

Friday, 21 April 2017

John Pierce  
Chairman  
Australian Energy Market Commission  
Lodged Electronically

Dear Mr Pierce,

**RE: EPR0053 System Security Market Frameworks Review, Directions Paper Submission**

The Clean Energy Council (CEC) is the peak body for the clean energy industry in Australia. We represent and work with hundreds of leading businesses operating in solar, wind, energy efficiency, hydro, bioenergy, energy storage, geothermal and marine along with more than 4,000 solar installers. We are committed to accelerating the transformation of Australia's energy system to one that is smarter and cleaner.

The CEC agrees with the Australian Energy Market Commission's (Commission) view that the National Electricity Market (NEM) is changing, and strongly supports the need to adapt the market in a way that moves away from a reliance on conventional, high emission and synchronous generation technologies. Many of these generators are expected to be subject to an emissions abatement strategy to meet Australia's COP21 targets over the coming decade.

Energy security and power system security have to be considered in the context of a different fuel mix, with increasing renewable energy and energy storage, and decreasing contribution from older, emissions intensive generation. While the Commission has proposed an immediate package of reforms that progresses towards this outcome, the CEC reminds the Commission that around 94 per cent of generation in the NEM is synchronous, yet major frequency control issues<sup>1</sup> have emerged over the last 12 months. These issues have emerged while creating an over-reliance on synchronous inertia in the NEM when compared

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<sup>1</sup> AEMO, Frequency Monitoring – three year historical trends, December 2016, page 4

to other markets<sup>2</sup>. The assumption that these issues are strongly associated with renewable energy has been proven to be manifestly inaccurate. The present frequency control issues must be addressed as a critical priority for power system security and must be rectified before creating new market mechanisms. A major and fundamental review of the frequency control regime is required and this process should account for the introduction of co-optimisation of FFR services.

More specific feedback on the Directions Paper is below.

***Defining FFR services with distinction from synchronous inertia services will create barriers to entry for new technologies***

However, the Commission should be concerned that the use of prescribed inertia standards or minimum thresholds may potentially lock in the use of synchronous technologies, when lower-cost alternatives may be available now or in the future. The Commission should take care not to define these services, or create an implementation framework that secures one technology over another.

One area where this is evident will be the definition of the services used to provide FFR vs inertia. While the Commission has set out the characteristics of FFR services, it will be important to compare these to synchronous technologies in order to define both services. For example, the time delay introduced by the wide governor deadband settings in the operation of thermal generation (i.e. the absence of primary generator control inside the normal operating frequency band<sup>3</sup>) is analogous to the measurement and signalling delay in FFR-enabled technologies. Recovery periods are also inherent in all generation technologies as the lost kinetic energy in the rotating masses must be recovered after the event<sup>4</sup>.

Given the Commission's opinion that FFR is a 'fledgling' technology, it is expected that the technology and AEMO's understand of its integration into the NEM will change over time. Thus, service definitions should be given flexibility to change and adapt over time. While a rules-based performance criterion must consider this, the National Electricity Rules' 'minimum-negotiated-automatic' framework to setting performance should be utilised to enable this evolution.

Language that draws distinctions between technologies and is perpetuated through the National Electricity Rules will create barriers to the use of new and emerging technologies in

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<sup>2</sup> CEC, Issues Paper submission; CEC, Finkel Review Submission

<sup>3</sup> K. Summers, Fast Frequency Service – Treating the symptom not the cause, February 2017

<sup>4</sup> DGA Consulting, International Review of Frequency Control Adaption, 2016, page 21

the future. As the operating and response characteristics are not unique to FFR technologies, it will be critical to ensure that equivalent representation of them is given when defining the service that these technologies are providing. The definitions of services must remain focussed on the need of the power system while providing scope to ensure that any technology that can fulfil this need is not prevented from doing so.

***Current FCAS market design will inhibit the use of FFR***

As raised previously, the current design of the frequency regime prevents the use of primary governor control within the normal operating frequency band, and some market participants have been penalised for doing so<sup>5</sup>. Participation by FFR providers will be inhibited while the FCAS regime deters this operating capability across all participants.

As a result, the current form of the FCAS regime is not sustainable if these technologies are to be expected to play a pivotal role in the future. This issue needs to be addressed as a matter of priority.

***AEMO's role in deploying new FFR technologies must be clearly stated and supported***

To date, the NEM has made poor use of diversity to manage frequency, tending instead to rely on synchronous generation. Diversity in technological solutions will be critical to ensuring power system security in the future as the generation mix changes.

The proposed role of AEMO in testing and introducing FFR technologies alongside the obligation on TNSP's to meet minimum thresholds for inertia services would require clear accountability placed on AEMO to deliver this outcome.

The Commission needs to provide AEMO with a clear mandate to investigate and explore new technologies in their role in diversifying the scope of system security services, including enabling appropriate funding and cost recovery avenues available to AEMO. Rule 4.3.1 of the National Electricity Rules should be updated to include a clear mandate for AEMO to ensure technological diversity in the provision of system security services.

This framework should require frequent reporting on progress towards wider uptake of FFR services and the capability of technologies deployed across the market, including benchmarking of the capability of the technologies against AEMO's expectations, progress, lesson's learned and next steps in AEMO's trials and technology testing.

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<sup>5</sup> AER, CS Energy Enforceable Undertaking, 29 June 2016.

This framework must look beyond FFR and focus on enabling a power system security framework with a focus on diversity. This will require a strong role for AEMO to inform the market and adapt to new technologies and solutions.

***TNSP obligations must ensure new technologies are part of the solution***

Alongside clear reporting by AEMO, the Commission's preferred approach to require TNSPs to meet minimum baselines of inertia would likely deter the use of new technologies. TNSPs are inherently risk-averse and have a demonstrated orientation towards prudent solutions to network services. However, this approach to the minimum levels of a service may deter FFR from having a significant role in the future.

If carried through to the draft rule, this approach must include a strong obligation to report on the uptake and deployment of FFR capability. Where AEMO has identified opportunities to deploy FFR within the minimum standard, the TNSP must also be required to adopt this solution. Reporting obligations should also be placed on the TNSP to present arguments and supporting information about the site-specific need and the most cost-efficient solution.

***FFR capability obligations require definition***

The Commission has made a strong statement of opinion that FFR is not a well understood or demonstrated technology, whilst indicating a direction to require all new non-synchronous generators to provide this capability. A clear set of expectations on equipment manufacturers must be established through the generator performance standards in order to guide the immediate deployment of FFR capability.

In parallel, the Commission should be investigating the control philosophies applied to primary governor control on synchronous generating units, as the NEM would expect that a technology-neutral approach applies an equivalent obligation on this technology.

***The Reliability Panel must set calculation procedures based on frequency changes, not inertia***

The Reliability Panel is responsible for developing standards and guidelines associated with the management of system security. However, the Commission has recommended that the procedures for calculating the minimum inertia levels be enshrined in the National Electricity Rules.

There is a need to ensure that the NEM can respond quickly to changes resulting from the technological transformation currently underway. Because these changes have a direct

influence on the inertia levels in the system and the interaction between generation and demand, the Reliability Panel should be the curator of the calculation procedure. Further, defining 'minimum inertia levels' in this procedure will lead to barriers to entry from other providers. The procedure should clearly stipulate the outcome of meeting minimum rates of change of frequency or absolute frequency deviations, not minimum inertia levels.

The outcomes of the procedure should also be reported on in the Reliability Panel's Annual Market Performance Review consultation process, as doing so will enable stakeholders to consider them and provide comment on the direct market or technical impacts.

***Prescribed services for inertia/FFR are appropriate but competition should be encouraged***

Should TNSPs be obliged to meet minimum standards, their provision should be a prescribed service. The major technological change currently occurring in the NEM requires foresight to plan and manage. This needs an investment framework that deals with the introduction of new technologies, alongside the withdrawal of established technologies. Consumer-funded investment is appropriate within defined standards, as proposed by the Commission's model.

There is unlikely to be significant benefit from the major layers of complexity added where such solutions are integrated within the NEM's dispatch arrangements. Further, causer-pays arrangements are nonsensical where the major causer's are large generators de-registering from the market.

The rule change would need to ensure these services can be contracted from third parties, rather than provided directly by the TNSP. The Network Support Control Ancillary Services framework should be considered to provide these services. It will also be necessary to ensure that AEMO, the Reliability Panel and the AER have strong roles in assessing solutions that are implemented.

***RoCoF responses must be understood to provide inertia services***

The Commission has noted that the RoCoF withstand capability of generating units commissioned prior to 2007 is undocumented and largely assumed based on experience (although operating point influence on RoCoF withstand capability remains unknown). Inertial contribution from these units to meet a minimum inertia level requires greater confidence in performance, given the fundamental nature of system security. Therefore, it is unacceptable that generating units within unknown or undeclared RoCoF withstand capability might contribute to firm system security inertia limits.

The Commission and National Electricity Rules must be clear that only generating units with clearly stated and known RoCoF performance standards may participate in the provision of inertia services.

***System strength is a localised problem that will require localised solutions***

While the recommended approach to managing system strength is looking to marry inertial and system strength solutions, care should be taken to ensure that the National Electricity Rules do not focus on promoting investment in such solutions by connecting generators where alternatives may be effective.

In practice, there are likely to be limited instances where a synchronous condenser is the preferred solution for a connecting generator, as the minimum system strength threshold would provide a baseline, above which connecting generators can take actions to limit their impact on system strength. For example, a wind farm may include braking resistors or other equipment in order to manage impacts on the local network or neighbouring generators.

It will be critical that the National Electricity Rules provide ample opportunity for the connecting party to manage this risk and cost, rather than expecting the local TNSP to contract for the provision of these services in all cases. Indeed, the National Electricity Rules already carry an obligation in cl. 5.3.5(d) that prevents a connecting generator from doing harm to the performance standards of an existing generator. It is unclear why an additional system strength obligation is required to be considered.

Similarly, system strength obligations should be limited to the transmission network. They can already be managed locally within the distribution network generator connections arrangements and procedures (cl. 5.3.5(d)). Given there is thousands of kilometres of weak distribution network in the NEM blanket minimum standards, if applied to distribution networks would have major investment ramifications for DNSPs (consumers) that have not been justified by this review.

***Minimum 'Short Circuit Ratio' (SCR) standards will lead to over-investment in synchronous condensers***

The prevailing thought behind applying minimum SCR levels to TNSPs is at odds with the needs of the power system and will likely lead to inefficient investment. The Commission should be focussing such requirements on enabling the secure operation of existing protection, generation and equipment. This approach would localise the solutions and enable new technologies or providers to provide the required services as needed and would only expand existing requirements on TNSPs to ensure the secure operation of the network.

***Allocation of system strength must be transparent and timely***

The allocation of system strength to a connecting party has to be done under a transparent approach and calculation methodology, with the information provided to a connecting party in a reasonable timeframe. The power quality (harmonics and flicker) allocation processes already set a precedent that should be replicated for system strength. In addition, as the TNSP may be the provider of the system strength through meeting its inertia requirements, the rules should be clear that this would be a negotiated service provided under the negotiating guidelines and with scope for the use of the independent engineer, as set out by the Transmission Connections and Planning Rule Change.

***Short circuit ratio (SCR) standards must be technology neutral if applied***

The Commission's proposal to consider applying minimum SCR standards to inverter-based generation omits the stability limits of synchronous plant. If a standard is to be applied, it should be technology neutral and apply to all generating equipment (including synchronous compensators). Examples include the United Kingdom's National Grid Code CC6.3.2 which applies to synchronous generators.