Your Ref: ERC0263; ERC0296

4 February 2021

Ben Hiron
Australian Energy Market Commission
Submitted online to: www.aemc.gov.au

Dear Ben

Submission: Directions Paper on Frequency Control Rule Changes

CS Energy welcomes the opportunity to provide a submission to the Australian Energy Market Commission's (**AEMC's**) *Directions Paper – Frequency Control Rule Changes* (**Directions Paper**). CS Energy is strongly supportive of the creation of mechanisms that appropriately procure services that are critical to the effective and efficient delivery of secure and reliable energy into the future.

About CS Energy

CS Energy is a Queensland energy company that generates and sells electricity in the National Electricity Market (**NEM**). CS Energy owns and operates the Kogan Creek and Callide B coal-fired power stations and has a 50% share in the Callide C station (which it also operates). CS Energy sells electricity into the NEM from these power stations, as well as electricity generated by other power stations that CS Energy holds the trading rights to.

CS Energy also operates a retail business, offering retail contracts to large commercial and industrial users in Queensland, and is part of the South-East Queensland retail market through our joint venture with Alinta Energy.

CS Energy is 100 percent owned by the Queensland government.

Key recommendations on the system services consultation processes

The NEM is inarguably changing and will continue to do so as it transitions to a market with more variable renewable energy (**VRE**) and an overall lower carbon footprint. The ability to effectively and efficiently manage power system security and reliability against this evolving landscape is paramount, and CS Energy supports the need to develop market and regulatory frameworks for system services that are flexible and adaptive.

Whilst specific feedback has been provided in Appendix A to this letter, CS Energy would also like to raise broader feedback and suggestions in relation to the overall process of reviewing services required for a secure and reliable energy system.

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CS Energy is concerned that the consultation processes underway by the AEMC on system services will lead to a series of incremental layers over current mechanisms, the complexity of which will risk efficient and effective outcomes for consumers. In CS Energy's view, the AEMC should consider the following:

- Apply a more holistic approach to the development of system service mechanisms that captures the physical outcomes that they are each delivering while challenging the underlying frameworks where appropriate;

- Prioritise the development of operational metrics on which service procurement mechanisms are to be based, whilst ensuring that sufficient stakeholder consultation is conducted;

- Re-evaluate the timing of the processes to allow the appropriate sequencing of work that will properly inform the development of potential options and the consultation process. It is critical to allow for the necessary technical work to be completed and publicised prior to any decisions on mechanisms; and

- Consider ways in which stakeholders can assess the proposed mechanisms holistically rather than through disparate processes. This could be achieved by the AEMC establishing a stakeholder strategic working group or similar that provides umbrella assessment of the mechanisms for system services.

Responses to the specific questions

CS Energy's responses to the specific questions in the Directions Paper are set out in Appendix B.

If you would like to discuss this submission, please contact Teresa Scott (Market Policy Manager) on 0438 665 056 or tscott@csenergy.com.au or Henry Gorniak (Market and Power System Specialist) on 0418 380 432 or hgorniak@csenergy.com.au.

Yours sincerely

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APPENDIX A

General comments on the system services consultation processes

Efficient market and regulatory frameworks are best developed via a holistic approach that diligently examines both the underlying operational needs as well as the economic outcomes and trade-offs of potential mechanisms. For system services, this strategic pathway was initiated by the AEMC in its 2017 System Security Market Frameworks Review[1] (**SSMFR**) and the subsequent 2018 Frequency Control Frameworks Review[2] (**FCFR**). These reviews sought to understand emerging operational challenges related to system security, the efficacy of current frameworks and potential adaptations to these, as well as mapping out the work required to be undertaken to inform any potential solutions.

Unfortunately, this work has not been sufficiently advanced or coordinated, at least in the public sphere, with the current consultation on system services prompted by rule change requests from industry. As CS Energy highlighted in its submission to the Energy Security Board's (**ESB**) Consultation Paper[3], the ESB through its NEM 2025 market reform program, has not provided strategic leadership on this topic, leaning instead on the advice from FTI Consulting (**FTI**).[4] The work of FTI was a thorough assessment of potential procurement mechanisms and an excellent report but its scope was generic and added no new dimensions to the discussion that had already been raised by both the SSMFR and AEMO work to date on future power system needs. The "strategic roadmap" for essential system services posited by the ESB[5] is simply a relegation to the system services rule change requests with no new detail or direction.

The absence of a holistic approach to determining fit-for-purpose frameworks and the resultant poor outcomes was raised by many stakeholders in response to the ESB's Consultation Paper.[6] CS Energy is cognisant that the ESB has requested the AEMC pursue these rule change requests, however, in this consultation CS Energy considers the AEMC has not applied the required strategic overlay to develop efficient frameworks, particularly with respect to the following.

(a) Overall process

In its July 2020 consultation, the AEMC acknowledged the breadth of material related to system services and proposed streamlining the consultation by grouping the rule change requests based on their "operational timeframe". This presumably explains why this Directions Paper draws the Fast Frequency Response (**FFR**) rule change request into the consultation on Primary Frequency Response (**PFR**), while consultation on operating reserves is currently a separate process.

CS Energy agrees that it is appropriate to consider system services such as system strength independently, but the others should not be unbundled unless there is a clear mapping to their place in the broader context. As stated in its submission in July 2020[7], CS Energy considers that any grouping should be based on the operational outcome that the services are intended to deliver rather than on an arbitrary timescale.

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[1] AEMC, *System Services Market Frameworks Review, June 2017*
[2] AEMC, *Frequency Control Frameworks Review*, July 2018
[3] CS Energy, *Submission Energy Security Board Post 2025 Market Design Consultation Paper*, October 2020, p.32
[4] FTI Consulting, *Essential System Services in the NEM*, August 2020
[5] ESB, *NEM Post 2025 Market Design Consultation Paper*, September 2020, p.72
[6] See for example, submissions from AGL, Origin, Aurora, Business Council of Australia, Energy Consumers Australia, Energy Australia, Joint submission by the Australian Council of Social Services and its signatories, Tilt Renewables, The Australia Institute.
[7] CS Energy, Submission to AEMC's *Consultation Paper – System Services Rule Changes*, August 2020

In the absence of a clear strategic framework, the grouping as proposed by the AEMC will likely lead to inefficient outcomes through the development of a potentially complex overlay of incremental changes that overlook intricate interactions. This will likely result in a costlier and less operationally efficient outcome for the market and ultimately consumers.

The structure of this process also denies stakeholders the opportunity to assess the rule changes holistically and will limit the completeness of feedback that is able to be provided. This will likely result in unintentional outcomes or potential opportunities not being identified.

(b) Timeframe

There appears to be misalignment in the timing of these consultation processes with the ESB's timeframe for providing recommendations. For example, the timeline for the reserve services consultation paper indicates that the ESB will be providing its final recommendations to Energy Ministers prior to the consultation on the draft determination.[8]

It is difficult to understand how the work required to develop and assess viable options can be completed in the next six months to appropriately inform any recommendations even if high-level. While discussions on some system services like PFR are more progressed, the reserve services consultation paper has little detail on the proposed options and is still inviting feedback on what the purpose of the operating reserves should be. This feedback is to be a key input into the ESB options paper which presumably needs to be as complete as possible as it represents the only opportunity for public consultation on the market designs that may be implemented. The lack of detail in the reserves paper particularly, raises concerns that the next stage of the reform process will not be appropriately informed and thus will not lead to optimal outcomes.

It is also noted that the ESB is leading a workstream on inertia. CS Energy encourages the AEMC to provide greater transparency on how this consultation will interact with the ESB's work program, including how stakeholder responses will link into the ESB's option paper proposed for March 2021 and its timeframe for providing recommendations. The AEMC's position that valuing inertial response is complex and requires additional time is inconsistent with the ESB's timeframes and the deliverables under its work program to develop spot market arrangements.

(c) Sequencing of work

The current approach to the consultation, perhaps driven by the timeframe, is, in CS Energy's view, unlikely to lead to an optimised outcome. As highlighted by FTI, developing mechanisms for procuring system services first requires understanding of the need and its quantification via an explicit operational metric.[9] Without this metric, details of potential options such as procurement requirements, risk exposure and cost-recovery cannot be plausibly drafted, let alone any assessment on the efficacy of mechanisms. This sentiment was also acknowledged in the FCFR which, for example, highlighted the need to develop an understanding of the desired frequency performance within normal operating conditions[10], and set out a joint workplan with AEMO to undertake the required technical work to inform the development of any new mechanisms or changes to existing frameworks. However, AEMO's subsequent Frequency Control Work Plan published in September 2020[11] demonstrates a complete misalignment with the timetable of this consultation

[8] AEMC, *Directions Paper Reserve Services Mechanism for the NEM,* January 2021
[9] FTI Consulting, *Op Cit.*
[10] AEMC, *Frequency Control Frameworks Review*, July 2018, p.42
[11] AEMO, *Frequency Control Workplan*, September 2020

process, and more generally is focussed on the short-term needs rather than broader strategic considerations. In this regard, CS Energy's concerns include:

- AEMO's technical report on PFR advising its incentivisation framework scheduled for June 2021;

- Development of a feasible (operationally and economically) metric for frequency performance within the Normal Operating Frequency Band (**NOFB**) has not, to CS Energy's knowledge been progressed by the Reliability Panel. If it has, there has been no opportunity for industry input to date; and

- There is no work to explicitly consider reserve services and the materiality of the need.[12] The directions paper for the operating reserves consultation indicates that AEMO will be providing advice on this but there is no transparency on what this is, when it will be provided and how it will inform the options being consulted on.

The experience with the recent Coordination of Generation and Transmission Investment market review should serve as an example of the need to provide the technical detail and modelling and undertake consultation on these details earlier in the process.

Mechanisms cannot be efficiently designed if the procurement need is not understood, and stakeholders cannot comment on the materiality of an operational problem without the relevant technical information.

The sequencing concern is exemplified by the fact that any review of the Frequency Operating Standard (**FOS**) will occur *after* new mechanisms have been decided. CS Energy appreciates that the AEMC's timeframe is restricted and incompatible with the timeframe required for a FOS review, but this shouldn't circumvent due process. The AEMC, with technical advice from AEMO, could commence work on the initial stages of the assessment to establish draft operational metrics to assist in streamlining the FOS review process when this is commenced by the Reliability Panel. The Reliability Panel can then continue to develop economically efficient metrics, which balances the trade-off between security and cost, and review the performance of these metrics and how to embed them within the standards' frameworks.

(d) Scope

Developing mechanisms via disparate rule changes not only has the consequence of not properly capturing potential interactions, but it also removes the opportunity to adequately question the efficacy of the broader frameworks in which the mechanism(s) under consultation would operate. For example, it is unclear whether the existing Frequency Control Ancillary Service (**FCAS**) markets are being challenged and potentially adapted. Challenges with scope can be partially addressed by considering the rule changes in terms of the physical outcome delivered.

The need for mechanisms to value system services is rooted in terms of the transformational changes to the power system yet there seems to be an unwillingness to change how one may view the frameworks and their underlying definitions. In its submission to the ESB Consultation Paper, CS Energy touched upon the need to ensure that any options developed are based on definitions, frameworks and outcomes that better reflect the future

[12] CS Energy considers reserves to be relevant to the frequency control consultations as: reserves address supply-demand imbalances (MW/time); ramping considerations are important; and some of the options proposed include co-optimising reserves with existing frequency control markets.

NEM. For example, understanding the new "normal" operating state given the changing generation mix will help to articulate the operational outcomes required of system services.

Instead, it appears that the default action continues to be proposing additional layers that encapsulate these changing dynamics while leaving the core unchanged. Perhaps this is the most efficient outcome, but in CS Energy's view, that is unlikely, and irrespectively this conclusion cannot be ascertained unless the full gamut of options is assessed alongside the operational need. The absence of this examination will likely serve to undermine the efficacy of any proposed mechanisms over time.

Table 1 below provides CS Energy's high-level view of the system services that need to be considered holistically by the AEMC and briefly outlines how they contribute to the operation of the NEM during normal operating conditions and following credible contingency events. Note, this does not imply that CS Energy considers these mechanisms as necessary or as separate to existing ones but serves to demonstrate a perspective that is useful, particularly to illustrate the linkages in the roles that are performed by each service.

Service	Broad characteristics	Role in NEM normal operations	Role in NEM credible contingency
Primary Frequency Response	Governor response proportional to small frequency deviations.	Managing small deviations in frequency within the NOFB to maintain frequency as close to 50 Hz contributing to system resilience.	• Frequency is close to or at 50Hz at the time of the contingent event • Initial response to arrest the frequency change immediately following event. • PFR assists in regulating frequency as it is restored following an event during tertiary control
Rate of Change (ROC) capability	Rate of Change reflects the ability of a unit to change its output over time, often referred to as ramp rate.	Currently incorporated in energy dispatch (and dispatch price outcomes) and enables AEMO to match supply and demand. Rate of Change (**ROC**) published in pre-dispatch and dispatch instructions include ROC. While ROC target applied for the 5min interval it can respond to variability in proceeding intervals providing operational flexibility.	ROC contributes to the restoration of the supply/demand balance with more ROC capability facilitating quicker recovery in the 5 min FCAS. ROC in offers for contingency FCAS
Inertia	Automatic, physical characteristic that is distinct from frequency control. Characteristic of synchronous generation and some load.	Resilience; Real time response to minor frequencies	Load relief, instantaneous response to arrest frequency change
FFR	Form of frequency control; sensory response that provides fast and earlier frequency control. Proportional response to frequency. 0-2s	Nil though could potentially provide a fast reserve service if required	FCAS contingency that arrests frequency and can stabilise also. (can provide frequency control if capable)
Regulation FCAS	Integral frequency response provided by generators delivered on a 4-sec automatic generation control (AGC) cycle	Manage frequency as close to 50 Hz as possible with volume procured and enabled over a 5-min period. Raise and lower services.	AGC suspended during large frequency excursions following a contingency event, reinstated after frequency restored.
Contingency FCAS	Frequency control to arrest, stabilise and restore frequency following a contingency event. Contingency capacity	Nil	Provides primary, secondary and tertiary frequency control to arrest, stabilise and restore frequency respectively.

Service	Broad characteristics	Role in NEM normal operations	Role in NEM credible contingency
	reserves to maintain security		
Operating reserves	Capacity reserves held to manage operational reserves	Low reserve condition (LRC), Lack of reserve (LOR); headroom to maintain operational reliability Potential to manage variability in short-term.	Nil – these are contingency reserves except where they are utilised to replace capacity and contingency capacity reserves following a contingency event.

Table 1: Role of system services in the NEM

APPENDIX B
Responses to specific questions in the Directions Paper

CHAPTER 4 – FAST FREQUENCY RESPONSE MARKET ANCILLARY SERVICE

Question 1: Section 4.5.3 – PROBLEM DEFINITION AND REFORM OBJECTIVE — FFR RULE CHANGE	
What are stakeholders' views on the problem definition and reform objective for FRR as set out in section 4.5.3 of the directions paper?	CS Energy considers the analysis in the Directions Paper captures the essence of the problem arising from declining inertia in the NEM and is supportive of the problem definition and reform objective. CS Energy agrees a mechanism should be developed which considers the co-optimised provision of FFR and inertia. In proposing a solution, CS Energy encourages the AEMC to: • Apply a more holistic approach to the development of mechanisms to procure frequency response, with a key objective being the avoidance of incremental layering and complexity. This review should consider whether the current six raise and lower contingency markets are appropriately defined; the markets for secondary and tertiary frequency control should also be examined and specifications updated if required. • As a first step, understand and quantify the need via an explicit operational metric; CS Energy has previously stated its concerns on the absence of a power system standard based on the rate of change of frequency (**RoCoF**) as a transparent guide to the procurement of FFR and inertia that is already quantified by AEMO.[13]
Question 2: Section 4.7.1 – FFR PROCUREMENT	
In relation to the discussion of potential procurement arrangements for FFR services in section 4.7.1 of the directions paper: • What are stakeholders' views on the pros and cons of establishing new FCAS market arrangements for FFR services	CS Energy reiterates its previous comments that developing mechanisms for procuring system services first requires an understanding of the need and its quantification via an explicit operational metric. Without this metric, details of potential options such as procurement requirements, pricing arrangements, risk exposure and cost-recovery

[13] CS Energy, *Ibid*, p.14

versus revising the existing arrangements to incorporate FFR within the fast raise and fast lower services? • Do stakeholders agree that the existing arrangements for contingency FCAS provide an appropriate model for FFR market arrangements? • What are stakeholders' views on how each of the proposed procurement arrangements for FFR would interact with the arrangements for the existing contingency services? • Are there any aspects of the existing contingency FCAS arrangements that should be varied for procurement of FFR services?	cannot be plausibly drafted, let alone any assessment on the efficacy of mechanisms undertaken. CS Energy's high level position on potential procurement arrangements is that it strongly favours a broader review of the existing FCAS markets to incorporate FFR services and explicitly consider its interaction with inertia. The AEMC's consultations on the FFR rule change and PFR incentive arrangements (which are considered in this Directions Paper) and the reserve service mechanism each propose new FCAS markets as one of several potential solutions for consideration. CS Energy cautions against simply establishing a new FCAS market to address each of the identified problems; incremental layering of markets is likely to lead to inefficiencies and undesirable outcomes for the market and consumers. As highlighted in Table 1[14], there are numerous overlaps in the contribution provided by each of the system services during both normal operations and following credible contingency events. Services should not be duplicated. As an example, FFR and the current 6 sec (fast) FCAS have similarities and this overlap arguably supports exploring reconfiguring the existing FCAS arrangements as opposed to incremental layering of FCAS.[15] A possible solution is the creation of a 2 sec containment capability and the amalgamation of the remaining 4 sec of the existing 6 sec service with the 60 sec service for the stabilisation capability (which likewise requires an assessment of whether the existing 60 sec service remains appropriate). This would also avoid the potential exclusion of current 6 sec providers from the FCAS markets, in the event they are enabled and will have delivered some proportional response within the 2 sec period following a frequency excursion requiring a contingency FCAS response. Any assessment of timeframes must also consider those new modes of failure and the changing nature of credible contingencies. PFR is also being delivered in the 2 sec period, however simply adding a new FCAS arrangement for FFR (and potentially PFR) overlooks this interaction.[16] CS Energy considers these congruencies in the services delivered support its argument that the first step must be the development of operational metrics, which for the procurement of FFR (and inertia) is a system standard for RoCoF. The existing contingency FCAS frameworks are capable of incorporating a FFR service with raise and lower components including any proposed changes to the contingency FCAS parameters for containment, stabilisation and restoration. AEMO and market

[14] Refer Appendix A, p.6
[15] CS Energy anticipates this view will likely be affirmed by technical work of AEMO that demonstrates that different timeframes are more suited to both the evolving need and capability.
[16] This example is provided for illustrative purposes only and is not intended to represent CS Energy's preferred position.

	participants are familiar with the design and operations of the current contingency FCAS markets and this may result in lower implementation costs. However, CS Energy's support for utilisation of the existing FCAS frameworks should not infer that it believes new FCAS markets should simply be added, the appropriateness of the existing regulation and contingency services must be challenged. NEMDE is currently capable of co-optimisation and it is anticipated that this capability will continue if a new FCAS design was to incorporate inertia (refer comments to Q6), which in turn will determine the dynamic FCAS requirements. Procurement of FFR and inertia in terms of a RoCoF requirement removes the concerns regarding how to incorporate the binary nature of inertia into dispatch. It is important to note however that inertia is not frequency control and it does not need to be procured via the same mechanism as FFR. There are several features of the existing FCAS frameworks which CS Energy considers should be re-evaluated, which are not limited to the procurement of FFR services, as follows: • the design should not discriminate against other services that also provide a response; for example, currently the Market Ancillary Service Specification (**MASS**) explicitly excludes inertial response from being recognised – if markets for FFR services are introduced, inertia (natural and synthetic) should also be rewarded as it is performing a similar function;[17] and • providers are rewarded for enablement, and not actual performance. CS Energy encourages the AEMC to consider a "payment for performance" approach for all FCAS markets. Additionally, compliance is not well monitored; in the absence of a significant event there is minimal ongoing monitoring that units in fact deliver the volume of FCAS procured.
Question 3: Section 4.7.2 – FFR PRICING ARRANGEMENTS	
In relation to the discussion of potential pricing arrangements for FFR services in section 4.7.2 of the directions paper: • What are stakeholders' views on the pros and cons of maintaining the existing FCAS pricing arrangements for FFR services?	As noted in Q2, until operational metrics are adequately defined and consulted on, pricing arrangements cannot be considered nor assessed with any efficacy. CS Energy however makes the following comments about the current FCAS pricing arrangements and their potential application to FFR services:

[17] Refer Q6, all inertial response should be valued not only from units enabled for FCAS

• What are stakeholders' views on the potential pros and cons of incorporating performance-based multipliers into the pricing arrangements for FFR services?
• Do stakeholders have any other comments or suggestions in relation to the pricing arrangements for FFR services?
	• The current FCAS pricing arrangements are a potential option for pricing FFR services.
	• CS Energy does not support performance-based multipliers:
	  ○ All response should be equally valued, as each MW provided in response to a frequency deviation contributes to arresting and restoring frequency.
	  ○ Operational outcomes for contingency responses rely on a suite of response profiles, so different characteristics such as ROC are equally important in frequency control as speed of response. It is not clear why this response characteristic should be considered by default to be of greater value than other characteristics.
	  ○ A price multiplier approach would add further imposts on measurement and processing with little evidence of efficiency improvements, costs may exceed the benefits. The existing FCAS framework utilises a volume multiplier approach in the MASS to recognise different technological performances; it is difficult to identify the net benefits arising from the proposed performance-based multipliers being incorporated into the pricing arrangements for FFR services.

Question 4: Section 4.7.3 – FFR COST ALLOCATION	
In relation to the discussion of arrangements for the allocation of costs associated with FFR services set out in section 4.7.3 of the directions paper: • What are stakeholders' views on the arrangements for the allocation of costs for FFR services? • Would it be appropriate for the cost of FFR services to be allocated in a similar way to the existing arrangements for the allocation of contingency FCAS costs?	As noted in Q2, until operational metrics are adequately defined and consulted on, pricing arrangements cannot be considered nor assessed with any efficacy. CS Energy however provides the following comments on the possible arrangements for cost allocation. CS Energy agrees that as the FFR services proposed in the Directions Paper closely align with the current contingency FCAS, the current cost recovery methodology is a potential option for FFR services. CS Energy does not favour the proposal to allocate FFR costs by reference to the degree to which a participant causes the need for FFR (the theory being that a market participant that provides inertia may be assessed as not causing the need for FFR and therefore allocated less of a share of costs for FFR), as it is concerned it will add layers of complexity. Any allocation of contribution would be complex to calculate as it would need to consider the value of online inertia and also allocate charges to consumers when DER displaces inertia and therefore requires greater levels of FFR procurement. CS Energy's preference is to develop a mechanism that separately values and procures inertia.

Question 5: Section 4.8 – ISSUES FOR CONSIDERATION – FFR	
Are stakeholders aware of any additional issues that the Commission should take into account in developing market ancillary service arrangements for FFR?	In developing market arrangements for FFR, CS Energy encourages the AEMC to explicitly recognise the linkages between inertia and FFR. The AEMC has stated it does not intend to specifically include in its consideration of an FFR mechanism the valuation of inertial response, its reasoning being the issues with inertia are more complex and it does not want to delay other reforms such as FFR whilst considering these issues.[18] CS Energy strongly disagrees with this approach. The volume of FFR procured cannot be considered separately to system inertia, and taking a siloed approach is unlikely to result in an efficient outcome. It is imperative an operational standard for inertia or RoCoF is developed. An operational standard will provide the required levels of transparency, allocation and NEMDE FCAS pricing outcomes. CS Energy would endorse the co-optimisation of FFR, inertia, FCAS (the current 6 sec FCAS if this remains) and energy. In its submission to the ESB Consultation Paper, CS Energy suggested inertia and FFR could be co-optimised as an interim step, with inertia procured via contracts to meet the minimum level required while the additional services required to manage RoCoF can be met by FFR where more efficient to do so.[19] CS Energy would welcome further clarity as to why the AEMC considers FFR and inertia cannot be co-optimised, given that ultimately the objective function is a dollar figure. CS Energy also refers the AEMC to its comments in Appendix A seeking greater transparency on how this consultation will interact with the ESB's work program, including how stakeholder responses will link into the ESB's option paper proposed for March 2021 and its timeframe for providing recommendations.[20]
Question 6: Section 4.8.1 – VALUATION OF INERTIAL RESPONSE	
In relation to the potential arrangements for the valuation of inertial response described in section 4.8.1 of the directions paper: • What are stakeholders' views on the valuation of inertial	As stated in Q5, valuing inertia is a priority and it is disappointing the AEMC is not developing and implementing arrangements for the valuation of inertia through the FFR rule change. The proposal to consider interactions between FFR and inertia as part of this rule change, but leave the consideration of spot market arrangements for inertia to be led through the ESB's workstream is confounding. As noted above, the volume of FFR

[18] AEMC, *AEMC briefing for AEC on current projects*, 27 January 2021
[19] CS Energy, *Submission Energy Security Board Post 2025 Market Design Consultation Paper*, October 2020
[20] Refer Appendix A, p.4

response as part of the contingency services, including the proposed new FFR contingency services? • What are stakeholders' views on the current governance arrangements for contingency services; where the detailed service specification is determined by AEMO and documented in the MASS? (Is it appropriate for the NER to provide further guidance on how inertial response should be considered in the MASS?)	procured cannot be considered separately to system inertia, and even if different mechanisms for each are developed, the "demand curve" is dependent on both. CS Energy is concerned the development of mechanisms under disparate processes does not allow for a holistic re-evaluation of the underlying contingency frameworks where appropriate, nor does it afford the opportunity to evaluate the trade-off between potential mechanisms. The provision of inertia as part of the contingency frameworks should be explored, and a mechanism developed that considers both the provision of FFR and inertia. Operational standards would set the procurement requirements. Procurement of FFR and inertia volumes can be co-optimised through NEMDE. With respect to consideration of the inertial response in the MASS, the MASS currently subtracts the inertial contribution. It is an anomaly that needs to be addressed in a review of the MASS. All responses which arrest frequency change should be valued. CS Energy acknowledges that more detailed consideration is required as simply removing this subtraction would only reward units enabled for FCAS. This adjustment does not of itself properly value inertial response or send appropriate market signals.
Question 7: Section 4.8.2 – PRICE RESPONSIVE DEMAND FOR CONTINGENCY SERVICES	
In relation to the discussion of arrangements for incorporating price responsiveness into the procurement of contingency services in the NEM set out in section 4.8.2: • What are stakeholders' views on the potential pros and cons associated with the implementation of a "demand curve" approach to procurement of FCAS? • What are stakeholders' views on the priority of such a change to the market frameworks? • If such an approach was to be implemented, what are stakeholders' views on the appropriate governance arrangements, including the potential oversight role for the AER?	CS Energy does not support the implementation of arbitrary demand curves for the procurement of contingency services; demand curves are only efficient if they are based on clear system standards for these services. Underpinning any "demand curve" is the quantity of the service required to deliver system security, as established by the standard. The proposal for a demand curve approach is difficult to reconcile with a deterministic technical envelope and the current contingency management approach. In the event of introducing a probabilistic component to the contingency management approach, the procurement outcome should reflect the system security requirement. It provides consistency and certainty reflective of any applicable system standard. There are potentially many complexities arising from the concept and application of a demand curve approach to procurement of contingency services without obvious benefits from the process. The demand curve concept is presented in a simplistic manner and does not identify or highlight the potential complexities or the tangible value that comes at a cost to consumers arguably because it is deemed cheap but not required according to the power system security standard. The technical envelope and the power system

	security requirements should be the determinants of the FCAS requirements and procurement. If the AEMC were to proceed with the demand curve proposal, any investigation of such a proposal should be overseen by the Reliability Panel to assess the costs and benefits of the proposed FCAS demand curves. It is not clear why the Directions Paper mentions AEMO and the AER as the bodies to advance this proposal with no mention of the Reliability Panel. The Reliability Panel's remit is to assess the economic trade-off between power system security and cost. CS Energy's strong preference is, however, for the AEMC to quantify the system needs via explicit operational standards. It is noted that this approach aligns with the advice provided to the ESB by FTI.[21]
Question 8: Section 4.8.3 – INTERACTION BETWEEN MANDATORY PFR & FFR ARRANGEMENTS	
What are stakeholders' views in relation to the potential interactions between new FFR arrangements and the Mandatory PFR arrangement?	It is imperative that any final market design recognises the linkages between inertia, FFR, 6 sec raise/lower services and narrow Mandatory PFR, so that the procurement of these services is harmonised. Each of these services provide a response to arrest and restore frequency deviations. As illustrated in the diagram below, following a contingency event (where the frequency deviation exceeds 50.15Hz or falls below 49.85Hz) the following services will be delivered: • inertial response will be automatically provided; • an initial narrow Mandatory PFR response will be provided; • any remaining PFR capability (acknowledging there is no obligation to maintain headroom or footroom) will be delivered on a proportional basis; • FFR contingency FCAS will be delivered on a proportional basis; and • assuming no changes to the existing FCAS markets, a proportion of the 6 sec contingency FCAS will be delivered in the proposed FFR 2 sec timeframe. In the event of a contingency event, PFR is effectively the delivery of 'contingency FCAS' before it is required.

[21] FTI Consulting, *ESB Essential System Services - Technical Webinar #1*, May 2020

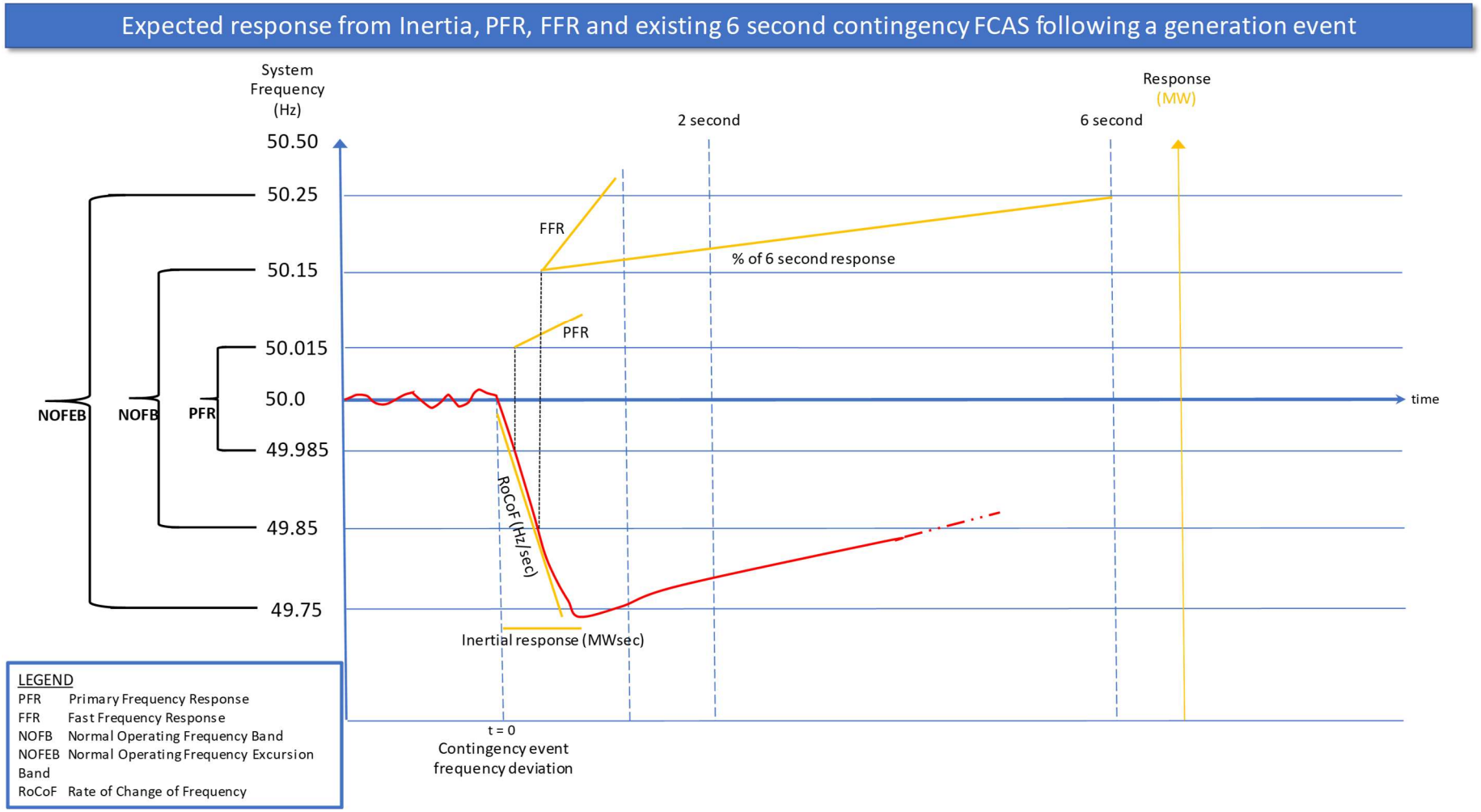

Diagram: Provision of system services following contingency event

Question 9: Section 4.8.4 – IMPLEMENTATION AND STAGING FOR FFR	
In relation to the discussion of the implementation arrangements for FFR services as set out in section 4.8.4: • What are stakeholders' views in relation to the process for the implementation of FFR arrangements in the NEM? • What are stakeholders' views on the potential need for interim or transitional arrangements as part of the transition to spot market arrangements for FFR?	CS Energy is concerned that the process for implementation of FFR set out in the Directions Paper is either overlooking, or is not properly sequencing, several fundamental steps that it considers must occur in developing an efficient spot market mechanism for FFR. Relevantly, the process does not provide for any definition of the need via an operational metric, which CS Energy has previously suggested could be achieved through a review of the FOS.[22] With respect to transitional arrangements, CS Energy views these cautiously, unless there is a clear imperative to address an immediate need. There is always a risk that transitional arrangements become permanent on the pretext that other priorities have emerged which require immediate attention, or the transitional arrangements lead to inefficient outcomes as the final design choices build upon this interim "foundation" instead of exploring a holistic solution that may be more efficient. Based on the public information on the proposed synchronous generator retirement dates, CS Energy considers there is adequate time to properly consider any spot market arrangements for FFR design prior to the emergence of the forecast power system security challenges (provided these dates are not brought forward). CS Energy does support transitional pathways that inform the development of a long-term mechanism. As noted above, CS Energy believes valuing inertia is a priority, and encourages the AEMC to consider contracting as a short-term solution. As noted in its submission to the ESB Consultation Paper, CS Energy posited this could have several benefits.[23] In terms of informing the development of a spot market mechanism for FFR, CS Energy suggests the AEMC obtain technical advice from AEMO on the FFR arising from the performance to date from the existing Battery Energy Storage Systems (Dalrymple (grid forming), Gannawarra, Ballarat, Lake Bonney and Hornsdale (grid following) in response to power system events over the last 2 years. This analysis may provide an insight to the challenges and costs of implementing an FFR arrangement in the NEM and potential measure for addressing these challenges and mitigating the associated risks.

[22] Refer Appendix A, p.5
[23] CS Energy, *Ibid*, p.37

CHAPTER 5 – PRIMARY FREQUENCY RESPONSE INCENTIVE ARRANGEMENTS

Question 10: Section 5.1.3 – THE ROLE OF MANDATORY PFR	
In relation to the discussion of the role for a mandatory obligation as part of the enduring PFR arrangements in the NEM, set out in section 5.1.3: • Do stakeholders agree that a mandatory PFR arrangement provides a valuable safety net to help protect the power system from significant non-credible contingency events? • Do stakeholders agree that the narrow, moderate and wide settings for a mandatory PFR response band adequately represent the broad policy options for the frequency response band for Mandatory PFR?	CS Energy recognises the desirability from an operational perspective to maintain frequency as close as possible to 50Hz. In principle, the narrow Mandatory PFR delivers a tighter frequency control outcome under normal operating conditions. However, CS Energy considers the proposition that "*a mandatory PFR arrangement provides a valuable safety net to help protect the power system from significant non-credible contingency events*" is conflating two separate issues, the use of PFR to control minor deviations and to respond to rare, 'major' deviations. If the objective is to help protect the power system from significant non-credible contingency events, the Directions Paper has ignored the purpose of Wide Band Frequency Response (**WBFR**) (outside ±0.5Hz) that by definition arguably represents a safety net. This position has been covered in extensive detail in CS Energy's submission to the Mandatory PFR consultation and to the AEMO Power System Frequency Risk review.[24] CS Energy continues to be of the position that WBFR represents a safety net, not the narrow Mandatory PFR, and supports mandating WBFR. If WBFR is deemed insufficient as a safety net, then the AEMC should provide strong justification. The narrow Mandatory PFR was introduced following the power system event of 25 August 2018 and observed deviations away from 50Hz under normal operating conditions. In neither case was there a breach the FOS, system frequency remained consistently within the NOFB and the FOS is silent on the distribution of frequency within the NOFB. Although AEMO has repeatedly indicated that this characteristic has adverse implications for system security, and industry has raised these concerns with the Reliability Panel[25], the Reliability Panel has eschewed the opportunity to revise the FOS to address this issue. CS Energy also considers the narrow Mandatory PFR distorts the existing markets and over time may reduce the value and efficacy of the FCAS market. Additionally, the mandatory PFR is only a partial mandate, as it does not stipulate the requirement for headroom or footroom, without which may ultimately undermine power system security.

[24] CS Energy, *Response to Primary frequency response Rule changes (ERC0274)*, October 2019; CS Energy, *Submission: Power System Frequency Risk Review Draft Report Stage 1 Consultation*, July 2020
[25] See for example the Australian Energy's Council (**AEC**) submission to the Reliability Panel's 2017-19 FOS review, here; AEC letter to the Reliability Panel July 2020, here

Question 11: Section 5.4 – PROBLEM DEFINITION AND REFORM OBJECTIVE — PFR INCENTIVE ARRANGEMENTS RULE CHANGE	
What are stakeholders' views on the problem definition and reform objectives for enduring PFR arrangements set out in section 5.4?	The summary in section 4.5 largely captures the core of the problems for arrangements for PFR in the NEM however because of the generality of the discussion several nuances with the issues to be resolved are lost: • *Dot Point 1*: CS Energy agrees that PFR within the NOFB is necessary to maintain frequency however there is no quantification of the size of the narrow PFR deadband that may be necessary. The SSMFR and FCFR both contained recommendations that the AEMC develop an understanding of what good frequency control looks like. Modelling should also be undertaken by the AEMC as to the economically efficient level of PFR. • *Dot Point 2*: Refer to Q10. The narrow Mandatory PFR (±0.015Hz) does not provide the desired safety net; the desired safety net is delivered by WBFR. With respect to the proposed solutions, CS Energy strongly suggests that the AEMC escalates step 5 (review of the FOS) to the top of the priority list. Arguably, this review should already have been completed to provide the baseline to develop the design for PFR in the NEM (together with a revision of the FCAS frameworks). As noted above, CS Energy acknowledges that this review takes time, however it has suggested possible options for developing interim operational metrics.[26]
Question 12: Section 5.4.1 – ECONOMIC ANALYSIS OF MANDATORY PFR	
In relation to the discussion of the costs and benefits of Mandatory PFR arrangements set out in section 5.4.1: • What are stakeholders' views of the indicative curves for costs and benefits of Mandatory PFR with respect to the frequency response band settings, set out in figure 5.4? • Do stakeholders agree that the frequency response band setting is a key variable for the determination of enduring PFR arrangements that meet the power system needs and are economically efficient over the long term?	Figure 5.4 in the Directions Paper is a standard conceptual analysis but overlooks several undesirable impacts arising from Mandatory PFR including: • The impact on the value of the actual service without reference to investment incentives for the provision of PFR; • The analysis does not account for the forecast reduction of PFR supply as thermal generators exit the NEM; and • The analysis does not account for the distortion to the FCAS market. Narrow deadband PFR and WBFR provide different utility within the context of delivering the required power system security for a given technical envelope. Narrowband PFR provides frequency control within the NOFB, however the required performance metrics

[26] Refer Appendix A, p.5

• What are stakeholders' views on the effectiveness of the exemption framework under the Mandatory PFR arrangement? • What are stakeholders' views on the role that the allowance for variable droop settings plays in relation to the cost impacts of Mandatory PFR? • Based on the initial roll out of the Mandatory PFR arrangement to generators over 200MW, what are stakeholders' views on how the cost impacts of Mandatory PFR are impacted by the proportion of the fleet that is responsive to frequency variations? Provide more comments on this as per Barry's feedback • What other considerations are there in relation to developing effective and efficient arrangements for PFR in the NEM?	need to be stipulated in the FOS if the enduring arrangements are to meet power system security needs and be economically efficient over the long term. WBFR provides a safety net. The exemption framework under the Mandatory PFR arrangement appears comprehensive and realistic. CS Energy notes that AEMO has not granted any exemptions to date for the Tranche 1 (> 200MW) generators.[27] The case for implementing variable droop settings to meet power system needs is not evident. The progressive roll out of mandatory PFR on the Tranche 1 generators has resulted in an observed convergence of system frequency towards 50Hz during normal system operating conditions. The performance is directly correlated with the number of generators providing the narrow Mandatory PFR. CS Energy provides the following observations, drawn from its experience to date. • It is not reasonable to infer that a competitive market could be created for narrow deadband PFR based on the observed improvement to frequency performance. • The major contributors to the frequency control performance are the thermal coal generators that are progressively slated for retirement over the coming years. It is an imperative that the appropriate incentives for narrowband PFR are established prior to the forecast retirement of the narrowband PFR providers to provide the visible signals to market to invest in technologies to procure this service. • In all the commentary, the absence of a review of the FOS or even a heuristic metric for "good frequency performance" makes it challenging to provide meaningful responses to the efficacy of existing and proposed PFR initiatives. • Narrow Mandatory PFR has been implemented for an insufficient time period for CS Energy to provide any meaningful feedback as to whether the arrangements will translate to increased "wear and tear" on plant. Each unit's response has been unique, and it is anticipated that the long-term impact of narrow Mandatory PFR will vary across the CS Energy portfolio. Some parts of the plant, such as the hydraulic governors and boilers, are definitely "working harder", which may lead to more frequent overhauls and, ultimately a material increase in costs.

[27] https://aemo.com.au/-/media/files/initiatives/primary-frequency-response/2020/pfr-implementation-report-v11-20-jan-21.pdf?la=en

Question 13: Section 5.5 – ADVICE FOR ENDURING PFR ARRANGEMENTS	
What are stakeholders' views of the Commission's proposed approach to obtaining advice to inform its determination of enduring arrangements for PFR in the NEM?	CS Energy believes that if the FOS had been reviewed to determine a PFR metric following on from the FCFR, then AEMO would have been able to provide technical analysis of frequency outcomes on proposed enduring arrangements. CS Energy reiterates its view that AEMO (understandably) focuses only on the technical analysis and remains separated from the economic and market design components that fall under the remit of the AEMC and Reliability Panel.
Question 14: Section 5.6.1 – PROCUREMENT ARRANGEMENTS FOR NARROW BAND PFR SERVICES	
In relation to the discussion of potential procurement arrangements for narrow band PFR services in section 5.6.1: • What are stakeholders' views on three options identified for further consideration? a. Existing market ancillary service arrangements b. New market ancillary service arrangements c. New incentive-based arrangements for voluntary provision • Are there any other options that would be preferable?	Until operational metrics are adequately defined and consulted on, procurement arrangements cannot be considered nor assessed with any efficacy. It is imperative that the AEMC, as a first step, articulate the need by developing metrics for the desired frequency performance within the NOFB. This will determine whether the desired outcome should be that frequency continue to be maintained as close as possible to 50Hz or, recognising the new "normal" operating state given the changing generation mix, whether a revised standard permits a wider distribution of frequency within the NOFB. With respect to the procurement options identified by the AEMC, CS Energy reiterates its previous comments and encourages the AEMC to: • Challenge the frameworks for the existing FCAS markets, including whether the existing regulation FCAS markets should be revised.[28] The Directions Paper is silent on this. • Apply a more holistic approach which examines both the underlying operational needs as well as the economic outcomes and trade-offs of potential mechanisms not only with respect to the existing FCAS markets but also potential markets proposed for FFR, inertia and operating reserves. If new operational metrics require the procurement of PFR to respond to small frequency deviations during normal operations, CS Energy's preference is for a procurement

[28] For example, the impact of providing regulation raise FCAS using AGC, should be analysed for thermal plant as the AGC action of ramping up will cannibalise stored energy or reduce pressure reserve resulting in a potentially diluted PFR raise response.

	mechanism that will elicit a market response, with performance (not enablement) rewarded.
Question 15: Section 5.6.2 – PROCUREMENT ARRANGEMENTS FOR NARROW BAND PFR SERVICES	
What are stakeholders' views on the arrangements for the pricing of PFR as described in section 5.6.2?	Refer to Q14. Until the need is quantified, it is difficult to properly consider if any of the proposed pricing arrangements will provide the required economic signals to drive the level of investment required. In respect of the pricing arrangements identified, CS Energy provides the following comments: • **Pricing through the dispatch of Market Ancillary Services:** CS Energy is supportive of pricing arrangements that operate in a similar way to the existing FCAS markets however refer to our comments in Q3 regarding review of the existing FCAS markets to reward performance and not enablement. • **Double Sided Causer Pays (DSCP):** CS Energy, in its submission on Mandatory PFR, proposed DSCP as an option for rewarding the provision of PFR within the NOFB and maintains strong support for DSCP as a viable option;[29] CS Energy is also promoting a joint study with the AEC, IES and ARENA on the feasibility of DSCP. A key attribute of a DSCP mechanism is that actual performance is rewarded. • **Regulated pricing for PFR:** Based on CS Energy's understanding of the utilisation of regulated pricing in Nordics's frequency frameworks, this arrangement is not supported. An outstanding item requiring further investigation and analysis is the choice of the appropriate frequency input source.
Question 16: Section 5.6.3 – ALLOCATION OF COSTS FOR NARROW BAND PFR	
What are stakeholder's views on the allocation of costs for narrow band PFR services as described in section 5.6.3?	CS Energy's preference is for DSCP or deviation pricing, as a key feature is the self-funding mechanism. It is reasonable to apply the causer pays allocation of costs as utilised in regulation FCAS, albeit with a more sophisticated methodology than is currently employed, to the allocation of

[29] CS Energy, *Ibid*

Do stakeholders agree that the any additional costs for narrow band PFR be allocated through the existing causer pays procedure for the allocation of regulation costs (or a revised version as described in section 5.9?	costs for narrowband PFR services.
Question 17: Section 5.7 – PATHWAYS FOR ENDURING PFR ARRANGEMENTS	
In relation to the pathways for enduring PFR arrangements set out in section 5.7: • What are stakeholders' views on the enduring PFR pathways? • Do stakeholders agree with the Commission's preliminary preference for pathway two? (the widening of the PFCB and the introduction of market arrangements for narrow band PFR)	Refer to Q14. CS Energy is hesitant to identify any preference until the operational metrics are adequately defined and consulted on. As has been repeated on several occasions, a revised FOS should establish the requirement for narrowband PFR. With respect to the discussion in section 5.7.1 of the Directions Paper, CS Energy makes the following observations: • The introduction of a Primary Frequency Control Band (**PFCB**) that differs from the current mandatory PFR ±0.015Hz deadband together with the reference to wide band PFR is puzzling, and adds confusion to the pathway proposals. The mandatory PFR ±0.015Hz deadband objective is to maintain the frequency close to 50Hz under normal operating conditions. The WBFR referenced in the Rules and the Generator Performance Standards is set at ±0. 50Hz but there is ongoing uncertainty on when the setting should be enabled. CS Energy is of the view that it should be mandated without compensation (within the context of the current generation mix, not necessarily following the transition) and this wideband represents the safety net that is being sought in response to the occurrence of non-credible contingency events on the power system. The narrow and wide features have different purposes which equally deliver different outcomes, albeit each related to frequency control. The pathways continue to conflate these two issues. • Any mandatory imposition of narrowband PFR would likely result in oversupply and inefficient procurement of the service that does not satisfy the National Electricity Objective; refer to comments in the final dot point below. • Implementing Mandatory PFR with a widening of the PFCB to the current contingency FCAS MASS settings, or even a wider setting, appears to contradict the initial purpose of narrowband PFR. Is the objective to maintain frequency during normal operations or to respond to a contingency event? • Performance statistics to date have indicated that it only takes a small subset of PFR providers to deliver the required frequency performance. Supporting evidence of this is the recent power system event where a large generator (550MW) was disconnected in NSW at 2318 hours Tuesday 2 February 2021 resulting in a frequency excursion from effectively 50Hz to a minimum frequency of 49.79Hz (within the normal operating

	frequency excursion band) with the containment, stabilisation and restoration being provided primarily by PFR and most likely assisted by the AEMO AGC. While this outcome does highlight the utility provided by PFR, it also highlights that PFR response is only required from a proportion of providers, and mandating PFR will result in an oversupply. At the same time, the potential concerns raised above on the distortive effect of Mandatory PFR and perverse incentive for the market operator to reduce the amount of contingency FCAS highlights the importance of providing the appropriate incentives for the provision of PFR that reflects a 'fit for purpose' FOS. Following the FOS review that produces the narrow PFR metric, CS Energy suggests a "Lack of PFR" 1, 2, and 3, similar to the LOR for capacity reserves, could be developed to provide the required level of visibility to the market operator and participants. It is questionable that lack of confidence could arise for PFR availability when it does not occur for energy or FCAS provided the appropriate market signals are generated enabling participants to respond.
Question 18: Section 5.8 – FUTURE REVIEW OF THE FOS	
What are stakeholders' views of the Commission's proposed approach towards a future review of the FOS as part of the development of enduring PFR arrangements?	CS Energy agrees it is imperative that the FOS be reviewed but strongly disagrees with the AEMC's proposed timetable. Mechanisms for the enduring PFR arrangements will be proposed prior to the review of the FOS, which is not scheduled to commence until Q3 2021, without any assessment of the appropriate balance between the security benefits versus the cost of procurement. This assessment falls within the remit of the Reliability Panel, not the AEMC or AEMO. As previously stated, CS Energy implores the AEMC to re-prioritise the review of the FOS.
Question 19: Section 5.9 – REFORMS TO THE NER RELATING TO COST ALLOCATION FOR REGULATION SERVICES – CAUSER PAYS	
In relation to the proposed reforms to the NER relating to the allocation of regulation costs, set out in section 5.9: • What are stakeholders' views on the proposal to allocate regulation costs on the basis of performance against system frequency as opposed to Frequency indicator (FI)? • What are stakeholders' views on the proposal to align the sample	This topic of FCAS Regulation Causer Pays appears to be somewhat misaligned with the FFR/PFR subject under consultation. It is important not to conflate proportional frequency response such as PFR and integral frequency control such as regulation. The measurement method needs to be fit for purpose. It appears that FI is appropriate for regulation. CS Energy supports the publication in real time of the FI. The current causer pays methodology does not reflect real time performance. The Directions Paper refers to unintended incentives arising from the current approach without any

and application periods for determination of causer pays factors and shorten the application period to 5 minutes, in line with the NEM dispatch interval? • What are stakeholders' views on the removal or shortening of the ten-day notice period for causer pays contribution factors? • What are stakeholders' views on AEMO's proposal to pre-calculate seven sets of contribution factors including local contribution factors? • What are stakeholders' views of AEMO proposal to include non-metered generation in the residual component for allocation of regulation costs?	supporting information. An area that requires attention is that the current causer pays process does not value or reward positive contribution factors. This does not reflect actual performance. At this stage, CS Energy reserves its response on the removal or shortening of the ten-day notice period for causer pays contribution factors in anticipation of the fact that the notice period could be reviewed as part of a future rule change proposal.[30] CS Energy would encourage exploration of the feasibility of real time processes and calculations for determination of causer pays factors. CS Energy supports the use of multiple factors to recover local requirements. CS Energy supports the explicit recovery of costs from non-metered generation by inclusion in the residual component for allocation of regulation costs.

[30] AEMC, *Directions Paper*, December 2020, p. 97