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Australian Energy Market Commission
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Frequency control rule changes Directions Paper

Snowy Hydro Limited welcomes the opportunity to comment on matters raised in the Directions paper from the Australian Energy Market Commission (the Commission) on the Frequency control rule changes.

The most urgent issues facing the NEM is the need to address 'missing markets' for essential system services. The growth of variable renewable energy and the retirement of thermal capacity has increased the need for essential system services to keep the lights on so the power system can remain secure and reliable.

Snowy Hydro welcomes the frequency control rule changes which highlights the need for such services is a physical reality and that the market must provide sufficient incentives to ensure they are adequately supplied. As a general principle, we believe that a market-based approach enables a technically sound solution through the most efficient allocation of resources in the long term. The development of an efficient and effective policy mechanism requires a performance-based and incentivised approach consistent with the value these mechanisms offer the system. This will assist AEMO and market participants through enhanced transparency.

The Commission has correctly noted that a mandatory requirement for primary frequency control is not a complete solution and that arrangements needed to be made to incentives and reward the provision of the service. Ther Mandatory Primary Frequency Control Ancillary Services (FCAS) rule change is inadequate for the long term efficient operation of the NEM. Given the transformation underway, not all services required for the efficient, secure and reliable operation of the changing system are being valued or appropriately procured. As a result, the power system is experiencing or approaching binding limits across a range of technical and economic parameters.

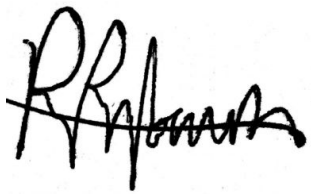
Appropriate incentives that align with existing market structures is the most cost effective and efficient means of supporting the provision of frequency control and addressing current concerns with frequency performance. A market based mechanism, appropriately aligned with power system stability fundamentals, enables a technically sound solution through the most efficient allocation of resources. Additionally, a technically sound solution is more likely to be realised through industry consultation rather than one directed by AEMO.

Snowy Hydro's views on the frequency control rule changes that are most critical to achieving a successful long-term NEM are as follows:

- The need for ancillary services such as more flexible frequency control services, voltage and reactive power control, system strength, and inertia will continue to increase as the generation mix continues to change.
- An inertia market is required, separate to an FFR market, to ensure that the current NEM energy-only design delivers ongoing security and reliability of supply as the energy transition continues. Further assessment needs to be undertaken in an inertia spot market like the FCAS market, where generators and synchronous condensers are evaluated.
- The fast frequency response market ancillary service should operate in a similar manner to the existing market arrangements for FCAS. We therefore support Option 1 which proposes new market ancillary services to procure FFR FCAS.
- The differential pricing proposal is not supported. The proposal which would allow for ancillary services prices paid to each participant to vary based on a scaling factor that reflects the value offered by that individual participant would be complex to implement.
- The Mandatory primary frequency rule should sunset in June 2023 with a new market for ancillary service being formed similar to existing market ancillary services.
- Our preference is to use existing FCAS mechanisms via change to Normal Operating Frequency Band (NOFB) which would be the simplest approach to implement
- There is no market failure that justifies mandating the free provision of primary frequency control. We believe there will be flow on impacts to current market based FCAS services and AEMO will seek to scale back the amount of those services procured from providers.
- Under no circumstances should the sunset approach for the Mandatory Primary Frequency Control rule change be extended. Providing primary frequency response through the mandatory approach represents a cost in terms of wear and tear and efficiency and the mandatory proposal increases the 'workload' on the remaining generators providing this service which in turn encourages these generators to stop providing the service.

Snowy Hydro appreciates the opportunity to respond to the Commision on the Directions Paper on the Frequency control rule changes and any questions about this submission should be addressed to panos.priftakis@snowyhydro.com.au.

Yours sincerely,



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Fast Frequency Response (FFR) Market Ancillary Service

Inertia market still required

The Directions Paper correctly acknowledges that "FFR" is not a direct substitute for synchronous inertia[1]. *"While FFR can help control system frequency during low inertia operation, a minimum quantity of synchronous inertia will continue to be required over the medium term."*[2] *AEMO's Fast Frequency response specification and consultation report clearly identified that FFR and inertia are delivered via different physical mechanisms and are not directly interchangeable*[3].

The need for inertia will continue to increase as the generation mix continues to change. As is now well understood, the retirement of thermal generation and increase in inverter-based generating systems has reduced inertia. The main issue now is that the current categorisations of the services are not always fit for purpose, particularly in potential islanding areas where there can be large amounts of variable renewable energy (VRE) generation and low inertia. With increasing levels of inverter-based generation, the inertia of some subsystems like North Queensland, Tasmania and South Australia are already low at times of high VRE generation. This will worsen in the future. As inertia reduces, frequency control becomes more challenging as there is less time available to address imbalances in supply and demand. An inertia market is therefore required to ensure that the current NEM energy-only design delivers ongoing security and reliability of supply as the energy transition continues.

The effectiveness of an inertia market will depend on its ability to provide adequate incentives for the provision of the service. Snowy Hydro understands the difficulty in integrating an inertia price within the energy market price, however we believe further assessment can be undertaken in an inertia spot market like the FCAS market, where generators and synchronous condensers are evaluated.

The synchronous services markets proposes to address this issue by integrating the dispatch of a "synchronous service" with the existing energy and FCAS spot markets. It is important that the proposal is effective in addressing a number of key issues identified with our current system strength frameworks with minimal disruption to the market. We support the Commission's view that the complete arrangement for the valuation of inertia will not be undertaken through the FFR rule change and should be implemented and assessed separately.

Finally the Commission should assess the effectiveness of the proposed inertia and FFR markets working together and that a mandatory primary frequency control rule change does not distort the performance of these markets removing their effectiveness.

Concerns around the increased electricity costs

[1] AEMC, Frequency control rule changes, 17 December 2020, pp19

[2] AEMC, Frequency control rule changes, 17 December 2020, pp19

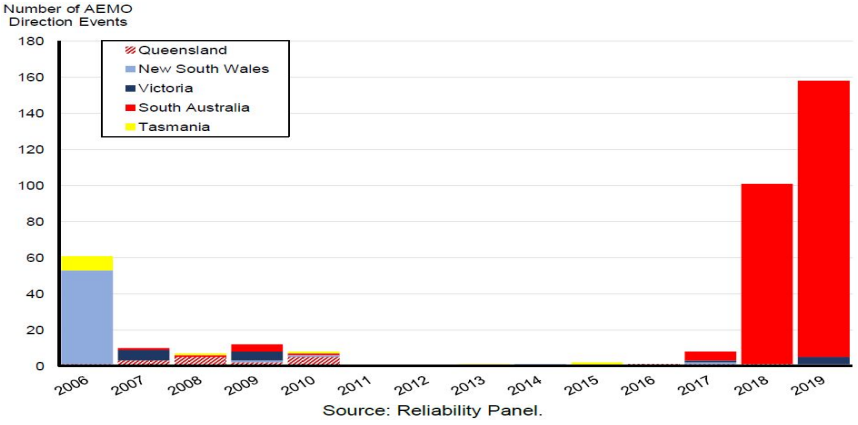
[3] AEMO, Fast frequency response specification – Release of GE energy consulting report, 15 March 2017, p.1-3.

Concerns regarding the increased electricity costs due to the introduction of new market arrangements for FFR have been well addressed by the Commission. The Commission notes that economic analysis indicates that the introduction of an FFR service will instead likely mitigate future increases in the costs of frequency control services and will likely lead to more efficient outcomes in the wholesale market.[4]

In recent years we have seen a troubling development in the form of increased market intervention that should be a greater concern on cost impacts. The greater uncertainty, variability and growing proportion of variable renewable generation (on-grid and behind the meter); an aging fleet of thermal generation; and unexpected retirement of capacity increasing risk of forced outages has increased the amount of interventions by the operator. These interventions have been ultimately funded by consumers and are more expensive alternatives than operating an efficient market to solve the system issues such as frequency control and inertia.

This is a case of a "Missing Market" (i.e. unpriced System Strength services vis-à-vis inertia and voltage stability) and not about increasing costs on consumers. Only identification and pricing of the relevant services and constraints will achieve this. For example, looking at the SA example, a key precipitating factor in the recent rush to high levels of interventions was triggered by the much publicised consumer distress during the SA blackout event in 2016. The long run, least-cost solution to inadequate System Strength proved to be the installation of four synchronous condensers (at a cost to consumers of $166 million) to reduce future AEMO interventions[5].

Figure 1: Number of AEMO Interventions [6]



FFR Policy Options

As synchronous inertia in the power system decreases, the rate of change of frequency (RoCoF) following contingency events increases, which increases the need for a faster acting frequency response to meet the requirements of the power system frequency operating standard. Fast-acting technologies can manage risks associated with system frequency in a low inertia system, including the management of RoCoF. Therefore the need for a fast frequency response market is required.

[4] AEMC, Frequency control rule changes, 17 December 2020, pp36

[5] Paul Simshauser and Joel Glimore, 2020,"Is the NEM broken? Policy discontinuity and the 2017-2020 investment megacycle" University of Cambridge, Energy Policy Research Group

[6] Paul Simshauser and Joel Glimore, 2020,"Is the NEM broken? Policy discontinuity and the 2017-2020 investment megacycle" University of Cambridge, Energy Policy Research Group

Snowy Hydro believes that the fast frequency response market ancillary service should operate in a similar manner to the existing market arrangements for FCAS. We therefore support Option 1 which proposes a new market ancillary services to procure FFR FCAS. AEMO should determine the specifications for the FFR service in the Market Ancillary Services Specification (MASS) and the market would be open to generation, loads and aggregators. Introducing the FFR service could help reduce overall volumes of services required to operate the system.

This process would mean that two new FFR services would operate alongside the existing eight FCAS markets which could facilitate co-optimised dispatch of FFR with energy and contingency services. This would increase transparency in relation to reporting of market dispatch outcomes including service prices and quantities due to the increased number of service categories.

Snowy Hydro supports existing pricing arrangements for market ancillary services. This includes utilising competitive bidding by market ancillary services providers to set the price that is paid for provision of each of the FCAS products in each dispatch interval. The Commission notes that the existing arrangements would recognise the speed at which FCAS can be provided and a faster service will be credited with a higher MW enabled receiving a higher payment than a slower response generator.

The differential pricing proposal is not supported. The proposal which would allow for ancillary services prices paid to each participant to vary based on a scaling factor that reflects the value offered by that individual participant would be complex to implement.. Tailoring the price to the specific unit characteristics for each service provider would not provide for an efficient pricing outcome rather it could provide a barrier to entry for new technologies as it would be unclear how AEMO would determine the scaling factors which could incorrectly scale them.

Primary Frequency Response Incentive

The mandatory requirement for primary frequency control is not a complete solution to sufficiently meet the operational needs of the power system now and into the future. The mandatory approach needs to be replaced by a market or incentive based arrangements for primary frequency control.

The NEM has successfully acquired frequency control services from spot markets for twenty years and for this reason Snowy Hydro strongly opposed the Mandatory Primary Frequency Control rule change, which was not a long-term solution. The system operator can't continue to free ride on the existing stock of synchronous generation as a way to procure system services. The requirement that it be supplied by generators as part of their technical requirements merely disguises its cost and does not provide a sustainable basis for future supply. There needs to be recognition of the role of incentives. It is therefore concerning that the Commission appears to contemplate the continued use of Mandatory Primary Frequency Control and any extension to the explicit sunset date of 4 June 2023.

There are types of generation which are well suited to providing primary frequency control. However, some generation capacity is not, without installation of additional equipment, which risks making the projects unviable and stalling the development of

new capacity. In addition to negatively impacting investment, the mandatory proposal violates the technology neutrality principle that underpins the NEM leading to inefficiencies, as it would discourage other, more suitable technologies. AEMO had highlighted in their primary frequency control update that the changes in frequency control settings are *"expected to result in changes in power system frequency performance, including reducing the contribution to the need for regulation FCAS from larger generating systems."*[7] This highlights that the mandatory primary frequency control change is essentially substituting the paid-for service with one provided by regulatory fiat, distorting investment and the proposed essential system services markets.

The negative impacts of the mandatory rule change are also highlighted by the Commission which note the increased operating costs due to inefficient allocation of responsive plant and the cost of primary frequency response being passed through to the energy market market that could place costs directly on the consumers.[8]

PFR Policy Options

It is for this reason, Snowy Hydro does not consider the unrewarded mandatory PFR option on all capable plant to a near-zero deadband as a sustainable long term policy option. The rule should sunset in June 2023 with a new market for ancillary service being formed similar to existing market ancillary services. This would allow AEMO to prescribe the required amount of each type of service.

Our preference is to use existing FCAS mechanisms via change to Normal Operating Frequency Band (NOFB) which would be the simplest approach to implement, as it is done now. Under this approach, the Reliability Panel would tighten the NOFB bounds from ±150 mHz t [±50mHz] and oblige AEMO to achieve it under their FCAS existing markets within the existing (post sunset) rules.

Design element	*Options*
Existing Regulation FCAS (secondary frequency control)	AEMO would increase procurement and tighten AGC tuning targeting the more conservative NOFB standard.
Existing Contingency FCAS (PFR)	AEMO would respecify FCAS Contingency Services MASS to operate from the narrower edge of new NOFB. Contingency FCAS' would activate in what is presently considered "normal" (i.e. non-contingency) conditions.

The benefits of such an approach would include, as noted by the Australian Energy Council Primary Frequency Response Incentive Arrangements submission[9]:

- Uses existing frameworks, and potentially requiring minimal regulatory and AEMO system changes.

[7] AEMO Communications, 24 September 2020, *"Primary Frequency Response implementation update"*
[8] AEMC, Frequency control rule changes, 17 December 2020, pp59
[9] AEC, Sept 2020, " Primary Frequency Response Incentive Arrangements"
https://www.aemc.gov.au/sites/default/files/2020-10/20200922%20AEC%20PFR%20submission.pdf

- Use contingency-based FCAS providers to support frequency performance in non-contingency conditions
- Would provide remuneration to providers of PFR
- Preserves existing FCAS markets, and builds on established co-optimised FCAS services approach.

Other options are more complex in how they would be implemented and avoid negatively impacting the service where there is a step change in how the unit responds at different frequencies.

The Commission correctly notes that under the Mandatory PFR pathway 1 it is likely to lead to under-pricing of PFR[10].The paper however does not demonstrate that the regulated pricing for PFR, which is seen as a simpler alternative arrangement that could respond to the under pricing of PFR under the mandatory narrow band regime, also would significantly under price PFR.

The regulated pricing approach may provide some compensation and could potentially be simple to implement however it is not a long term solution for the NEM. The disadvantages of the regulated pricing approach outweigh any benefits of easy implementation, the disadvantages includes:

- Lessening the perverse incentive in the mandatory requirement to intentionally not build or maintain quality PFR capability.
- No available "fair" price, it will almost certainly be arbitrarily decided based on regulatory bargaining.
- Whilst the mandatory provision remains, providers' bargaining position is very weak so price will likely end up being a nominal quantity, in which case industry acceptance will remain poor.
- Does not discriminate between low- and high-cost providers – no opportunity to incentivise the most efficient system.
- Does not on its own target an efficient level of frequency control.
- The remuneration is not sufficient to remunerate investment.

Norway has a mandatory PFR service, but payment is at a fixed nominal (administratively determined) cost for "residual" service which is demonstrated by the AEC paper. The key disadvantages are noted in the summary of that report.

Mandatory PFR frequency response band options

Snowy Hydro does not support narrow and moderate dead band options. The tighter the deadbands the higher the costs we expect on market participants as it will likely lead to greater wear and tear on machines as well as likely negatively impacting other FCAS markets. AEMO's concerns regarding wider responses causing issues for the NEM can be improved appropriately procuring PFR through a market approach and should continue to be future focused and not relying on mandatory response to manage system security.

Sunset to the Mandatory Primary Frequency Control rule should remain

[10] AEMC, Frequency control rule changes, 17 December 2020, pp92

The inclusion of the sunset does demonstrate the Commission's commitment to the implementation of further reforms prior to June 2023 to appropriately value and reward the provision of frequency control services. Snowy Hydro believes the Commission should continue to take a clear leadership role of developing future arrangements to appropriately incentivise and reward frequency control in the NEM.

Providing primary frequency response through the mandatory approach represents a cost in terms of wear and tear and efficiency and the mandatory proposal increases the 'workload' on the remaining generators providing this service which in turn encourages these generators to stop providing the service. Snowy Hydro would be cautious about any mandatory mechanism that would actually reduce costs. Snowy Hydro has kept pace with the FCAS markets that have been provided and should not be made to pay for the consequence of no further work undertaken by AEMO and the Commission to understand the power system requirements for maintaining good frequency control and to reform the existing frequency control frameworks to meet these needs now and in the future.

The Long Notice Reliability and Emergency Reserve Trader (RERT) was originally designed with a sunset clause, with the Commission extending indefinitely. Allowing the mandatory PFR requirement to be extended indefinitely or in any way would increase uncertainty about future market design changes and what they may look like. This uncertainty will only cost consumers in the end. There needs to be a clear review that provides accountability to all the market bodies before that date.