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Ms Anna Collyer
Chair
Australian Energy Market Commission
Level 15, 60 Castlereagh Street
SYDNEY NSW 2000

Lodged online: www.aemc.gov.au

Dear Ms Collyer,

Submission to AEMC's draft rule determination on efficient management of system strength on the power system

We welcome the opportunity to respond to the Australian Energy Market Commission's (**AEMC**) draft rule determination (draft determination) on our Efficient Management of System Strength on the Power System rule change request (rule change request).

The rapid transition of the energy system to one that has a high penetration of renewable generation is creating significant system strength issues more quickly than anticipated.

We support the intention and proposed framework outlined in the AEMC's draft determination, which aims to address the urgent need to make it simpler, faster and more predictable for new renewable generation to connect to the grid, whilst keeping supply as secure as possible.

There are four key aspects of the draft determination that we would urge the AEMC to reconsider:

1. **The potential for an unintended consequence of thermal generators benefitting to the detriment of consumers:** We would like to see mechanisms in place to ensure that a) the costs of providing the existing system strength services in the network does not transfer from generators to consumers; and b) thermal generators are not able to charge for the system strength service that they currently provide. There is significant system strength services provided by thermal generation as a by-product of their energy generation (due to the legacy design of the power system based on synchronous generation). Under the draft determination, there could be an unintended consequence that thermal generators could start to charge for this by-product. Generators should not benefit commercially from system strength shortfalls.

2. **Providing a choice to connecting parties to remediate their own impact**: The current arrangements (whereby a generator can provide their own system strength remediation) do not enable a holistic system wide approach to system strength. Providing a choice to connecting parties to provide their own solution will mean that individual generators are utilising technical solutions (usually outside their core capability) and using a discrete and localised option that addresses only their immediate connection issue. This will result in costly, disparate and independent solutions placed on the network.

3. **A streamlined regulatory framework for the timely provision of system strength services:** The identification and provision of system strength services will increasingly need to be done in an agile, flexible and expedient manner. The existing regulatory framework is not well suited to deliver system strength needs on short notice. Our view is that a streamlined version of the existing Regulatory Investment Test for Transmission (**RIT-T**) or similar, should be adopted for system strength services to facilitate a shorter timeframe between identification of any need and

delivery of the solution. In addition, the regulatory framework needs to ensure that cost recovery arrangements are appropriate and that Transmission Network Service Providers (**TNSP**) are not exposed to significant cash flow issues arising from the provision of unexpected system strength services due to a system wide or unexpected event.

4. **An increase in the proposed new access standard for relevant generators, loads and market network service providers:** The proposed standard in the draft determination in our view is not adequate to capture the necessary requirements required to maintain a stable energy system.

We appreciate the opportunity to comment on the AEMC's draft determination. If you require any further information or clarification, please feel free to contact me directly.

Yours sincerely,

Eva Hanly

Executive Manager, Strategy Innovation and Technology

TransGrid's detailed comments

Supply side

AEMC's position

The AEMC proposes a new obligation on TNSPs, working closely with the Australian Energy Market Operator (**AEMO**), to provide system strength when and where it is needed. System strength will be provided as a prescribed transmission service, with the TNSP required to meet a system strength standard at certain locations on its network.

Our view

We support the AEMC's draft determination to place a new obligation on TNSPs to provide system strength when it is needed as proposed in our rule change request.

Power system quality (including system strength services) is the most critical element in enabling large scale renewable energy to be integrated safely into the energy system. The management of system strength issues in a well-coordinated and efficient manner will improve the ability of renewable generators to connect to the power system more quickly and at lower cost, significantly reducing the commercial risks they are exposed to.

TNSPs are best placed to have the obligation for planning, procurement and operation of system strength services because they:

- Already have the capability, processes and systems in place for forecasting and monitoring power quality and the resilience of the system.
- Have detailed information on generator connection enquiries within their own networks, as well as those forecast in other network service providers' networks through joint planning with Distribution Network Service Providers (**DNSP**) and other TNSPs. This enables system strength solutions to be coordinated and optimised across regions.
- Can rigorously test the appropriateness of network and non-network options to procure efficient and appropriate system strength services.
- Are well positioned to determine the appropriate scale, location and timing of any capital system strength solution so that the least cost investment for the whole network can be delivered.
- Can operate any assets that provide system strength services on behalf of the network, as opposed to third parties that are driven by commercial imperatives and are unconstrained by network reliability standards.
- Can consider the co-ordination of system strength services requirements with other network services (such as inertia, voltage control and thermal capacity) which are increasingly able to be provided by a single asset solution (and therefore a more cost effective solution) as technology evolves.
- Have expenditure that is regulated by the Australian Energy Regulator (**AER**) to ensure it is prudent and efficient for consumers.

However, we see a number of issues in the draft determination that warrant further consideration by the AEMC.

1. **Generators should not commercially benefit from the rule change to the detriment of consumers**: System Strength Service Providers' (**SSSP**) (one in each jurisdiction: TransGrid, TasNetworks, Powerlink, AEMO and ElectraNet) would be required to provide resources on a forward-looking basis to ensure that the system strength at each 'system strength node' does not fall below a certain threshold. Requiring SSSPs to be 100% responsible to meet the system strength standard specification (AEMO's 3-year forecast) is likely to lead to increased costs for consumers unless there are mechanisms in place to ensure generators do not benefit. This is because thermal generators who currently provide this service as a by-product of their current

generation, will be able to charge additional costs for a service that otherwise would have no or minimal cost and that are already recovered through the energy market.

The implications of the unbundling of energy and system strength and the cost implications to consumers' needs to be carefully considered.

We would like to see a mechanism in place to ensure that consumers only pay for the efficient expenditure required to deliver electricity to meet their needs, and not pay for system strength services already provided by existing thermal generation.

2. **Cost recovery for system strength services:** The draft determination assumes that TNSPs are able to recover the costs of providing system strength services from new generators and consumers, which we agree with. However, there are three issues for which we would like to seek clarification:
    - Ambiguity in the TNSP's ability to recover costs,
    - Regulatory approval process, and
    - The level of cash flow volatility.

Ambiguity in the TNSPs ability to recover costs

In our view, there is ambiguity in the draft determination on the ability for TNSPs to recover their costs. The draft determination suggests that costs could be recovered as a prescribed transmission service by a number of methods, including:

- the inclusion of planned capital and operating expenditure as part of the 5 yearly revenue determination process;
- inclusion of contingent project applications **(CPA)** in their revenue proposals;
- cost pass through, for example where there is an unforeseen change in regulatory obligations; and
- the network support pass through mechanism, for expenditure on non-network options.

We acknowledge and support the flexibility that the AEMC is considering in providing a number of mechanism for cost recovery. However, there are three key issues with these mechanisms:

a. **Timing mismatch:** The existing cost recovery mechanism were designed for very different types of network and technical projects which are often able to be identified, forecast and planned with medium and long term time horizons. Conversely, the amount of system strength services required is highly variable based on market, policy and economic factors, so we are heavily reliant on AEMO's system strength forecast. This forecast is undertaken by AEMO on a three yearly cycle which does not align with TNSPs revenue determination cycle. In TransGrid's case, this means that we will lodge our 5 year revenue determination in early 2022 and AEMO's forecast will be updated in late 2022. The practical consequence of this is that we could be faced with a forecast that we have not accounted for and therefore leave TransGrid without the required funds to meet the new forecast.

We would like to see the AEMC provide transitional arrangements for network businesses who have recently completed or are in the middle of their revenue determination with the AER, to ensure those network businesses are able to recover their costs.

b. **Conditions and Triggers:** The existing mechanisms have certain triggers and threshold levels that need to be met which may not be suitable for system strength services. For example for a CPA on system strength services, the rules should allow for a reduced expenditure threshold or an aggregation of system strength projects, given the distributed nature of system strength services.

We would like to see the existing mechanism amended so that network businesses are always able to recover their costs to meet the system strength obligations

c. **Further definition of regulatory change event:** It is unclear under what circumstances TNSPs are able to recover costs under the cost pass through mechanism. The AEMC notes that the 'regulatory change event' definition could accommodate any increase in costs associated with new system strength obligations. However, it is not clear to us that the 'regulatory change event' mechanism is entirely fit for the purpose of providing for recovery of system strength service costs. Given the sequenced introduction of the various changes, there is a question as to when the change in obligation actually occurs.

We would like to see further assessment of what the relevant 'regulatory change event' is, and (importantly) when that event occurs.

Regulatory approval process

To meet the proposed system strength standard specifications, TNSPs will likely need to use a combination of network and non-network solutions. To do this under the existing framework, a RIT-T would need to be made. The existing RIT-T process is not well suited to deliver system strength needs on short notice.

Our view is that a streamlined version of the existing RIT-T should be adopted for system critical services. This streamlined process would need to facilitate a shorter timeframe between identification of any system strength shortfall and delivery of the solution. It would also facilitate prudent and efficient costs.

Cash flow volatility

Under the draft determination, the TNSP is required to ensure there is enough system strength at all times. We have concerns about cash flow volatility for network agreements that are used for non-network solutions. For example, there will be delays when we procure the services and the recovery of costs through transmission use of service charges **(TUOS)**. The annual costs of providing system strength services may be material and unpredictable, as AEMO responds to real-time operational issues.

Our view is that costs for system strength services that are required (and not part of AEMO's 3 year forecast) should be recovered through an accelerated cost pass through mechanism without a materiality threshold.

Coordination

AEMC's position

The AEMC proposes a charging mechanism, which imposes an obligation on parties to pay for the system strength services that they require to remediate their impact. The draft rule also provides a choice for parties to either pay the TNSP for this service, or providing their own system strength solution.

Our view

We support the AEMC's proposal that parties whose activities impact the amount of system strength required should be obligated to pay their share of the cost. This change would provide greater equity in the allocation of costs.

It is also consistent with our rule change request where we suggested a further change to the charging mechanism whereby TNSPs are able to charge connecting generators for their share of the provision of system strength services, rather than passing the total cost of that service directly through to consumers through TUOS.

However, we do not agree with the AEMC's approach that provides connecting parties the option to remediate their own impact. Our rule change request advocated for this responsibility to be with the TNSP to enable a proactive system wide approach to system strength. This avoids the risk of individual generators investing in technical areas usually outside their core capability and using a technical solution that addresses only the immediate connection issue.

Assets that provide system strength services are being overbuilt by subsequent connecting generators as they cannot rely on the assets built by earlier generators being in operation. Each time this occurs tens of millions of dollars in unnecessary costs are passed on to consumers.

We recognise that the AEMC predicts that this system strength charge will be significantly less than the costs of a generator remediating its own system strength impact and so expects that developers will be incentivised to elect to pay the new charge. However keeping this option will not deliver the least costs solution to consumers.

By way of practical example, through the pilot project undertaken by TransGrid of a synthetic inertia 60MW battery project at Wallgrove (supported by the NSW Government and ARENA) we were able to identify a network solution for inertia that is 60% cheaper than the provision of multiple synchronous condensers (which is the most common technical solution used by generators).

Our view is that the responsibility for provision of system strength services be with the TNSP to enable a system wide approach to system strength, which will ensure greater reliability and lower cost.

Demand side

AEMC's position

The AEMC proposes a new access standard for relevant generators, loads and market network service providers, to ensure that future connecting parties' plant have a minimum level of system strength performance.

Our view

We support the AEMC's proposed introduction of a new access standard. However, the proposed standard in our view is not adequate to capture the necessary requirements required to maintain a stable energy system. For example:

- The draft determination proposes a short circuit ratio (**SCR**) of 3.0. Generator inverters currently in operation are able to have stable operation down to SCR values much lower than 3.0. We would recommend a lower SCR to be included in the performance standard, as this will lead to a reduced overall system strength costs and better outcome for customers. We propose that a SCR of 1.8 (under n-1 conditions) is suitable for reasonable quality, well-tuned generator inverters. However, we recognise AEMC's view on generators having an incentive to offer a better SCR capability to reduce their system strength mitigation requirement charge.
- The draft determination also proposes a voltage angle change of 20 degrees. We recommend a voltage angle of 60 degrees as this would be suitable for a reasonable quality, well-tuned generator inverters. Generation inverters currently in operation in NSW are able to have stable operation to voltage angle changes much higher than 20 degrees. A higher voltage angle withstand will lead to better outcome for customers as it reduces overall system strength costs and better outcome for customers.
- We also want to ensure the ability of an asynchronous generating plant to withstand and ensure stable operation in the event of high Rate of Change of Frequency events. The existing rule, clause S5.2.5.3, partially captures this. However, well-tuned modern inverters can achieve higher performance such as 6 Hz/sec. In our opinion, higher performance is an important requirement to ensure the power system can withstand multiple-generator trip events and avoid widespread interruptions. Suggested improvements to the proposed performance standards are provided in item 6 of Attachment 1.

Our view is that the AEMC should consider an increase in the access standard responsibility required by future connecting parties in order to ensure long term system security and reliability.

We have provided further detailed comments on the Draft Rule in Attachment 1 to this submission.

TransGrid

Attachment 1 – Detailed Draft Rule comments

#	Item	Draft Rule Determination commentary	Proposed Draft Rule language	Comment
1	Maintenance of the existing shortfall mechanism	**Reference: 3.1.4** As a result, the shortfall mechanism of the existing arrangements is maintained in the Rules until 30 September 2025. **Reference: Summary, paragraph 84** This also includes the maintenance of the shortfall mechanism until 1 September 2025.	**Reference: 11.[XXX].1** "system strength transition period" means the period from the effective date to 1 September 2025.	AEMC to confirm the existing shortfall mechanism is intended to end on 1 September
2	Removal of system strength from NSCAS	**Reference: 3.4.2** The AEMC has decided against AEMO having a reserve obligation to declare a system strength shortfall as a NSCAS gap after the transition period.	**Reference: 5.20C.3(h)** A SSSP may include the cost of system strength service payments in calculation of network support payments in accordance with Ch 6A.	AEMC to consider whether 5.20C.3(h) is redundant once the transition period ends.
3	Treatment of existing syncons	**Reference: B.9.2** Where applicable, SSS Providers would apply the RIT-T to decide which investment should be pursued to meet the system strength standard. No changes to	N/A	A number of projects have installed synchronous condensers in TransGrid's network under the do no harm regime as system strength remediation schemes which the projects have paid for. A number of these projects are now seeking to sell the synchronous condensers to TransGrid. This may be an efficient solution to operate these assets

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		the existing RIT-T framework is required for this draft rule. When considering alternative investment options under the RIT-T the TNSP is required to assess the benefits and costs of each alternative and choose the option that maximises the present value of net economic benefits to all those who produce, consume or transport electricity in the market. No new enduring RIT-T exemptions are proposed as part of this draft rule.		as part of the regulated network rather than for individual projects. However, this would require TransGrid to justify the acquisition through a RIT-T process but from experience in similar situations, TransGrid understands the AER takes the view that such assets are sunk cost and have zero value so TransGrid could not actually acquire these assets from the project at a fair value. The AEMC should consider whether a transitional provision to the RIT-T process to enable these assets to be transferred to the SSSPs and brought into the RAB at a value as determined under a RIT-T process.
4	SSIAG	**Reference: B.7** AEMO must amend the System Strength Impact Assessment Guidelines to provide methodologies and guidance to TNSPs on the application of the new regime, eg the methodology for calculating the system strength locational factor. AEMO must publish the amended guideline by 15 March 2023.	**Reference: 4.6.6, 11.[XXX].2, 11.{XXX}.6** The new charging regime to be applied by TNSPs also commences on 15 March 2023.	SSSPs will need sufficient lead time from the publication of the amended SSIAG to the start of the SSSPs' obligations to enable SSPs to be ready to apply the methodologies and avoid delays to connections. TransGrid suggests the amended rule should require AEMO to publish an amended SSIAG by 30 September 2022.
5	Timeframe for AEMO to publish System	**Reference: B.7.3** The draft rule requires AEMO to publish the system strength report by 31 August each year, which would set out the system strength	**Reference: 5.20C.1(b)** AEMO must, by 31 August each year, determine the system strength requirements for each system strength node.	AEMO is required to determine (not publish) its system strength requirements by 31 August each year. AEMO is only required to publish its System Strength Report annually. AEMO's most recent System Strength Report was published in December 2020.

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	Strength Report	requirements and the system strength standard specification for the relevant year. This should allow sufficient time for TNSPs who are SSS Providers to include these forecast requirements and the specification in their annual planning reports of that year, which must be published by 31 October.	In determining system strength requirements, AEMO must apply the system strength requirements methodology.	The amended rule should require AEMO to publish its System Strength Report by 30 September each year to enable SSSPs to include this information in their TAPRs.
6	New generator access standards	**Reference: C** The 'demand side' reforms of the draft rule introduce two new access standards that relate specifically to system strength.	**Reference: S5.2.5.15 (short circuit ratio) and s5.2.5.16 (voltage phase angle shift)**	**Comments on clause S5.2.5.15:** Our experience is that the present generation inverters can ensure stable operation down to SCR values much less than 3.0. We propose that an SCR of 1.8 (under n-1 conditions) is suitable for reasonable quality, well tuned generator inverters. **Clause S5.2.5.15(c) and (d) General requirements**: For asynchronous generators connecting to stronger points in the network where the plant will be tuned to an SCR greater than 3.0 the agreed SCR as per S5.2.5.15(b) will be 3.0 although plant parameters will be tuned to suit the larger SCR value. This will require assessment at two SCR values; at SCR = 3.0 to ensure compliance with paragraph (b), and at the location specific larger SCR value to confirm performance with final tuned parameters. This will significantly increase generator, NSP and AEMO workload. It would be better if AEMC can clarify expectations on compliance assessments for paragraph (b).

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				Comments on clause S5.2.5.16: Present assessment practices include testing at voltage angle changes of 40 and 60 degrees (refer AEMO DMAT Guidelines, February 2021), and well-tuned inverters meet these requirements. We propose that a voltage angle of 60 degrees is suitable for reasonable quality, well-tuned generator inverters. Clause S5.2.5.16(b) does not require modelling to assess the withstand capability. It is possible that the generating system experience instability causing widespread system impacts without tripping the plant. We propose to amend paragraph (b) to expect generator stable operation in such events; i.e. not only to have vector shift or similar relay or protective functions. We recommend the AEMC clarify expectations on compliance assessments for paragraph (b). It is not clear how the clause S5.2.5.16(c) can be applied, and how a negotiated access standard is determined. We propose that this clause is further clarified. **New performance standard on rate of change of frequency:** We want to ensure the ability of the asynchronous generating plant to withstand and ensure stable operation in the event of high Rate of Change of Frequency events to ensure the power system can

#	Item	Draft Rule Determination commentary	Proposed Draft Rule language	Comment
				withstand multiple-generator trip events avoiding widespread interruptions. The existing rule, clause S5.2.5.3, Generating system response to frequency disturbances captures this to some extent. We propose a 6 Hz/sec requirement since our experience is that well-tuned modern inverters can achieve this level of performance.
7	Right to costs	**Reference: C.6.4** Clause 5.3.12(e) allows a NSP, who is not the SSSP, to recover the costs of the SSSP.	**Reference 5.3.9 and 5.3.12** Under paragraph (f), the NSP must require payment of a fee if so requested by AEMO.	Clauses 5.3.12(f) (and equivalent in clause 5.3.9) should be so the NSP must require payment of a fee under paragraph (e) if requested by another NSP and not just AEMO. There is more likelihood of multiple NSPs being involved in connection and the other NSP's costs should be made clear to the connection applicant. .
8	Timeframe to comply with system strength standard	**Reference: E.1.1** AEMO must, by no later than 30 September 2022…publish its first system strength report under clause 5.20.7 of the draft rule, including… the system strength requirements… which would be binding on the SSS Providers to meet the S5.1.14 standard three years after those requirements are declared. **Reference: Table E.1** Due Date: 30 September 2025 Milestone: SSS Providers must be using reasonable endeavours to comply with the new standard set out in S5.1.14 in accordance with the system strength requirements	**Reference: 11.[XXX].2(b)** By [30 September 2022], AEMO must publish the first System Strength Report under new clause 5.20.7, which includes the system strength requirements that AEMO has determined in accordance with new clause 5.20C.1 and clause 11.xxx.3. **Reference: 5.20C.1(b)** AEMO must, by 31 August each year, determine the system strength requirements for each system strength node. In determining system strength requirements, AEMO must apply the system strength requirements methodology. **Reference: S5.1.14(a)**	On a literal read of the draft rule, a SSSP would not be required to comply with the three year forecast in AEMO's 2022 system strength report if that report was not published by 31 August 2022. AEMC to consider clarifying the intention and amend the rule if appropriate.

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		for 2025, determined by AEMO in its 2022 System strength report.	**system strength standard specification** means, for a system strength node at any time in a relevant year, the forecast system strength requirements for the system strength node determined for the relevant year three years prior (that is, in the system strength requirements due to be determined by 31 August falling three years before the relevant year commenced and disregarding any revision under clause 5.20C.1(f)).	
9	New system standard	**Reference: E.1.2** The new system standard is in S5.1a.9 and S5.1.14	**Reference: S5.1a.9** The power system should have minimum three phase fault levels sufficient to meet certain criteria.	TransGrid considers further wording is needed in S5.1a.9 to make it clear that a SSSP is not required to meet this standard to the extent the level is not forecast three year prior in AEMO's identification of the system strength requirements (as per S5.1.14).
10	Revenue arrangements	**Reference: E.2.1** The Commission has not included any transitional rules relating to the revenue arrangements for TNSPs who are SSS Providers. This is because we consider there to be three possible ways under the existing rules/processes for SSS Providers to incur expenditure to meet the new system strength standard — subsume some costs within an existing revenue allowance, submit a contingent project application where provided for in a	**N/A**	TransGrid queries whether a contingent project application is realistic given thresholds and timing. Given the distributed nature of system strength services throughout an SSSP's network, the Rules should allow for a reduced contingency capital expenditure threshold or an aggregation of system strength projects under this mechanism.

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		revenue determination, or through the regulatory change event cost pass through rules.		
11	Request for further preliminary impact assessment	N/A	**Reference: 5.3.4b(a4)** A Connection Applicant can request the NSP to undertake a further preliminary impact assessment and provide a revised system strength locational factor. The NSP may require the payment of a fee to meet the reasonable costs anticipated to be incurred in undertaking any further preliminary impact assessment.	This is a new provision that was not discussed in the draft determination. TransGrid does not understand the rationale behind allowing further assessments and recommends that this provision is removed from the final rule.
12	Definition	**N/A**	**System strength transmission user** Includes a NSP whose network is connected to the transmission network of a SSSP and whose network includes any system strength connection points	AEMC to consider whether this should only refer to NSPs (who are not also a SSSP) whose network is connected to the transmission network of a SSSP.