Enel X Australia Pty Ltd
Level 18, 535 Bourke Street
Melbourne, Victoria 3000
Australia
T +61-3-8643-5900
www.enelx.com/au/

Ben Hiron
Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235

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Dear Mr. Hiron

RE: Primary Frequency Response Consultation Paper

We welcome the opportunity to provide feedback on the consultation paper for the *Primary Frequency Response* rule change requests.

Enel X works with commercial and industrial energy users to offer demand side capacity into the National Electricity Market's (NEM) frequency control ancillary services (FCAS) markets. Since October 2017 we have participated in the fast raise (R6), slow raise (R60) and delayed raise (R5) contingency FCAS markets. Following the entrance of Enel X's and other new participants in these FCAS markets, the costs to the Australian Energy Market Operator (AEMO) of procuring these services has reduced significantly.

Enel X agrees that maintaining a stable and secure system is paramount. As outlined in the AEMC's consultation paper, there are a number of ways in which a greater amount of primary frequency control can be procured. It's important to consider potential solutions in the wider context of the transition to a low carbon electricity market with more distributed energy resources and the way in which solutions may support or inhibit this transition.

The two rule change requests submitted by AEMO and Dr Peter Sokolowski both propose mandating the provision of primary frequency response for all capable scheduled and semi-scheduled generation. Enel X is concerned that this approach:

- risks relying on baseload generators for the continued provision of frequency services while reducing incentives for alternative technologies to participate in FCAS markets, potentially leaving a gap as baseload generators become less utilised, less reliable and ultimately retire
- risks locking in dependence on inefficient technologies at a higher cost to customers
- is likely to adversely impact the business case for battery storage, at a time when governments, policy makers, businesses and AEMO are looking to batteries to help resolve multiple market issues

Enel X supports exploring intermediate steps that will halt the deterioration of frequency control and potentially begin to improve it, including AEMO's rule change proposal to remove the disincentives on generators from providing primary frequency response and its existing process to improve its Automatic Generator Control (AGC) to improve the timeliness of regulation FCAS.

Enel X considers that a market-based approach to providing primary frequency control will provide better outcomes in the long term, including by supporting the timely roll-out of battery storage and allowing more efficient technologies to develop and replace baseload generators as they become less reliable and ultimately exit the market. Ensuring we have an operating market is the best way to enable the participation of flexible, lower-cost alternatives that are better suited to the changing operating paradigm.

We acknowledge the immediacy of the issue and, as such, propose that an appropriate interim step is to explore a contracting solution. However, it is critical that work continue on developing a more efficient long-term solution.

We look forward to the opportunity to work through the issues with the AEMC and AEMO to identify a solution that not only maintains grid security, but does so at low cost to consumers in the long term and in a way that supports continued investment in new technologies. This submission sets out Enel X's feedback on specific aspects of the consultation paper. If you have any questions relating to this submission, please do not hesitate to contact me.

Regards

Elisabeth Ross
Consultant, Industry Engagement and Regulatory Affairs
elisabeth.ross@enel.com

1. CONTEXT FOR THIS RULE CHANGE

Enel X notes AEMO's concerns that frequency is increasingly difficult to manage. Enel X agrees that maintaining a safe, stable and secure grid is paramount. However, it is important to consider the potential solutions to the issue in the wider context of the transition to a low carbon electricity market.

The NEM is at a critical turning point. Traditional baseload fossil fuel generators, which have also been the main source of inertia and primary frequency response to date, are becoming less reliable and exiting the market. 5,000 MW of coal-fired generation is expected to reach the end of its technical life by 2030, with a further 9,000 MW expected to retire by 2040[1].

AEMO has stated that as fossil-fuelled generation is replaced with non-synchronous generation, "*frequency control services will need to be increasingly sourced from non-traditional sources (for example, from battery storage systems, demand-based resources, and renewable generation)*"[2].

It is important to provide the right conditions for these solutions to develop and be online in the immediate future, as baseload fossil fuel generators are pushed to lower utilisations, as a result of increasing renewable penetration, and begin retiring as early as 2022. Indeed, as we see increases in renewable penetration, particularly in the middle of the day, typical baseload generators will have decreasing utilisation at these times and thus increasingly be unavailable to provide PFR. Moreover, as these base load generators begin to near their technical life, they may contribute to an increased number of frequency events. **It's critical to lay the groundwork for a secure grid not just today but into the future.**

More generally, there is wide acknowledgement that battery storage will play a key role in the NEM going forward. As AEMO has noted in its Integrated System Plan (ISP):

> *To support the flexibility and system security required of this future energy mix, the ISP shows a strong role for energy storage that can shift renewable energy production at scale and provide firming support as well as system security*.[3]

Similarly, the Energy Security Board has noted in the context of its NEM post-2025 review:

> *The future market design will need to provide sufficient incentives for efficient investment in firm, dispatchable generation or storage throughout this transition.*[4]

Conditions need to be right to allow investment to occur in battery storage. FCAS markets currently provide an important source of revenue that helps make investment in battery storage commercial. Batteries are important not just for system security, but also for providing other services such as firming capacity. In considering potential solutions to improve PFR, it is therefore important to consider the potential impact on the rollout of battery storage, not just in terms of their ability to provide frequency control, but the whole range of services they are expected to provide as the market transitions away from fossil fuel generation.

We note the AEMC's intention that "when the fundamental system security needs are met, the Commission will seek to investigate further improvements to the frequency control arrangements to increase the overall economic efficiency of frequency control in the NEM". The short term and long term cannot be considered in isolation from each other: any solution that the AEMC implements in the

[1] AEMO, Integrated System Plan, July 2018, p21-22
[2] AEMO, Integrated System Plan, July 2018, p68.
[3] AEMO, Integrated System Plan, July 2018, p84.
[4] ESB, Post 2025 Market Design Issues Paper, September 2019, p18.

short term will necessarily influence longer term outcomes. Enel X encourages the AEMC to consider carefully the longer term impact of any solution not just on frequency control but on the wider NEM.

2. UNDERSTANDING THE PROBLEM

We agree that the grid would benefit from AEMO having additional tools with which it can manage frequency.

AEMO has provided evidence that there have been increased deviations in frequency away from 50 Hz and increased excursions outside the normal operating frequency band (NOFB). However, we have not seen any quantification of the costs of operating in an environment of increased fluctuations in frequency. Without better understanding the costs it is difficult to evaluate the relative merits of potential solutions. In particular, it's difficult to know whether a more intrusive regulatory solution such as mandating all scheduled and semi-scheduled generators provide PFR is warranted, versus alternative solutions that may be able to achieve a sufficiently stable grid at lower cost.

In addition, Enel X considers an important step is understanding how much PFR is actually required in the NEM. It is not clear from the evidence provided that the market needs to shift from a few generators providing PFR to all capable generators providing PFR.

3. CONCERNS WITH MANDATING PRIMARY FREQUENCY RESPONSE

AEMO has indicated the urgent need to address the deterioration in frequency control to maintain the safe, secure and reliable operation of the power system. While we agree it is important to halt and begin to reverse the deterioration in frequency control, there is no evidence to suggest that requiring all scheduled and semi-scheduled generators to provide PFR is a proportionate solution.

We have a number of concerns with the proposals that PFR should be mandated for all scheduled and semi-scheduled generators:

1. The cost and benefits of the proposed solutions have not been quantified and imposing a mandate will likely result in inefficient provision of PFR
2. There is a risk of locking in higher costs
3. Mandated PFR risks stymying the market for batteries and other technology solutions

Further details on each of these points is provided below.

3.1. Understanding the costs and benefits of the proposed solution

The costs and benefits of mandating that all scheduled and semi-scheduled generators provide PFR have not been quantified. AEMO identifies the following costs associated with its proposal:

- Costs of changing plant control systems to provide PFR
- Direct costs of the provision of PFR, including wear and tear and additional fuel costs, for generators not currently providing PFR.[5]

While AEMO does not expect these to be material in most cases, it should be possible to quantify these costs to better understand the impact of the proposed solution, and the financial burden on AEMO in providing compensation to generators for changing their systems.

[5] AEMC Consultation Paper, p64.

AEMO notes that one of the consequences of operating at the edges of the NOFB is increased wear and tear on plant.[6] However, providing PFR can also contribute to wear and tear and reduced operating efficiency, all of which can be expensive. For example, our sister company Endesa operates the Carboneras coal-fired plant in Spain. The Spanish system's procurement of ancillary services is much less sophisticated than the NEM's. For PFR, there is no market, only a mandate for all generators to provide the service. At this coal plant, these costs are so significant that Endesa has built a 20 MW battery facility on site.[7] The idea is that the frequency response is provided by the battery system, allowing the main plant to run more efficiently and avoid the wear and tear. While, viewed narrowly, this makes economic sense for Endesa as a more cost-effective way to meet their obligation, it is clearly less efficient than allowing market signals to drive investment in battery systems with appropriate locations and capabilities to provide the most valuable services.

As the above example suggests, different generators have different capabilities and costs associated with providing PFR. AEMO has acknowledged this to some extent. For example, they have proposed that standing exemptions from complying with the Primary Frequency Response Requirements would apply for the steam turbine components of CCGT plant and for plant when operating in synchronous condenser mode. They also note that generators may seek exemptions where a plant cannot be modified or requires "significant augmentation" to provide PFR.[8] The AEMC's consultation paper also states that all plants would be required to comply "provided the upfront costs of plant modification are reasonable in AEMO's opinion".[9]

However, there is no indication or guidance of what might constitute "significant augmentation" or "reasonable" costs. Without understanding this, it is difficult to know what the costs associated with mandated PFR might be.

3.2. There is a risk of locking in higher costs

The AEMC has noted it will first consider system reliability, with opportunities to improve efficient provision of PFR to be considered later.

It's not clear how the AEMC could introduce a more efficient approach if it first proceeded with the option for AEMO to pay for all capable scheduled generators and semi-scheduled generators to augment their plant and be required to provide PFR. Augmenting existing generation plant means locking in higher cost solutions until those plants fail. Once augmented, it's not clear how a more efficient solution could be introduced ex post.

A major financial impact of the proposed rule change will result from AEMO providing compensation to generators for changing their system. This will be an immediate impact and will not be reduced or recouped by a move to a more efficient provision of PFR in the future, thus there will be no relief from this cost.

Further, without understanding how much PFR is required, there is a strong risk that mandating its provision by scheduled and semi-scheduled generators will result in more PFR than is actually required. Ultimately, customers will bear the cost of over-procuring PFR.

Mandated provision of PFR will also stifle potential innovation in the provision of PFR.

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[6] AEMC Consultation Paper, p21.
[7] See e.g. https://www.endesa.com/en/press/news/d201709-endesa-signs-agreement-eps.html.
[8] AEMC Consultation Paper, p61.
[9] AEMC Consultation Paper, p59.

3.3. Stymying the market for batteries and other FCAS providers

The consultation paper notes that "Generators may … experience a potential decrease in generator revenue from contingency FCAS markets due to increased supply pushing down FCAS prices"[10].

It is worth noting that it's not just generators that participate in FCAS markets. Since 2017, demand response and batteries have provided contingency FCAS services. As AEMO noted, there will be increasing reliance on storage, demand side and renewable resources to provide frequency services. There is a risk that a significant fall in price will not only prevent some of these new resources coming online, but could also result in existing players leaving the market due to a fall in investor confidence. While this could benefit customers in the short term in the form of lower prices, it may leave a critical gap in multiple forms of frequency response capabilities as baseload generators become less reliable, as discussed below.

Enel X embraces competition, and indeed has contributed to bringing down the cost of contingency raise FCAS services through introducing additional competition in the form of demand side response as a market ancillary service provider. However, having AEMO pay to augment generating plant to provide PFR, which can then be used to offer services in the FCAS markets, creates a market distortion and gives a "leg-up" to baseload generators.

Further, the current commercial case for batteries relies on a number of revenue streams, one of which is revenue from participating in FCAS markets. A reduction in price in FCAS could jeopardise ongoing investment in battery storage, just as AEMO, the AEMC and others are outlining the need for increased investment in batteries as a solution to a range of NEM issues – not just frequency control services but also firming capabilities.

While the rule change purports to be technology neutral, in practice it will primarily be baseload generators providing PFR. Renewable generators will only be able to provide lower services, and only when they're operating. Similarly, hydro and peaking generators will only be able to provide PFR when these plants are operating, which is intermittently. Enabling PFR for these plants may have significantly higher marginal cost of enabling PFR ($/GVA per available hour) compared to baseload generators, particularly where there is no mechanism to ensure PFR is available when required.

This leaves baseload generators providing the majority of the response. However, these generators are increasingly operating at minimum loads, are becoming less reliable as they age and will ultimately exit the market.

Renewables are forcing wholesale prices down, and baseload generators are increasingly paring back their availability. We understand that some generators are already operating at minimum loads and are increasingly competing to remain on. This means there are likely to be gaps in PFR provision, due to baseload generators' own physical operating constraints. These gaps will likely be both seasonal, as generators might choose longer maintenance gaps, as well as diurnal, as we see an increase in generation from rooftop PV.

Bloomberg New Energy Finance predicts economic curtailment of renewables due to negative prices to become more frequent in the NEM from 2023[11], and accelerate dramatically from 2026, which is a harbinger for these 'availability gaps'. These will affect the availability of baseload plant to provide inertia both diurnally and seasonally.

[10] AEMC Consultation Paper, p64.
[11] BNEF, Australia Power Price Forecast, January 2019

Combined with our concern that the market for batteries and other technologies will be stymied, there is a risk that the frequency problem will simply be "kicked down the road" and that the problem will be much more acute as baseload generators are increasingly unable to respond to frequency events.

4. ENEL X SUPPORTS EXPLORING ALTERNATIVE OPTIONS

Enel X considers there are a number of intermediate steps that could halt and ultimately reverse the deterioration of frequency control at a lower cost and with fewer detrimental impacts on other parts of the market.

- **Remove disincentives for providing PFR**
- **Improve AGC**
- **Regional procurement of FCAS**
- **Consideration of market based solutions**

Implementing these changes should help stabilise frequency, and improve system resilience, to allow further time to consider alternative, market-based options.

Enel X notes the alternative mechanisms to improve frequency performance presented by the AEMC in its consultation paper. At this stage, Enel X does not have a view on which of these would be most appropriate for the NEM in the longer term. However, for reasons outlined above, we consider that mandating the provision of FCAS is likely to be detrimental to the long term development of the NEM.

Rather, our preference is for market-based solutions that are truly technology neutral and allow alternative, more efficient technologies to be explored and implemented and ensure the NEM is well-placed to continue to provide a secure and stable grid into the future as fossil fuel generators exit.

4.1. Remove disincentives for providing PFR

Enel X support AEMO's suggestion to remove disincentives for generators providing PFR. We believe this is a logical step towards encouraging and incentivising the provision of PFR and should provide immediate help in halting any further deterioration in frequency control.

4.2. Improve AGC

AEMO notes it already has a review underway. Improving the timeliness of response in secondary markets may assist in reducing the number of instances when frequency falls outside the NOFB. As such, Enel X support this review and improvement as a necessary step towards a more resilient system.

4.3. Regional procurement of FCAS

We note that FCAS is procured for the whole NEM, with no minimums based on region, and therefore separation events can mean that FCAS is not available where it is needed. Setting minimum amounts of FCAS to be procured on a regional basis would provide the diversity required.

As detailed in AEMO's operating incident report, dated 10 January 2019, into the QLD and SA system separation on 25 August 2018, a key contributing factor to the incident was the regional distribution of FCAS reserves across the NEM. Thus, minimum regional procurement of FCAS can alleviate concerns

around disproportionally skewed procurement of FCAS services, which is one of the concerns raised by AEMO as a reason for the submitted rule change requests.

Enel X supports this approach as a means to ensure that FCAS is available in the regions in which it is required.

4.4. Consideration of market-based solutions

Enel X firmly believe the most efficient way to resolve the issue highlighted by AEMO is through market-based solutions. Whilst it is appreciated that an efficient market-based solution will take time to develop, Enel X believes it is possible to take initial steps towards this long-term solution that can be implemented in a timely manner, and thus help to relieve some of the concerns relating to the immediacy of the issue.

Enel X believe a more logical and less intrusive and severe solution is the implementation of a contract mechanism in the short-term to provide the necessary amount of PFR, as suggested by the AEMC in its Frequency Control Frameworks Review[12]. This solution would help encourage a technology neutral provision of PFR whilst reducing the negative impacts on energy and ancillary services markets that would be seen if mandates were to be implemented. It will also provide a solution that would result in an easier transition to a more efficient market-based solution in the future.

However, Enel X believe any interim solutions implemented by AEMC to enable the provision of PFR should be time limited, their sole purpose being to provide AEMO with a means to stabilise frequency control in the short term and allow the AEMC sufficient time to develop a proper market for PFR. The development of a market for PFR should continue to be a priority, even once the immediate system security issue has been resolved.

[12] AEMC, Frequency Control Frameworks Review, 26 July 2018