

Managing power system fault levels

Final rule made

The Australian Energy Market Commission has made a final rule to place an obligation on Transmission Network Service Providers to maintain minimum levels of system strength.

The Commission's final rule

System strength in some parts of the power system has been decreasing as conventional synchronous generators are operating less or being decommissioned. This can mean that the system strength is not sufficiently high to keep the remaining generators stable and connected to the power system following a major disturbance. The relative stability of the power system can also reduce when additional non-synchronous generators connect.

A 'strong power system' is one that is characterised by high fault levels. The Commission considers that a secure power system demands that minimum fault levels are maintained at all times and has placed an obligation on Transmission Network Service providers (TNSPs) to provide this service at the least cost possible. This will provide confidence that system security can be maintained in all regions of the National Electricity Market (NEM) while minimising the cost to consumers.

This rule change complements and is part of the AEMC's broader system security reforms. An overview of the AEMC Security and Reliability work program is set out in Attachment A

What is system strength?

System strength is a characteristic of an electrical power system that relates to the size of the change in voltage for a change to the load or generation at a connection point. When the system strength is high at a connection point the voltage changes very little for a change in the loading. However, when the system strength is lower the voltage would vary more with the same change in loading.

The exit of large thermal synchronous generation, together with an increasing proportion of non-synchronous generation like wind and solar, has contributed to decreases in system strength in some areas of the power system.

A reduction in system strength in certain areas of the network may mean that generators are no longer able to meet their technical performance standards and may be unable to remain connected to the system at certain times. It may also lead to voltage instability and a reduction in the effectiveness of the protection systems used by network businesses, generators and large customers. If not addressed, these effects could lead to system instability and potential major supply interruptions.

The final rule

The key features of the final rule are as follows.

- AEMO to develop a system strength requirements procedure from which it can determine the required fault level at key locations in each transmission network necessary for the power system to be maintained in a secure operating state.
- Where a system strength shortfall exists, an obligation on TNSPs to procure system strength services needed to provide the fault levels determined by AEMO which services are then enabled by AEMO as needed.
- AEMO to develop system strength impact assessment guidelines that set out a methodology to be used by network service providers (NSPs) and generators when assessing the impact of a new generator connection on system strength
- A requirement on new connecting generators to 'do no harm' to the security of the power system, in relation to any adverse impact on the ability to maintain system stability or on a nearby generating system to maintain stable operation.

The Commission has concluded that, for the following reasons, the best mechanism to meet the minimum fault level requirements associated with maintaining system security would be through provision of system strength services by TNSPs.

- The framework in the final rule clearly allocates responsibility for system strength to the party who is best placed to manage the risks associated with fulfilling that responsibility – that is, the relevant TNSP. The framework enables TNSPs to identify efficient, least cost solutions that support long run efficient operation, use and investment in electricity services.
- The final rule provides for a holistic, flexible and technologically neutral solution to issues arising from reduced system strength by requiring TNSPs to maintain system strength at the levels determined by AEMO. As system strength is one of a number of services (including inertia and voltage control) required throughout a network for the effective operation of the power system, it is most effectively co-ordinated by one party across that network. TNSPs have a holistic perspective of their network and are able to address system strength in a manner that considers the best options for the entire network, including being able to optimise between sources that can provide system strength services as well as other key services such as inertia.

The Commission's final rule implements recommendations made in the Independent Review into the Future Security of the NEM (Finkel Panel Review) to require TNSPs to provide and maintain a sufficient level of system strength for each region or sub-region.

New connecting generators should 'do no harm'

The final rule places an obligation on new connecting generators to 'do no harm' to the level of system strength necessary to maintain the security of the power system.

When a new generator is negotiating its connection with the relevant NSP, a system strength impact assessment will be required to be undertaken by the NSP to assess the impact of the connection of the generating system on the ability of the power system to maintain stability in accordance with the NER, and for other generating systems to maintain stable operation following any credible contingency event or protected event.

This assessment would be performed using a methodology and power system model set out in system strength impact assessment guidelines developed and published by AEMO. The guidelines will provide guidance about the different network conditions and dispatch patterns and other relevant matters that should be examined through the assessment.

The new connecting generator would be required to fund the costs associated with the provision of any required system strength services to address the impact of its connection on system strength. This will incentivise new connecting generators to have the capability to operate at lower levels of system strength and to connect to the network where there is sufficient system strength. As a result, new connecting generators will be able to consider the costs of remediating adverse system strength impacts when making investment decisions. This will reduce overall costs to the system of new generator connections as these connections start to adversely affect power system stability.

This obligation on new connecting generators only applies at the time the connection is negotiated, based on the information available at that time. After this has been established, it will be incorporated into the connection agreement between the generator and the NSP. TNSPs will then be responsible for maintaining system strength on an ongoing basis.

On 13 September 2017 AEMO declared an NSCAS gap in relation to system strength in South Australia through an update to its 2016 NTNDP. The final rule makes transitional provision for this gap in order to seamlessly integrate it into the new framework.

Commencement

Obligations under the final rule will commence on 1 July 2018 by which date AEMO must have developed and published the methodology it will use to determine system strength requirements for each region in the NEM, determine minimum three phase fault levels for each region and whether there will be a fault level shortfall. If a shortfall is declared, the TNSP will have been given notice by AEMO of this shortfall by this time and will then need to have system strength services available to address the shortfall by 1 July 2019.

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AUSTRALIAN ENERGY MARKET COMMISSION

AEMC SYSTEM SECURITY AND RELIABILITY ACTION PLAN

Final:
Mar 2017 ✓

Emergency frequency control scheme rules

Enhanced schemes to act as a last line of defence in an emergency

Final:
Jun 2017 ✓

System security market frameworks review

Recommendations to deliver a stronger and more resilient system with better frequency control as the generation mix changes

Final:
Sept 2017 ✓

Managing the rate of change of power system frequency rule

Makes networks provide minimum levels of inertia

Final:
Sept 2017 ✓

Managing power system fault levels rule

Makes networks provide services necessary to meet minimum levels of system strength

Final:
Sept 2017 ✓

Generating system model guidelines rule

Requires detailed information on how generators and networks perform

Draft:
Nov 2017

Inertia ancillary service market rule

Will deliver inertia above minimum levels where there is market benefit

Stage one final:
Nov 2017

Reliability Panel review of frequency operating standards

Assessing whether the existing standard is appropriate to maintain a secure power system as the generation mix changes

Final:
mid-2018

Frequency control frameworks review

Looking at ways to integrate new technologies and demand response to help keep the system secure

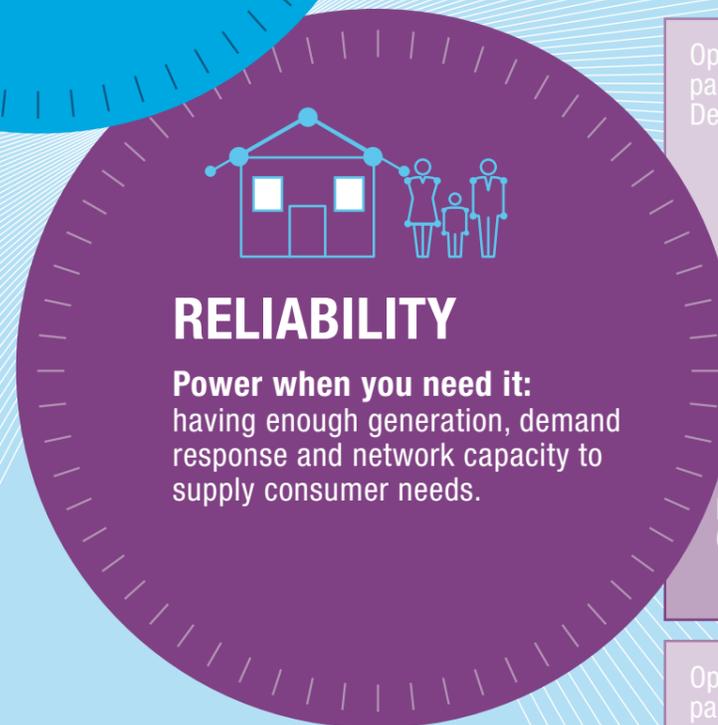
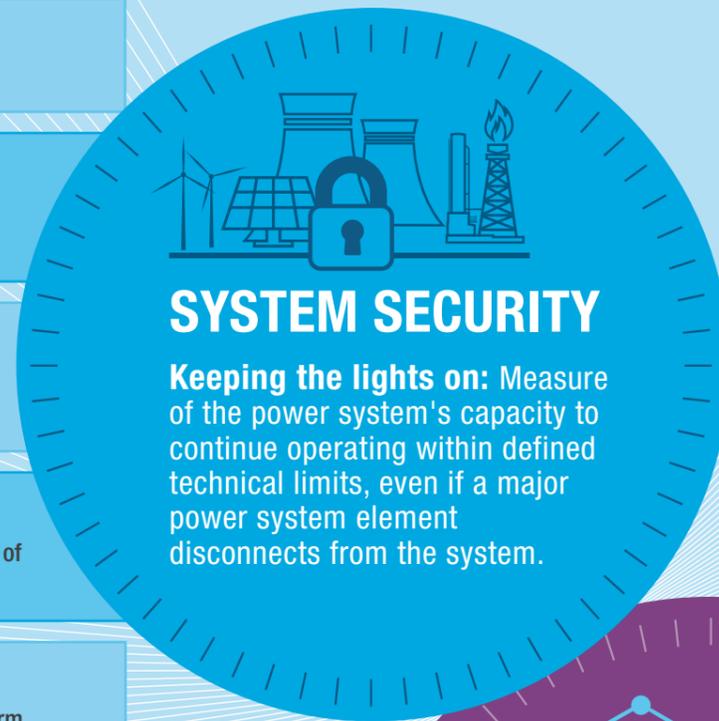
Consultation:
Sept 2017

Generator technical performance standards

Updating the technical performance standards for connecting generators and the process for negotiating them

Underway

Review of the system black event in South Australia on 28 September 2016



Final:
Jul 2017 ✓

Coordination of generation and transmission investment review: stage 1

Recommended that stage 2 investigate options to improve the coordination of transmission and generation investment

Final:
Apr 2018

Reliability Panel review of reliability standard and settings 2018

Assessing whether the standard and settings are appropriate to guide efficient investment to meet consumer demand

Options paper:
Dec 2018

Reliability frameworks review

Considering what changes may be needed to deliver enough dispatchable energy from the supply and demand side in the short term, to support more efficient operational decisions, and the longer term to guide necessary investment. The review will also look at Finkel recommendations:

- a Generator Reliability Obligation
- the need for a Strategic Reserve
- the suitability of a 'day ahead' market
- mechanisms to address demand response priorities

Draft:
Oct 2017

Declaration of lack of reserve conditions rule

Seeks to amend lack of reserve framework so it can support changing power system conditions

Options paper:
Nov 2017

Coordination of generation and transmission investment review: stage 2

Investigating options to improve coordination of generation and network investment, including potential renewable energy zones, transmission pricing and access

