Transgrid

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Summary: Maintaining safe and reliable operation of Inverell substation

RIT-T Project Specification Consultation Report

Region: Northern NSW

Date of issue: 20 March 2025

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Summary

We are applying the Regulatory Investment Test for Transmission (RIT-T) to options for maintaining the safe and reliable operation of Inverell substation. Publication of this Project Specification Consultation Report (PSCR) represents the first step in the RIT-T process.

Inverell 132/66 kV substation is located in Transgrid's Northern NSW network. It connects to Transgrid's 132 kV Moree, White Rock and Armidale substations. It also connects to Essential Energy's 66 kV distribution network which supplies industrial and residential loads in the Inverell region.

There are two 132/66 kV transformers at Inverell substation which were both commissioned in 1983, and both transformers are considered under this need. The health index considers natural age, dissolved gas analysis (DGA), oil quality (OQ), Bushing Dielectric Dissipation Factor (DDF), defects, load and corrosive oil.

The purpose of this PSCR is to examine and consult on options to address the deterioration of the Inverell No.1 and No. 2 transformers at Inverell substation to reduce the likelihood of prolonged and involuntary load shedding in the Northern NSW region and reduce the risk of safety and environmental hazards associated with a catastrophic failure.

Identified need: ensure the safe and reliable operation of Inverell substation

The identified need for this project is to maintain the safe and reliable operation of Inverell substation and the broader transmission network in NSW by addressing the risk of failure of Inverell substation's No. 1 and No. 2 power transformers.

The No.1 and No. 2 transformers are approaching the end of their serviceable life and showing signs of deterioration due to the following key factors:

- **Natural Age:** The transformers were manufactured and commissioned in 1983. The transformers will be 42 years in 2024/25 and will be approaching their 45-year expected useful life by the end of 2023-2028 regulatory period.
- **Aged Oil Impregnated Paper (OIP) Bushings:** The 132 kV and 66 kV OIP bushings were originally installed in 1983 and are over the 30-year useful life of high voltage bushings.
- **Internal Arcing:** Dissolved Gas Analysis (DGA) shows high levels of acetylene in the main tank of the transformers. This typically indicates arcing in the paper or oil at high temperatures.
- **Oil leaks:** There are leaks from the bushings, valves, pipework flanges, and main tank lid gasket, allowing moisture ingress and oxygen into the main insulation.

These condition issues have been evaluated through the transformer health index methodology to give an effective age for the No.1 transformer of 51 years (2024/25) and 55 years for the No. 2 transformer (2024/25), which is significantly above their chronological ages. These condition issues, if not remediated, increase the probability of transformer failure.

Replacement of the Inverell transformers will significantly reduce the likelihood of prolonged and involuntary load shedding in the northern region and help Transgrid manage its safety obligations.

The key economic benefits associated with addressing this need are summarised as:

- Reduction of risk as valued as direct impact to Transgrid and consumers including:
  - Changes in involuntary load shedding
  - Safety and environmental hazards associated with a catastrophic failure.
- Avoided operating expenditure related to an escalation of corrective maintenance.

The proposed investment to address the asset condition has significant 'market benefits' as the proposed investment will help to avoid involuntary load shedding. Options considered under this RIT-T have been assessed relative to a base case. Under the base case, no proactive capital investment is made and the condition of No.1 and No.2 Inverell transformers will continue to deteriorate. The investment will also assist Transgrid to manage and mitigate safety risks that would otherwise arise from a failure in transformers.[1]

Two credible network options have been identified

We have identified two credible network options that meet the identified need from a technical, commercial, and project delivery perspective.[2] These options are summarised in the table below.

Table E-1 Summary of the credible options

Option	Description	Capital costs ($M, 2024/25)
Option 1	Replacement of the No.1 and No.2 Inverell transformers	15.50
Option 2	Refurbishment of the No.1 and No.2 Inverell transformers	2.48

The preferred option is Option 1, as it has the highest positive weighted NPV result of the technically and commercially feasible options which have been considered at this stage of the RIT-T.

Four other options were considered but not progressed including increased inspections, elimination of all associated risk, and non-network solutions. The reasons these options were not progressed are outlined in section 3.3 of this PSCR.

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 will not mitigate the expected lost load, safety risks and environmental risks from failure of the No. 1 and No. 2 transformers.

[1] Transgrid manages and mitigates safety risk to ensure they are below risk tolerance levels or 'As Low As Reasonably Practicable' ('ALARP'), in accordance with Transgrid's obligations under the New South Wales Electricity Supply (Safety and Network Management) Regulation 2014 and Transgrid's Electricity Network Safety Management System (ENSMS). In particular, risks for Transgrid and its consumers are mitigated unless it is possible to demonstrate that the cost involved in further reducing the risk would be grossly disproportionate to the benefit gained.

[2] As per clause 5.15.2(a) of the NER.

Option 1 delivers the highest net economic benefit and will meet NER requirements

We have assessed that Option 1 is the best performing option under all three reasonable scenarios considered in this PSCR. On a weighted basis, where each scenario is weighted equally, Option 1 is expected to deliver net benefits of approximately $21.85 million.

Draft Conclusion

This PSCR finds that Option 1 is the preferred option to address the identified need. Option 1 involves replacement of the No.1 and No. 2 transformers at Inverell substation.

The capital cost of this option is approximately $15.50 million (in $2024/25). Planning, design, development and procurement (including completion of the RIT-T) will occur between 2025/26, while project delivery and construction will occur in 2026/27 and 2029/30. All works are expected to be completed by 2029/30. The expected project timeframe is 60 months with an expected asset life of 45 years. Routine operating and maintenance savings are estimated at approximately $1,141 per annum (in $2024/25).

Exemption from preparing a Project Assessment Draft Report

Subject to the identification of additional credible options during the consultation period, publication of a Project Assessment Draft Report (PADR) is not required for this RIT-T as we consider that the conditions in clause 5.16.4(z1) of the NER exempting RIT-T proponents from providing a PADR have been met.

Specifically, production of a PADR is not required because:

- the estimated capital cost of the preferred option is less than $54 million;[3]
- we have identified in this PSCR our preferred option and the reasons for that option, and noted that we will be exempt from publishing the PADR for our preferred option; and
- we consider that the preferred option and any other credible options do not have a material market benefit (other than benefits associated with changes in voluntary load curtailment and involuntary load shedding).

If an additional credible option that could deliver a material market benefit is identified during the consultation period, then we will produce a PADR that includes an assessment of the net economic benefit of each additional credible option.

If no additional credible options with material market benefits are identified during the consultation period, then the next step in this RIT-T will be the publication of a Project Assessment Conclusions Report (PACR) that addresses all submissions received, including any issues in relation to the proposed preferred option raised during the consultation period.[4]

[3] Varied from to $54m based on the AER Final Determination: Cost threshold review, November 2024.
[4] In accordance with NER clause 5.16.4(z2).

Submissions and next steps

We welcome written submissions on materials contained in this PSCR.

Submissions are due on 23 June 2025 and should be emailed to our Regulation team via regulatory.consultation@transgrid.com.au.[5] In the subject field, please reference 'Inverell substation renewal PSCR.' 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.

Should we consider that no additional credible options were identified during the consultation period, we intend to produce a PACR that addresses all submissions received including any issues in relation to the proposed preferred option raised during the consultation period. Subject to additional credible options being identified, we anticipate publication of a PACR by mid-2025.

[5] Transgrid is bound by the Privacy Act 1988 (Cth). In making submissions in response to this consultation process, Transgrid 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.