



EnergyAustralia

LIGHT THE WAY

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Dear Commissioners

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EnergyAustralia is one of Australia's largest energy companies with over 2.6 million electricity and gas accounts in NSW, Victoria, Queensland, South Australia, and the Australian Capital Territory. We also own and operate a multi-billion dollar energy generation portfolio across Australia, including coal, gas, and wind assets with control of over 4,500MW of generation in the National Electricity Market (NEM).

EnergyAustralia is supportive of the Commission's efforts to review frequency control and we welcome the opportunity to comment on the Frequency Control Frameworks Review (the Review). As highlighted by the Commission in the Review, frequency distribution has changed markedly between 2001 and 2017 and this presents challenges for managing system security in the NEM. EnergyAustralia is aware of some of the issues caused by the flatter frequency distribution within the normal operating frequency band (NOFB), however, the system security impacts are yet to be quantified. In our view, the goal of frequency management needs to be clearly defined before solutions are developed to improve frequency control. While our submission focuses on highlighting the questions that need to be answered by this Review, we have provided comments to some of the questions posed by the Commission in the attached document.

Extensive work has been done by the Commission and other market participants to provide information on observed frequency changes, the underlying causes and possible approaches to addressing the changes. Discussion of some of the negative consequences of wider frequency distribution, such as increased wear and tear on units and increased difficulty in arresting frequency deterioration, have also been provided. However, an assessment of what characteristics of system frequency would represent efficient frequency management in the NEM has not been completed.

Based on the work to date, it is not clear whether it is more important that the normal operating frequency band is tightened, or that the shape of the frequency distribution is closer to that seen in 2001. Solutions presented by the Commission and others appear targeted towards returning frequency distribution to prior conditions. However, there has been less consideration of whether this objective is appropriate, necessary, reflective of an efficient market outcome, or feasible given the expected future generation mix.

One of the key aims of this review should be to consider what constitutes an acceptable standard for frequency control. Determining the objective for frequency control will naturally lead to greater clarity on which potential solutions are most appropriate for delivering an improved level of security at least cost for consumers in line with the National Electricity Objective.

As with the concept of *good electricity industry practice*¹ as defined in the National Electricity Rules (NER), a similar concept of good frequency control could provide an overarching principle against which new mechanisms or markets are assessed. As part of this assessment we would suggest that some fundamental questions need to be answered, including:

- what acceptable distribution of frequency around the 50Hz level is acceptable (i.e. the shape of the distribution within the NOFB), and
- what lower and upper bounds of that distribution are required to support system security.

Consideration of these elements should help to determine which issues are the most important to rectify or improve through new mechanisms or markets.

In developing the frequency control framework, the causes of low frequency oscillations with the NOFB should also be investigated. Persistent oscillations, such as those seen on 10th February 2017, indicate an unstable system and the causes need to be analysed and mitigated.

As with the Commission's complementary System Security and Reliability Reviews, we note the need for ongoing coordination on related topics by other market bodies. This includes the work being undertaken by the Reliability Panel in reviewing the Frequency Operating Standard.

Clear objectives for frequency control, developed by this Review, could then provide a robust framework against which changes to the Frequency Operating Standard (FOS) can be assessed. The Commission has highlighted the importance of primary frequency control where generating units automatically respond to frequency deterioration when the frequency exceeds a pre-defined band. By first determining the objective, then defining the bands, the quantity of primary frequency control that is needed would be more easily determined and then procured. In addition, this Review should consider whether more regular reviews of the FOS will be needed, in the short to medium term, to accommodate the challenge of operating an evolving grid and generation mix.

We support work done by the Commission to review international power grids to inform determination of effective frequency management. Comparison of international approaches to frequency settings and control frameworks will provide useful guidance on determining what constitutes good frequency control under various conditions. However, as each grid is unique, international experiences may not indicate the appropriate approach to take in the NEM. Additionally, the goal of the Commission should be to implement efficient frequency management strategies. Technical best

¹ Chapter 10, National Electricity Rules

practice should not be the primary objective as this is likely to lead to unnecessarily high costs for consumers with minimal marginal benefit.

The development of the concept of good frequency management will ensure that we do not impose a higher standard of control, at great cost to consumers, than is required to minimise the potential risks. In developing the frequency control framework, the Commission should take care to clearly define the problem that is being addressed. It should then work to develop a framework against which an efficient balance of the costs of frequency control mechanisms and system impacts of looser control can be assessed.

If you would like to discuss this submission please contact Chris Streets (03 8628 1393, chris.streets@energyaustralia.com.au) or Georgina Snelling (03 8628 1126, georgina.snelling@energyaustralia.com.au).

Regards

Melinda Green

Industry Regulation Leader

Attachment – Comments on specific questions raised by the Commission

Question 3a: What are the likely impacts on frequency of increasing proportions of non-dispatchable capacity, and reducing proportions of scheduled generation?

EnergyAustralia anticipate that frequency control would deteriorate without increased use of primary frequency control. AGC alone cannot manage large and rapid frequency changes.

Question 4: Are there other drivers of change affecting frequency control?

Rule changes to introduce mandatory inertia levels² and other associated rule change proposals are likely to impact on frequency control requirements. Inertia in the system reduces the requirement for faster frequency response.

Question 6: Assessment approach

As outlined earlier, EnergyAustralia suggests the Commission conducts further assessment on what characteristics of frequency are needed to ensure security of the NEM.

Question 8: Are there any other risks that stakeholders are aware of with respect to degradation of frequency control as represented by the flattened frequency distribution within the normal operating frequency band?

If the current distribution shape is maintained but is compressed within a narrower NOFB, will the system be sufficiently resilient to respond to a contingency is the system is operating at the edge of this NOFB (compared with the ability to respond if the system is at 50Hz)?

Question 10: Comments on mandatory primary frequency control

One suggested approach to improving frequency control management is to amend the generator technical performance standards to reintroduce a governor response capability. As outlined in the main body of our submission, we strongly encourage the Commission to first determine the objectives for frequency control in the NEM before assessing potential changes to the regulations. However, primary frequency control is a key component of system management and changes made to strengthen the governor response will improve system security.

To strengthen the effectiveness of primary frequency response, standards are required to ensure that generators operate consistently and are not acting against each other causing frequency to oscillate. Generators respond to locally observed frequency and if governor standards are not consistent across the NEM, individual generators are likely to respond differently to frequency deviations and 'hunt' against each other, resulting in poor frequency control. The use of primary frequency control should therefore be

² Managing the rate of change of power system frequency rule change, <http://www.aemc.gov.au/Rule-Changes/Managing-the-rate-of-change-of-power-system-freque>

standardised to fully harness the benefits of its use and these standards should be consistent across jurisdictions.

The Commission has also discussed the reintroduction of a mandatory response requirement. EnergyAustralia considers that, where possible, primary frequency control services should be procured through a market mechanism. As primary frequency control comes at a cost to market participants, is valued by the NEM, and is measurable; there should be incentives for participants to continue to provide that service. However, we acknowledge that where a well-functioning market cannot be established to procure the service, a mandatory requirement may be appropriate where the costs of establishing the response mechanism are not excessive.

In developing standards for primary frequency control, the Commission should carefully consider the design of the standards and the applicability of changes to the existing generation fleet. Modifications to provide mandatory response may not be cost effective for all generators. Should the Commission prescribe a mandatory response, a framework should be created to assess the cost effectiveness of changes required to provide the service. That is, the capital cost of meeting a specified standard should be considered and obligations should only be implemented across the existing fleet where significant capital investment is not required to meet the standard. However, where significant capital investment is required, the standard should be applicable if a generation asset is upgraded or modified and the negotiated connection agreement is reopened under the existing NER clause 5.3.9.

In principle, we support changes that would prescribe a 'do no harm' requirement for new generators connecting to the network. The 'do no harm' criteria will be difficult to apply to distributed energy resources (DER). Currently, it is assumed that these generators are too small to have an impact on the power system, but in aggregate can act in concert to detrimentally impact system strength and security. As the number of DER installations increase, the power system cannot be seen as an 'infinite bus' that will absorb all changes without impact. Introducing higher standards for DER is likely to increase the costs of individual installation and the total costs should be weighed up against the cost of system-wide solutions to issues caused by non-standardised DER installations.

Question 10d: 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 per cent of generators registered capacity?

In recent years generators have been running with 'valves wide open' to capture all available value in the energy market, leaving them with reduced capability to increase output in response to a contingency. Introducing a mandatory requirement to reserve a small availability for frequency response has merit, however, it will cause an increase in costs of customers due to lower levels of generation for energy and this trade-off needs to be assessed.

Question 14b: What metrics should a frequency monitoring report include?

The reporting matrix should include:

- a) Frequency distribution during high, low or variable wind conditions.

- b) Average frequency by trading interval, disaggregated into work days and non-work days. This can be used to identify if there are any temporal patterns to frequency changes caused by daily load movements, or if changes are driven by other factors such as mains power clock adjustment.

Question 16: What are your views on the indicative approaches to varying the design of FCAS services, and on other potential changes?

EnergyAustralia takes the view that existing Frequency Control Ancillary Services (FCAS) markets are sufficient to accommodate the use of fast frequency response (FFR) and that creation of additional services is not required, nor justified, within the Frequency Control Framework at this time.

FFR can currently participate in the FCAS market by bidding into the 6 second market. Market based services are only effective when there is enough competition to drive the provision of cost effective services. At present, there is not enough potential supply, nor diversity of providers, to give us confidence that this market would function well. The introduction of a poorly functioning market is likely to unnecessarily increase the costs of frequency management. Care must be taken by the Commission to ensure that suitable market conditions exist before introducing a market procurement approach. Although, the introduction of a new market should be considered in future reviews when a significant pool of FFR providers is likely to be present.

Question 18a: Is the existing FCAS framework sufficient to maintain frequency as greater proportions of non-dispatchable capacity enter the power system?

As outlined earlier, EnergyAustralia think that a frequency control framework needs to be clearly articulated before changes to the FCAS framework and FOS can be assessed. However, it is likely that primary frequency control standards, fast frequency response and changes to the FOS will be required in the future as the generation mix changes.

Question 18b: Would it be more efficient to improve the forecasting of non-dispatchable capacity to reduce imbalances in supply and demand, or to rely on higher levels of regulating FCAS to manage those imbalances.

EnergyAustralia think that effort should be given to both approaches. By definition, forecasts will never be correct, but work can be done to improve their accuracy in conjunction with changes to regulation FCAS.

Question 19a: Do you consider existing cost recovery arrangements for contingency FCAS to be appropriate?

The current contingency FCAS recovery mechanisms will need to be re-examined in the context of changes to FCAS and the FOS. Specifically, as loads become more variable and responsive to market conditions, the allocation of cost recovery for services needs review.