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**EnergyAustralia**

LIGHT THE WAY

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**Meeting system strength requirements in NSW – RIT-T Project  
Specification Consultation Report – 16 December 2022**

EnergyAustralia is one of Australia's largest energy companies with around 2.4 million electricity and gas accounts in NSW, Victoria, Queensland, South Australia, and the Australian Capital Territory. EnergyAustralia owns, contracts, and operates a diversified energy generation portfolio that includes coal, gas, battery storage, demand response, solar, and wind assets. Combined, these assets comprise more than 5,000MW of generation capacity.

We appreciate the opportunity to provide feedback on Transgrid's Project Specification Consultation Report (PSCR). Enabling solutions to address state-wide system strength needs over the next decade will be critical in accelerating the transition in a way that minimises cost to consumers.

This is also the first Regulatory Investment Test for Transmission (RIT-T) on behalf of a System Strength Service Provider (SSSP) under the new rules framework. Elements of this framework are still evolving, including AEMO's forecasting of 'efficient' system strength levels, the setting of system strength unit pricing, and potential interactions with the Operational Security Mechanism (OSM). These added layers of uncertainty and complexity will be important to carefully work through with all stakeholders to ensure the RIT-T is completed expeditiously, noting that the procurement of non-network solutions appears necessary and must be ready by 2025. Transgrid's analytical approach for this RIT-T and its procurement of non-network solutions will also be important in setting expectations for how SSSPs approach system strength needs into the future. We look forward to engaging with Transgrid throughout this RIT-T process and by participating in its concurrent Expression of Interest (EOI).

Our specific feedback on the PSCR is the following sections.

## The investment need should be characterised in finer detail

AEMO is required under NER clause 5.20C.1(c) to specify, for each system strength node, the minimum three phase fault level (in MVA) and forecasts of inverter-based resources (IBR) for the next ten years, in its annual System Strength Reports. Schedule S5.1.14(b) requires an SSSP to maintain this minimum MVA fault level and also stable voltage waveforms in light of AEMO's IBR projections.

The PSCR appropriately identifies the investment need in terms of explicit MVA shortfalls under the current system strength arrangements. Investment needs from 2 December 2025 also appear to be consistent with NER requirements, however in our view these are insufficiently detailed in the case of the 'efficient' system strength level, which depends on changes in the technology mix over time. Transgrid notes that it has flexibility to determine 'efficient' system strength needs on the basis of maintaining a stable voltage waveform, subject to how this is defined in AEMO's new system strength requirements methodology:

AEMO has not specified 'fault level' as the metric to ensure a stable voltage waveform, and has instead defined four criteria that must be met, relating to voltage magnitude, change in voltage phase angle, voltage waveform distortion and voltage oscillations. This allows us to innovate in the way that system strength services are provided and provides greater flexibility to value system strength support. For example, studies published by Powerlink indicate that grid forming batteries hold significant promise to contribute towards maintaining stable voltage waveforms and AEMO has contracted with a grid forming battery for system strength services.<sup>1</sup>

On the basis of these requirements, Transgrid has "estimated the approximate fault level that would be required to ensure a stable voltage waveform for new connecting renewables, as an indicative proxy for the quantum of system strength services required to meet the efficient level".<sup>2</sup>

We appreciate the PSCR is a high-level scoping document and detailed analysis of the investment need, and how different solutions address this need, will be forthcoming. The investment need in the PSCR appears to reflect a deterministic MVA target based on IBR values from AEMO's December 2022 System Strength report, which draws on the 2022 Integrated System Plan. Our expectations for the Project Assessment Draft Report (PADR) are that Transgrid will:

- articulate how future editions of IBR forecasts in AEMO's annual system strength reports will form part of Transgrid's obligation to meet the "system strength standard specification" and "forecast system strength requirements" under S5.1.14. This includes the rolling three-year forecasting horizon in the definition of the specification. The PSCR appears to present the IBR forecasts in AEMO's 2022 system strength report as a 'static' articulation of the efficient level of system strength, and Transgrid should confirm whether this is correct in the context of NER requirements.

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<sup>1</sup> Transgrid, *Meeting system strength requirements in NSW: RIT-T Project Specification Consultation Report*, 16 December 2022, p. 15.

<sup>2</sup> *ibid.*, p. 21.

- explain whether and how it intends to articulate forecast system strength requirements beyond AEMO's 10 year horizon, given the RIT-T analysis will extend 20 years, to 2041-42.
- explain (and further to the above) what effects (if any) will arise through the declaration of new system strength nodes in AEMO's reporting framework over the assessment period.
- explain how the duration of system strength needs, as expected to be determined via the OSM, affects the scope of system strength 'capacity' that it will plan towards and eventually procure. The PSCR presents useful data on the duration of fault level MVA for the declared shortfall to 1 December 2025. Forecasts and time series of these durations for future efficient levels of system strength should be presented for each system strength node.
- provide technical analysis on how it has translated AEMO's four criteria relating to voltage waveforms into a single minimum MVA fault level metric. Our expectation is that Transgrid has adopted the same approach as AEMO when determining shortfalls. Even so, Transgrid should demonstrate that this approach is robust and that it has explored opportunities for innovation in the provision of solutions.
- explain how the operation of different IBR technologies and forecasts of other generation and network investments interact, over time and over different locations (including in other jurisdictions), to affect waveforms as per AEMO's criteria and Transgrid's fault level projections.
- consider other flexibility that AEMO has provided the SSSP in its IBR forecasts, including the potential to adjust near term forecasts as more information emerges on IBF and market network service facilities, and how to treat distribution-connected IBR.<sup>3</sup>
- advise to what extent minimum post contingency fault levels from 2 December 2025 and efficient fault level projections to 2033 (Figure 2-6 in the PSCR), are suitable as a proxy for stable voltage waveform.

Transgrid states that the efficient MVA values in the PSCR reflect an upper limit, including because it has assumed coincident operation of all solar and wind generators.<sup>4</sup> Transgrid should clarify whether it intends to conduct further detailed analysis and present a more accurate (i.e. reduced) estimate of the investment need to form part of this RIT-T. Alternatively, this statement could mean that it intends to procure capability at this upper limit, reflecting analysis it has already completed for the PSCR. In either case, we would expect to see appropriate risk metrics and analysis, including duration, weather sensitivities and other scenario analysis, in order to justify the target level of procurement, its associated expense and the expected risk to be borne by customers.

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<sup>3</sup> AEMO, *2022 System Strength Report*, December 2022, p. 28.

<sup>4</sup> Transgrid, p. 21.

## Transgrid should help establish markets for system strength services

The type of analysis Transgrid is completing for this RIT-T should be leveraged into broader and frequent reporting of actual system strength levels. This reporting could be managed by AEMO however overlaps with TNSPs' SSSP and pricing obligations.

As noted in our introduction, this is a new system strength framework and it will be important to carefully work through uncertainties and build stakeholder confidence. There are also material new costs being paid for by customers that were previously unvalued externalities, which will materially change over time as thermal plant exit. The best way to minimise these costs is to provide credible long-term signals to prospective developers who might otherwise detract from system strength, and to others that can provide efficient solutions.

As the SSSP in NSW, Transgrid has a role in gathering and socialising data around the needs and costs of system strength solutions in order to substantiate its system strength unit prices (SSUP) which relate to the procurement of system strength solutions. At present, there is poor visibility on how SSUP have been set across all jurisdictions, and we will continue to engage with TNSPs and the AER on ways to improve the pricing methodology framework. This RIT-T process has already raised questions around system strength pricing in NSW, owing to the first and concurrent pricing methodology process:

- the costing of network solutions in the PSCR appear to be materially out of line with the long-run average costs implied in Transgrid's SSUP
- it is unclear whether and how the costs for non-network solutions have been factored into SSUPs, or the process by which this will be done in the future. For example, data gained from Transgrid's current EOI process, or from future EOIs, could factor into SSUP in NSW and potentially other jurisdictions
- how the above data sources inform or could be informed by AEMO's IASR and system strength reports.

Nevertheless, it is critical that system strength providers and those paying system strength charges understand how prices might evolve into the future and especially over investment timeframes. Confidence and clarity in pricing will better enable this to evolve as a market and assist developers in what technical, locational and operational decisions they will need to make in response.

Information on 'actual' system strength levels should also be communicated at a level of granularity and frequency (ideally 'real time') that enables market participants to understand what drives these investment needs. Whilst AEMO has not specified 'fault level' as the metric for the efficient level of system strength, but rather several criteria that must be met to ensure a stable voltage waveform can be maintained, we believe the articulation of system strength needs should at one level be simplified to reflect 'fault level' but also reflect all technical details about voltage waveform and how different technologies affect these sub-criteria definition, as required.

## **The network option candidates are not clearly justified**

Generally it is difficult to ascertain from the PSCR how Transgrid has determined the number and location of synchronous condensers relative to AEMO's declared Shortfalls and IBR forecasts. With respect to Shortfalls, the fault level contributions from network options 1 and 2 (1874MVA and 2222MVA respectively) appear to far exceed the MVA shortfalls identified by AEMO up to 1 December 2025 at the Newcastle and Sydney West nodes (i.e. 1190MVA and 1026MVA). Option 2 is intended to provide a "scale efficient solution" in relation to future system needs however it is not clear how this has been determined, and both options appear well oversized. In relation to efficient system strength needs, it is not possible to correlate visually the projections of IBR, fault levels and number of synchronous condensers across Transgrid's charts.

We look forward to seeing a clear demonstration of the efficient scoping and timing of network solutions in the PADR, including how inter-regional relationships have been modelled, and scale efficiency achieved and justified.

## **Transgrid's analytical approach should transparently identify benefits**

We note Transgrid's comments that all candidate solutions should equally avoid directions to plant to provide system strength or load-shedding identified in the base case, and its expectation that this benefit would therefore not alter the ranking of solutions on a net present value basis. Transgrid also refers to Dr Biggar's advice on the Powering Sydney's Future RIT-T in support of its view. However Dr Biggar's recommendations were to cap the amount of market benefits where these are expected to increase to arbitrarily large levels into the future<sup>5</sup>, not that they be ignored entirely. In any case it is not evident from the PSCR that the cost of directions (fuel use, etc) or the amount of lost load would result in 'astronomically' high benefits, and this should be validated in the PADR.

As per our observations above on articulating the investment need e.g. duration and other probabilistic elements, some quantification of the amount and value of directions and involuntary load-shedding will be necessary to substantiate Transgrid's approach to risk, and hence the scaling, timing and mix of associated solutions. Transgrid should also clearly explain its approach to valuing AEMO directions under the base case, which would occur prior to any involuntary load-shedding, in the context of the dispatch profiles of plant operating in the market and unit commitment/decommitment profiles in its market modelling. Some amount of AEMO directions could also form part of a candidate portfolio of non-network solutions and may also be worth exploring given uncertainties in how (or whether) the OSM will be the mechanism to dispatch system strength services.

Transgrid notes it will explore timing constraints around the feasible delivery of network solutions. As noted below in the context of IASR inputs and uncertainties in key project timings, we expect there could be material option value in the procurement of flexible non-network solutions which are likely to be less capital-intensive and ready for immediate deployment. The cost trade-offs and risks of over or under-procurement of different

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<sup>5</sup> Biggar, Darryl - An assessment of the modelling conducted by TransGrid and Ausgrid for the Powering Sydney's Future program - May 2017

solutions will also depend on how Transgrid will explore system strength needs over a 20 year horizon, relative to AEMO's 10 year forecasts of IBR under the NER requirements. We therefore encourage Transgrid to adopt a scenario-based approach to timing options around delivery of network solutions, including how it anticipates it may efficiently import system strength from neighbouring regions.

Views raised in consultation on AEMO's 2024 ISP methodology may also provide guidance on whether and how to accommodate changes to the NEO to reflect emissions reduction objectives.

### **Transgrid should openly explore the complexities in modelling system strength**

As alluded to above there are various complexities that will arise in Transgrid's technical and economic modelling. We expect to see transparency on the treatment of:

- interactions between synchronous condensers and non-network solutions across different candidate portfolio options
- how Transgrid will model the dispatch of different technologies including interactions with energy and ancillary services markets under the OSM
- locational factors, including DUID-level effects on system strength across nodes, and interstate interactions
- the evolution of system strength needs at each node as new transmission investment is commissioned
- the intraday shape and seasonality of system strength supply and demand over example reference years
- assumptions about motors (e.g. pumped hydro) providing fault current.

### **Transgrid will need to depart from 2021 IASR data and ISP methods**

Our expectation is that Transgrid's EOI will elicit a wide range of technical solutions, costs and commercial models which move beyond AEMO's current datasets and modelling methods, noting these are also subject to change with consultation on the 2024 ISP and other AEMO forecasting.

The current set of IASR parameters in relation to thermal generation and their use by AEMO suggests that Transgrid's modelling will presume generators are run inflexibly, thus this will overstate the likely underlying levels of system strength provision. If adopted, this would in turn understate the amount of system strength Transgrid expects to procure. Transgrid should test this potential bias and validate likely plant operational schedules with owners of existing generators, and also check the assumptions used by different EOI candidates, including a test of their economic sustainability in terms of revenue sufficiency. A wide range of inputs affecting dispatch profiles and unit commitment should be considered and

evaluated as part of the economic evaluation to determine the robustness of the considered solutions to a wide range of conditions.

In our engagement with AEMO, particularly in the wake of the events of Winter 2022, we have been encouraging more sophisticated modelling of fuel costs and instances of scarcity pricing. This is difficult to transparently model as it reflects intertemporal decision-making in the face of fuel limits, which will be explored in a revised set of EAAP scenarios. We also expect AEMO to continue exploring use of energy limits in its ISP methodology.

These factors are likely to be critical in modelling the costs and bids from non-network services providers. That is, Transgrid will need to examine whether it is realistic to use AEMO's standard set of fuel cost and unit commitment assumptions in the modelling of non-network services. This could materially affect the ranking of network candidate options which will tend to have lower variable costs. Given the commercial sensitivities of information gained through the EOI process, the PADR could address this via carefully designed sensitivity analyses around these assumptions.

Transgrid notes that it will base its scenarios on the 2021 IASR, which featured in the 2022 ISP. It will also adopt the latest IASR inputs which we expect will accommodate significant policy announcements and other critical data that post-date the 2022 ISP. AEMO's recent IASR and ISP engagement indicates stakeholder preference for more aggressive emissions reductions settings, which would tend to accelerate the overall transition. At the same time, there is a need to accommodate complexities associated with gaining social licence, likely in the form of commissioning delays and higher costs arising from suboptimal route and site selection. We encourage Transgrid to factor these elements into scenario and sensitivity design across its modelling. To the extent these are not reflected in the draft and final 2023 IASR or 2024 ISP methodology, Transgrid should explore credible sensitivities around Eraring's closure date, the commissioning of Central West Orana REZ infrastructure, Snowy 2.0, HumeLink, Sydney Ring projects and VNI West. We note there was limited insight into the nature of market modelling scenarios to be adopted for this inaugural assessment of system strength supply and demand in the PSCR.

If you would like to discuss this submission, please contact me on [REDACTED] or [REDACTED]

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