



Managing the rate of change of power system frequency

Final rule made

The Australian Energy Market Commission has made a final rule to place an obligation on Transmission Network Service Providers to procure minimum required levels of inertia or alternative frequency control services to meet these minimum levels.

The Commission's final rule

The widespread deployment of non-synchronous generating technologies, such as wind farms and solar panels, is having impacts on the operation of the power system. These technologies have low or no physical inertia, and are therefore currently limited in their ability to dampen rapid changes in power system frequency, which is needed in order to maintain a secure power system.

The Commission considers that a secure power system demands the availability of minimum levels of inertia 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.

Minimum required levels of inertia

The more preferable final rule has been made with respect to a rule change request received from the South Australian Government. The South Australian Government considers that less synchronous generation in the NEM is leading less inertia. This reduction in inertia is increasing the susceptibility of the system to rapid changes in frequency that arise as a result of system disturbances, which can lead to blackouts.

Historically, most generation in the NEM has been synchronous and, as such, the inertia provided by these generators has not been separately valued. As the generation mix shifts to smaller and more non-synchronous generation however, inertia is not provided as a matter of course giving rise to increasing challenges for the Australian Energy Market Operator (AEMO) in maintaining the power system in a secure operating state.

The shift to newer types of generation has been more pronounced in some regions of the NEM than others. South Australia, in particular, has experienced a substantially faster change than other regions as an increasing volume of non-synchronous generation comes into service. Flows on the interconnector with Victoria allow power system security to be maintained in normal circumstances because of inertia provided by generators in other parts of the NEM. Where there is an outage of this interconnector, the risks to system security in South Australia increase significantly because it must rely on inertia provided by generators within the region. This makes it harder to arrest the frequency change and restore the frequency to normal operating levels. As the generation mix changes in a similar way across the NEM, these risks may become more widespread.

Prior to a system disturbance, AEMO can minimise the resulting initial frequency change by either constraining the power system to minimise the potential size of the disturbance or increase the level of inertia in the system to resist the initial frequency change. However, short of constraining all generation and network flows to zero, there is a minimum level of inertia required even to operate the system in a heavily constrained manner.

With increasingly less synchronous generation in the NEM, the Commission has established an obligation on TNSPs to provide confidence that this minimum level of inertia will be available to AEMO when needed to maintain a secure operating system.

The final rule

The final rule is part of the broader package of system security work being progressed by the AEMC. The key features of the final rule are as follows.

- An obligation on AEMO to determine sub-networks in the NEM that are required to be able to operate independently as an island and, for each sub-network, to:
 - determine the minimum required levels of inertia; and
 - assess whether a shortfall in inertia exists or is likely to exist in the future.
- Where an inertia shortfall exists in a sub-network, an obligation on the relevant TNSP to make continuously available minimum levels of inertia, determined by AEMO.
- An ability for TNSPs to contract with third-party providers of alternative frequency control services, including fast frequency response (FFR) services, as a means of reducing the minimum required levels of inertia, with approval from AEMO.
- An ability for AEMO to enable the inertia network services provided by TNSPs and third-party providers under specific circumstances in order to maintain the power system in a secure operating state.

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

- The existing economic regulatory framework will provide an incentive for the TNSP to assess the least-cost approach to meeting the obligation with oversight by the AER. The TNSP will be able to meet the obligation in the short-term by contracting with existing third-party providers of inertia or investing in network assets, while concurrently assessing the most efficient long-term means of meeting the obligation.
- Placing the obligation on TNSPs to provide inertia network services will provide a greater ability to coordinate the provision of inertia network services with other network support requirements for the relevant sub-network, such as system strength. This should result in a more efficient outcome for consumers in the long term by minimising the potential duplication of investment.

The Commission's final rule in part implements recommendation 2.1 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 inertia for each region or sub-region, including a portion that could be substituted by fast frequency response services.

Additional inertia for market benefit

The final rule relates to the provision by TNSPs of the minimum level of inertia required to maintain secure operation of the power system. This can be distinguished from additional levels of inertia that may increase economic benefits by allowing for greater power transfers on the network, such as greater energy flows on interconnectors.

The AEMC has been assessing a rule change request received from AGL, which proposes the establishment of an inertia ancillary services market. Through its assessment of this rule change request, the AEMC is considering the benefits of a mechanism to guide the provision of additional inertia for market benefit. The Commission will make a draft determination on this rule change request by 7 November 2017.

A market mechanism will complement and build on the certainty created through the TNSP obligation by providing the ability to continuously adjust the level of service provision in real time to maximise efficiency. Ultimately, the combined TNSP obligation and market mechanism will form an enhanced framework which efficiently balances certainty and flexibility for the management of system frequency in the long term interests of consumers.

Commencement

New obligations stemming from 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 inertia requirements for each region in the NEM, determine minimum inertia levels for each region and whether there will be an inertia shortfall. If a shortfall is declared the relevant TNSP will have been given notice by AEMO of this shortfall by this time and will then need to have inertia 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

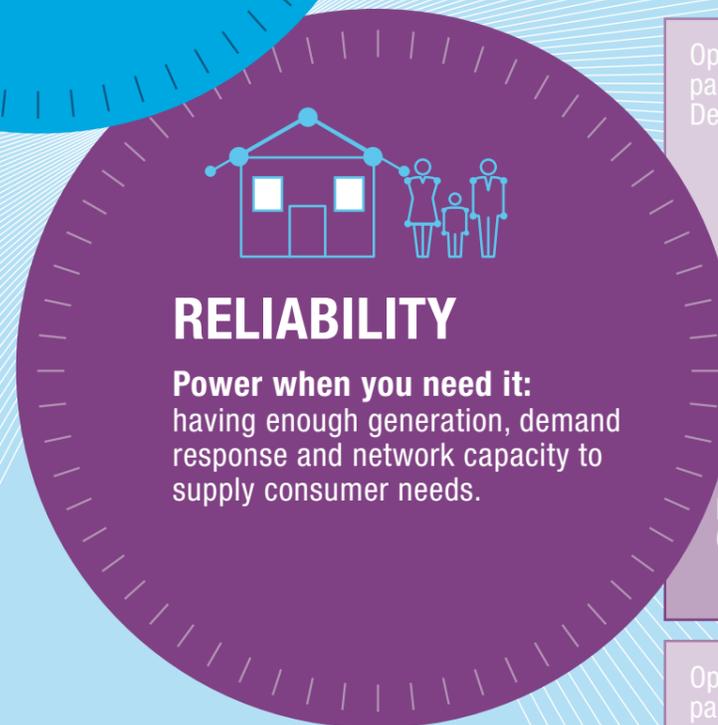
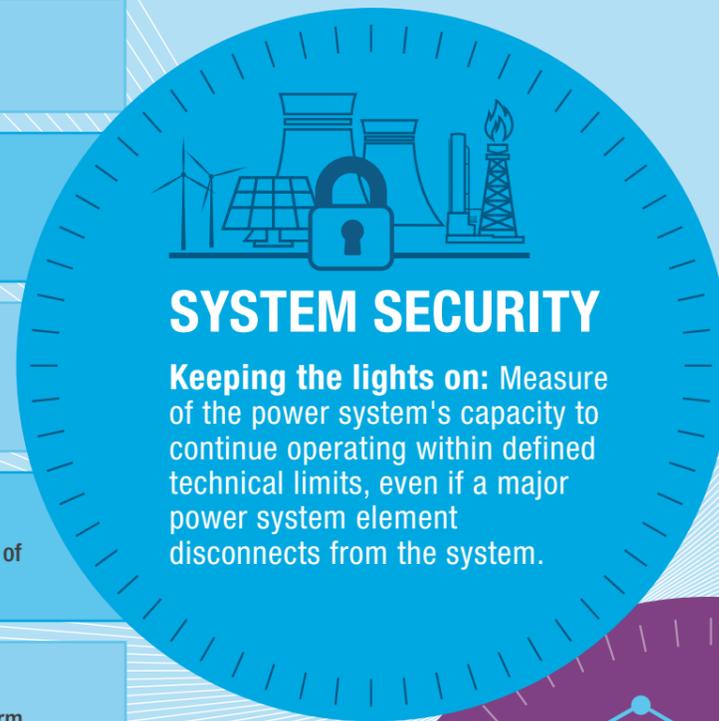
Consultation:
Sept 2017

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

