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Australian Energy Market Commission
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Sydney South NSW 1235

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Project number: ERC0274

Primary frequency response rule changes (Mandatory primary frequency response) Consultation Paper

Snowy Hydro Limited welcomes the opportunity to comment on matters raised in the Consultation paper from the Australian Energy Market Commission (the Commission) on the Primary frequency response rule changes.

Snowy Hydro Limited is a producer, supplier, trader and retailer of energy in the National Electricity Market ('NEM') and a leading provider of risk management financial hedge contracts. We are an integrated energy company with more than 5,500 megawatts (MW) of generating capacity. We are one of Australia's largest renewable generators, the third largest generator by capacity and the fourth largest retailer in the NEM through our award-winning retail energy companies - Red Energy and Lumo Energy.

Snowy Hydro understands the potential implications for the management of power system frequency through the imbalance between electricity demand and supply. If the NEM is facing frequency control issues however changes should be based on the National Electricity Objective (NEO) and the NER's market design principles and not through mandatory requirements in reaction to a low probability contingency event (the lightning strike on QNI 25 August 2018). Rather than mandating service provision, the Australian Energy Market Operator (AEMO) should adapt market processes to cater for the new environment of greater variable renewable energy penetration and generation units' governor responses consistent with the NEO.

Appropriately structured incentives that align with existing market structures continue to be the most cost effective and efficient means of supporting the provision of primary regulating response and addressing the 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 in the long term. Additionally, a technically sound solution is more likely to be realised through industry consultation rather than one directed solely by AEMO. Snowy Hydro therefore strongly opposes mandatory approach proposal.

Snowy Hydro believes that the proposed rule change gives rise to a potentially justiciable constitutional issue. Section 51(xxi) of the Australian Constitution empowers the Commonwealth to make laws with respect to "the acquisition of property on just terms from any State or person for any purpose in respect of which the Parliament has power to make laws...". For these purposes property has been very broadly defined, including as a "bundle of rights capable of acquisition", or as a "legally endorsed concentration of power over resources" (*Telstra Corporation Ltd v Commonwealth* (2008) 234 CLR 210 at 230). The mandatory nature of the PFR and the direct benefit to AEMO as a result of the PFR strongly suggests it involves an acquisition of property, enlivening s51(xxi). If that is correct, then the proposed compensation arrangements must be on "just terms" (as understood in Constitutional jurisprudence), or otherwise the PFR requirements risks being found

constitutionally invalid. We recommend that the AEMC seek legal advice on this issue before finalising the consultation process.

Further to this, Snowy Hydro has additional views and concerns with the consultation paper, which include:

- There is no market failure that justifies mandating the free provision of primary frequency control.
- Providing primary frequency response 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.
- Mandating primary frequency response with no specifications on headroom is likely to result in a random effect on frequency performance
- 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.
- Location of fast acting primary frequency control providers is mainly needed in potential sub-regions, which have low inertia. In stronger parts of the system, the higher costs associated with very fast responding systems is difficult to justify. Snowy hydro therefore believes that a locational signal is apparent and that market based provision of PFR is feasible.
- Snowy Hydro supports the removal of ambiguous wording in NER where primary frequency control is dis-incentivised. Primary frequency control must be prioritised above target compliance.
- AEMO should critically review new optimisation methods and software to deliver efficiency improvements for critical systems that were developed early in the NEM. Examples of improvement areas include fast and accurate recognition of electrical islands and subsequent dispatch of co-optimised Energy and FCAS.
- The rule change makes primary frequency response sources less economically competitive with rooftop and large scale solar PV in order to address an increased risk of future frequency instability that AEMO has identified is caused by rooftop and large scale solar PV.
- 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.

Snowy Hydro appreciates the opportunity to respond to the Consultation Paper and any questions about this submission should be addressed to me by e-mail to panos.priftakis@snowyhydro.com.au.

Yours sincerely,



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Snowy Hydro

Detailed submission

Markets

Primary Frequency control markets have operated since 2001. Since 2001 however there has been a significant increase in large scale variable renewable energy (VRE), a reduction in load growth, increased solar PV penetration at the household level and retirements of coal generation. Existing FCAS arrangements have been designed around the plant mix where high inertia coal, gas and hydro predominated. The market was designed around the characteristics of the power system at the time and have worked well. As the NEM continues to change, we understand that the frequency performance under the normal operating conditions has been deteriorating.

The current arrangements may not reflect the reality of the evolving power system however the benefit of a market-based approach to security and reliability services is that the participants best able to provide the services are appropriately incentivised. Intervention-based approaches, such as the proposed mandatory primary frequency control proposal, are a second-best alternative to a well functioning market that promotes economic efficiency in the long-term interests of consumers. Markets encourage innovation, as opposed to prescriptive approaches which can become obsolete as technology changes. A mandatory approach that will look at historic system characteristics to define mandatory requirements for inertia and governor responses is unlikely to deliver the most efficient outcome compared to creating appropriate market arrangements.

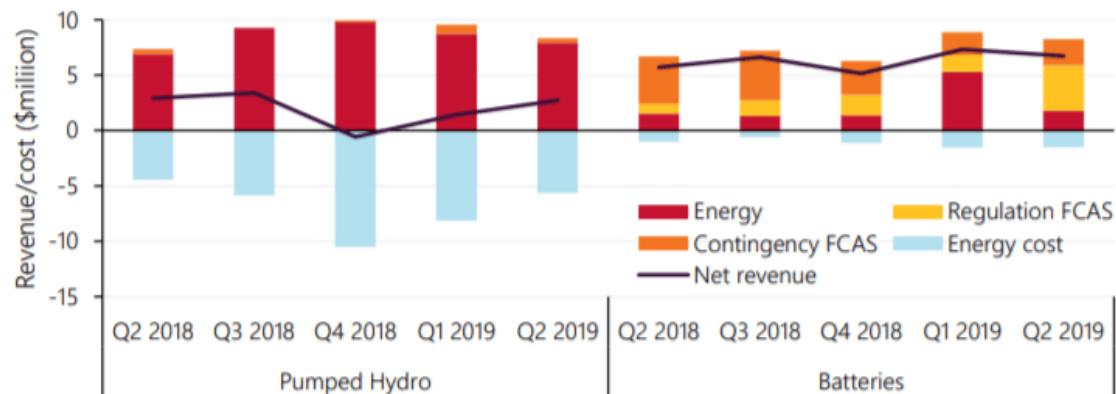
Snowy Hydro does not believe there is a market failure, or a risk of market failure, that justifies the mandating of any contingency frequency services via mandating the free provision of primary frequency control. It also appears likely that mandating primary frequency control in the NOFB will impact the existing regulation FCAS markets further undermining these markets thus creating inefficiencies that are likely to translate to higher prices for consumers in the long term.

Costs

Changes to the existing frequency control framework must ensure that existing generation does not suffer additional costs that were not anticipated at the time of commissioning of the plant, or forced to retire prematurely by the imposition of a mandatory framework that physically cannot be met. Regulatory and market arrangements should be designed to explicitly take into consideration the trade-off between the risks and costs of providing a secure supply of electricity while the technology neutral approach is designed to take into account the full range of potential market and network solutions.

Providers of a primary regulating response should be remunerated for the costs of providing the service. Figure 1 below shows that there are costs in providing frequency control for pumped hydro. Providing primary frequency represents a cost in terms of wear and tear and efficiency but there is minimal financial benefit in providing the service. A reduction in primary frequency service providers in the NOFB increases the ‘workload’ on the remaining generators providing this service which in turn encourages these generators to stop providing the service. The opportunity costs associated with the provision of response and headroom under mandatory approach are likely to be substantial which will not likely be economically efficient and hence not consistent with the NEO.

Figure 1: Regulation FCAS revenue drives batteries' profitability in Q2¹



There should be efficient market arrangements that value services correctly and provide appropriate incentives for behaviour that assists with managing frequency. This approach provides a vision of how an effective FCAS market could operate in the future. The suggestions will require more detailed analysis and testing and some refinements before they are suitable to be implemented as operational systems in the NEM. The consultants report has been formally submitted to the consultation process.

Drivers of frequency performance degradation

The consultation paper notes that “variable renewable technologies such as wind and solar can change output quickly due to sudden changes in localised weather conditions”² with the suggestion that increased levels of future frequency excursion is due to rooftop and large scale solar PV. This is followed by the point that AEMO believe there is insufficient primary frequency response suggesting that primary frequency response should be mandatory and generators price their energy accordingly. Rooftop and solar PV however has no requirement to provide primary frequency response and therefore has no need to increase their energy price.

The rule change is therefore making primary frequency response sources less economically competitive with rooftop and large scale solar PV in order to address an increased risk of future frequency instability that AEMO has identified is caused by rooftop and large scale solar PV. It is therefore important as the Consultation Paper notes that “as these technologies form an increasingly large proportion of the supply mix” that “any PFR arrangements consider the capabilities and performance of these newer technologies adequately”.³

The recent degradation of frequency performance in the NEM

Location of fast acting primary frequency control providers is mainly needed in potential sub-regions, which have low inertia. In stronger parts of the system, the higher costs associated with very fast responding systems is difficult to justify. Adding a ‘very fast’ contingency primary frequency control service is probably of questionable value unless it is located in a part of the network that could be isolated and where fast response times are required. A very fast acting service in Victoria will not help a potential islanding of South Australia or North Queensland, for example. With the increase in inverter technologies and the potential for their software to give these systems a wide

¹ AEMO Quarterly Energy Dynamics Q2 2019

² AEMC, Primary frequency response rule changes, Consultation paper, 19 September 2019

³ AEMC, Primary frequency response rule changes, Consultation paper, 19 September 2019

range of frequency response characteristics, it would appear preferable to model each system's response to frequency in the co-optimisation.

The concerning aspect of the rule change is that it appears to be driven by the Queensland and South Australia system separation on 25 August 2018:

- Primary frequency response of Vic-NSW island appears to have been sufficient as per FOS.
- Primary frequency response in QLD was the issue (along with SA) - although sufficient PFC was provided by QLD generators to reduce QLD frequency to near 50.6Hz immediately after frequency spiked to max level after the separation event.
- AEMO AGC continued to dispatch raise FCAS to QLD when QNI had separated (95MW) until 13:20 (as it was slow to adjust to new network topology post QNI separation).
- AEMO NEMDE contributed heavily to sustained high QLD frequency by continuing to over dispatch high targets in QLD (800MW+).
- This is the fundamental issue as dispatch compliance has been prioritised above compliance.
- The issue appears to be with the setup of NEMDE, not the lack of existing frequency response.

Figure 2: Regional Frequencies and RoCoF during the event

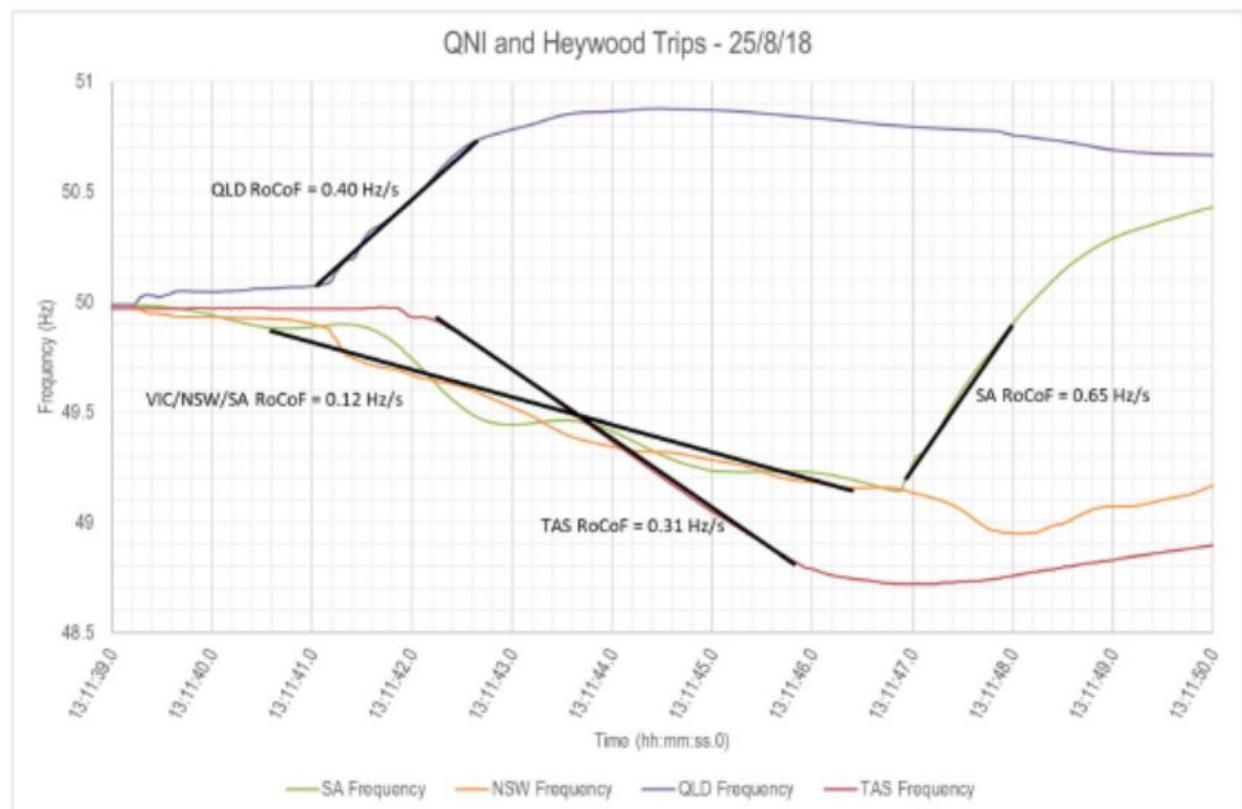
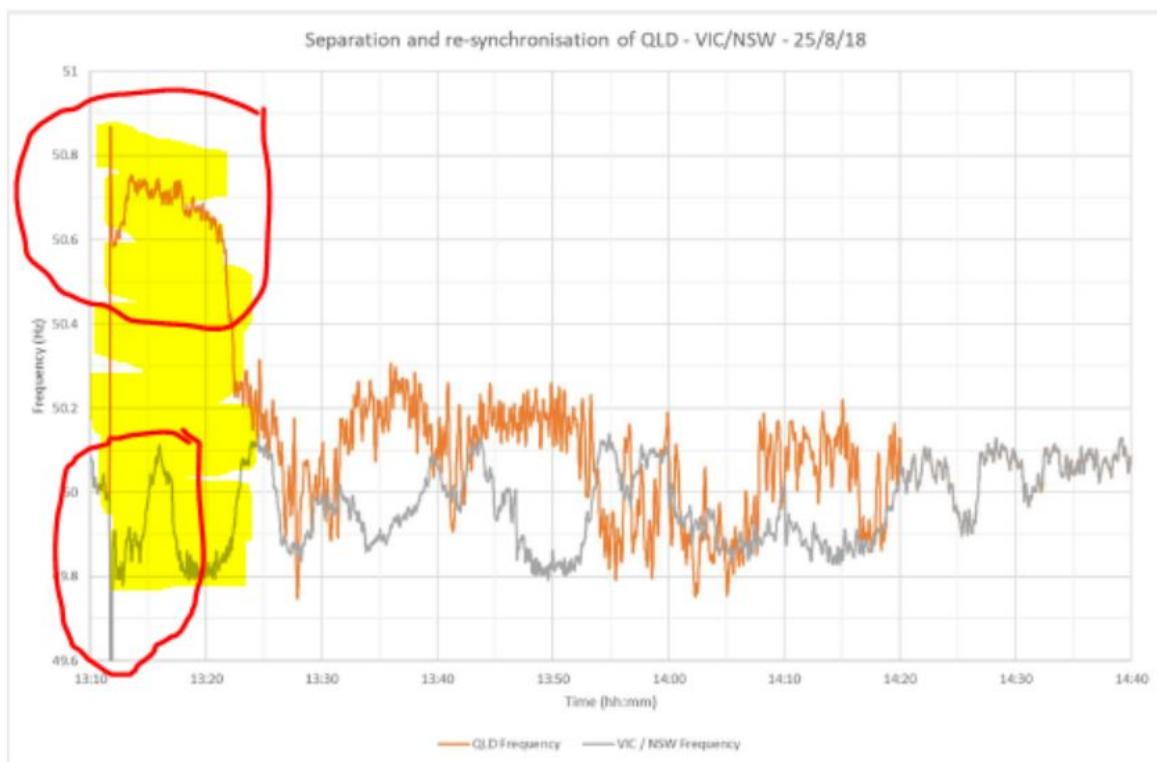


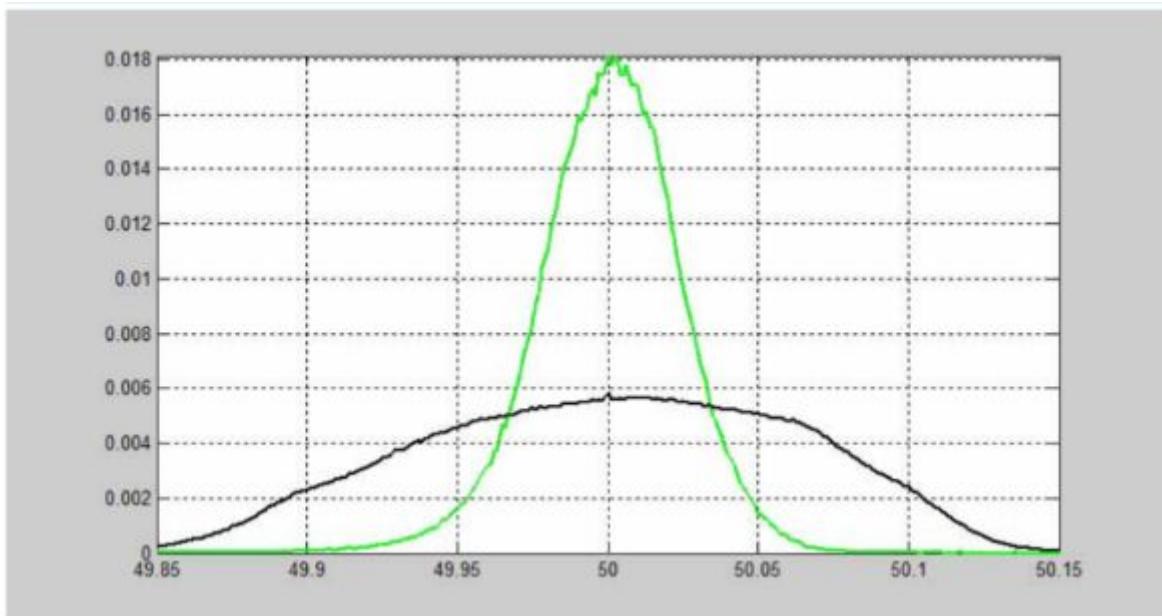
Figure 3: QLD and VIC/NSW Frequency



It is for this reason Snowy Hydro does not believe the mandatory proposal will solve the immediate concerns noted in the consultation paper. Minimum volumes of contingent FCAS is always enabled in each electrically islanded network that can be separated by an interconnector in combination with the global requirement (eg. contingent FCAS requirements for each RRN in addition to global requirement).

The consultation paper shows the frequency distribution within the normal frequency operating band in the NEM between 2005 and 2018, as shown below, highlights the problem with changing frequency. Snowy Hydro is concerned by this comparison as it is a redundant comparison undertaken by AEMO. In 2005 there was a large amount of headroom in NSW and Victoria synchronous generators whereas in 2018 there was minimal on the NSW and Victorian synchronous generators.

Figure 4: Frequency distribution within the normal frequency operating band in the NEM 2005 snapshot v. 2018 snapshot⁴



Snowy Hydro questions the urgency of the mandatory primary frequency rule change in favour of a long term efficient solution for the NEM. In early October 2019, Kogan Creek power station tripped. Initially frequency dropped 400MW equivalent however primary frequency reacted and returned frequency to its initial position within a minute, after which Kogan Creek tripped offline with primary frequency reacting appropriately and stabilising frequency. After the trip, flow was sent north from NSW into QLD, and not the other way. This is another example that the urgency may not be as pressing as AEMO has indicated in recent reports. A long term efficient solution will provide better outcomes for the NEM and consumers.

⁴ Source: AEMO, Removal of disincentives to the provision of primary frequency response during normal operating conditions - Electricity rule change proposal, 1 July 2019, p. 14.