

# Summary: System Security Roadmap Operational Technology Upgrades

RIT-T Project Specification Consultation Report

Issue date: 14 October 2024



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## Summary

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We are applying the Regulatory Investment Test for Transmission (RIT-T) to options for Transgrid's System Security Roadmap (SSR) Operational Technology (OT) contingent project, to upgrade operational technology and tools for use in our control rooms and corporate offices.

The Australian Energy Regulator (AER) accepted the SSR operational technology project as a contingent project for Transgrid's 2023-28 regulatory period, subject to the successful completion of early works and fulfilling specific trigger events.<sup>1</sup>

One of the trigger events identified by the AER for the contingent project application was the completion of a RIT-T. Alongside written support from the Australian Energy Market Operator (AEMO<sup>2</sup>), this RIT-T demonstrates that an investment in technological upgrades and tools is the preferred option to address the increasingly complex operational challenges faced by Transgrid.

Publication of this Project Specification Consultation Report (PSCR) represents the first step in the RIT-T process.

### **Project context: operational challenges in a transitioning power system**

The electricity system in NSW is currently undergoing a period of transformation, with several factors driving increased complexity in power system planning and operations.

Historically, the consistent output profile of base load generators helped transmission network operators stabilise the technical operating envelope of the power system to quickly return the system to secure operations following contingency incidents (generator trips, equipment failures, weather events, etc). However, the NSW power system is now undergoing a transition from a small number of large, centrally distributed thermal generators to many small, distributed, variable generator connection and storage resources. At the same time there is also a growth in smart devices on our network as well as more active distribution networks feeding into the transmission network. Whilst all these developments will ultimately benefit consumers through increased access to lower cost, zero emission energy sources and the ability for the network to operate more flexibly overall to meet demand, they also increase the complexity of the system Transgrid needs to manage.

This transition is driving a substantial increase in information and analysis requirements across our operational control and operational planning functions, particularly due to an increase in the number and new types of transmission assets, in combination with unprecedented changes in generation and load interacting with our network. Additional complexity also arises from the more variable characteristics defining renewable generation and storage (compared to retiring base load generation).

In the absence of an upgrade to the capabilities used in our control rooms and corporate offices, the increasing complexity of the NSW power system means that:

- it is likely that Transgrid will need to impose constraints more frequently on the operation of the power system in NSW, and generally begin to operate the system in a more conservative manner (which may require placing constraints on the operation of low cost, renewable generators), to have sufficient confidence that the system will remain within its required operating envelope; and

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<sup>1</sup> AER, *Transgrid transmission determination – 1 July 2023 to 30 June 2028 – Attachment 5: Capital expenditure*, Final decision, p. 47.

<sup>2</sup> AER, *Transgrid transmission determination – 1 July 2023 to 30 June 2028 – Attachment 5: Capital expenditure*, Final decision, p. 40.

- there is an increased likelihood that contingency events may occur when our operators are overburdened from needing to access and confirm the accuracy of information from multiple sources, and therefore less equipped to take the action within the required time. This in turn poses a greater risk of expected unserved energy (EUE) to end consumers going forward.

Transgrid would like to address these potential adverse outcomes proactively, and this RIT-T is being carried out to provide us with the tools to prevent such a situation from arising.

### **Identified need: net market benefits arising from investment in operational technologies and tools for use in control rooms and corporate offices**

The investments considered in this RIT-T are expected to address limitations in the way in which we operate the network going forward. We expect market benefits will predominately arise from:

- reduced expected unserved energy (EUE), resulting from reduction in the risk of contingency events escalating to point where load shedding is required; and
- reduced dispatch costs and reduced greenhouse gas emissions, resulting from the ability to operate the system with fewer constraints on low-cost and low-emission renewable generation.

Our initial assessment indicates that the market benefits from enhancing the capabilities of operational technology (OT) systems (including our SCADA system) in our control room and corporate offices are expected to exceed the costs of these investments. As such, we have identified this as a 'market benefits' driven RIT-T (i.e., as opposed to a 'reliability corrective action' to address regulatory or service standard obligations).

Notwithstanding, continued investment in operational technology and tools is also likely to be integral to Transgrid continuing to meet our regulatory obligations under the National Electricity Rules (NER) in relation to the secure operation of the system under an increasingly complex operating environment.

The proposed investments are also important to meet AEMO's expectations as it considers the need to ensure system resilience in the face of the energy transition and increasing complexity of the system. Transgrid is working closely with AEMO in considering the interaction of our enhanced control room capabilities with the wider needs of the system. In particular, we are exploring options that align with AEMO's Operations Technology Roadmap<sup>3</sup> and Engineering Roadmap,<sup>4</sup> and which are consistent with the experience of system and market operators globally.

### **Three credible options have been identified at this early stage in the RIT-T process**

We have undertaken early works to further investigate and develop alternative options for improving our control systems and corporate office capabilities. This has involved extensive investigation and planning by our internal teams, as well as the commissioning of expert input from independent international and Australian experts (Electric Power Research Institute (EPRI) and GHD Advisory).

As a result of these early works, we have identified three feasible options from a technical, commercial, and project delivery perspective that can be implemented in sufficient time to meet the identified need:

<sup>3</sup> AEMO, *Operations Technology Roadmap*, available at: <https://aemo.com.au/en/initiatives/major-programs/operations-technology-program/operations-technology-roadmap>, accessed 19 September 2024.

<sup>4</sup> AEMO, *Engineering Roadmap to 100% Renewables*, available at: <https://aemo.com.au/en/initiatives/major-programs/engineering-roadmap>, accessed 19 September 2024.

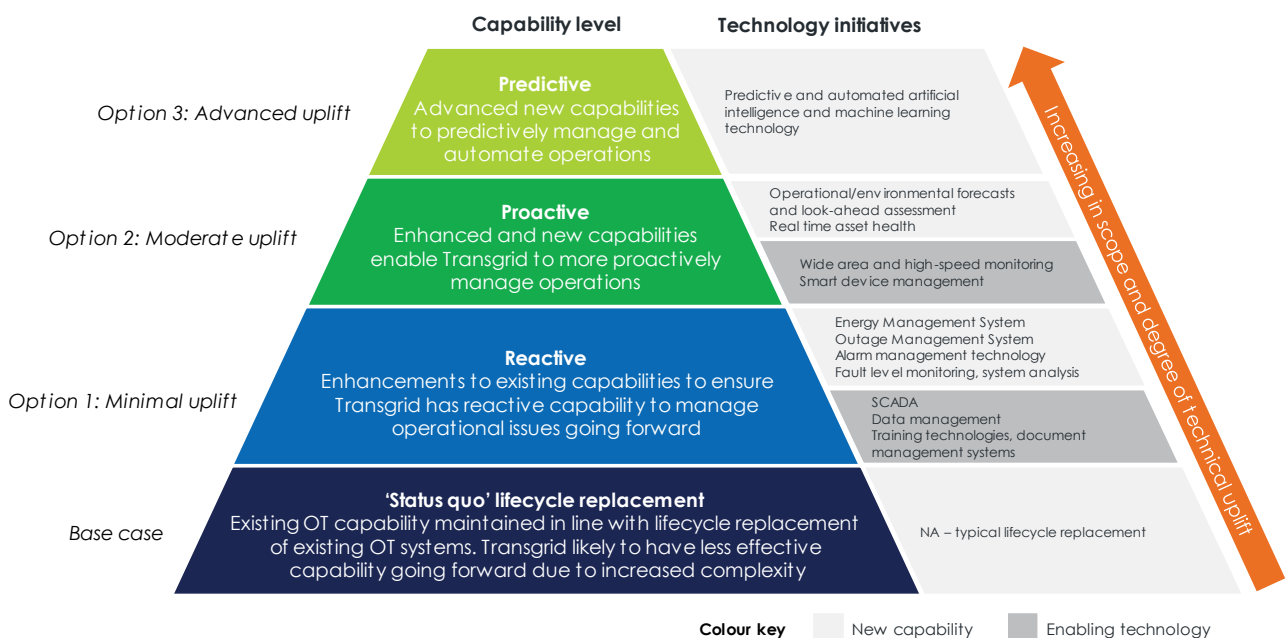
- Option 1: **Reactive capability** – provides enhancements to Transgrid’s existing core OT capabilities (beyond typical lifecycle replacement capability) to improve the reactive capabilities of Transgrid’s control room and corporate offices;
- Option 2: **Proactive capability** – provides further, moderate enhancements across a portfolio of Transgrid’s existing OT capabilities, as well as additional new capabilities, so that Transgrid can proactively plan for, and respond to, operational issues across its control room and corporate offices; and
- Option 3: **Predictive capability** – provides a suite of advanced enhancements to existing capabilities, as well as adding advanced new capabilities, to enable Transgrid to employ a predictive approach to operations in our control room and corporate offices.

Each option comprises and builds upon the preceding option, ie, Option 2 includes the initiatives and capabilities in Option 1, typically at a higher level of technical uplift. In other words, the options increase in scope, capability and the degree of technical uplift. The implementation of technology initiatives under each option are staged to prioritise the initiatives required most urgently to meet the needs of an evolving power system.

The three options have been developed as a package to reflect the minimum incremental technology solution required to enable a defined level of capability (i.e., reactive, proactive, predictive). As a result, partial implementation of an option would not result in the intended capability being achieved.

The differing features of the options are illustrated in Figure E-1E-1 below, which summarises the key characteristics of the three options, in terms of the capabilities, associated technology and the extent of technical uplift.

Figure E-1: Option capability-technology pyramid



Note: In addition to the technology initiatives identified above, operational planning sits across several of the technology initiatives as an enabling and complementary function.

We are undertaking a market testing process (through the issuing of a Request for Information to potential vendors) to confirm the availability and costing of the options being considered, and to test whether there

are other credible options that should be considered in this RIT-T. The results of this market testing will be considered in the analysis presented in the Project Assessment Draft Report (PADR).

Estimated capital costs for each option are summarised in Table E-1E-1 below. Transgrid will be undertaking further work (including drawing on the market testing process) to refine these cost estimates prior to the PADR assessment.

Table E-1: Summary of credible options and capital costs \$m (+/- 25%)

Option	Capability	Scope	Capital cost
Option 1	Reactive capability	Enhancements to Transgrid's existing core OT capabilities	77.9
Option 2	Proactive capability	Moderate enhancements across a portfolio of Transgrid's existing OT capabilities, as well as additional new capabilities	110.1
Option 3	Predictive capability	Advanced enhancements to existing capabilities, as well as additional advanced new capabilities	131.6

Transgrid is very mindful that its expenditure needs to be efficient. In further refining the options, and in considering the additional revenue we request in our contingent project application, we are investigating the potential to achieve synergies with works being considered by AEMO and other Network Service Providers, as well as ensuring that our incremental revenue request takes into account the revenue that has already been included by the AER in our current regulatory determination.

### Non-network options are not expected to be able to assist with this RIT-T

We do not consider non-network options to be commercially and technically feasible to assist with meeting the identified need for this RIT-T.

Non-network options (which typically include options such as local generation and/or demand management) are unable to contribute towards meeting the identified need for this RIT-T, as these options cannot affect the capabilities of Transgrid's control rooms or corporate offices. There are currently no known non-network alternatives that could effectively augment or substitute for the investments that Transgrid is proposing.

### Submissions and next steps

The purpose of this PSCR is to set out the reasons we propose that action be undertaken, present the options that address the identified need, outline why for this particular RIT-T we do not consider non-network options are able to assist, and allow interested parties to make submissions and provide input to the RIT-T assessment.

We welcome written submissions on materials contained in this PSCR. Submissions are due on 15 January 2025.

Submissions should be emailed to our Regulation team via [regulatory.consultation@transgrid.com.au](mailto:regulatory.consultation@transgrid.com.au).<sup>5</sup> In the subject field, please reference 'System Security Roadmap Operational Technology upgrades PSCR'.

<sup>5</sup> We are bound by the *Privacy Act 1988 (Cth)*. In making submissions in response to this consultation process, we will collect and hold your personal information such as your name, email address, employer and phone number for the purpose of receiving and following up on your submissions. If you do not wish for your submission to be made public, please clearly specify this at the time of lodgement. See Privacy Notice within the Disclaimer for more details.

At the conclusion of the consultation process, all submissions received will be published on our website. If you do not wish for your submission to be made public, please clearly specify this at the time of lodgement.

We intend to produce a Project Assessment Draft Report (PADR) that addresses all submissions received and presents our draft conclusion on the preferred option for this RIT-T. Subject to what is proposed in submissions to this PSCR, we anticipate publication of a PADR in early 2025.