

ABN 70 250 995 390

180 Thomas Street, Sydney
PO Box A1000 Sydney South
NSW 1235 Australia
T (02) 9284 3000
F (02) 9284 3456

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Michael Gatt
EGM Operations
Australian Energy Market Operator
MELBOURNE VIC 3000

Via email: operations@aemo.com.au

Dear Mr Gatt,

Transgrid submission to Draft Transmission System Operator Capability Framework

Transgrid welcomes the opportunity to provide a submission to the Australian Energy Market Operator's (AEMO) Draft Transmission System Operator Capability Framework (TSOCF). Transgrid is the primary TNSP in NSW and the ACT, responsible for planning, operating and maintaining the high-voltage transmission network that underpins the secure and reliable supply of electricity to consumers across NSW and the ACT.

Transgrid welcomes the development of the TSOCF, to support and inform necessary transmission network control room upgrades. The transformation of the power system is making system operation progressively more complex, as both supply and demand become more volatile. New inverter-based technologies are able to provide increasing amounts of data, which must be managed in ways that enhance system operation rather than exponentially increasing complexity. Importantly for energy consumers, advanced control rooms can better manage and reduce the potential for operational impacts to the energy market, for example due to planned outages, network configuration or static inverter limits.

Beyond stating our support for the TSOCF, Transgrid makes a number of specific comments about elements of the Draft TSOCF, below.

Specific areas of feedback

Overall, the structure of the TSOCF provides a strong foundation for considering future operational technology investment needs. In particular, it:

- sets out the core operational technology capabilities maintained by TNSPs;
- articulates AEMO's expectations of TNSP capabilities;
- clearly links those expectations to relevant NER and other formal obligations, supported by concise plain-language descriptions; and
- highlights emerging operational and system conditions that may challenge TNSPs in meeting both regulatory obligations and AEMO's expectations.

This structure should assist Transgrid in developing the rationale for future investments by helping to identify emerging needs and articulate the likely base case in the absence of investment. While TNSPs will still need to assess their current capability maturity, identify capability gaps, and develop options for economic assessment, these activities are appropriately undertaken by the individual TNSP given the

network-specific nature of these considerations. Also noting, where solutions are complex, costly or require industry collaboration, expectations that TNSPs “need” to act should instead encourage them to consider options or pursue opportunities, subject to demonstrated benefits, feasibility and coordinated industry development.

To further strengthen the framework and enhance its practical application, there may be opportunities to provide a clearer line of sight between the forecast future operating conditions described in the "emerging situations" and the capability expectations placed on TNSPs. In several instances, the framework identifies potential future challenges but does not clearly establish the circumstances under which investment may be required to address them.

For example, greater specificity around the key forecast drivers (such as DER penetration, connection volumes, system complexity or operational variability), the risks that may emerge if particular capabilities are not maintained, and the potential consequences of those risks could improve the framework's usability. This would help TNSPs, AEMO and the AER develop a common understanding of when capability uplift may become necessary and why.

Enhancing this connection between system drivers, capability requirements and potential consequences would improve the framework's actionability and support more efficient investment planning and assessment. It would also provide greater confidence that investments proposed to support the capabilities identified in the framework can be clearly traced to emerging system needs and associated operational risks.

By way of example, the drafting for Core Capability 1.2 could be enhanced as follows:

- **Emerging situation:** The power system is transitioning from relatively predictable regional demand and generation patterns to increasingly variable operating conditions, which may challenge TNSPs' ability to undertake [specific operational outcome]. Where appropriate forecasting, modelling or decision-support capabilities are not available, TNSPs may experience [specific consequence]. These challenges may become more pronounced as DER/CER penetration increases, large-scale generation connections grow, or demand profiles become more dynamic.
- **Expectations on TNSPs:** TNSPs maintain the capability to process, interpret and apply forecast information from AEMO and other relevant sources at the level of granularity required for their network. This supports effective management of increasingly variable operating conditions and helps mitigate the risk of [consequence identified in the emerging situation].

The table below provides additional specific feedback on the capabilities.

Framework Reference	Feedback
1.1 Expectations on TNSPs	Standardisation of limits advice could inadvertently reduce innovation in constraint formulation techniques and local engineering approaches. The framework could be enhanced with a note to preserve the ability to apply network-specific methods where they deliver better operational or market outcomes.
1.2 Expectations on TNSPs	TNSPs will require more granular forecasts than the AEMO regional forecasts, which the first sentence is articulating. The framework could be enhanced by updating to “TNSPs should consider inputs from AEMO and others when establishing transmission forecasting at the sub-regional locations to demonstrate prudence and efficiency.

1.6 Expectations on TNSPs	The framework could be enhanced by updating the second sentence to “This should provide more efficient market dispatch outcomes, increase certainty of outages or quicker reconciliation of issues, whilst preserving clear governance over what rating is approved for operational use.
1.7 Expectations on TNSPs	In inclusion of a note that AEMO and TNSPs need to collaborate closely when determining the approach for model exchange.
2.3 Expectations on TNSPs	Consideration to noting the defined split between widespread stability risks (e.g. oscillatory stability) managed by AEMO, and localised stability risks (e.g. power quality) managed by the TNSP?

Application of network regulatory processes impacts the timing of technological upgrades

Transgrid is in the process of making investments to upgrade our control room and operational technology. This experience has informed the development of the draft TSO CF, through Transgrid’s active involvement in its development. Transgrid is hopeful that the development of the TSO CF can help to expedite the process for other Transmission Network Service Providers (TNSPs), including AER assessment and approval of necessary expenditure. Upgrading control rooms and associated facilities takes years, rather than months, excluding the RIT-T process which itself can take several years.

In addition, the net present value assessment for capability uplift in an operational sense is complex, being that operational benefits are broad and far reaching across the network (hence not analysed like a network project for an augmentation to a specific route on the network). Transgrid has used case studies to highlight the benefits in our operational technology uplift Contingent Project Application, using a range of conservative assessments. This work took about 12 months and included consultation that the TSO CF is seeking to circumvent (by identifying needs that are common across operators). Where possible, clearly linking the required capability to forecasted power system events or transition points will support TNSPs ability to justify the need and timing for capability enhancements.

Ongoing development of the TSO CF

As the power system continues to rapidly transform, Transgrid notes the importance of regular reviewing and updating the TSO CF. Transgrid sees merit in tying updates to the TSO CF to specified transition points in the evolution of the power system. In particular, updates to the TSO CF could be explicitly tied to AEMO’s Transition Plan for System Security and the transition points that it identifies. This will support the articulation for the trigger and need date for any capability enhancement.

If you require any further information or clarification on this submission, please contact Stuart Barber, Manager – Future Control Centre, via stuart.barber@transgrid.com.au.

Yours sincerely,



Jesse Steinfeld
GM System Resilience (Acting)