

05 December 2017

Ms. Anne Pearson
Chief Executive
Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235

Attention: Ms. Claire Richards

Frequency Control Frameworks Review – Issues Paper (EPR0059)

Energy Networks Australia (ENA) welcomes the opportunity to make a submission to the Australian Energy Market Commission's (AEMC) Frequency Control Frameworks Review (November 2017) Issues Paper.

Energy Networks Australia is the national industry body representing businesses operating Australia's electricity transmission and distribution and gas distribution networks. Member businesses provide energy to virtually every household and business in Australia.

Energy Networks Australia supports this important and necessary review into the regulatory and market frameworks that underpin frequency control in the National Electricity Market (NEM). However, at this early stage of the review process, the issues currently reflected in the review seem to be most relevant to Distribution Network Service Providers (DNSPs), and Energy Networks Australia would like to suggest that the AEMC consider the role of Transmission Network Service Providers (TNSPs) in more detail as part of the review. For example, in the design of future inertia markets, procurement functions, and/or how Distributed Energy Resources (DER) could be utilised to provide support services to both DNSPs and TNSPs.

Other key points and issues that Energy Networks Australia and our members consider should be examined in more detail by the AEMC in this review, include:

1. Clearly defining the issues, ensuring the scope is proportionate and any proposed outcomes are manageable and coordinated with related processes;
2. Consideration and advancing the findings of the joint CSIRO/ENA Electricity Network Transformation Roadmap (ENTR) and ensure a holistic review of DER issues;
3. Any examination of potential market or regulatory arrangement options considers suitable structural, governance, monitoring and reporting arrangements;
4. Ensuring consistency of arrangements across the NEM, while taking into account jurisdictional differences/needs;

5. Suggesting that the AEMC facilitate a further review of AS4777 Grid Connection of Energy Systems via Inverters Installation Requirements;
6. Not to advance the design or establishment of Inertia Markets until outcomes of new regulatory frameworks realised; and
7. Consideration of impacts on existing automatic under frequency load shedding schemes.

Each of the points identified above, are now explored in more detail.

1. Clearly defining the issues, ensuring the scope is proportionate and any proposed outcomes are manageable and coordinated with related processes

Energy Networks Australia supports the approach being undertaken by the AEMC for this review, and accepts that a proportionate and manageable scope in progressing this review will be key. Progress should continue to be sequential, and take into account other reviews and rule changes. For example, it is critical to ensure consideration of system security implications from any frequency control reforms in the NEM remains paramount. A key driver for the AEMC and other NEM regulatory institutions is to be as consistent as possible with the intent (and timing) of related recommendations contained in the Independent Review into the Future Security of the National Electricity Market - Blueprint for the Future Final Report (June 2017).

In addition, it will be important for the AEMC to continue to communicate fully and in a timely way regarding any related processes and concurrent work undertaken by the Australian Energy Market Operator (AEMO) as part of the AEMC-AEMO Collaboration Agreement. Coordination of this AEMO research, with revisions to the framework, is necessary, to obtain the best possible outcomes.

2. Consideration and advancing findings of the joint CSIRO/ENA Electricity Network Transformation Roadmap (ENTR) and ensure holistic review of DER issues

Advancing the findings, jointly undertaken by CSIRO and Energy Networks Australia as part of the Electricity Network Transformation Roadmap (ENTR), will be instructive. This recent report places a priority on the role of **Distributed Energy Resources (DER)** in a **transforming energy sector**. Various implementation pathways are required to enhance system security, and establish platforms and intelligent systems to orchestrate DER. Energy Networks Australia would welcome a holistic examination of DER issues and the potential opportunities that will evolve.

- a. The Issues Paper identifies the significant issues surrounding the inclusion of DER in providing frequency response services. Energy Networks Australia supports the view that, there is a need to integrate DER services so that they can be deployed and orchestrated for these purposes. As identified in the Roadmap, if DER will account for more than 40 per cent of generation in the medium term, then it is necessary to facilitate a transition to DER integrated into the energy supply system to allow for their orchestration. Otherwise, there

would be a growing reliance on assets that solely provide security services to support the power system. This is unlikely to be necessary or efficient.

- b. The ENTR sets out the objective and pathway for such integration. However, coordination of resources with the network's capability to get the services to market is a critical dependency. As the Issues Paper notes, there is a significant difference in the modelling, monitoring, responsiveness etc. of distribution systems compared with transmission systems, to be able to deliver these kinds of services. It will take time to achieve this outcome, and significant reliance on optimisation at the network operation level.
- c. We consider the increase in DER-related connections has driven the need for standards to be applied, such as AS4777.

DNSPs involvement in the development of the standards has clearly been focused on managing local network issues, as without resolving these particular issues, such situations would cause a significant obstacle to DER connection.

The Paper also notes that DER has been connected largely for energy services, without any real understanding of potential opportunities or lack of opportunities for security services. Energy Networks Australia notes this view, and contends that these connections have been negotiated based on customer enquiries, invariably for energy service capability.

Significant progress has been made by networks in streamlining connections. This includes the development of Chapter 5A of the National Electricity Rules (NER), and the commencement of a program of work by Energy Networks Australia, to develop a set of nationally consistent DER connection guidelines that outline the technical requirements to facilitate streamlined integration of customer distributed energy resources. AS4777 supports this connection approach. Its establishment is developed and amended by users, suppliers and networks, and somewhat provides the necessary 'generator performance standards' at this level.

At a micro-generation level, connection agreements have been similarly designed to achieve their required purpose, and are often of an individual nature. As such, these are unable to provide security services without aggregation. Energy Network Australia foresees changes in these arrangements to support DER providing security services, however this will need to be through integration with the distribution network as a dynamic system to optimise capability. This has to grow over time, through trials, new technology deployment, and platform development to facilitate capability. Stakeholders and our members would seek to facilitate DER entry into all possible markets, to deliver the most cost effective power supply for customers in the very different future envisaged.

Energy Networks Australia suggests the review recognise the need to ensure local supply quality and security is not compromised in enhancing wider network stability.

- d. A further examination of NSPs role in facilitating frequency control services from DER will be instructive. The primary role of DER response is best managed by Aggregators (or other developing service providers) who have the direct facing customer role, and can manage a diverse set of services.

However, it is important to recognise that should the role of Small Generator Aggregator(s) not materialise nor fully develop, there may be a place for NSPs to perform this facilitation role or be a platform to do so. It should also be recognised that network management services are locationally based, whereas it is likely that Aggregators will not be restricted to a particular area, or will have all or even a significant portion of the available DER in the location. This implies the need for coordination.

3. Any examination of potential market or regulatory arrangement options considers suitable structural, governance, monitoring and reporting arrangements.

It is essential that any examination of potential changes to market or regulatory options consider suitable governance and structural arrangements, as any change could have unintended consequences as the lines and responsibilities between local DNSPs and the TNSP, and AEMO may become more blurred. This could lead to a lack of clarity in roles etc. that will need to be addressed.

4. Ensuring consistency of arrangements across NEM while taking into account jurisdictional differences/needs

Energy Networks Australia considers that the AEMC consider as part of its review, jurisdictional Codes and legislation to avoid outcomes that do not account for individual needs or jurisdictional circumstances. These instruments, , may need to be amended to ensure alignment with a frequency control framework that in future becomes less transmission / big generation centric. For example, key aspects of the Victorian Electricity Distribution Code prescribes responsibility for frequency lies with AEMO and not the distribution businesses.

As the AEMC correctly points out in its recent 7 November 2017 Draft Determination on AGL's Inertia ancillary services market rule change proposal:

“regulatory or policy changes should not be implemented to address issues that arise at a specific point in time or in a specific jurisdiction only” (page 12).

5. Suggesting that the AEMC facilitate a further review of *AS4777 Grid Connection of Energy Systems via Inverters Installation Requirements*

AS4777 specifies the electrical installation requirements for inverter energy systems and grid protection devices with ratings up to 10kVA for single-phase units, or up to 30kVA for three-phase units, for the injection of electric power through an electrical installation to the electricity distribution network. As such, while Energy Networks Australia is aware that any review of AS4777 is the responsibility of Standards Australia, it suggests that the AEMC should consider taking this opportunity to proactively work with Standards Australia to facilitate a further review relevant aspects of AS4777 in light of:

- The network impacts resulting from a mixture of DER connected under both older NER and AS4777, and newer requirements (applicable since October 2016), and
- The mix of mandatory and non-mandatory aspects of this crucial Standard.

Energy Networks Australia would suggest that the AEMC in facilitating any review of the standard understands that the standard has a number of features that have implications for consider if there are further things the AEMC review might suggest to complement it or integrate with the frequency framework better. For example:

- » It limits export for 5kW systems, but DNSPs can over-ride this at their discretion. The objective here is to ensure that power quality obligations to customers on the local network are not impacted. It provides a mechanism whereby networks can monitor the growing impact as more generators connect, and can respond when threshold levels arise.
- » Includes a volt-watt response mechanism that applies at 250V supply point voltage, with a function that reduces export proportionate to the voltage level. The inverter does not need to have this feature, but where it does, it is applied by default.
- » The standard also currently includes Demand Response Enabling Device (DRED) capability, (which would itself be subject to the DRED standard AS4755).
- » As to what aspects of the standard should be binding/mandatory or otherwise. We are aware it is certainly mandatory in relation to wiring rules (AS3000).

6. Not to advance the design or establishment of Inertia Markets until outcomes of new regulatory frameworks realised

The interplay between inertia services and the various frequency control ancillary services is complex. Modelling, and experience and analysis for the likely South Australian implementation of FFR should help inform the value that may (or may not) be created by establishing shorter time-frame FCAS markets.

Energy Networks Australia supports the AEMC's current position to not take the market approach as outlined in its Draft Determination regarding the development of an Inertia Ancillary Services Market released in November 2017, and this consultation paper confirms that. It should be noted that the AEMC identified in its draft determination that:

"... given the current power system operating conditions, the need to understand practical outcomes from new regulatory frameworks recently introduced, and assess outcomes from various programs of work on foot by the Commission and the Australian Energy Market Operator ... the Commission is not satisfied that the introduction of a market mechanism for additional inertia for market benefit will meet the national electricity objective (NEO)¹ ..."

¹ Draft Determination, Executive Summary, page i.

It is expected that such conditions are unlikely to dramatically change during the Review's consultation period to warrant a move away from such a position. However, given the role of network service providers to provide minimum levels of inertia, Energy Networks Australia consider it imperative that if any change in the current position on this issue evolves through this review, that it be involved in industry discussions on how such a market may be further developed.

7. Consideration of impacts on existing automatic under frequency load shedding schemes.

The local DNSP has responsibility for these schemes; however, the settings are issued by the TNSP and AEMO. As a result, Energy Networks Australia considers that further exploration of these technical issues will be required to fully comprehend the potential two-way impacts of any reforms on the operation and performance of these existing schemes and vice-versa on any new services.

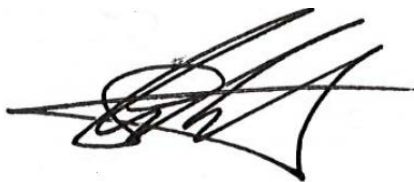
This submission also responds to a selection of the Issues Paper questions. These are provided in Attachment # 1.

Energy Networks Australia is also supportive of setting aside Stage 2 of the Reliability Panel's Review of the Frequency Operating Standard until this review progresses.

Energy Networks Australia and our members are happy to work with the AEMC through its Technical Working Group and more broadly through the on-going consultation processes to progress this important review.

Should you have any additional queries, please contact Norman Jip, Energy Networks Australia's Senior Program Manager - Transmission on (02) 6272 1521 or njip@energynetworks.com.au

Yours sincerely



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Attachment 1 - Responses to Selected Issues Paper Questions

Question 1 - Scope

Are there any other frequency control related questions that should be included within the scope of the review?

Not necessarily. The AEMC must keep the scope of the Review manageable, cognisant of, and consistent with, on-going related reviews and rule changes.

Question 2 - Drivers of degradation of frequency performance in the NEM

(a) Do stakeholders agree with the drivers of the observed long term degradation of frequency performance as identified by DigSILENT?

(b) Are there any other drivers of frequency degradation in the NEM that are not mentioned?

The AEMC appears to have considered the appropriate factors and issues.

Question 3 - Materiality of frequency impacts from non-dispatchable capacity

(a) What are the likely impacts on frequency of increasing proportions of non-dispatchable capacity, and reducing proportions of scheduled generation?

(c) Does the analysis for wind generation above hold true for large scale solar PV? Does large scale solar PV output change more rapidly than wind output? Are changes in solar output more difficult to forecast?

(a) If the anticipated increase in the proportion of non-dispatchable capacity continues, appropriate monitoring appears necessary of 'ramping' requirements and trends in intermittency.

(c) This appears to require further empirical analysis extending the current material provided in the Issues Paper.

Question 5 - Assessment principles

(a) Do stakeholders agree with the AEMC's proposed assessment principles? Are there any other principles that should be included?

(b) Are there any other principles that should be included?

Energy Networks Australia agrees with the principles outlined in Chapter 4.3. We also note the AEMC's acknowledgement at page 56 of the Paper, that:

"... in some instances (for example, where security concerns are manifesting in operational time scales or where the risk external to the energy market prevents it from being well-functioning). Intervention mechanisms are likely to be appropriate in order to maintain the integrity of the power system".

Question 6 – Assessment Approach

Are there any comments, or suggestions, on the Commission’s proposed assessment approach?

Energy Networks Australia proposes that the AEMC should state a clear position on the validity of a Cost Benefit Analysis in undertaking assessments of reform options.

Question 9 – Are stakeholders aware of any other international experience in relation to primary frequency control that is relevant for this review of frequency control frameworks in the NEM?

Energy Networks Australia would encourage additional international reviews by NEM regulatory bodies and detailed consideration of the examples outlined for:

- » the UK, where generators 50 MW+ must provide frequency response (p.67) and
- » in Ireland where generators must use governor control system response and are paid on a flat rate per MWh (page 69).

Question 10 – Mandatory primary frequency control

(d) Should an obligation for generators to be responsive to changes in system frequency outside a pre-defined dead band include a required availability reserve, such as 3% of a generators registered capacity as in the case in Argentina?

Energy Networks Australia proposes further consideration of this and any-other related developments in international jurisdictions, by the AEMC.

Question 14 – Frequency monitoring and reporting

(a) What are the potential benefits or costs associated with a requirement for AEMO to produce regular frequency monitoring reports?

(b) What metrics should such frequency monitoring reports include?

As noted in our response to Question 3 above, it will be important to have an assessment and comparison monitoring regime to examine the success or otherwise of this review and any related reforms. From a compliance perspective, monitoring and reporting will be important such that any non-conforming units at power stations are not inadvertently ‘masked’ by the overall performance of an entire station or a generation portfolio.

This reporting could be undertaken six-monthly/annually, or sooner, if a suitably framed (and metric or key incident/trigger) occurs.

In due course, such monitoring can be less frequent, but establishing such a monitoring regime appears to be worthwhile from a governance and performance perspective.

Monitoring and reporting processes should not be readily dismissed.

Question 15 – Defining Fast Frequency Response (FFR)

What are your views on AEMO’s advice on how and when FFR might emerge in the NEM?

Energy Networks Australia considers that the overview provided by AEMO in its recent ‘Fast Frequency response in the NEM: Working Paper’, and re-stated by the AEMC in Section 6.3.2 of the Issues Paper is a reasonable assessment of the current state of play and likely readiness of Emergency Response FFR, Contingency FFR, Fast response regulation, and simulated inertia/grid-forming technologies.

Question 20 – Co-optimisation with other markets

(a) Are there other systems services, such as inertia, system strength or system stability, that should be co-optimised with FCAS markets?

Energy Networks Australia considers that these issues should all be considered, and if practical to do so, be co-optimised with FCAS markets. Potentially, industry and regulatory institutions may need to recognise that NEM Dispatch Engine might not be capable to manage and co-optimize all potential markets (both existing and future).

Energy Networks Australia also suggests that any associated framework should recognise that the local DNSP has the responsibility to develop a policy appropriate to their network, such that they can ensure all of its customers are served.

The suggestion at page 96 of an “*extended development timeframe*” to consider the complex issues is supported. Based upon the AEMC’s Final Determination on the Five-Minute Settlement Rule change proposal released on 28 November 2017, to commence from mid-2021, there appears some time/scope to examine these issues.

Question 21 – Consistency in the provision of system security services

To what extent is it important that the NER arrangements for the provision of system security services are consistent between providers of such services, e.g. large, transmission-connected generators and DER?

Energy Networks Australia considers that where possible, consistency be pursued across the NEM. The AEMC will need to take into account applicable jurisdictional legislation and relevant Codes that may require appropriate navigation.

For example, in the case of Victoria, some concerns have been raised as to the interaction of this issue and present responsibilities or otherwise for Distribution businesses (e.g. frequency and standard voltage) under the current [Victorian Electricity Distribution Code](#). Avoiding any unintended consequences by way of new or contradictory obligations for Victorian DNSPs will be crucial. For example, section 4.1 of the Code states:

4.1 Supply frequency

4.1.1 *AEMO* is responsible for the frequency of each *distributor’s distribution system*, having an obligation under the **National Electricity Rules** to use

reasonable endeavours to maintain system frequency at 50 Hz, subject to the allowable variations set out in that Code.

4.1.2 A *distributor* has no obligation in respect of the frequency of its *distribution system*".

Question 24 - Technical challenges

(a) Is the aggregated capability of DER sufficiently 'firm' for aggregators to provide the system security services that AEMO needs?

(b) Are there any other technical challenges relevant to the provision of system services via DER that are not discussed in this section?

- a) Not at this stage, this may be so in future. There is a need for more research to prove what levels of DER control is required to provide such services. .
- b) Communications and control would be a large portion of the technical challenges. An additional emerging issue is that of the Small Generator Aggregator issue and the need to aggregate small and micro contributors to attain a total of 1 MW blocks.