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Wednesday, 31 May 2023

Integrated System Plan Team
Australian Energy Market Operator

Lodged via email: ISP@aemo.com.au

Dear Sir/Madam,

2023 Transmission Expansion Options Report Consultation

Transgrid welcomes the opportunity to respond to the *Transmission Expansion Options Report* consultation paper published by the Australian Energy Market Operator (AEMO) on 2 May 2023.

Transgrid operates and manages the high voltage electricity transmission network in NSW and the ACT, connecting generators, distributors and major end users. We have an important role in managing one of the key parts of the Australian energy system as it transitions to a higher renewables penetration. We remain committed to playing our part in delivering the major transmission investments identified in the Integrated System Plan (ISP) to provide significant benefits to consumers.

Transgrid considers that there is significant value in the trusted, comprehensive, and detailed nature of AEMO's ISP. We support AEMO's efforts to collaboratively consult on conceptual transmission network expansion options and its proposed approach to cost estimation.

Our specific feedback to the consultation is limited to the following matters:

- Transmission cost estimation process and database.
- Review of TNSP cost estimates.
- Importance of exploring all transmission line augmentation options for social licence.
- AEMO's approach to estimating operational expenditure.
- System strength costing.
- Broken Hill REZ.
- Offshore renewable energy zone design.

Each of these matters is discussed below.

Transmission cost estimation process and database

Transgrid supports AEMO's efforts to update transmission cost estimates to reflect supply chain constraints and global competition for electricity infrastructure. This will allow recent cost data to inform the development of the 2024 ISP and increase stakeholder confidence in its outcomes.

AEMO's report details that its commissioned update to the Transmission Cost Database generally shows around a 15-20% increase in costs compared to equivalent cost estimates prepared for the 2022 ISP. Transgrid encourages AEMO to investigate further, including in existing joint planning forums, whether this increase in costs is reflective of recent transmission cost inflation.

For example, the Central NSW to Sydney, Newcastle and Wollongong (SNW) flow path Option 1 (Hunter Transmission Project) has comparable network upgrades and associated works as Option 2 (Sydney Southern Ring). However, the cost estimate for Option 2 is more than 15-20% higher than Option 1 despite the comparable characteristics. Some of this difference may be explained by Option 2's estimate being further progressed however it may also highlight that recent cost inflation assumptions require further consideration by AEMO.

Transgrid encourages further individual consultation with respective Transmission Network Service Providers (TNSPs) before finalising the Transmission Cost Database for the 2024 ISP. This will ensure that the identification of actionable ISP projects is based on up to date, transparent and trustworthy information. Transgrid notes that it will be providing an updated Preparatory Activities Report for the Sydney Southern Ring for inclusion in AEMO's final Transmission Expansion Options Report.

Review of TNSP cost estimates

When reviewing cost estimates provided by TNSPs, AEMO should consider like for like projects that have recently been costed by other TNSPs and not just compare against the Transmission Cost Database. The Central NSW to SNW Options 1 and 2 example explained above show the value of this.

Importance of exploring all transmission line augmentation options for social licence

Transgrid agrees with AEMO's position in the paper that *securing local community acceptance, or 'social licence', will be vital to the timely delivery of new infrastructure projects in the NEM*. Social licence is critically important to enabling a smooth and accelerated delivery of major transmission projects crucial to Australia's energy transition.

We encourage AEMO to consider providing a clear and transparent methodology to assess social license issues for transmission expansion analysis. This methodology should have strong consideration to:

- The cost and benefits of upgrading existing infrastructure instead of greenfield infrastructure in terms of minimised impact on communities and the local environment. This includes considering virtual transmission line upgrades.
- The additional benefits associated with some higher cost network augmentation options that reduce the impacts on local communities.
- Factoring in other benefits revenues that some network augmentation options allow including sharing network infrastructure with telecommunications infrastructure to improve mobile reception in regional areas.

AEMO's approach to estimating operational expenditure

AEMO estimates the operational expenditure for transmission projects by assuming 1% of the total capital cost per annum can be used as the operation and maintenance cost for each transmission project. Transgrid acknowledges this has historically been an appropriate figure for new build projects.

Transgrid considers that AEMO's assumption of 1% may not be appropriate as the baseline estimate going forward. An adjusted assumption could recognise the uplift in network-wide complexity that is arising from an expanded transmission network connecting vast quantities of

intermittent renewable generation and storage assets. To manage this increasing network complexity and maintain a secure power system through the transition to 100% renewables TNSPs need to invest in additional operational tools and resourcing.

System strength cost estimation approach

Transgrid supports AEMO's approach on system strength costing as detailed in the report.

Broken Hill REZ

Transgrid recognises the abundant renewable resources available in Broken Hill. Selection of alternative transmission routes and associated costs should be considered to optimise for technical, network, economic and social licence outcomes. Increased focus on the opportunities available for major inland solar developments will complement existing REZs developments. Transgrid is keen to collaborate with AEMO on developing the idea of a major inland solar REZ in NSW for further consideration in the 2024 ISP.

Offshore renewable energy zone design

Offshore wind is a proven technology internationally and has gained increased support in recent years in Australia. Driving a coordinated approach to the planning and delivery of the necessary infrastructure is important to ensuring offshore wind can be delivered at least cost to consumers.

Transgrid considers that AEMO's proposed cost estimation process is reasonable if it was considering a small number of discrete offshore wind projects individually connecting to the grid. However, given the significant scale of developer interest and potential for offshore wind as a source of renewable energy out to 2050 a more granular approach to technology, design and cost assumptions is required, as is outlined below. This will ensure the ISP is accurately comparing the relative merits of planting generation in offshore compared to onshore renewable energy zones.

'GenCost' assumptions on connection assets

Transgrid appreciates the clarification provided by AEMO, in figure 12, to illustrate the network asset inclusions in the 'GenCost' estimates. This figure details that cost estimates for offshore wind include the network assets from the generating plant up until a substation 20 km inland. Transgrid encourages AEMO to include this clarification clearly in future publications.

Offshore wind projects are highly sensitive to the cost of offshore and onshore connection distances. Given this, Transgrid does not support the standard inclusion of 30 kilometres offshore and 20 kilometres onshore of undergrounded radial network assets into the generation cost estimates.

This approach would not allow the 2024 ISP to accurately compare the merits of different offshore wind REZs given some projects may not require this distance of offshore or onshore network assets or require onshore assets to be undergrounded. Additionally, there is the potential for many offshore wind projects to share offshore and onshore network assets.

Without factoring in a more granular level of detail of offshore wind REZ connection asset requirements and the potential for shared connection assets the 2024 ISP will not accurately model the attractiveness of some offshore wind REZs. To address this issue AEMO should consider introducing a new category of connection asset needs to allow for additional differentiation in generation plant cost estimates for offshore wind REZs.

Floating and fixed offshore wind

Transgrid considers that there is a need to differentiate floating and fixed offshore wind as two generation categories for the 2024 ISP. This would likely require an update to the CSIRO GenCost report however this is required given they are different technologies, especially on a cost basis.

Innovation in offshore wind technology and connection models

Transgrid encourages AEMO to consider the following recent offshore wind technology innovations:

- Introduction of modular offshore substations, termed offshore transformer modules, which are now increasingly being used up to about 100 kilometres from shore. These modules allow for significant cost reductions and time savings as they can be attached to turbine foundations and are lower weight than a typical offshore substation, reducing need for special heavy-lift vessels.
- TenneT, a transmission system operator in the Netherlands and Germany, has developed a 2GW HVDC program which it claims will increase the pace of the energy transition and boost grid expansion in the North Sea. The approach planned by TenneT is to standardise offshore wind connections into a one-size-fits-all 2 GW HVDC offshore platform and a new 525 kilovolt (kV) bipolar cable system.¹
- Anabaric, a North American transmission developer, carried out a study on offshore wind transmission development in New England.² This study found given the high cost and difficulty of building onshore transmission, a planned approach to developing offshore grids can significantly reduce the need and costs for onshore upgrades. This includes developing links to more distant load centres on the existing grid to decrease the total combined onshore and offshore transmission costs.

Next steps

We will continue to work collaboratively with AEMO as it develops this report and other key elements of the 2024 ISP. If you require any further information or clarification on this submission, please feel free to contact me or Doug Thompson at Doug.Thomson@transgrid.com.au.

Yours faithfully



Kasia Kulbacka
General Manager, Network Planning

¹ For more information see TenneT's website [here](#).

² For more information on this study carried out by the Brattle Group for Anabaric see the report [here](#).