17 June 2021

Ms Anna Collyer
Chair
Australian Energy Market Commission
PO Box A2449
Sydney NSW 1235

Lodged via AEMC website: www.aemc.gov.au

Dear Ms Collyer,

ERC0300: DRAFT RULE DETERMINATION – EFFICIENT MANAGEMENT OF SYSTEM STRENGTH ON THE POWER SYSTEM

The Clean Energy Council (CEC) is the peak body for the clean energy industry in Australia. We represent and work with around 900 of the leading businesses operating in renewable energy, energy storage and renewable hydrogen. We are committed to accelerating Australia's clean energy transformation.

The CEC welcomes the opportunity to provide feedback to the Australian Energy Market Commission (AEMC) on the draft determination for the efficient management of system strength on the power system rule change request. We strongly support the progress that has been made to date on this important reform initiative. The proposed reform is timely given the continuation of significant system strength issues across all NEM jurisdictions, and that the system strength requirements as part of the generator connection process are leading to substantial uncertainties, costs and delays to new projects. As a result, although the current minimum system strength and 'do no harm' frameworks have only been in place since 1 July 2018, they are not producing efficient outcomes and therefore, not producing the best outcomes for customers. There is clearly a need for revision.

In May 2020, the CEC provided a detailed submission on the AEMC's system strength frameworks discussion paper. Our prior submission included summaries of the key issues with the existing frameworks and our feedback on alternative frameworks. This submission is focused on the AEMC's proposed approach as outlined in the draft determination. The CEC supports the proposed approach of proactively procuring system strength services; however, we have identified several improvements that will help ensure the final solution is effective and efficient.

Supply side: Proposed system strength planning standard

The CEC supports the introduction of a new planning standard that requires the proactive procurement of system strength services. This will help to improve the certainty around costs and connection timeframes for new generation projects, which in turn should improve the investment signal for generation in the NEM. As proposed by the AEMC, it will be important for AEMO and the TNSPs to collaborate effectively to ensure that investments are made in the right place at the right time. It is

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proposed that AEMO project efficient levels of generation development and identify nodes where the system strength standard will apply.

AEMO Planning Obligation

In recent times, AEMO and TNSP planning processes have significantly underestimated the pace of the energy transition, so it will be important for AEMO to consider a range of plausible scenarios when determining the efficient level of IBR to include at each node. The CEC supports the utilisation of existing planning tools such as the Integrated System Plan (ISP) and the Electricity Statement of Opportunities (ESOO), but we note that the energy transition is now better aligned with the Step Change scenario from the ISP. It is proposed that AEMO will have the discretion to determine the system strength nodes. We are concerned that if AEMO declare too few nodes, the locational signal seen by generators via the proposed System Strength Locational (SSL) factor will be arbitrary. This issue could be addressed by maximising the number of nodes, but we understand this must be balanced against the requirement to select nodes that can be planned independently. We also suggest that the final rule should explicitly require the nodes to be based on the expected locations of system strength demand, rather than correlated to the existing location of the synchronous fleet.

RIT-T

The CEC supports the requirement for TNSPs to undertake cost benefit analysis to determine the most efficient option for meeting the planning standard. However, we have experienced significant issues with the existing RIT-T process such as prolonged completion timelines and difficulties to establish non-network options. We support the continuation of parallel processes to reform the RIT-T to ensure that the process does not prevent the realisation of efficient solutions for consumers, in terms of both investment timing and the selected solution.

Equipment manufacturers are investing significant research and development capital into Virtual Synchronous Machine (VSM) technology. This emerging technology has already proven its capability to resolve system strength related issues. For VSM technology to be utilised to meet system strength needs under a RIT-T process, it will be necessary for TNSPs to provide very clear guidance on the performance that the VSM is required to provide to meet the identified need. This performance should not be specified as a quota of required fault level but rather in terms of the system security that the VSM would be required to resolve. We encourage the AEMC to provide explicit guidance in the final rule to this effect.

The AEMC has proposed to utilise the existing regulatory framework for prescribed transmission services and notes that any new penalties or enforcement measures will be consulted on by the AER after the Final Determination. The CEC considers that more clarity on these specific issues in the Final Determination would be useful to guide AER consultation. For example, it is unclear whether system strength remediation will qualify as part of the Efficiency Benefits Sharing (EBS) or Capital Expenditure Sharing Schemes (CESS), or whether some other incentive and enforcement regime, along the lines of the Service Target Performance Incentive Scheme (STPIS), is preferred.

Unbundling system strength services from the energy market

It is understood that the AEMC's intent in the draft determination is to unbundle system strength from the energy market. Under this approach, TNSPs would not be able to assume that any amount of system strength is provided by synchronous machines due to incidental dispatch in the energy market; TNSPs would be required to procure the whole amount of system strength to provide the minimum fault levels and meet the IBR stability criteria at each node. The alternative approach is to permit TNSPs to consider system strength provided by synchronous machines due to incidental dispatch in the energy market;

TNSPs would only be required to procure the gap amount of system strength above what is incidentally dispatched to provide the minimum fault levels and meet the IBR stability criteria at each node.

The CEC suggests that the two alternatives outlined in the paragraph above have not been adequately analysed. Given that generators are facing the marginal forward-looking System Strength Price (SSP), we do not expect that this decision will have a material impact on the price borne by connecting parties. However, there may be some significant impacts on consumers that have not yet been considered. For example, whether they will effectively pay twice for system strength if a generator is already dispatched in the energy market and to what extent such payments may contribute to delaying the decarbonisation of the energy sector. The CEC suggests further investigation or clarity is provided on these matters to ensure no unintended consequences will arise as a result.

Virtual Synchronous Machines

Equipment suppliers are currently investing significant capital in developing new and enhanced VSM technologies applicable to wind, solar and storage assets. This has included detailed engagement with AEMO and NSPs. VSM technology can provide equivalent services with respect to system strength but are often coupled with battery storage that offers other consumer benefits in terms of wholesale energy prices, FCAS prices, network utilisation and avoidance or deferral of transmission augmentations. In our view, this technology will play a key role in enabling a rapid transition and decarbonisation of the electricity sector. The CEC supports a technology neutral approach to meeting the planning standard. To enable a technology neutral approach, it will be important for TNSPs to focus on maintaining stable voltage waveforms rather than utilising fault levels as a proxy for system strength to ensure that cost effective VSM technology and re-tuning options are not unnecessarily ruled out. We note that Powerlink have been undertaking detailed modelling to demonstrate how a battery energy storage system utilising VSM technology can stabilise voltage waveforms in North Queensland.

Demand side: Proposed generator access standards

The CEC understands the requirement to introduce new access standards to ensure that new connecting generators do not have excessive demands for system strength services that may exceed assumptions made by TNSPs when procuring the services upfront. However, it is important that these new access standards do not increase the barrier to entry for certain technology types or increase the timeframes for the connection process. In the below paragraphs, we have outlined some proposed improvements intended to ensure technology neutrality and avoid extending connection timeframes.

Minimum Short Circuit Ratio (MSCR)

The CEC considers that the proposed new MSCR minimum access standard of 3.0 requires further consultation and analysis. Whilst the majority of inverter and turbine manufacturers have stated MSCR capabilities equal to or less than 3.0, the impedance of the internal reticulation system leads to a lower level of MSCR capability at the connection point. This issue is particularly relevant for larger wind farms with more extensive internal reticulation. Further, the appropriateness of the proposed minimum access standard cannot be assessed properly until the methodology for determining the MSCR for a generating system has been presented. Without understanding the full detail of the methodology, we suggest that a minimum access standard of 5.0 would be more appropriate. A higher minimum access standard would help to ensure that synchronous condensers do not need to be included behind the meter of generating systems just to meet the standard.

The Draft Determination is clear that the proposed minimum access standard would only place obligations for new inverter-based resources to be capable of operating at the MSCR, but not tuned to those settings at the time of connection. Rather, the connection will still need to use settings required to meet its performance standards suitable for the network conditions at the connection point. Whilst we

agree in this important distinction between capability and site-specific tuning, the CEC is concerned that this duality could significantly increase the complexity of connections studies required as part of the application and registration processes. Our preference is for the Final Determination to further clarify the MSCR assessment process to reduce the risk of extending connection timeframes by duplicating modelling efforts. The MSCR would be linked to a strong financial signal for inverter-based resources under the System Strength Quantity (SSQ) of the System Strength Mitigation Requirement (SSMR). For this signal to work effectively, the MSCR assessment methodology must be simple, transparent and consistent so that developers and equipment manufacturers can properly respond to this signal when selecting or designing new technology.

For the avoidance of doubt, the CEC expects that generators that have implemented VSM would not pay system strength charges due to an assessed MSCR and SSQ of zero. We note that VSM technology is currently under development for solar, storage and wind technologies.

Voltage phase angler shift

The CEC supports the introduction of a new minimum access standard for generating systems comprising of partly or fully asynchronous generating systems to not include a vector shift or similar protection relay that would operate for a voltage phase angle shift less than or equal to 20 degrees, as measured at the connection point. As noted by the AEMC, this proposed standard is consistent with Australian and IEEE standards.

Coordination: Proposed system strength mitigation requirements

The CEC supports the proposed System Strength Mitigation Requirement (SSMR) as a preferred alternative to the existing 'do no harm' provisions that are applied to new connections. The 'do no harm' provisions introduced in 2017 have significantly extended connection timeframes, reduced investment confidence and led to the inefficient installation of costly synchronous condensers. If the implementation of the SSMR is carefully managed, there is an opportunity to reduce connection timeframes, improve investment confidence and install scale efficient system strength solutions. There is also an opportunity to incentivise the development of projects that minimise their demand for system strength through site selection, design of connection assets and selection of equipment. However, the SSMR will introduce a potentially significant cost for new generators to bear, which will eventually be borne by end-users. Our discussion in the following paragraph is focused on reducing the delivery risk of the SSMR and minimising costs borne by end users.

System Strength Price (SSP)

The SSP component of the system strength charge is proposed to represent the forward-looking cost of the SSS Provider supplying system strength at each system strength node as a result of a change in demand for the service. The CEC recognises that it may be economic for connecting generators to face the SSP because the locational and technology choices made by generators will impact the total demand for system strength. However, system strength is a fundamental requirement for a secure system. TNSPs depend upon system strength for the proper operation of their protection equipment and load customers depend upon system strength for the proper operation of their equipment.

Under the new system strength planning standard, TNSPs will procure the minimum level of system strength required for system stability and the efficient level required for new inverter-based resources to connect. The delta between the minimum and efficient level of system strength may vary significantly between nodes. In instances where this delta is zero or small, it may not be efficient for the SSP to be based on the marginal cost of providing the service, given that total amount of required system strength services is not impacted by the amount of inverter-based resources. As such, the CEC considers that

further analysis is required to ensure that the methodology for determining the nodal SSPs correctly allocates costs between beneficiaries.

The CEC is concerned that if the SSP values are too high, connecting parties will be forced to select the self-remediation option, even when connecting near a system strength node. This would lead to an inefficient outcome where TNSPs invest proactively in system strength services but connecting parties opt out and invest in their own system strength remediation schemes, essentially resulting in a white elephant risk for consumers. To address this risk, we suggest that the AER play a role in approving the nodal SSPs. The AER could undertake a benchmarking exercise to ensure that the nodal SSPs are cost competitive compared to the cost of generators self-remediating by connecting synchronous condensers at the medium voltage level. The AER should consult with industry to obtain relevant information required in this benchmarking exercise.

Investment in new wind and solar generation is typically underpinned by corporate climate objectives. Therefore, it will be essential for a transparent methodology to determine the nodal SSPs so that investors can determine whether their investments are cross subsidising fossil fuel assets. If the allocation of funds is unclear, investors driven by climate objectives may be forced to opt out and pursue their own remediation actions, which could undermine the efficiency objectives of this rule change. To facilitate investment confidence, the CEC has a strong preference for long term price certainty for the nodal SSPs, ideally through the connection agreements. However, the AEMC's proposal to fix the SSP for 5-year periods would introduce a material risk for investors to consider. As a compromise, the CEC strongly supports the consideration of smoothing mechanisms aimed at reducing investment risk and flow on impacts to cost of capital for new entrant projects. Ideally, the mechanism would be similar to the indexing mechanism used by TNSPs to adjust annual connection charges under the connection agreements. We also support the proposal for TNSPs to confirm the relevant SSP in their responses to connection enquiries.

System Strength Locational Factor (SSL)

The SSL factor reflects the locational nature of system strength. This component varies the magnitude of the system strength charge in proportion to the approximate electrical distance or impedance from the closest system strength node. It is proposed that AEMO will have the discretion to determine the system strength nodes. The CEC are concerned that if AEMO declare too few nodes, the locational signal seen by generators via the proposed System Strength Locational (SSL) factor will be arbitrary. This issue could be addressed by maximising the number of nodes, but we understand this must be balanced against the requirement to select nodes that can be planned independently. We also note that the final rule should explicitly require the nodes to be based on the expected locations of system strength demand, rather than correlated to the existing location of the synchronous fleet.

To facilitate investment confidence, the CEC has a strong preference for long term price certainty regarding the SSL factor, ideally through the connection agreements. However, the AEMC's proposal to fix the SSL for 5-year periods would introduce a material risk for investors to consider. As a compromise, the CEC strongly supports the consideration of smoothing mechanisms aimed at reducing investment risk and flow on impacts to cost of capital for new entrant projects. The CEC considers that the SSL is likely to reduce over time as the transmission network is augmented but it is important for the SSL assessment methodology to remain completely static. We also support the proposal for TNSPs to confirm the relevant SSL in their responses to connection enquiries.

To facilitate the effectiveness of a long-term location investment signal, the SSL assessment methodology must be stable, simple and transparent so that developers can replicate their own SSL calculations using information that is currently available via AEMO data requests (OPDMS snapshots). The SSL methodology could be based on either system normal (N) or worst-case credible contingency (N-1) scenarios. In most locations, the magnitude of the SSL factor would vary significantly between N

and N-1 scenarios, so the CEC considers it essential that the Final Determination provides absolute clarity on whether the SSL is based on N or N-1 conditions. This decision will require consultation with AEMO, NSPs and generators to ensure that the resultant locational signal leads to efficient outcomes.

System Strength Quantity (SSQ)

The SSQ component of the charge reflects the amount of service used by the connection. The CEC understands that the SSQ is the product of the connecting plant's export capacity in MW and its MSCR as negotiated in the access standards. However, the SSQ formula is not clear in the Draft Determination, so we recommend that the formula for calculating the SSQ is made explicit in the Final Determination.

The SSQ serves as an incentive for developers to select equipment with a lower demand for system strength. Equipment suppliers are progressing with analysis and design work on VSM technology. Given the lead time for developing new technologies, it will be important for AEMO to provide very clear guidance to equipment suppliers well ahead of the connection process. Proponents should not need to wait until the advanced stages of the connection application to understand the SSQ. The publication of a detailed SSQ assessment methodology will enable equipment suppliers to develop equipment with lower demand for system strength, which will lower overall system costs for consumers. The CEC considers that the publication of this methodology is urgent. To reiterate, the CEC expects that generators that have implemented VSM would not pay system strength charges due to an assessed SSQ of zero. We note that VSM technology is currently under development for solar, storage and wind technologies.

The CEC supports the proposal to lock the SSQ in via connection agreements with the ability to reduce the SSQ via 5.3.9 or 5.3.12 processes as new VSM technologies become available. This provision will help minimise the demand for system strength over time.

Option to self-remediate

The CEC supports the proposal for connection applicants to opt out of the SSMR and self-remediate their system strength impact. The Draft Determination suggests that the self-remediation requirements are determined through the existing Full Impact Assessment (FIA) which may lead to applicants undertaking their own system strength remediation works or contracting directly for others to undertake the works on their behalf. However, there are some significant practical challenges of implementing the existing FIA process if the proposed system strength planning standard and SSMR is in place. We suggest that further clarity is required on the assumptions that NSPs use when undertaking the FIA. For example, it is not clear whether the base case network models for these FIAs only include the minimum level of system strength or the efficient level. It is also not clear whether the decision to include an existing or committed generator depends on whether the generator preceded the implementation date of the final rule, opted into the SSMR, or opted out of the SSMR. These decisions will have a major impact on whether the option to self-remediate is feasible.

When connecting parties opt for the self-remediation option to undertake an FIA and negotiate an alternative system strength solution, the NSP will be able to influence the timeframe of the FIA process and the scope and cost of the self-remediation options. The CEC suggests that a conflict resolution process should be considered to ensure that FIAs are conducted in a timely manner and that options for self-remediation are developed in a transparent manner so that connecting parties are not forced to adopt the SSMR process when not efficient to do so.

We strongly believe that these matters are far too important to be left open to interpretation until the publication of an AEMO guideline.

Transitional arrangements

The CEC supports the proposed approach of proactively procuring system strength services. Given the severity of the issues associated with the current system strength framework, we consider that the implementation of the revised framework is urgent to prevent costly delays in the connection application process and the inefficient investment in additional white elephant assets by individual generators. This urgency must be balanced against the need to provide timely information required for developers to optimise their projects and make choices that minimise the cost of energy for end-user. The AEMC has proposed that the SSMR and new generator access standards would apply to connection applications lodged from 15th March 2023. The CEC considers that applicants must have clarity on the following information at least 6 months prior to the implementation date of the SSMR and new access standards:

- SSP for each node in the NEM
- Detailed SSL assessment methodology
- Detailed SSQ (MSCR) assessment methodology
- Detailed FIA methodology for applicants who choose to opt out of the SSMR

The AEMC has also proposed that existing fault level nodes will be deemed as system strength nodes. The existing fault level nodes are poorly correlated with the expected location of inverter-based resources and subsequent demand for system strength. The CEC suggests that this specific component of the transitional arrangements is reconsidered to prevent further investment in system strength services at inefficient locations.

Relationship to the ESB's Post 2025 market design

It is understood that the Energy Security Board (ESB) is considering options for the implementation of a Unit Commitment for Security (UCS) and/or System Security Market (SSM) mechanisms. In our view, the UCS could be utilised by AEMO in real time to activate the services procured by TNSPs under the system strength planning standard. The CEC suggests that the Final Determination includes further guidance on how the UCS could be used to activate system strength services and whether there are any options for AEMO to settle payments directly with parties contracted to provide system strength. This may help avoid cash flow issues that have been raised by some TNSPs.

Other considerations

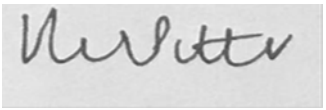
The NER framework for negotiating generator performance standards requires generators to meet the automatic access standards. Access standards may be negotiated if the automatic is not technically or economically feasible. Under the negotiating framework, AEMO and TNSPs are required to push for the automatic standard whilst negotiating. In many instances, a performance level below the automatic standard would lead to better system security outcomes and better facilitate the introduction of further generators in the nearby network. This issue specifically applies to the reactive current injection requirements under S5.2.5.5 and reactive power rise/settling times under S5.2.5.13.

The CEC considers that there would be merit in exploring options to amend the NER negotiating framework so that site-specific performance standards can be utilised for some specific standards. These changes would improve system security outcomes because generators would no longer be forced to use aggressive settings not suitable for weaker connection points. The barrier to entry for future generators would be reduced as there will be a reduced need to re-tune existing generator settings. This relatively simple change would also reduce the total amount of system strength services that need to be procured to meet the proposed planning standard.

Thank you for the opportunity to comment on this consultation. The CEC appreciates the opportunity to engage with the AEMC on this important rule change, including nominating members to participate in

the technical working group. If you would like to discuss any of the issues raised in this submission, please contact Tom Parkinson, Senior Policy Officer, on tparkinson@cleanenergycouncil.org.au.

Yours sincerely,



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