INFORMATION

Fact sheet: What is reliability?

To keep the lights on, the power system needs to be:

- ***secure* – able to operate within defined technical limits, even if there is an incident such as the loss of a major transmission line or large generator**
- ***reliable* – have enough capacity (generation and networks) to supply customers.**

What is reliability?

While 'security' relates to the *stability* of the power system, 'reliability' of the power system is about having sufficient *capacity* to generate and transport electricity to meet consumer demand.

A reliable supply of electricity requires generators to produce electricity, and the transmission and distribution networks to transport the electricity to customers in real time.

As a result, a reliable supply of electricity to customers requires adequate planning, capacity, and maintenance of all parts of the electricity supply chain so that electricity can be delivered to customers when it is required.

What are the causes of power outages?

Outages can be planned or unplanned. Planned outages generally occur so that maintenance or construction can be undertaken on generators or the transmission or distribution networks. Unplanned outages occur when equipment failure causes electricity to be disconnected unexpectedly.

The reliability that customers experience is a combination of the service provided by generators, transmission networks and distribution networks. However, most of the outages that customers experience are due to issues on the distribution networks.

Large amounts of money have been spent on distribution networks across Australia to provide a reliable supply of electricity. While the level of reliability experienced by customers can vary for different areas of the network, average reliability is at a high level.

To further improve current average levels of reliability, significantly more expenditure would be needed. As a result, it would not be cost efficient to try to remove all outages on the distribution networks.

There are also a number of factors which can lead to unplanned outages, which distribution networks have only a limited control over. This includes factors such as birds or possums on lines, or extreme weather such as storms, which may bring lines down.

How are reliability levels currently set?

The reliability standard currently requires there be sufficient generation and transmission interconnection such that 99.998% of annual demand for electricity is expected to be supplied.

Put another way, the standard specifies the maximum expected unserved energy (USE), or the amount of electricity demanded by customers which is at risk of not being supplied. It is currently set at 0.002% of the region's annual energy consumption in a financial year.

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It is not a regulatory or performance standard that is 'enforced' but rather it is a planning standard used to indicate to the market the required level of supply to meet demand on a regional basis.

The reliability standard was set by the AEMC's Reliability Panel and is now incorporated into the National Electricity Rules. The Panel reviews the standard every four years.

State and territory governments set the level of reliability that must be provided by transmission and distribution networks (the 'poles and wires').

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Who is responsible for reliability?
The Australian Energy Market Operator (AEMO) is responsible under the National Electricity Rules for maintaining security and implementing reliability across the power system in accordance with standards and guidelines.

Generation reliability

AEMO must continuously monitor levels of generation as generators retire from the market and new generators take their place.

AEMO's *Electricity Statement of Opportunities* assesses supply adequacy across the national electricity market over the next ten years, taking into account any significant developments such as the closure of Hazelwood Power Station in Victoria.

In the short and medium term, AEMO assesses supply adequacy through its Projected Assessments of System Adequacy (PASA) process. This involves collecting information and analysing if electricity supply can meet the reliability standard in the short term (a one week outlook) and medium term (a two year outlook).

There are mechanisms in the national electricity rules which enable AEMO to take action if it believes the balance of electricity supply and demand will not meet the reliability standard:

- In the first instance, AEMO can activate the reliability and emergency reserve trader (RERT) mechanism, which allows AEMO to contract for (or 'lock in') electricity reserves ahead of a period where it projects a shortage.
- If there is still a shortfall in supply, AEMO will issue a market notice, inviting generators to bid any spare supply into the market. By this stage, spot prices are usually very high due to the shortage of supply relative to demand, which is an incentive for generators to offer their supply. This is how the market is designed to work.

If the response from generators to the market notices is insufficient, and there is a risk to the secure or reliable operation of the power system, AEMO can:

- direct a generator to increase its output, but only if this is possible and can be done safely. To be effective, the generator must have enough time to 'ramp up'. If the generating unit is not already generating, it can take time for it to connect to the network and begin to ramp up. Gas generating units can usually turn on within a few hours if they have fuel available. Hydro plant can connect and ramp up faster than this, whereas coal generators can take several days.
- direct a large energy user, such as an aluminium smelter, to temporarily disconnect its load or reduce demand. This only applies to large users who are registered market participants.

If there continues to be a shortfall of generation, AEMO may require involuntary load shedding as a last resort to avoid the risk of a wider system blackout or damage to generators or networks. Network businesses shed this load following schedules provided by the relevant state government.

Reliability and Emergency Reserve Trader
The Reliability and Emergency Reserve Trader (RERT) allows AEMO to contract for electricity reserves ahead of a period where AEMO projects an insufficient amount of supply to meet the reliability standard.

AEMO is able to dispatch RERT reserves to manage power system reliability and, where practicable, system security.

It is one of a few mechanisms available to AEMO to intervene in the market to address potential shortfalls of supply. The RERT may be used when informal negotiations with participants do not resolve the shortfall.

Under the National Electricity Rules, the Reliability Panel is required to carry out reviews of the reliability standard and reliability settings once every four years.

The national electricity rules require AEMO to develop procedures that detail how AEMO intends to exercise the RERT.

When exercising the RERT, AEMO must aim to have the least distortionary effect on the operation of the market and the least cost to end use consumers of electricity.

AEMO must also follow the RERT guidelines when contracting for reserves which cover:

- the information AEMO must take into account when deciding whether to exercise the RERT
- actions that AEMO may take to be satisfied that the shortfall is unlikely to be addressed by the market
- the process AEMO should follow when contracting for reserves under the RERT.

In June 2016 the AEMC made a rule to extend the RERT indefinitely to preserve this safety-net feature of the market.

What are the reliability settings?

Reliability settings are the price mechanisms under the national electricity rules: the market price cap; the market floor price; the cumulative price threshold; and the administered price cap.

The market price cap and the market floor price define the price envelope within which the wholesale electricity pool is dispatched and settled. In certain unusual circumstances, such as very high levels of demand or a power system outage, the market price cap (currently $14,000 per megawatt hour) may be reached.

These high prices are central to the efficient functioning of the national electricity market. They provide price signals that incentivise investment in generation capacity and demand-side response to deliver the reliability standard.

However, extended exposure to sustained high prices can place substantial stress on market participants, with potential implications for the stability of the entire market. For this reason, the sum of spot prices cannot exceed the level of the cumulative price threshold (currently $210,100) within a rolling seven day period. If this occurs, AEMO takes action to apply an ‘administered price period’ which effectively caps the price at $300 per megawatt hour.

The reliability standard and the reliability settings are inter-related:

- When the reliability standard is reviewed, the Reliability Panel considers the appropriate trade-off between the value consumers place on supply reliability and the overall power system costs associated with achieving a certain reliability level. Tightening the reliability standard would reduce the costs associated with supply losses but it would also raise the prices consumers must pay.
- This is because an increase in the level of the reliability standard would likely require a corresponding increase in the level of market price cap, or some other form of generation remuneration, to signal the appropriate level of investment to deliver the higher standard.
- Depending on the effectiveness of that pricing signal, there could potentially be reliability shortfalls. The shortfalls may be managed by AEMO through the two intervention mechanisms described above: the reliability and emergency reserve trader (RERT); and reliability directions (directions to generators to produce). These two intervention mechanisms aim to provide a ‘safety net’ if there is insufficient generation capacity to meet demand.

Review of the reliability standard and reliability settings

Under the National Electricity Rules, the Reliability Panel is required to carry out reviews of the reliability standard and reliability settings every four years.

This regular review allows the Panel to take into account any changes in market arrangements and consider whether the reliability standard and reliability settings remain suitable, or whether changes should be made to ensure these mechanisms continue to meet the requirements of the market, market participants and consumers.

The review is currently underway and includes extensive consultation with stakeholders. In accordance with the rules, the review must be completed by 30 April 2018.

Network reliability

Each state and territory government retains control over how transmission and distribution reliability is regulated and the level of reliability that must be provided.

Investments in transmission and distribution networks are ongoing and involve a trade-off between the cost of building and maintaining the networks and the value placed on reliability by customers.

The key is to strike a balance between delivering secure and reliable electricity supplies, and maintaining reasonable costs for electricity customers

Developing values of customer reliability

Understanding how customers value reliability is an important consideration when planning new network infrastructure. A reliable supply of electricity is important to everyone: electricity interruptions can be costly, but it can also be disproportionately expensive to try to avoid them completely.

The key is to strike a balance between delivering secure and reliable electricity supplies, and maintaining reasonable costs for electricity customers.

A value of customer reliability (VCR) measure, represented in dollars per kilowatt-hour, indicates the value different types of customers place on having reliable electricity supplies under different conditions. VCR surveys can therefore help guide electricity planning and decisions on investments by energy businesses, governments and regulatory authorities.

What is the AEMC's role in reliability?

In 2013 the AEMC developed frameworks to help jurisdictions set levels for transmission and distribution reliability in the national electricity market. The frameworks aim to promote greater efficiency, transparency and community consultation in how network reliability levels are set and provided. In particular, the frameworks recommend the use of VCR surveys to assess the value that customers place on reliability. The Independent Pricing and Regulatory Tribunal (IPART) in NSW has adopted these frameworks.

The AEMC's Reliability Panel determines standards and some of the guidelines for maintaining a secure and reliable power system, as well as reviewing, monitoring and reporting on system performance. The Panel is comprised of members who represent a range of participants in the national electricity market, including AEMO, generators, network businesses, consumers and large end users.

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