Your Ref: Consultation under National Electricity Rules – clause 5.20A.1

22 July 2020

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Submitted by email to: 2020PSFRR@aemo.com.au

Dear Luke

Submission: Power System Frequency Risk Review Draft Report Stage 1 Consultation

CS Energy welcomes the opportunity to provide a submission on the Power System Frequency Risk Review (**PSFRR**) Draft Report Stage 1 Consultation (**Report**).

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 coal-fired power stations. 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.

General comments

CS Energy commends AEMO on the content quality and production of the Report. CS Energy's response primarily focuses on the sections of the Report that address stage 1 and anticipates that AEMO will consider the feedback in the submission as relevant for consideration and inclusion in the PSFRR stage 2 report which is due later in 2020.

Our detailed comments on the Report are set out in the Attachment.

Please contact us if you would like to discuss this submission further.

Yours sincerely

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ATTACHMENT

1. Key Omission from the Report

Section 4.3 of the Report summarises relevant non-credible contingency events which occurred in Queensland since the last PSFRR. The Report does not include other events which have a sustained material impact on frequency.

Relevantly, the Report makes no reference to a frequency event that occurred on the evening of 28 January 2020 and resulted in a sustained high frequency for a significant duration. It is understood that the frequency event arose from a failure of AEMO systems.

Information is scarce on the frequency event, including the root cause and any learnings. To date AEMO have only published a Market Notice with limited information (the notice was published on the evening of 28 January 2020 soon after the rectification of the issue and return to normal operation).

CS Energy remains concerned that a preliminary report was not published within five business days followed by a comprehensive report on the completion of a full investigation detailing the learnings and recommendations.

Similar to the reporting on non-credible contingency events, CS Energy recommends that AEMO includes a section in the Report on the failure of systems that impact adversely on the power system frequency and cite specific events that have occurred for the period being reviewed for the Report.

2. CS Energy perspective on the NEM Queensland and South Australia system separation on 25 August 2018

CS Energy notes the AEMO Incident Report for the Queensland and South Australia system separation on 25 August 2018 Incident Report[1] issued 10 January 2019.

CS Energy would encourage AEMO to provide further detailed insight and explanation on the following observations and comments in relation to this event.

(a) The lack of consistent understanding and application of the wide band frequency response (**WBFR**) of generating plant to a frequency event outside the ± 0.5Hz. This item is explored further in section 3 below.

(b) Prior to the power system event, the NEM Dispatch Engine allocated the FCAS enablement on an economic basis that resulted in a mismatch of raise and lower requirements post the occurrence of the power system event. CS Energy remains concerned that notwithstanding some initial commentary on this subject, further progress has not occurred to mitigate this type of occurrence following a power system event.

(c) There is evidence of lack of coordination between Transmission Network Service Providers (**TNSP**) of protection changes across the Queensland New South Wales

[1] https://aemo.com.au/-/media/files/electricity/nem/market_notices_and_events/power_system_incident_reports/2018/qld--sa-separation-25-august-2018-incident-report.pdf?la=en&hash=49B5296CF683E6748DD8D05E012E901C

(**QNI**) interconnector for the Single Phase Automatic Reclose component that resulted in an extended period of operation not reflective of primary protection clearing times jeopardising power system security with the worst case scenario being the loss of synchronism between Queensland and the remainder of the NEM.

(d) The operation of the Emergency APD Portland Tripping scheme was not appropriate in this instance. While the 'conditions' for operation of the scheme were met, it was a perverse outcome as the positive frequency response from the South Australia generators manifested itself a 'legitimate input' to the scheme logic. However, the input was a positive contributor to the required power system response to the event and its removal created an unnecessary adverse outcome.

(e) Following the power system event resulting in the formation of the Queensland region electrical island, CS Energy notes that AEMO invoked network constraints to 'constrain off' generation to enable the largest risk to match the available FCAS in the Queensland electrical island. While CS Energy does not advocate the use of network constraints in this manner to meet the Frequency Operating Standard, it does recognise the efficacy delivered in this instance to restore the power system to a secure operating state within the prescribed times following the non-credible contingency event.

However, when the secure operating state has been achieved, when would AEMO consider converting the 'constrained off' generation outcomes to *directions* for power system security?

CS Energy provides further comments on protection schemes in section 5 below.

3. Wide deadband

CS Energy raised the following issues with respect to WBFR in our submission to the AEMC Mandatory Primary Frequency Response Draft Determination consultation[2].

> "*CS Energy has previously championed the benefits provided by wide deadband frequency response (response to the system frequency moving outside the 49.5 – 50.5Hz range). CS Energy remains concerned that this area continues to receive levels of attention that do not reflect the importance of the service (to provide system resilience to non-credible events) and the need to remove the current ambiguity on this subject.*
>
> *CS Energy continues to be concerned that several generators in the NEM turn off their Partial Load Rejection capability specified in s5.2.5.7.*
>
> *The "frequency response" capability specified in s5.2.5.11 can be turned off if the unit is not participating in the FCAS market, although AEMO has the power to direct generators to enable the capability in the event of a market failure. However, there are issues that remain unclear in respect of the exercise of this power: Is it assumed that unit operators can switch the frequency response influence back on at short notice through a selection switch on an operator's control system screen? Is it assumed that waiting hours for a call out technician to re-enable the frequency influence would not be satisfactory? Are generators that have switched off Partial Load Rejection capability, required to provide their*

[2] https://www.aemc.gov.au/sites/default/files/documents/rule_change_submission_-_erc0274_-_cs_energy_-_2020_02_20.pdf

operators with the ability to switch the wide range governor frequency response influence back on at short notice if directed by AEMO?

s5.2.5.7 "Partial Load Rejection" does not include a statement like that in s5.2.5.11(i)(4) "Frequency Response", that generators are only required to operate in frequency response mode when enabled for a relevant market ancillary service. Hence the interpretation of s5.2.5.7 is ambiguous. Partial Load Rejection capability falls outside the scope of the FCAS market, as some generators have automatically limited the contingency governor response to the amount of 0.5 Hz deviation response dispatched, and the response measurement methodology in the MASS does not cover deviations beyond 0.5 Hz. An FCAS market for Partial Load Rejection capability would be impractical because the frequency band needs to be set inside individual generator's maximum continuous operating frequency, creating fairness and co-ordination difficulties. A Partial Load Rejection capability market would also need to be distributed into regions covering potential islands. It would also be inefficient, because it would be rarely needed. Hence there appears to be a clear need for AEMO to direct enablement of Partial Load Rejection capability to maintain system security until the issue is resolved.

AEMO have previously advised CS Energy that it believed it would not be allowed to direct enablement of Partial Load Rejection capability at present, even after the separation event on 25 August 2018. CS Energy considers the Rules should clarify the circumstances in which AEMO can direct re-enablement of Partial Load Rejection capabilities e.g. would threats to an inter-connector as reflected in constraints due to lightning near the line, be enough cause? If not, AEMO is unlikely to be able to direct enablement before incidents occur, because system separation events are by nature rare and unexpected, as the result of a "non-credible contingency". In which case, specifying a Partial Load Rejection capability would appear to be of no benefit to AEMO in managing system security.

CS Energy questions how AEMO can realistically determine system stability constraints when the system response to large disturbances is dependent on how many generators have their Partial Load Rejection capability enabled. There has been a lot of criticism of poor narrow range frequency control compromising system stability constraint calculations, because a disturbance could start with frequency already near the edge of the NOFB. However, a lack of Partial Load Rejection capability is much more serious, and it is wrong to conflate this with the raise/lower regulation FCAS problem within the NOFB. While both require increased fast proportional governor response to provide adequate control, they apply to different frequency bands with very different needs. Partial Load Rejection capability is rarely needed but needs to be distributed throughout the NEM, while raise/lower regulation FCAS is continuously required, and can be sourced anywhere in the NEM.

Given a high percentage of new solar and wind inverters are providing high frequency response, as required under revised Australian Standards and NEM rules, it is incongruous to allow large thermal generators to disable Partial Load Rejection capability. Generators that have disabled Partial Load Rejection capability are free-loading on others who provide the fast re-balancing of generation with load after separation events; this protects the freeloader's plant from stresses and risks associated with fast load reductions, and further avoids a reduction of generation into the energy market, while exacerbating these conditions for the others who delivered the load rejection. However, if the system collapses as a result, every-one is much worse off, hence it is a common good,

> *and it would be appropriate for Partial Load Rejection capability to be mandatory under the NEM rules.*
>
> *CS Energy considers that the evidence is overwhelming in support of mandating a wide deadband frequency response performance. As stated in our submission on the Consultation Paper, CS Energy does not consider mandating a wideband response is likely to impose an economic cost as, in this case, the incentive is already present (with the cost of responding to major deviations likely to be less than the cost of failing to do so).*"

CS Energy strongly encourages AEMO to address, where possible, the issues raised on the provision of WBFR particularly for benefits provided by WBFR in response to the occurrence of low probability high consequence non-credible contingency events.

Furthermore, AEMO makes numerous references to the lack of Over Frequency Generator Schemes (**OFGS**) in several NEM regions including Queensland.
A NEM wide application of mandated WBFR as proposed in the above would provide AEMO with the equivalent of an OFGS but without the need for intricate coordination challenges in anticipation of where the power system may breakup in response to a non-credible contingency event(s).

4. Protected Event

CS Energy has reviewed the references to *protected event*, its application and further expansion.

While understanding the requirement for the *protected event*, CS Energy is concerned that the current provisions may not be operationally effective. It is noted that the concept of *protected event* arose from the South Australia Black System Event. However, as noted in the Report[3], since the declaration of *protected event*, AEMO's records indicate it has occurred twice (on 8 August 2019 and 22 January 2020) for a period of around 24 hours in total.

CS Energy notes since the declaration of a *protected event*, AEMO has issued many Market Notices under the "General" category particularly for the South Australia region detailing potential threats to the power system arising from abnormal weather conditions and resultant actions like that for a *protected event.*

CS Energy encourages AEMO to consider if the conditions for a *protected event* are too onerous and warrant review to obtain the appropriate conditions while achieving the appropriate economic outcome. This review is important to determine if the efficacy envisaged with the protected event is being delivered, and if not, initiate the necessary changes before increasing the number of protected events in the NEM that includes South Australia and as proposed for consideration in the Queensland for the Central South intra-connector.[4]

5. Protection Systems

The Report makes numerous references to climate and extreme weather conditions applicable to each of the regions in the NEM.

[3] AEMO, Power System Frequency Risk Review Draft Report Stage 1 Consultation, 2020 – p16
[4] *Ibid* – p35

CS Energy acknowledges the references but also notes the absence of reference to the changing patterns of lightning behaviour as result of the changes to the climate.

The transmission network lightning protection systems including shielding angle and footing resistance factors, most likely require review due to:

(a) the impacts of climate change;

(b) lightning intensity and characteristics; and

(c) the impact of the drought on footing resistance.

CS Energy considers these factors may render the current protection designs as not fit for purpose. CS Energy would encourage a proactive approach on this subject rather than responding in a reactive manner to power system event that highlights these deficiencies. Furthermore, it may reduce the requirement to increase the protected event portfolio.

CS Energy would strongly encourage AEMO and the TNSPs to conduct regular audits of the protection systems of high priority transmission elements including but not limited to interconnectors and key intra-connectors to ensure the settings and operation remain consistent with the design and purpose and not have been inadvertently compromised.

As the number of special protection schemes increase in the NEM including their speed of operation and sophistication, it is an imperative to ensure regular reviews or audits are conducted to avoid undesirable interactions and inadvertent triggering of protection schemes.

CS Energy notes the reference to the Central Queensland to Southern Queensland Special Protection Scheme.[5] It is further noted that the scheme currently only includes the Callide generators, but AEMO has recommended that the scheme be expanded to include other generating units in addition to the existing Callide generators. If Market Participants are to be included in the Southern Queensland scheme (or any special protection scheme), it is critical that affected generators are consulted with; be provided with the appropriate level of detail to fully inform the generator of the impact of the scheme on their plant; and the generator's agreement be obtained.

[5] *Ibid* – p34