
Transmission Revenue Reset 2027 to 2032 (TRR 2027-32)

Project Cost Update Summary: KTS Transformer Replacement Project

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Table of contents

1. Purpose	3
2. Project Background	3
3. Summary of Change in Project Cost Compared to Initial Proposal	3
4. Market testing and independent review of program costs	4
5. Additional program scope due to ground wire fault level increases	5
6. Project Forecast Expenditure	6

1. Purpose

This document outlines the basis of the capital expenditure proposed for the Keilor Terminal Station (KTS) Transformer project as part of AusNet Services' TRR 2027-32 Regulatory Proposal. It also outlines the basis of the capital expenditure proposed for replacing ground wire line sections and reinforcing or replacing towers when the tower design does not allow for larger ground wires. This fault level mitigation work is needed for some of the 220 kV lines connected at KTS where the fault rating of the ground wires is below the increased fault level following the replacement of the 500/220 kV transformers at KTS.

2. Project Background

KTS is owned and operated by AusNet Services and is a major Victorian transmission hub located in Melbourne's north-west. It supplies both transmission and distribution customers across Melbourne's western metropolitan region with three voltage levels – 500 kV, 220 kV and 66 kV. Three 750 MVA 500/220 kV transformer and five 150 MVA 220/66 kV transformers are in services at KTS. KTS 66 kV supplies a total of approximately 200K customers in the areas of Sunbury, Sydenham, Tullamarine, Airport West, St. Albans, Woodend, Gisborne, Pascoe Vale, Essendon, and Braybrook. The Western Metropolitan 220 kV ring is also supplied from KTS and includes the following important terminal stations: West Melbourne, Fishermans Bend, Altona, Brooklyn, and Newport Power Station.

Three 750 MVA 500/220 kV transformers (A2, A3 and A4) and one 150 MVA 220/66 kV transformer (B4) at KTS are in poor condition and have exceeded their service life, with service ages between 54 and 55 years. Asset condition assessments have identified increased risk of failure, and refurbishment has been identified as not technically viable or economically feasible. This is driven by the condition of the transformer core and windings, the issues with the age of the assets and other limitations around the refurbishment of larger transformers.

AusNet Services' risk assessment has identified that continued operation of the existing transformers is associated with increasing reliability, safety, environmental and asset failure risks. Replacement of the transformers is therefore considered both prudent and economically efficient, as it supports the ongoing provision of reliable transmission services while reducing the probability and consequences of a major asset failure. Several options to replace the three KTS 500/220 kV transformers have been considered, including replacement with the same size (750 MVA) transformers and replacement with standard metro 500/220 kV transformers rated at 1000 MVA. The preferred option from the RIT-T is to replace with larger 1000 MVA transformers which is the standard for metro 500/220 kV terminal stations. This option supports efficient spares holding for the fleet of 500/220 kV transformers.

The KTS Transformer Replacement Project involves:

- Replacement
- of three 750 MVA 500/220 kV transformers (A2, A3 and A4) with three 1000 MVA 500/220 kV transformers;
- Replacement of the B4 150 MVA 220/66 kV transformer with a new 150 MVA 220/66 kV transformer;
- Construction of new 500 kV and 220 kV switch bays and busbar extensions to facilitate the transformer replacements; and
- Replacement of the existing 220 kV busbars with higher-capacity busbars rated to 6000 A continuous current and 50 kA fault current.

The Initial Proposal included a letter from AEMO as Appendix 4J, confirming their support for the preferred option.

3. Summary of Change in Project Cost Compared to Initial Proposal

AusNet's Initial Proposal forecast the KTS Transformer Replacement Project cost to be \$248.3 million. This reflects the preferred option for this project, involving replacement of three 750 MVA 500/220 kV transformers (A2, A3 and A4) with three 1000 MVA 500/220 kV transformers.

Since the lodgement of the Initial Proposal, AusNet has updated the estimated cost of the KTS project to reflect both market-tested costs and additional scope identified through further fault level investigations undertaken in consultation with VicGrid. The total project cost is now estimated at \$324.2 million, an increase of \$75.9 million compared with the Initial Proposal. Of this increase, \$26.4 million relates to revised market-tested costs for the original project scope, while \$49.5 million relates to the inclusion of additional ground wire replacement works required to address forecast fault level increases at KTS.

4. Market testing and independent review of program costs

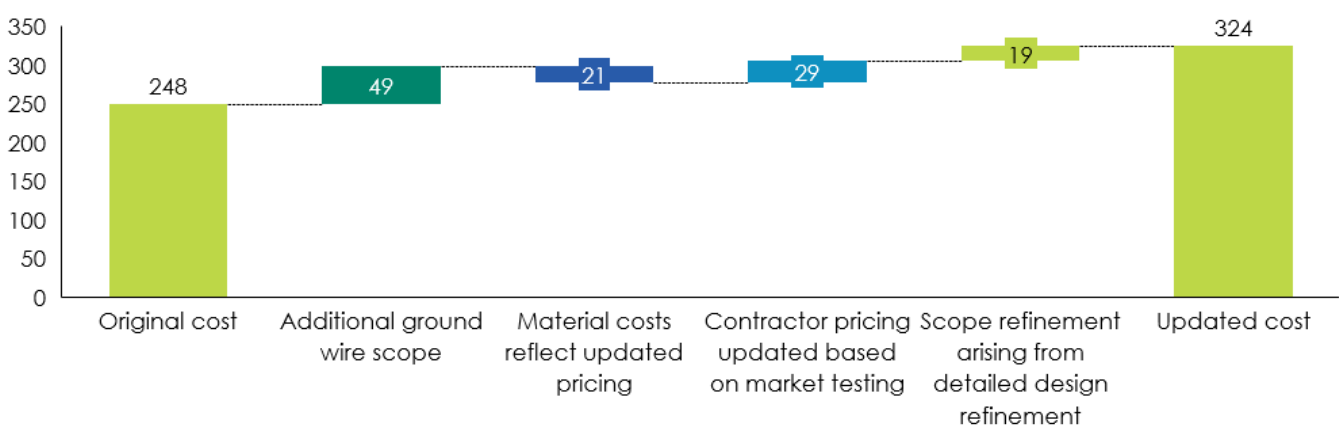
The KTS Transformer Replacement project is the largest project in AusNet's 2027-32 capex program, representing a particularly expensive and complex investment. To support the prudence and cost efficiency of the expenditure proposed under this program, AusNet has undertaken a rigorous cost estimation and assurance process. This has included market testing of key project costs where practicable, as well as the commissioning of an independent review to provide additional confidence in the reasonableness and robustness of the project cost estimates. AusNet engaged Arcadis to undertake an independent review of the KTS Transformer Replacement project budget, including the estimate basis, major cost drivers, and quantitative risk assessment. This report is provided as a supporting document alongside this submission. Arcadis stated that:

"...Arcadis considers the project budget and associated contingency allowances to be a reasonable representation of the anticipated cost to deliver the KTS A Transformer Replacement Project."

The market testing of costs undertaken by AusNet ensures that the pricing reflected in the project cost estimate is reflective of current market conditions. Notable updates reflected include:

- \$20.8 million downward revision in the 'materials' category based on contracted A-Transformer pricing
- \$28.6 million upward revision to the 'contracts' category to reflect a more detailed defined scope and alignment with current market pricing of costs.

Figure 1 Comparison of KTS Revised Proposal cost compared to Initial Proposal cost



Note: Not inclusive of management reserve, overheads and finance charges. The original cost was submitted in AusNet's Initial Proposal for the 2027-32 TRR. Scope change, due to investigation findings in relation to fault level increases, requiring remediation costs for the ground wire in the Revised Proposal. Change in material costs reflect updated pricing, to be in line with pricing across the major equipment and specialist services sector and due to market testing of costs. Revised contractor pricing updated based on market testing, reflecting the outcome of AusNet's engagement with delivery partners.

A detailed breakdown comparison of the project cost estimate (excluding the additional ground wire scope) compared to the initial proposal project costs has been provided in the Appendix of this document.

The independent review undertaken by Arcadis also supports the market testing applied throughout the KTS cost estimate, stating:

"...Arcadis found the estimate to be generally well supported by contractor pricing, supplier quotations, specialist estimates and owner-developed allowance methodologies. No material concerns were identified that would be expected to significantly alter the overall project budget position."

5. Additional program scope due to ground wire fault level increases

Replacing the three existing 750 MVA 500/220 kV transformers at KTS with 1000 MVA units will increase the fault level at the KTS 220 kV bus to approximately 40 kA. The fault current rating of the ground wires on several 220 kV transmission lines connected to KTS will be exceeded based on the new fault level at KTS 220 kV.

At the time of AusNet's Initial Proposal, detailed fault-level modelling and asset-specific assessments were underway to determine the extent of the impact on the existing ground wires. Although the potential need for consequential works had been identified, the affected assets, most effective remediation and associated costs had not been established with sufficient certainty to support its inclusion in the forecast. AusNet therefore excluded an allowance for this scope from both the KTS Transformer Replacement Project and the ground-wire rating-based replacement program.

Since submitting the Initial Proposal, AusNet has completed the detailed modelling and assessments. These studies identified sections of existing ground wire that would not have sufficient fault current rating under the post-project network conditions. The scope and cost of the works required to address these constraints have therefore been included in the Revised Proposal for the KTS Transformer Replacement Project, as the constraints arise directly from the increase in fault level caused by the transformer replacements (\$49 million, direct costs).

A ground wire's fault-current rating represents its ability to carry fault current for the applicable fault-clearing duration without exceeding its permissible thermal limit. If this rating is exceeded, the earth wire may anneal, lose mechanical strength or fail, which presents both a network security and safety risk. Addressing the identified constraints is therefore necessary to maintain the safe and reliable operation of the transmission network following commissioning of the replacement transformers.

Further investigations identified that forecast fault level increases at KTS will result in fault currents exceeding the fault rating of the existing ground wires on the following connected transmission lines. The proposed additional ground wire replacement works are therefore necessary to mitigate the associated safety, asset failure and network security risks arising from these elevated fault levels.

- KTS-GTS No. 1 line
- KTS-GTS No. 3 line
- KTS-DPTS No. 2 line
- KTS-TTS No. 1 line
- KTS-TTS No. 2 line
- KTS – WMTS No.1 line
- KTS – WMTS No. 2 line

Accordingly, the ground wire on these lines emanating from KTS will need to be replaced with higher-capacity conductors capable of withstanding the increased fault current levels. The installation of these larger and heavier ground wires will increase the mechanical loading imposed on the existing transmission towers and their foundations. Consequently, strengthening of the existing towers steelwork and foundations to AS/NZS 7000 will be required where the additional loads exceed the design capacity of the existing structures.

AusNet consulted VicGrid to address potential overlap in scope between the works proposed by AusNet and the project identified in the Victorian Transmission Plan (VTP), including works on transmission lines where network reconfigurations are foreshadowed in the VTP.

VicGrid considered AusNet's advice that the existing ground wire is not capable of withstanding the forecast fault levels following the replacement of the KTS 500/220 kV (A) transformers. Given this advice, VicGrid supports the view that it is reasonable to include the proposed ground wire replacement scope on the Keilor-Geelong No. 1 and No. 3 220 kV lines and the Keilor-Deer Park No. 2 220 kV line as part of the KTS Transformer Replacement Project.

VicGrid is aware that, where overlaps with projects identified through the VTP exist, AusNet has undertaken a risk assessment and removed overlapping scope from its Transmission Revenue Reset submission. In relation to the ground wire limitations on these lines, VicGrid agrees that AusNet has no means of managing the identified risk, nor is there sufficient certainty, given the timing of the relevant projects, that future network developments or changes in network configuration will resolve the issue by the time the KTS 500/220 kV (A) transformers are replaced. On this basis, VicGrid considers it reasonable for the proposed ground wire replacement scope to proceed as part of the KTS Transformer Replacement Project.

6. Project Forecast Expenditure

The table below presents AusNet Services' proposed capital expenditure (as incurred) for this project over the current and 2027-32 regulatory periods.

	TOTAL RY28-32	RY28	RY29	RY30	RY31	RY32
Project Total Cost (\$M, real 2026-27)	\$310.4	\$66.5	\$61.3	\$78.4	\$82.0	\$22.2

A. Detailed breakdown Revised Proposal project costs compared to Initial Proposal

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