

9 February 2017



Mr John Pierce
Chairman
Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235

Dear Mr Pierce

System Security Market Framework: Interim Report

Power system security is a critical area of market reform and Energy Queensland Limited (Energy Queensland) supports the Australian Energy Market Commission's (AEMC) review into the system security framework. In particular, the on-going integration of non-synchronous generation into the National Energy Market will necessitate responsive new inertia and fast frequency control services, to ensure appropriate management of system security.

However, notwithstanding our support for this review, Energy Queensland considers the scope of the Interim Report should be broadened. Specifically, reform to the power system security framework needs to encompass the new services required to manage the network impacts of *all* new technologies, and not be confined to the services needed to manage large scale non-synchronous generation. This issue is explored in detail in our submission. Energy Queensland has also contributed to and supports the submission made by Energy Networks Australia.

Should you require additional information or wish to discuss any aspect of this submission, please do not hesitate to contact either myself on (07) 3851 6416 or Trudy Fraser on (07) 3851 6787.

Yours Sincerely

A handwritten signature in black ink, appearing to read "Jenny Doyle".

Jenny Doyle
General Manager Regulation and Pricing

Encl: Energy Queensland's submission

Energy Queensland

System Security Market Frameworks Review

Submission to the Australian Energy Market Commission's
Interim Report

Energy Queensland Limited
9 February 2017



Contact details

Energy Queensland Limited
Jenny Doyle
Phone: +61 (7) 3851 6416
Email: jenny.doyle@energyq.com.au

PO Box 1090, Townsville QLD 4810
Level 6, 420 Flinders Street, Townsville QLD 4810
www.energyq.com.au

Energy Queensland Limited ABN 96 612 535 583

© Energy Queensland Limited 2016

This work is copyright. Material contained in this document may be reproduced for personal, in-house or non-commercial use, without formal permission or charge, provided there is due acknowledgement of Energy Queensland Limited as the source. Requests and enquiries concerning reproduction and rights for a purpose other than personal, in-house or non-commercial use, should be addressed to the General Manager Customer Strategy and Engagement, Energy Queensland, PO Box 1090, Townsville QLD 4810.

Contents

1	National Energy Market: System Security	1
1.1	The Distribution Level	1
1.2	Future Role of DNSPs in System Security	2
1.3	Electricity Network Transformation Roadmap	2
1.4	Future System Security: A Partnership Approach.....	3
1.5	Under Frequency Load Shedding	3
2	Further Considerations	4
2.1	Frequency Range.....	4
2.2	Cost Allocation.....	4

1 National Energy Market: System Security

1.1 The Distribution Level

Energy Queensland Limited (Energy Queensland) strongly supports the System Security and Market Frameworks' Review (the Review). The integration of non-synchronous large and small scale generation across the National Electricity Market (NEM) is already impacting system stability. Over the medium to long term, these challenges will only increase as more large scale renewable energy generation comes on-line and there is mass uptake of energy storage (Distributed Energy Resources (DER)) at the household level that will enable aggregated load shifting. Considering this likely proliferation of DER, Energy Queensland considers the focus of the Review is too narrow in respect of the long-term integration of DER across distribution networks.

Specifically, the Review is primarily focussed on additional system stability services that could be provided at the generation, Transmission Network Service Provider (TNSP) and Australian Energy Market Operator (AEMO) level, with the Australian Energy Market Commission (AEMC) stating the Review:

*...will consider changes to **wholesale energy market frameworks** to complement the shift to non-synchronous forms of generation. The Review will address power system security issues identified above to assist AEMO in maintaining power system security as the industry transforms.¹*

However, Energy Queensland notes that over the medium to long term, power system security will be as equally impacted by aggregated DER and / or load under control, as it will be by the loss of inertia created by the shift to non-synchronous generation at the wholesale market level. The market framework we build today needs to reflect and prepare for the scenarios of the future. At present, the new services recommended in the Review to enhance NEM security are all generator, TNSP or AEMO focussed. As such, while we support the Review's proposals for additional system security services, the providers of these services should be expanded to include DNSPs and customers/market participants that are connected in the distribution system, but could provide these services if aggregated. Doing so will create a flexible market framework that will shape the design of the future grid in the most efficient manner.

Specifically, the fast frequency response service (FFR) proposed as a support mechanism in the management of rate of change frequency (RoCoF) events, which is restricted to the provision or procurement of FFR by TNSPs or AEMO, should be expanded to include DNSPs. This approach is

¹ AEMC, (2016), *System Security Market Framework: Interim Report*, pgs. ii & iii.

in-line with the AEMC's principles to guide the development of new system security options, specifically technology neutrality. On this issue, the AEMC states in the Review that "arrangements should be designed to take into account the **full range of** potential market and **network solutions**" and that "wind, solar and batteries are all examples of technologies that have the capability to rapidly respond to deviations in system frequency".² Indeed, to capture the full benefits of these technologies over the medium to long term DNSPs will need to play a greater role in maintaining system security, as detailed below in the Electricity Networks Australia and CSIROs' *Electricity Transformation Roadmap*.

1.2 Future Role of DNSPs in System Security

As noted, current technologies will result in third party aggregators controlling fast responding loads and / or generation on distribution networks. Over time, in aggregated size these loads may exceed that of a market generator and thus will also create faster RoCoF events and a consequent need for an FFR response service. The events that aggregators will load shift in response to could include a market price trigger, a contract, or network constraints/outages. As the RoCoF impact of such load shifting will be first seen at the distribution level, DNSPs will also require the capability to acquire an FFR service.

The management of DER impact on distribution networks is the subject of the AMEC's Approach Paper: *Distribution Market Model* which explores the potential role of the Distribution System Operator (DSO) to manage system stability. It is apparent to Energy Queensland that this Review and the DSO framework are closely interrelated. The DSO function has been proposed to manage the localised, future distribution network stability issues created by aggregated DER; and as such one aspect of this role would likely include the provision or procurement of FFR required to mitigate faster RoCoF events created by market generator scale DER load shifting. As the DSO role will either need to be undertaken by DNSPs or managed via the implementation of smart grids³, this Review must acknowledge the requirement for DNSPs to become a service provider / procurer of FFS.

1.3 Electricity Network Transformation Roadmap

As the AEMC would be aware, the Energy Networks Australia and CSIRO's *Key Concepts Report* into their *Electricity Network Transformation Roadmap* project was released last month. The report involved a two year work program and incorporates the views of hundreds of stakeholders, 19 expert reports and analysis of energy system outcomes to 2050. Further, to deliver the Power System Security section of the Roadmap a formalised collaboration was established with the AEMO; based on the synergies between the Roadmap and AEMO's *Future Power System Security*

² The Review, pg. 47.

³ For in-depth detail in regards to why please refer to Energy Queensland's submission to the AEMC's Distribution Market Model: Approach Paper

program. The *Key Concepts Report* states “the distribution system is also a potential source of new ancillary services to support transmission-level system stability. New sophisticated control systems will allow inverter-connected devices to set and maintain frequency, enabling genuine replacement of synchronous generation in large network systems”⁴ and recommends that by 2027 DNSPs provide visibility of DER and potentially also enable FCAS and delegated balancing services⁵.

1.4 Future System Security: A Partnership Approach

As explained in detail in Energy Queensland’s response to the AEMC’s *Distribution Market Model Approach Paper*; the scale, technical constraints, network differences and sheer number of DER expected to be connected to distribution networks will make it technically impractical and inefficient for AEMO to model and manage all the distribution networks in a similar way. Further, where AEMO’s system management at the wholesale market level must respond to price signals, the distribution network is managed based on the required system response and thus must be managed independently. As such, as the NEM evolves over the medium to long term, system stability will require DNSPs to manage the localised impacts of DER / distributed non-synchronous generation (and for DNSPs to consider inertia more so than currently occurs). The data required for this purpose could then be aggregated for NEM wide application and provided to AEMO to assist in its management of the wholesale market.

1.5 Under Frequency Load Shedding

Moving forward, a partnership approach to power system security is also critical to the secure management of Under Frequency Load Shedding (UFLS). Network issues are already being experienced wherein UFLS is also shedding solar generation at the customer level; with this loss of generation exacerbating the frequency issue the UFLS response was initiated to alleviate. As DNSPs will have sight of DER it is critical that the system security framework is designed to enable a collaborative approach between AEMO and DNSPs, in order to safely manage the mass uptake of generation at the customer level.

⁴ *Electricity Network Transformation Roadmap: Key Concepts Report*, 2017, pg. 56.

⁵ *Electricity Network Transformation Roadmap: Key Concepts Report - Summary*, 2017, pg. 6.

2 Further Considerations

2.1 Frequency Range

In addition to the power system security services proposed, the AEMC should also consider if the networks' frequency bandwidth tolerances could be wider. Most if not all system loads can safely tolerate much wider frequency ranges. Further, the widespread use of direct current and advances in power electronics have reduced the traditional need for near continuous 50 hertz that was required 10-20 years ago. If a more flexible outcome were possible in this regard the benefits would flow through to inertia standards, stability standards, spinning reserve standards and also RoCoF response standards, which will ultimately translate into potential customer price reduction pressures.

2.2 Cost Allocation

The development of any new system measures should also include a consideration of the costs involved, and in-turn their allocation. In regards to power system security in the long term, this could include what responsibility DER aggregators may have in contributing to system stability. Incumbent in any market role is the obligation to mitigate costs their function may create on the broader NEM, in order to minimise cross subsidies. Designing the correct market framework prior to the emergence of foreseeable new roles will shape the design of the future grid in the most efficient manner.