangements. Reserve contracts for those resources are only formed when it is considered likely they will be needed. Medium and long notice RERT and interim reliability reserves have not been sought, as a result of current forecasts indicating that the reliability standard and the IRM will be met.

RERT resources for this summer

The 2021 ESOO and latest MT PASA do not project reserve shortfalls in excess of the reliability standard in any NEM region this summer. AEMO is entering into short notice panel agreements for RERT in Victoria, South Australia, Queensland, and New South Wales. These panel agreements allow AEMO to pre-identify a range of reserves that could assist in managing the risk of not meeting the reliability standard due to unforeseen operational conditions (such as bushfires or the unavailability of generation or transmission assets), and set the terms and conditions for those reserves to be contracted quickly if needed.

RERT panel agreements do not commit AEMO to a reserve contract or require upfront availability payment commitments. To date, AEMO has received expressions of interest for more than 2,000 MW of emergency reserves across the NEM that can be available to cover the risks associated with extreme system scenarios. AEMO currently anticipates that the procurement approach outlined above will deliver more emergency reserves under panel arrangements than last year.

RERT use during 2020-21 summer

Last summer, the RERT portfolio was used on 17 December 2020 (in New South Wales) to mitigate the risk of load shedding had the largest credible contingency event occurred. Further details are in AEMO's RERT reporting[14].

2.3 Availability of fuel for generation

Gas supplies for electricity generation

As in previous years, AEMO will continue to assess and mitigate any conflicts in planned gas maintenance to minimise the risk of any shortfall in gas supply for eastern and south-eastern Australian gas users. AEMO has not identified any gas availability shortfalls for Australia's eastern and south-eastern gas markets for the 2021-22 summer period.

[14] At https://aemo.com.au/en/energy-systems/electricity/emergency-management/reliability-and-emergency-reserve-trader-rert/rert-reporting.

AEMO will continue to monitor refilling of Iona underground gas storage reservoirs over summer, ahead of winter 2022. Iona inventory is currently at its lowest level this late in November for the last five years due to unusually cold weather during November and planned maintenance at the Longford Gas Plant. AEMO's 2021 Gas Statement of Opportunities and Victorian Gas Planning Report have forecast reduced gas production for winter 2022, which is expected to increase the reliance on Iona for Victoria and South Australian winter gas supply.

AEMO's work with gas facility operators includes understanding and allowing for the risk posed to maintenance and operations by COVID-19. AEMO's processes also include internal coordination to prevent major electricity transmission network outages conflicting with major gas facility outages, to prevent, for example, a major gas supply reduction coinciding with an interconnector outage for the same region.

Supplies for hydro, diesel, and coal generation

AEMO has been working with generators to identify whether there are any existing or anticipated key fuel supply risks to their operations. In addition to direct dialogue with and assurances from generators, AEMO uses the Generator Energy Limitation Framework (GELF) survey, in which generators provide specific information around potential energy constraints (fuel limitations). This could include, for example, water available for hydro generation, or cooling water for thermal generation during drought conditions.

Insights gained through the GELF survey are published in AEMO's Energy Adequacy Assessment Projection (EAAP). The November 2021 EAAP indicates that drought and other energy limitations are unlikely to significantly affect reliability in the two-year horizon, even under low hydro inflow conditions[15].

2.4 Availability of transmission networks

Transmission capacity must be optimised so power can flow where and when it needs to, and to avoid unnecessary network limitations that could reduce power transfer capability.

The summer readiness plan focuses on the following areas.

- AEMO continues to work with TNSPs to co-ordinate preparation plans for summer, and better understand and manage potential risks. This has included:
  - Confirming preventive maintenance on critical elements of the transmission network is performed ahead of the summer period to deliver a more resilient transmission system, including bushfire mitigation works and network upgrade plans.
    - AEMO notes the Para no.1 SVC in South Australia remains unavailable until the end of January 2022[16], reducing the nominal transfer capacity from South Australia to Victoria from 550 MW to 420 MW.
  - Maximising transmission availability during periods when it is required. This means minimising planned outages during periods of extreme conditions, to reduced risk to the power system.
    - AEMO has relaxed its summer outage guideline for 2021-22 to allow key network outages to be planned with sufficient capability to be recalled prior to forecast periods of extreme conditions.
  - Understanding the impacts of COVID-19 on normal maintenance activities.
- AEMO liaises with TNSPs on an ongoing basis so the latest changes to the network, including connection of new generation, are reflected in the limit advices and constraint equations (mathematical representation of the transmission system capacity) used to determine electricity dispatch through AEMO's market systems, to get the best capacity from the networks.

[15] See https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-reliability/energy-adequacy-assessment-projection-eaap.

[16] Refer AEMO Network Outage Scheduler (NOS) for more information.

- AEMO has continued to work with TNSPs and interconnector providers to optimise and increase interconnector capacity.
- AEMO and TNSPs continue to address emerging power system security concerns, including working to ensure four synchronous condensers are operational in South Australia for summer 2021-22[17].

[17] For more details, see: https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/system-operations/congestion-information-resource/related-resources/operation-of-davenport-and-robertstown-synchronous-condensers.

3. Operational improvements

AEMO continuously works to increase its investment in the skills of AEMO's team and to maintain the effectiveness of the emergency communication process.

3.1 Operator skills and training

AEMO continues to invest in a team with diversified skills, including engineers, forecasting analysts, and data science specialists, to meet the technical challenges of a rapidly transforming industry.

AEMO has extensive training programs for control room operators and operational support staff, delivered continuously throughout the year. The content of these programs is constantly updated for relevance and to meet priority needs. In 2018, a summer readiness supplement was added to the annual program, delivering targeted training to prepare NEM real-time operations staff for the above normal risks they may experience during the summer period.

The 2021-22 summer readiness training program covered a range of topics including reserve management and new processes for handling minimum system loads (refer section 1.2). Bushfire arrangements, plant availability, enhancements to forecasting systems, and other situational awareness tools were also covered. AEMO's gas real-time operations staff also received targeted training on managing pipeline capacities effectively in the Declared Wholesale Gas Market (DWGM).

As well as preparing for a range of operating scenarios over summer, AEMO collaborates with all governments and electricity and gas market participants to identify relevant, tailored, risk-based summer readiness scenarios for each region, develop contingency plans, and run emergency exercises.

3.2 Emergency exercise

The annual emergency exercises of the National Electricity Market Emergency Management Forum (NEMEMF) and the National Gas Emergency Response Advisory Committee (NGERAC) were conducted as a joint exercise on 8 October 2021, in a virtual format due to COVID-19 restrictions.

Entitled Exercise Indigo, the exercise included members and observers, including media representatives from the participating organisations, and had the following objectives:

- Ensure operational communication systems and protocols have the capability and capacity to cope with a large-scale and prolonged event.
- Ensure public communications are effective and coordinated across the NEM and gas network during a large-scale and prolonged event.
- Provide the opportunity for NGERAC members to explicitly consider the equitable gas sharing principles during the exercise.
- Test the suitability of the Interruption to Gas Supply Process (ITGSP) and Power System Emergency Management Plan (PSEMP) for response during an emergency.

This exercise was conducted as a combined functional and discussion exercise, facilitated online by an independent facilitator. All objectives were met, and a report will be made available to NEMEMF and NGERAC members before the end of 2021.

3.3 Summer Readiness Jurisdictional Sessions

AEMO held briefing sessions with each jurisdiction, including the Australian Government, to assist in alignment across both operational and communication activities. These sessions included the discussion of government, industry, and AEMO summer readiness activities.

3.4 Weekly readiness briefings

AEMO will be hosting weekly summer readiness outlook briefings from November 2021 to March 2022. The briefings will bring together jurisdictional government representatives, TNSPs, and AEMO to help foster open communication so all relevant stakeholders are briefed and aware of forecast conditions regarding weather, supply (including fuel for generation), demand, planned outages and the potential for unplanned outages, and broader risks such as bushfires, for the week ahead.

4. Collaboration and communication

With increasing public awareness and interest in the changing energy sector, AEMO continues to collaborate closely with external stakeholders and to communicate and engage openly and transparently with NEM consumers.

Summer 2020-21 again illustrated that considered planning and collaboration across governments and industry was crucial to the power system having the required resources to meet peaks in demand, considering any environmental challenges faced by the power system.

Before and during last summer, AEMO communicated and engaged openly and transparently with stakeholders and the wider community. Building on the success of last summer, AEMO will continue to:

- Engage in intensive communication with the wider industry and government jurisdictions.
- Take a proactive approach to communicating with the broader community about the upcoming summer, particularly where there are apparent risks to the power system such as heatwave events or during serious bushfires which could potentially impact major energy system infrastructure.

While historically summer has been the focus due to potential supply/demand challenges, AEMO's planning and communication has had to extend into the shoulder seasons as reducing minimum operational demand is creating new operating challenges.

4.1 Collaborating with industry and government

AEMO continues to work closely with jurisdictional representatives, NSPs, and generators, through one-on-one discussions, working group meetings, and desktop exercises, to share information and progress and expand on summer readiness activities.

This year, AEMO also initiated the first "Spring Readiness" workshop with the South Australian Government and NSPs due to emerging challenges maintaining power system security as electricity demand continues to decline with increasing distributed PV. Going forward, this may be extended to focus on other NEM regions, as required.

Key briefings will be initiated in the lead up to and during significant Lack of Reserve (LOR)[18] conditions across the NEM to exchange key information. Collaboration with governments on messaging protocols, including the potential use of voluntary reductions, will be paramount for the coming summer.

AEMO has worked with industry to understand the evolving impact of COVID-19 on operations, maintenance and project work. COVID-19 has impacted operations through a changing demand profile, and has impacted participants' ability to access distant resources and essential parts, conduct corrective and preventative

[18] LOR conditions indicate the system may not have enough spare energy if something major and unexpected happened, like the loss of a generator or interconnector, and AEMO issues LOR notices to inform the market of times extra reserves may be required to avoid the need for load shedding to maintain or restore power system security. This is addressed in clause 4.8.4 of the National Electricity Rules.

maintenance, and implement planned project work. Close ongoing coordination with participants, including under interim and final authorisations granted by the ACCC[19], has enabled essential summer preparations to proceed, including reviewing and modifying maintenance plans. This coordination will remain important throughout the summer period as various impacts of the pandemic evolve.

4.2 Communicating with households and businesses

AEMO will continue to use its website and social media channels to inform the community on summer readiness activities and how AEMO, industry, and governments have prepared and will respond to extreme conditions and unforeseeable events.

AEMO will also be developing and sharing relevant information pieces, such as why there is a need for strategic reserves, how minimum demand affects the operation of the network, and tips on how consumers can stay cool while using less energy.

[19] At https://www.accc.gov.au/public-registers/authorisations-and-notifications-registers/authorisations-register/australian-energy-market-operator.