



Fact sheet: The need for a new power system security plan

AEMC System Security Market Frameworks Review

What is power system security and why does it matter?

System security is necessary for the efficient functioning of the NEM. The Australian Energy Market Operator (AEMO) is required under the National Electricity Rules (NER or rules) to operate and maintain the power system in a secure operating state. In order for the electricity system to remain in a secure operating state, there are a number of physical parameters which must be maintained within a defined operating range. An electricity system that operates outside of these strict physical parameters may become unstable, jeopardise the safety of individuals, risk damage to equipment, and lead to the possibility of blackouts.

System security is distinct from reliability. The reliability of supply has a consumer focus and describes the likelihood of supplying all consumer needs with the existing generation capacity and network capability. Security of supply is a measure of the power system's capacity to continue operating within defined technical limits, even in the event of the disconnection of a large generator, load or major network element such as an interconnector. A secure operating system is a necessary condition for meeting consumer electricity needs.

Why is there a need for a new power system security plan?

The electricity industry in Australia is undergoing a fundamental transformation. The last decade has seen a rapid rise in the penetration of new generation technologies, such as wind farms and rooftop solar. In the past, these technologies accounted for only a small fraction of total electricity supply. Now they are a critical part of our power system, and their significance is continuing to grow.

Due to their different technical characteristics, the widespread deployment of these new technologies is having major impacts on the operation of the power system, including two key system security issues:

- There is less inertia in the power system. Reduced inertia increases the rate or speed at which the power system's frequency will change (rate of change of frequency or RoCoF) following sudden changes to demand or supply (disturbances).
 - Less inertia means that frequency control ancillary services (FCAS) may not respond quickly enough to rebalance demand and supply, and therefore stabilise frequency, in light of the higher rates of frequency change.
 - Existing emergency frequency control schemes may be too slow to respond in the absence of the 'dampening' effect inertia has on frequency changes.
- System strength is reduced in some areas of the network. System strength is a measure of the current that would flow into a fault at a given point in the system. A weaker system reduces the effectiveness of some types of system protection functions, makes it harder for some generators to meet certain technical standards (like the ability to ride through voltage dips) and generally makes the local, weaker network more susceptible to voltage instability.

The Commission has prioritised two key issues: frequency control and the management of system strength

How can these issues be addressed?

The increased RoCoF needs to be limited. This can be achieved by:

- AEMO constraining the system, that is, restricting the operation of the power system to reduce the potential size of sudden changes in generation or load. This can be a costly way to address this issue;
- increase the level of inertia;
- develop quicker forms of FCAS, as current FCAS may not be fast enough to arrest steep rates of change of frequency in time to stabilise the system; or
- a combination of the above.

Relatedly, existing emergency frequency control schemes need to be reviewed so those schemes are able to withstand the higher levels of RoCoF.

The effects of a weaker system need to be managed. This can be achieved by:

- increasing the capability of some network protection schemes;
- addressing network operators' ability to manage voltage on their networks; and
- addressing the ability of generators to operate such that they can meet their technical performance standards.

What must any plan for power system security cover?

A plan to address the issues identified above will need to include:

- a mechanism or combination of complementary mechanisms to be used to acquire and provide the additional services (inertia, faster frequency response services) the changing power system now needs to be able to manage RoCoF;
- a framework that provides an appropriate 'last line of defence' to protect against the risk of system black events in light of higher levels of RoCoF; and
- solutions for strengthening the power system.

How have we gone about developing this plan?

The impact of non-synchronous generation on power system security was highlighted in the AEMC's Strategic Priorities for Market Development as an important focus in the coming years. In July 2016 the Commission initiated its review into the regulatory framework that affect power system security in the National Electricity Market to continue its work in this area.

The AEMC's System Security Work Program comprises this System Security Market Frameworks Review and five related rule change requests received on system security matters. Four of the rule changes were submitted by the South Australian Government, with the fifth requested by AGL. These rule changes are being progressed concurrently and in coordination with the review.

Figure 1 AEMC System Security Work Program

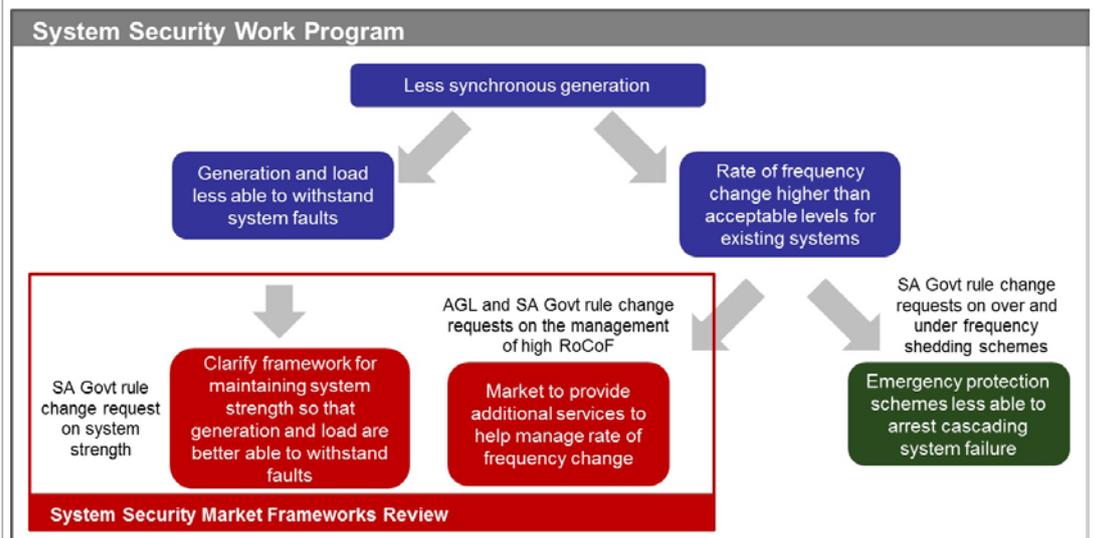


Figure 1 shows the relationship between the issues being considered under the system security work program and how these issues relate to the System Security Market Frameworks Review and the related rule change requests.

The AGL rule change request and the South Australian Government's rule change requests relating to inertia/high RoCoF and to system strength are being progressed concurrently and in coordination with the AEMC's review. These three rule change requests deal with a range of complex issues for which technical solutions have not yet been fully explored, both within the NEM as well as internationally. The Commission initiated the System Security Market Frameworks Review as a vehicle to coordinate the assessment of these inter-related issues and develop appropriate recommendations for future policy changes.

On 8 September 2016, the Commission commenced the first stage of stakeholder consultation on both the review and the three related rule change requests. On 15 December 2016, the Commission published an interim report in which it outlined options for the additional power system security services now needed. Submissions were received and additional consultation on the Commission's subsequent analysis took place with the Technical Working Group established by the Commission for this review. The Commission has now published a directions paper in which it presents its proposed approach to address the two key issues identified in the interim report.

The South Australian Government's rule change requests regarding over and under-frequency shedding schemes are being progressed separately to the review and the other three rule change requests. These rule change requests seek to refine the existing arrangements for emergency under-frequency control schemes and to establish a regulatory framework for over-frequency control schemes, respectively. Changes to the rules arising from these rule change requests may address some of the more immediate concerns in relation to the governance and operation of emergency protection schemes, particularly as it applies to managing the impact of a sudden separation of South Australia from the rest of the NEM. A final determination on those rule changes requests is scheduled for publication on 30 March 2017.

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