

Fact sheet: What is reliability?

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

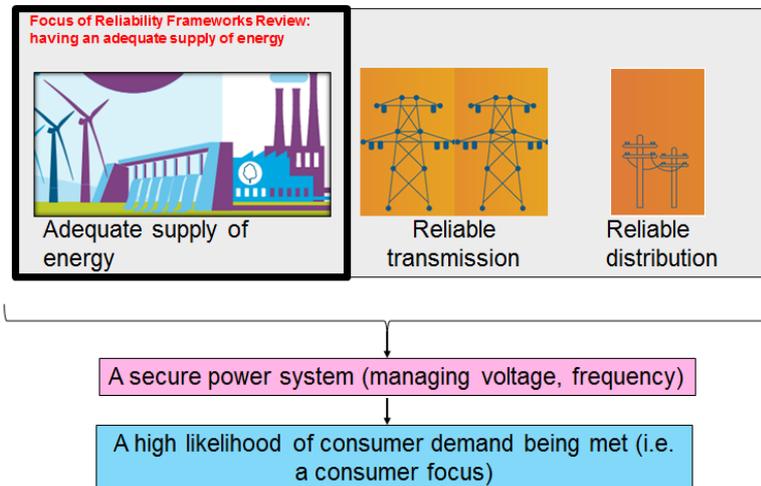
- **secure** – able to operate within defined technical limits, even if there is an incident such as the loss of a major transmission line or large generator
- **reliable** – have enough capacity (generation and networks) to supply customers.

What is reliability?

While ‘security’ relates to the *stability* of the power system, ‘reliability’ of the power system is about having enough generation, demand response and network *capacity* to supply customers with the energy that they demand with a very high degree of confidence.

A reliable supply of electricity therefore requires several elements:

- efficient investment, retirement and operational decisions by market participants resulting in an adequate supply of capacity to meet demand plus a sufficient level of reserves
- reliable transmission and distribution networks, as well as
- the system being in a secure operating stage (i.e. secure).



How do we achieve an adequate supply of energy?

The principal means of delivering the required reliability outcome in the NEM is through spot market price signals and, in turn, the prices of contracts that are used (in part) by participants to have more certain costs and revenue over time. Those market incentives are then supplemented by a series of mechanisms that allow the system operator to intervene in the market in a targeted way.

The design of the framework to deliver reliability in the NEM has been a deliberate one. Market-based solutions provide incentives to be innovative, benefiting consumers. This is because competitive pressures drive more cost-effective and efficient investment, operational and consumption decisions. Centrally-planned or mandated solutions can provide higher levels of certainty of having a reliable supply of energy but compared to a well-functioning market, are unlikely to deliver an efficient level of reliability at efficient cost. Unlike market participants, central planners do not have the same financial incentives to make efficient decisions and do not have to bear the risk of poor decisions, and their incentives are often to over-invest.

The reliability framework in the NEM is primarily market-based, but is supplemented by a series of mechanisms that allow the system operator to intervene in the market in specific circumstances

What are the market incentives?

The buying and selling of electricity, as well as associated financial products, via contract and spot markets is the main mechanism through which reliability is delivered in the NEM. Based on these market signals, market participants make investment and operational decisions.

In particular, the contract market provides certainty for participants in the short-term and so informs their decisions in the face of risky market conditions. In the longer-term, contracts provide signals of expectations of future spot prices; lower the cost of financing investment; and underwrite retailers' fixed-price offers to end-consumers

What are the market standard and settings?

The market settings – the market price cap, cumulative price threshold, administered price cap and market floor price – are an integral part of the reliability framework. They protect the long-term integrity of the market by limiting the extent to which wholesale prices can rise and fall. They are set at a level so as not to interfere with the price signals needed for efficient investment and operation.

The market settings underpin the reliability standard, which is the maximum expected unserved energy in a region for a given financial year. 'Unserved energy' means the amount of customer demand that cannot be supplied within a region of the NEM due to a shortage of generation or interconnector capacity.

The current reliability standard is 0.002 per cent unserved energy. Setting the standard involves a trade-off, made on behalf of consumers, between the prices paid for electricity and the cost of not having energy when it is needed.

The reliability standard underpins the reliability framework in the NEM, including AEMO's day to day operation of the market.

The Reliability Panel is currently reviewing the market standard and settings, with a final report due April 2018.

What supplementary information is provided?

AEMO is required by the NER to publish various materials which provide additional information to market participants – and any other interested parties – on matters pertaining to the reliability standard, that is, over and above the information contained in contract and spot market prices.

This information is provided in several formats and considers various time-frames. It helps guides market participants' expectations of the future, enabling more efficient investment and operational decisions. Some of these publications include: *Electricity Statement of Opportunities*; *Projected Assessment of System Adequacy*; and pre-dispatch schedules.

What are the intervention mechanisms?

As effective as information processes can be in delivering the desired reliability outcomes through market incentives, they cannot be guaranteed to work. If the market fails to respond to the information it publishes AEMO may engage informally with participants. But, if this fails, AEMO may have no other choice but to intervene in the market more directly.

AEMO therefore has various 'last resort' intervention powers that enable it to deal with actual or potential shortages of varying degrees of severity. In each instance, the power in question is designed to be implemented in a way that results in the smallest disruption possible to the ongoing operation of the market. These mechanisms include:

- Reliability and Emergency Reserve Trader obligations, allowing AEMO to contract for reserves ahead of a period where reserves are projected to be insufficient to meet the reliability standard.
- If there is a risk to the secure or reliable operation of the power system, AEMO can use directions or instructions under NER clause 4.8.9 to direct a generator to change its output, or direct a large energy users to temporarily disconnect load or reduce demand.

If there continues to be a shortfall in supply, AEMO may require involuntary load shedding as a last resort to avoid the risk of a wider system blackout, or damage to generation or network assets.

How is reliability different to security?

Reliability is distinct from system security. A secure system is one that is able to operate within defined technical limits, even if there is an incident such as the loss of a major

Supply interruptions that stem from reliability issues (not having enough supply to meet demand) are relatively limited in number

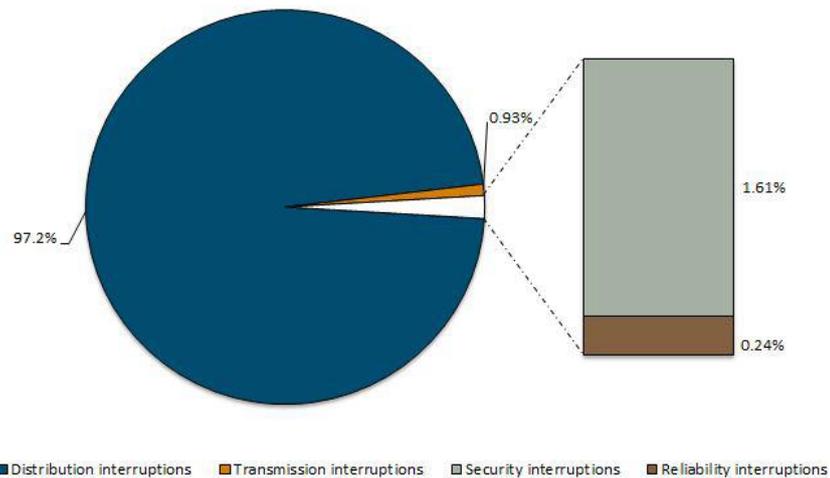
transmission line or large generator. Security events are mostly caused by sudden equipment failure (often associated with extreme weather or bushfires) that results in the system operating outside of defined technical limits, such as voltage and frequency.

While the two concepts are different, they are closely related operationally and it is not always so simple to separate the two concepts. A reliable power system is also a secure power system. However, the converse is not necessarily true; a power system can be secure even when it is not reliable. For example, the National Electricity Rules (NER) allows AEMO to undertake involuntary load shedding, potentially compromising reliability, in order to return the power system to a secure operating state.

There are a number of causes of supply interruptions to consumers: reliability (e.g. having insufficient generation to meet demand); security (e.g. load being shed to manage frequency across the system); or network (e.g. a particular line being out driving a network outage).

The below figure shows an indicative analysis of sources of supply interruptions in the NEM over the period 2007-08 to 2015-16. This shows that supply interruptions that stem from reliability issues (not having enough supply to meet demand) are relatively limited in number. Over the period, only about 0.24 per cent of total supply interruptions (in terms of GWh) was the result of inadequacy of supply. The vast majority was due to network interruptions, specifically from the distribution network.

Figure: Sources of supply interruptions in the NEM: 2007-08 to 2015-16



Source: AEMC analysis and estimates based on publicly available information from: AEMO's extreme weather event and incident reports and the AER's RIN economic benchmarking spreadsheets.

How is network reliability determined?

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.

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.

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.

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