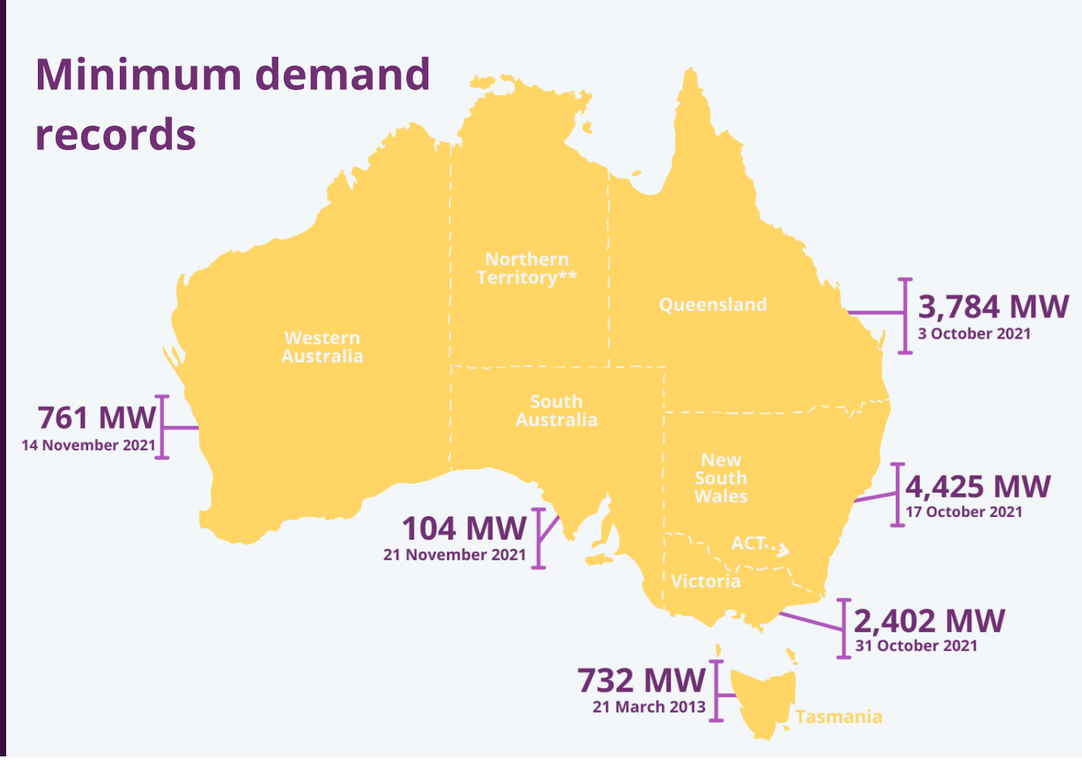
Factsheet

Minimum Operational Demand

Australia's energy ecosystem is rapidly transforming towards a decentralised, two-way power system, with world-leading residential investment in rooftop solar photovoltaic (PV) generation. While solar PV present fresh opportunities for consumers and energy service providers, operational challenges threatening the secure and reliable supply of electricity are emerging, such as declining minimum operational demand.



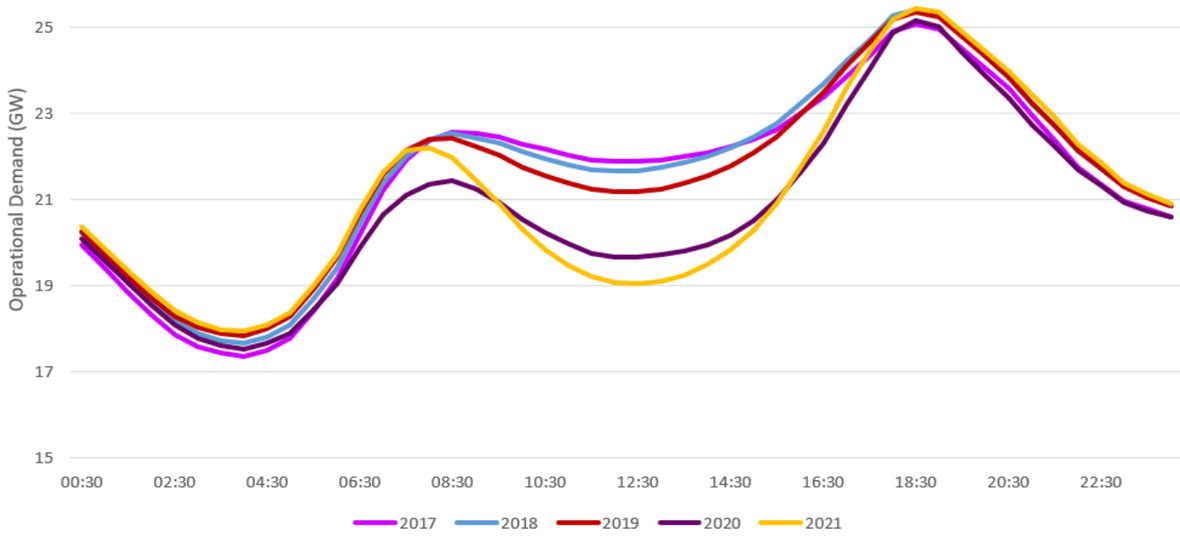
What is minimum operational demand?

Operational demand refers to meeting electricity demand from the power system (or grid).

Minimum operational demand means the lowest level of demand from the grid in any given day, week or year.

Minimum operational demand levels are more common on sunny, mild-temperature weekends with high rooftop solar generation substituting grid-scale generation. These scenarios create significant challenges for AEMO to maintain the secure and reliable operation of the grid.

Read AEMO's 2021 Electricity Statement of Opportunities to view forecasts for Minimum Operational Demand.



Operational demand for the NEM between 2017 and 2021. This shows a reflection of the downward trend in demand over a whole season.

The challenges

Voltage management – as demand levels decrease, it can become more challenging to manage transmission network voltages. De-energisation of major transmission lines may become necessary, reducing the resilience of the network.

Unintended disconnection of distributed solar – some distributed solar PV disconnects when exposed to power system disturbances. This affects network limits, frequency control, and other aspects of power system operation.

Minimum demand thresholds – on rare occasions, a NEM region such as SA or QLD may separate from the rest of the NEM and needs to operate as a secure island. While the island exists, it needs operational demand to be high enough so sufficient generation units stay online to provide security services such as system strength, inertia, and frequency control.

Emergency frequency control schemes – under-frequency load shedding (UFLS) is a type of emergency frequency control scheme designed as a last resort to avert the risk of system collapse or physical damage to parts of the power system. With more consumers using power from their own solar PV instead of the grid, this important last resort mechanism is less effective for managing severe disturbances.

System restart – a minimum quantity of stable load is required to restart the large synchronous units that provide System Restart Ancillary Services (SRAS) to enable system restoration after a major blackout. With large quantities of distributed solar PV operating, there may not be enough stable load and unpredictable DER behaviour.

The solution

As operational demand levels move closer to zero demand from the grid, new standards and system services are required to keep the power system secure and reliable. **AEMO is supportive of innovative solutions, which could include providers/aggregators of distributed energy resources offering services, such as increased PV controllability, load flexibility, storage, and load shifting. As an example, energy storage could act as a 'solar soak' to use excess distributed PV generation.**

In both the NEM and the Wholesale Electricity Market (WEM), AEMO is already working with industry, jurisdictions, the Energy Security Board (ESB), and market bodies to develop new standards to support cost-effective regulatory and market reforms that are required to keep the power system secure and reliable.

Options to address the challenges may include introducing:

Disturbance ride-through capabilities – to require that all new DER installed can keep operating through disturbances, by improving performance standards and enforcing compliance with those standards.

Emergency Solar PV curtailment capabilities – to require as a condition of connection that all new distributed solar PV, of any capacity, has the function to be disconnected as a last resort, in rare circumstances if abnormal operational conditions arise, to protect the overall power system. Any curtailment would only occur after all other operational measures to manage the power system have been exhausted. The best part is, the capabilities required to manage rooftop solar are the same that consumers can harness to engage in new markets to provide system security services, increasing further savings from rooftop solar systems.

Navigating these challenges of minimum demand is an ongoing process, so watch this space as AEMO and the industry continue to explore more ways to ensure the secure and reliable operation of the nation's energy grids in the best interest of all consumers.

Contingency and Minimum System Load (CSML) Framework

AEMO has implemented a notification process and operating framework to communicate actions taken to minimise power system risks if abnormal conditions or outages occur at the same time as high rooftop solar. The **three-stage operating framework** will have important benefits for the community by implementing a market signal and improved operational transparency around actions required to maintain system security, and avoiding the likelihood of state-wide blackouts.

Check out AEMO's factsheet on the CSML Framework here.