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Primary Frequency Response Rule Changes – Consultation Paper

The Australian Energy Council (“**AEC**”) welcomes the opportunity to make a submission to the consultation paper on the three rule changes associated with Primary Frequency Response (PFR).

The AEC is the industry body representing 23 electricity and downstream natural gas businesses operating in the competitive wholesale and retail energy markets. These businesses collectively generate the overwhelming majority of electricity in Australia and sell gas and electricity to over 10 million homes and businesses.

Summary

The AEC agrees the NEM’s existing frequency control is inadequate and requires correction. It however firmly disagrees that the approach presented in these three rule changes is the correct path for its resolution for five principal reasons:

- The appropriation of a valuable service is oppressive, runs counter to market philosophy, is economically inefficient, and, in the long-term, unsustainable.
- The proposals reach to solutions before defining their desired outcomes nor fully analysing the risks in such solutions.
- The proposals conflate two entirely separate issues: resilience to major disturbance and steady-state stability. These are best considered, and resolved, separately.
- They will distort the existing Frequency Control Ancillary Services (FCAS) markets.
- The proposed causer-pays relief will destroy the valuable signal this mechanism creates, that encourages dispatch conformance and is driving investment in innovative battery-renewable energy combinations.

The AEC is sympathetic to the sense of urgency placed upon AEMC by two reports¹ to make these rules in spite of the above shortcomings. AEC members are willing to ease this pressure by voluntarily adjusting governors, under AEMO direction, across a large proportion of the NEM’s steam plant in order to immediately improve frequency performance. The AEC envisages a re-creation of the aborted mainland trial that AEMO intended to undertake at the completion of the Frequency Control Frameworks Review (FCFR).

¹ (1) The investigation into the events of 25 August 2018 and (2) Notes on Frequency Control (Undrill Report)

The AEC is confident that generators will co-operate closely with a second attempt at a mainland trial of PFR. The purpose of offering such a trial is two-fold:

- To remove the sense of urgency such that the rule changes may be duly considered, along with alternatives; and
- To enable AEMO to oversee the progressive reduction of deadbands in a controlled manner to ensure increased provision of PFR performs as expected without unintended consequences.

Context

It has been several years since the decline in NEM frequency performance became evident. At the start of 2018 industry expected that the Reliability Panel, through the 2018 Frequency Operating Standard (FOS) review, would set the desired frequency control envelope, and that the AEMC, through the FCFR, would identify the preferred approach for delivery of that envelope. Instead these exercises completed with open-ended conclusions but as noted in the FCFR executive summary “The key deliverable of this stage of the review is a work plan”. This work plan involved major commitments by AEMO to undertake further technical research, including real-world trials, which would be returned to the AEMC and Reliability Panel for completion of their objectives.

That work plan noted short, medium and long-term activities, mostly allocated to AEMO. The long-term commitment included:

“If necessary the market/incentive-based mechanism for primary frequency control in the normal operating frequency band is further refined for implementation, which could involve:

- *development of new frameworks and associated cost-recovery mechanisms*
- *identification of transition pathways from the existing frameworks to new or redesigned mechanisms*
- *revision of associated regulatory frameworks*
- *consideration of the potential to extend the mechanism to contingency frameworks and other system services, such as inertia and fast frequency response*
- *phasing out / terminating any interim solutions that were implemented.”²*

And, in explaining the urgency context of that work plan:

“AEMO is undertaking a range of actions in an attempt to:

- *better understand the drivers of the recently observed deterioration of frequency control performance*
- *reverse this deterioration, or at the very least halt any further deterioration.*

AEMO advises that there is no immediate need to implement regulatory change to address the deterioration of frequency control performance under normal operation before the results of these short term actions are known, and that current regulatory tools are expected to be adequate to manage frequency performance in a manner consistent with the requirements of the frequency operating standard within this timeframe.”³

These sensible conclusions represented a compact that had been struck between the AEMC, Reliability Panel, AEMO and industry with a clear plan for a progressive process of research, trial and ultimately market-based solutions. Such a compact provided the AEMC with the confidence to conclude the FCFR in this open-ended

² FCFR Pg 65

³ FCFR Pg 58

manner, trusting that this collaborative work would deliver superior outcomes to any that the AEMC could propose without the benefit of AEMO's impending research.

That research task began in good faith, but within weeks had collapsed, ostensibly due to one event - 25 August 2018.

Since that time, instead of constructive collaborative analysis and trials, AEMO has sought to directly impose upon the market an untested, oppressive and permanent obligation. The industry compact reached in mid-2018 has thus been broken. Had this turn of events been envisaged by the AEMC and Reliability Panel, their reviews would certainly not have concluded in these open-ended ways.

The AEC considers that the best way forward is now for the AEMC and Reliability Panel to take back control of the design of frequency control markets with a view to developing an efficient and economically sustainable model. AEC members' offer to support a voluntarily trial provides a safe window for that development to occur.

A Conflation of Two Issues

It has been difficult for the industry to engage with the ERC0274 solution as its stated purpose has changed through its development. It appears to seek to address two entirely separate issues:

- Resilience, with respect to keeping the system intact following non-credible contingencies such as 25 August 2018; and
- Steady-state stability, with respect to the movement of frequency within the Normal Operating Frequency Band (NOFB) and the purported oscillations identified in the Undrill report.

These are entirely different problems and their analysis and optimal solutions are also entirely different.

For resilience, the appropriate solutions are likely to be a combination of more robust FCAS Contingency Services specification and procurement, supported by a backstop governor requirement with a very wide deadband, say $\pm 500\text{mHz}$.

For steady-state stability, this requires further complex analysis of a range of matters before progressing, but the most appropriate solution is likely to involve:

- Greater use of the existing secondary control systems, noting AEMO has achieved some preliminary success in 2019 with this;
- Refinement of the FCAS Market Ancillary Services Specification (MASS) to encourage enabled providers to assist NOFB frequency control; and
- Strengthening of the causer-pays mechanism to more sharply penalise non-conformance unsympathetic to frequency, and to provide positive incentives for non-conformance sympathetic to frequency.

Urgency – 25 August 2018 event

This event has been heavily cited as justification in all the rule changes. In the AEC's opinion, the frequency outcomes of this event do not provide direct evidence of an urgent need for mandatory narrow deadband PFR.

Much has been made of the comparison to a separation event on 28 February 2008, with the automatic under-frequency load-shedding of 2018 being linked to a lower level of PFR available. The AEC notes the significant differences between the events:

- The pre-contingent system conditions. Through good fortune, in 2008 there was approximately 4,783 MW of on-line plant headroom south of the separation, whilst in 2018 there was only 235MW in the islanded NSW/Vic region. This headroom was able to absorb the loss of the QNI south flow. The rule changes however instil no requirement for additional headroom, so there is no reason to believe that

the rule changes could have averted the need for automatic under-frequency load shedding in NSW/Vic in 2018.

- Because the 2008 separation was less complex, involving two not three islands, it was possible for AEMO operators to reconfigure the AEMO AGC systems much more quickly than in 2018. AGC systems were changed over to recognise the Queensland island in one minute in 2008 versus nine minutes in 2018. For those nine minutes Queensland generators were being driven higher in an attempt control a frequency measurement in NSW.

The prolonged high frequency in Queensland was strongly cited as problematic in 25 August 2018 event report. In response AEC noted that frequency remained within the FOS separation standard of 51Hz, with recovery to below 50.5Hz only 8 seconds longer than the 10 minutes allowed for in the FOS.

The AEC also disputes AEMO's claim⁴ that this non-credible event was only 15% more severe than the NEM's largest credible contingency. Islanding is much more severe than the loss of the flow on the interconnector because the sources of response are effectively halved as a result of the separation, i.e. there was no ability for response in Queensland or South Australia to resist the frequency decline as there would be following the credible loss of a large generator in an intact system. In any case, the largest credible contingency (loss of largest generator) events are common and there is no evidence that power system resilience to these is deteriorating, as would be expected if an event supposedly only 15% greater was having such consequence.

These concerns raised about 25 August 2018 relate to *resilience* to non-credible events. The appropriate solution to this would be:

- Greater use of existing FCAS contingency services, and AEMO's existing ability to achieve geographic diversity of its sourcing.
- Potentially requiring generators to provide PFR beyond a very wide last-resort style deadband.

Urgency – NOFB performance

The AEC accepts that NOFB performance deteriorated in the early part of this decade. This was fully acknowledged in the FCFR, and the AEC has always strongly supported its rectification, but it was also recognised in the FCFR that the deterioration had stabilised, remained within the NOFB FOS, and thus extreme actions were not warranted. There was some excursion from the FOS in the early months of 2019, but this was duly rectified by AEMO increasing its purchase of secondary frequency control as was intended by the 2001 design.

Thus the situation at the end of the FCFR was that NOFB performance was inadequate but not in crisis, and a careful technical process, led by AEMO, could look to solutions for its rectification, and, when these were found, a new NOFB FOS would be recommended. The AEC looked forward to this being undertaken expeditiously.

This approach was abandoned apparently on the justification of the Undrill report which claims to observe undamped oscillations within the NOFB. The AEC, and it appears AEMO, were previously unaware of this concern. Undrill's work was necessarily time limited and was unable to apply deep mathematical analysis of the qualitative observations. It should have immediately triggered more thorough analysis by local experts to fully understand its nature, and the cross linkages between units' governors and secondary frequency control that are causing it. Instead, AEMO has gone directly to submitting ERC0274.

In summary, AEC agrees that Undrill's observations are potentially serious – but the resulting urgency should be applied to greater research and trials, rather than moving directly to a solution that will create an entirely different frequency regime, which will almost certainly have its own risks.

⁴ Rule change proposal Pg 41

AEC recommends re-attempting a trial

At the end of the FCFR, AEMO had committed to undertake a mainland trial of PFR from mainland generators. This would have had the benefit of AEMO introducing progressively greater PFR volumes with progressively lower deadbands. This would have provided valuable knowledge in terms of both:

- The technical performance of the power system and importantly whether widespread provision of narrow deadbands PFR had unintended consequences;
- The amount of additional PFR necessary to restore NOFB to a tight outcome, which would have informed the design of a market procurement of the service.

AEMO however abandoned the trial in late 2018. The AEC acknowledges that some generators responded to AEMO's initial request for assistance cautiously, and this response may have been interpreted as uncooperative.

Since that time AEC has recognised the missed opportunity of that abandoned trial. The AEC conducted a confidential survey of its members to identify whether plant would now be made available for a re-attempt of a similar trial. These responses have offered over 9,000MW of steam plant which seems more than adequate for the original objective. This would achieve the Undrill report's recommendation that one-third of the connected mainland capacity participate in such a trial⁵.

Thus, AEC members stand ready to assist, under AEMO direction, with voluntary provision of PFR that would:

- Remove the sense of urgency that exists in processing such significant rule changes; and
- Allow AEMO to determine the key technical and market matters that they identified as lacking at the end of the FCFR.

The AEC urges the AEMC to extend consideration of these rule changes such that the trial and research process that was envisaged by the FCFR final report may be carried out.

Rule is inconsistent with good market principles

Mandating PFR provision runs counter to good market principles. The service comes unequally from different technologies and is substitutable between them. Some technologies, such as batteries, can provide extremely large PFR relative to their size, whereas others, for example wind turbines, have more limited, unidirectional capability.

Such circumstances imply that these different levels of service deserve differential reward. Obligation without compensation runs counter to this principle, in fact rewarding those technologies which are inherently less capable of PFR and penalising those which provide it well. These circumstances suggest the use of markets as the most efficient and fairest provision rather than obligation.

A reward commensurate to value is necessary for the long-term provision of PFR. It is widely recognised that the NEM is suffering on many fronts from failing to reward essential services that were once assumed to be inherently provided as part of generation, but, with the changing energy supply, are now in short-supply.

Recognition of this issue is core to the Energy Security Board's 2025 Market Design work⁶:

"The market and regulatory arrangements need to provide incentives to deploy innovative measures to both reduce the need for system security services and to supply them more efficiently. The potential for the competitive market to deliver dynamic efficiency benefits needs to be realised as the NEM, and power systems globally, change.

⁵ Undrill Report 5 August 2019, pg 12

⁶ Energy Security Board Post 2025 Market Design Issues Paper Sep 2019 Pg 24

Within each overall market design option, a range of options for the procurement and dispatch of system security services is possible. Expanding the number of spot markets as currently used for frequency control ancillary services could provide the services needed while maintaining efficient dispatch including co-optimisation between services and between services and energy.”

As one of its six pillars AEMO’s Mission Statement⁷ proposes new markets to support innovation:

“Implement new approved market requirements, adapt rules and markets to emerging needs within current regulatory framework; and influence overarching reform of regulatory processes to support rapid innovation.”

These rule changes however drive in the opposite direction. Mandating PFR may see it adequately supplied for a time from traditional sources, before it, like many other system services, declines – as there is no reward to exploit the best technology for its provision.

Failing to recognise its value will also undermine the value proposition of exactly the new technologies that should provide the long-term frequency support to the NEM: batteries. Whilst bulk energy storage is most likely to be drawn mainly from hydro for many years, batteries have found an excellent market niche in a frequency control role. For batteries, frequency control is a large, if not the largest, part of their value proposition already (discussed further below). Provision of a PFR revenue stream may well see a range of new battery investments, which have the potential to remove any question of a need for PFR from the less nimble traditional technologies.

All PFR involves costs upon plant. This includes wear and tear on the unit, the need to operate it more conservatively in case the governor responds, and the costs of moving away from the most economic dispatch. Usually these are difficult to calculate with confidence. In the case of batteries, the calculation is more quantifiable as the cycling clearly deteriorates their life. These costs are however quite acceptable if providers are able to recover the value of their services through a common price.

Headroom

The AEC welcomes AEMO’s clarification that the mandatory PFR will not oblige retention of any stored energy. This however raises the following issues:

- The physical response of the power system will be dependent on opportunistically stored energy, which will be random on the basis of market dispatch and other matters. It is not clear how this randomness creates additional confidence for AEMO.
- As there is no requirement to provide stored energy, it is likely that generators as a whole will respond much more effectively to high rather than low frequencies causing a lopsided NOFB performance and accumulating time error.
- It creates a new incentive for generators to effectively avoid the burden of compliance by intentionally operating without stored energy. The burden of managing the NOFB will then fall on the remainder, ultimately forcing all generators to look to ways to withdraw stored energy.
- One source of stored energy is available with confidence: those generators which have been enabled for R6 Contingency Raise which are required to maintain stored energy in return for FCAS revenue. It is likely that much of the support for NOFB frequency control will be drawn from this stored energy. Thus stored energy intended to protect the system from a contingency will be drawn down pre-contingency. This puts the system’s resilience at risk as well as making compliance with the Market Ancillary Services Specification (MASS) more challenging.

⁷ https://www.aemo.com.au/-/media/Files/About_AEMO/Our_Vision/AEM037_Summary-booklet.pdf

Confidence in frequency response can only come about if the PFR is supported by a known quantity of stored energy. In turn, this can only come about through dispatched, compensated provision, ideally co-optimised with the energy markets similarly to the existing FCAS markets.

AEMO's clarification that uncompensated stored energy is not required makes ERC0273 appear less oppressive. However AEMO has proposed this limitation in its procedures rather than its draft rules, allowing mandatory headroom to be unilaterally imposed by AEMO in the future. The rule change should therefore be considered in the context of the possible future imposition of such an obligation, with its associated market inefficiencies, such as semi-scheduled renewables being required to continuously operate below their maximum outputs.

Proposed Deadband is excessively tight

As discussed above, if the objective of ERC0274 is to improve system *resilience* then an increase in *wideband* PFR is all that should be sought. The AEC considers that mandatory PFR with a deadband in the order of $\pm 500\text{mHz}$ is appropriate for this purpose.

AEMO's claim that setting a wide deadband requirement would cause existing generators, which are providing PFR, to adhere to a narrower deadband than $\pm 500\text{mHz}$ is not a reasonable rejection of such an approach. These generators have no obligation to provide any PFR at present and their existing provision would relate to a physical issue such as unadjustable equipment. If the equipment becomes adjustable, then with status quo rules it is likely that the PFR would be removed entirely. In any case, AEMO should not rely upon narrow band PFR provided coincidentally from generators that are neither obliged nor paid to do so. It is far better that a specified quantity of narrow band PFR be specifically purchased.

Even if the AEMC feels it is necessary to mandate PFR into the NOFB range, the proposal of a $\pm 15\text{mHz}$ deadband is unreasonably tight and is unprecedented in Australia. Pre-NEM, deadbands of around $\pm 50\text{mHz}$ were standard. The narrow proposal takes the NEM into uncharted territory and runs the risk of unintended consequences with possible hunting between machines. Control engineers typically recommend against such abrupt changes in system parameters. A managed, progressive reduction in deadbands, closely observed for unintended outcomes, to find the optimal deadband is the proper way to approach imposition of such an obligation. This is exactly the opportunity that the aborted 2018 mainland trial presented.

An obligation to prioritise frequency control ahead of following dispatch targets whenever the frequency is outside $\pm 15\text{mHz}$ could mean that conditions are such that for very large periods of time generators captured by the rule are simply unable to follow dispatch targets. An oscillation could develop as the frequency comes back into the narrow band, followed by generators attempting to "catch-up" back to their dispatch trajectory, followed by the band being re-violated and so forth.

As not all generators will be captured by the PFR rule, this puts those subject to it at a significant competitive disadvantage in being able to obtain value through ramping to dispatch targets.

Existing FCAS markets distorted

An advantage of the widespread adoption of more controllable electronic governors in recent years is that they can be made responsive to the enablement signals of the FCAS markets. This has meant that traders have been able to consider the true marginal cost of providing FCAS when composing their offers into the market. This in turn has provided the correct market signal with respect to new entry which has become a very significant part of the revenue proposition of the large-scale batteries that have recently joined the NEM.

If the ERC0274 rule change comes into being, then it becomes illegal to use the governors in this manner as they will need to be effectively continuously set to respond, whether or not the unit is actually enabled for an FCAS contingency service. This means the marginal cost of being enabled falls to zero, which in turn will distort traders' composition of their offers into the FCAS contingency services. This distortion is anticipated by AEMO in the rule change itself:

"The proposed rule could, arguably, increase the number of Generators who offer their services into the Contingency FCAS markets, due to the reduced opportunity cost of providing Contingency FCAS."

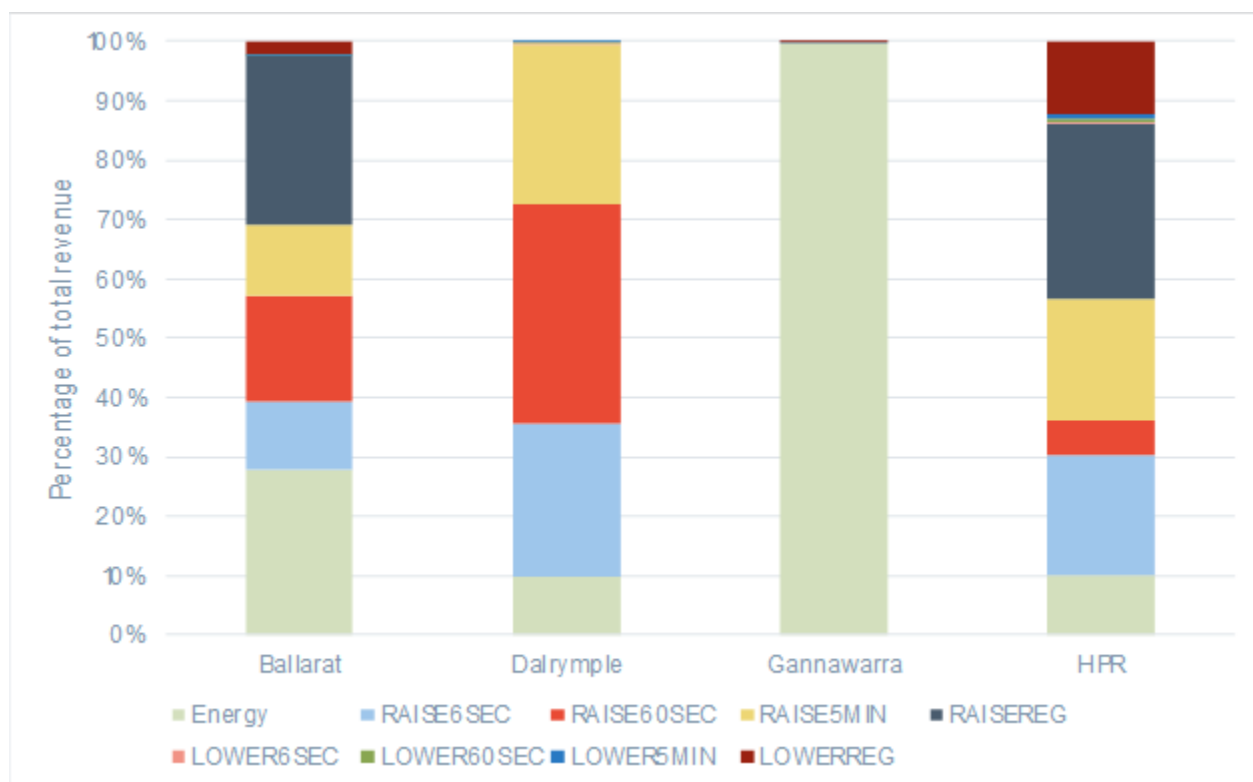
This increased supply may then put downwards pressure on the price of Contingency FCAS, reducing potential Generator revenues from that market.”⁸

Furthermore, the frequency control services obligated by this rule change will be used as an *alternative* to purchasing regulation services voluntarily offered into a competitive market. The Consultation Paper extraordinarily describes this uncompensated appropriation of a critical service as a *benefit*:

“A potential reduction in expenditure on FCAS procurement by AEMO, predominantly due to a potential reduction in the need for regulation services.....The inclusion of sufficient PFR that is responsive to frequency within the NOFB may allow for the quantities of regulation service procured by AEMO to be reduced.”⁹

These two effects will then destroy the important signal the FCAS markets are creating for innovation, such as the recent development of large-scale batteries. Whilst large-scale batteries remain an expensive option for full firming of *energy* output in the NEM, they provide an excellent source of frequency control, and thankfully this value is being recognised in their current revenues from FCAS, which are presently dominating their income. ERC0274 therefore presents an existential threat to the role of large-scale batteries in the NEM.

Figure 1: Battery Storage revenues by market (2018-19)



Source: Cornwall Insight Australia

Causer-Pays undermined

The AEC supports the clarity provided in ERC0263 that response to frequency control should not be considered non-conformance with dispatch instructions.

The existing causer-pays mechanism provides a weak, indirect incentive for PFR – through avoidance of a penalty. The strengthening of causer-pays signals in order to incentivise PFR was one of the possible market-based frameworks recommended for further investigation by the FCFR. For example, generators could receive

⁸ ERC0274 Pg 56

⁹ ERC0274 Consultation Paper Pg 97

a measurable financial reward where their PFR caused a unit to move away from a dispatch trajectory in sympathy with the frequency. Such a concept was supported by the AEC in its submission.

The proposal for blanket exemptions from causer-pays in ERC0263 however seems contrary to that intent. AEMO has proposed that where a generator has convinced AEMO that it has installed PFR to the capability of its plant, that it be relieved of all penalties.

This is intended to encourage the plant to voluntarily enable PFR in the manner that ERC0274 mandates. Quite apart from it being a redundant incentive in the presence of an obligation, the relief from penalty is given to all technologies and performances, despite very different actual PFR deliverability. This is clearly a poor signal. Indeed, the relief has most value to the technologies which are inherently *least* capable of responding in sympathy to frequency, i.e. it most greatly rewards the poorest PFR performers.

Finally, the relief will undermine the beneficial incentives that causer-pays has provided since 2001 by encouraging generators to not deviate from their dispatch trajectory in a manner unsympathetic to frequency. This signal has become more important as the market invests in wind and solar and has shown real benefit through a number of wind and solar plants investing in batteries at their connection points in order to minimise exposure to causer-pays signals. Batteries can perform this role very well. The ability to store five minutes' production in order to meet the energy promised in the semi-dispatch target is an efficient and cost-effective innovation justified by the private benefit of the causer-pays signal but with large public benefit. It is however still more expensive than activating frequency control equipment that can reduce solar-wind output (but not increase it). Under ERC0263, activating down frequency response will become the cheaper option to relieve the plant of all causer-pays incentives.

At the extreme, the tripping of a large traditional unit causes a significant frequency excursion and extreme deviation from the unit's dispatch trajectory. The causer-pays system correctly heavily penalises units as a result of such events, which intends to allocate the costs of frequency correction on the causing party. ERC0263 will remove this penalty entirely.

The AEC does not deny that the causer-pays mechanism is far from perfect in linking the system impact of plant performance to participant costs. However the solution is not to abandon the mechanism entirely as proposed in ERC0263, but to strengthen it, as was intended in the FCFR.

Sunset

The AEC has discussed above industry's preparedness to remove the urgent concerns about current frequency control by participating immediately in a PFR trial, which we hope should enable a restoration of the investigation of more market-based mechanisms as anticipated by the FCFR.

If, however, the AEMC feels this offer is unable to satisfy their concerns, and that ERC0274 must be made in order to restore immediate confidence in NEM frequency, then we request it is only put in place for an interim period until a long-term solution can be developed. We therefore suggest that if the rule must be made, it lapses after three years. This should provide more than adequate time to develop a model that is economically sustainable over the long-term.

This is likely to be a much better discipline on all parties than making an open-ended rule, even if accompanied by a statement of preference for a market solution to be developed in time. As the proposed rule is likely to remove parties' short-term concerns, it is likely the industry would de-prioritise focus on a long-term solution, and the rule will apply until existing PFR capability retires and there is simply no physical PFR plant left. Thus the long-term frequency situation could become a far more serious situation than experienced today, and there will be no physical options in existence that can be simply appropriated through more obligations.

A sunset will maintain the industry's discipline to develop a mechanism that is sustainable over the long-term.

Contracted and Regulated payment options

The Undrill report's observation¹⁰ that about one-third of plant in service would be satisfactory for a field trial suggests that a universal obligation is unnecessary. In that context competitive procurement is entirely feasible – such that PFR can be obtained only from the third most willing parties, with the lowest offers of provision.

Even simplistic competitive arrangements do require AEMO, with the guidance of the Reliability Panel, to set a demand on behalf of the power system, i.e. these parties must determine how much PFR makes the system adequately safe versus the cost of obtaining it. This of course places AEMO in the difficult position as they will either be criticised for spending too much, or, upon an extreme event, be criticised for not procuring enough.

This, however, is AEMO and the Panel's essential role – to act as the customer's proxy and optimise these trade-offs. In doing this, they set standards and predictability over the long-term. In contrast, ERC0274's obliging PFC from all available plant may appear attractive as an avoidance strategy, but as a result leaves the system's secure envelope undefined and effectively random: PFR will only be present on an opportunistic basis. Determining the trade-offs behind competitive processes is a healthy discipline for a power system that AEMO and the Panel should not resile from it.

Whilst a sophisticated market co-optimised with dispatch is ideal, AEC accepts the desire for rapid implementation. Below are several simple approaches to valuing PFR that could be implemented in the same timeframe as ERC0274, in declining order of preference:

1. Competitive Tenders

A circumstance of only requiring about one-third of plants to provide PFR could easily lend itself to a non-market ancillary services tender arrangement as is already performed by AEMO for System Restart Ancillary Services (SRAS), Network Support and Control Ancillary Services (NSCAS) and for long-notice Reliability and Emergency Reserve Trader (RERT). AEMO could oblige delivery performances similar to those proposed in ERC0274, but obtained through voluntary rewarded provision.

2. Partially Regulated arrangement

The UK National Grid arrangements described in appendix F of the consultation paper could be described as a quasi-competitive process; regulated for volume but not price. In this all capable generators are obliged to offer PFR (and/or other services) but are at liberty to offer a price for those services, and the market operator calls upon the services according to lowest price to meet their perceived need. Whilst AEC is doubtful of the need to regulate volumes, it is certainly preferable to an uncompensated mandatory obligation.

3. Mandatory delivery with regulated payment

Should the AEMC consider it essential that all equipped plant provide narrow-band PFR, the service then takes on characteristics of a natural monopoly, in which case a competitive process would be impossible. Fortunately, the NEM has processes and a regulator dedicated to replicating competitive outcomes upon natural monopolies. The rule could require that all PFR delivered is subject to a regulated fair payment. This would be determined by the Australian Energy Regulator (AER). The AER could determine the long run cost of providing PFR from particular technologies, subject to advice from AEMO as to the amount of response each provider was delivering. This would then be recovered as an ancillary service from customers.

Such a regulated process is not unlike the manner by which all frequency control services were rewarded prior to the creation of the FCAS markets in 2001.

Other causes of frequency performance deterioration

The AEC notes there are many causes for the deterioration of frequency performance in the NEM, for which the permitted withdrawal of generator PFR is only one. AEMO concurs on this point, however the approach in

¹⁰ Undrill report 5 August 2019, pg 12

ERC027 focuses entirely on the one supposed concern and runs the risk of de-prioritising critical work on the other causes. We note in particular:

- There is no available data that attempts to identify the share of the deterioration that was caused by the withdrawal of generator PFR. This should be possible through analysis of frequency performance around key dates of generator governor change.
- The growth of large-scale variable generation, whose FCAS contribution factors indicate this is a substantial cause of NOFB frequency fluctuation. Work needs to be carried out to see how compliance with semi-dispatch target accuracy can be improved, and how the causer-pays incentive can be strengthened to encourage more innovations such as the Lake Bonney Battery Energy Storage System¹¹.
- The need to oversee small-scale inverter compliance with AS4777/2015.

Transparency

In July 2019 the AEMC made Rule ERC0273¹² that obliges reporting on the outcomes of FCAS markets:

- The AER in respect of market outcomes; and
- AEMO in respect of technical performance.

The AEC supports AEMO's reporting obligations and considers that if a rule change is made that attempts to obtain PFR through obligation, or more preferably via a market, then it should include reporting obligations. This will assist plant owners understand their own roles in the context of the broader system.

In particular AEMO should provide aggregated information in relation to activated provision of PFR, dead-bands, droop and response time. The AEC anticipates that:

- Generators with different performance characteristics would be grouped into tiers, and the number and capacity of units in each tier reported.
- Averages of dead-bands, droop and response time characteristics would be reported.

The reporting would provide the information in national quantities and, to the extent permissible by confidentiality also be broken up into plant types and regions.

The information would need to be kept updated upon any future change in generator participation or parameter. It should apply immediately any process to increase PFR begins, either as a result of this rule change or upon the re-attempt of a voluntary mainland trial. If the rule change is made, such information would be extremely helpful during the implementation period. During either a trial or implementation period, this reporting would need to be live and potentially updated daily.

Opportunities for market solutions

Table 4.1 of the Consultation Paper has reproduced a good summary of Primary frequency response options presented as part of the of the FCFR's work plan. ERC027 is option C which the AEC has always considered the worst of the seven options – the only blunt, non-voluntary and entirely uncompensated proposal. Whilst the themes in Options E (new dynamic markets), F (two-sided causer pays) and G (deviation pricing) represent ideal approaches, it is recognised that these will take some time to develop in themselves. In the meantime:

- Options A (PFR required from regulation FCAS) and B (changing contingency FCAS triggers) appear to be quickly implementable, potentially without a rule change.

¹¹ <https://www.infigenenergy.com/lake-bonney-battery-energy-storage-system-0/>

¹² <https://www.aemc.gov.au/rule-changes/monitoring-and-reporting-frequency-control-framework>

- Option D (PFR and headroom via contracts) is the non-market ancillary service concept discussed above. Again, this would be appear quick to implement, delivers the type of response intended by ERC027 but would be more predictable by retaining a known fixed quantity of stored energy.

Conclusions

As observed by the FCFR in June 2018, the AEC agrees frequency control in the NEM is inadequate and that PFR can play a part in its rectification. However it stridently disagrees that uncompensated mandatory provision is the appropriate approach. The workplan described in the FCFR represented a compact between all parties to develop a sustainable, competitive and innovative approach.

Whilst the workplan was soon abandoned by the proponent, the AEC considers it is not too late to resurrect the compact. AEC members are prepared to voluntarily offer substantial PFR capacity under circumstances similar to that intended in 2018's aborted mainland trial. The AEC feels this will restore immediate confidence in the NEM's frequency performance in order to allow the AEMC to extend its rule change consideration period, and in turn allow it to contemplate far superior alternatives to ERC027.

Any questions about our submission should be addressed to me by email to ben.skinner@energycouncil.com.au by telephone on (03) 9205 3116.

Yours sincerely,



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