TD-0003454 - KTS Transformer Replacement Project Business Case

Portfolio Business Line	Work Category	Work Code / Name
Transmission % Split: Trans: 100%	Replacement	2002 TCAPEX Station rebuilds
Project Start Date	**Commissioning Readiness Date/AIS**	**Project Completion Date**
24/02/2023	20/12/2030	29/08/2031

Business case purpose and overview

This business case seeks approval to invest **$333.3 M** (Including Direct Capital, OHs, CFCs, MR & WDV) CAPEX at Keilor Terminal Station (KTS) to replace:

1. Three 750 MVA 500/220 kV transformers (A2, A3 and A4) with 1000 MVA 500/220 kV transformers,
2. The B4 150 MVA 220/66 kV transformer with the same size transformer.

The three 500/220 kV transformers and the B4 220/66 kV transformer are in poor condition and approaching end-of-life. A failure of any one of these critical assets would significantly impact electricity users, resulting in involuntary load curtailment. Investment in replacement transformers is economically justified to mitigate this risk. The present value of the total asset failure risk exceeds $2 billion, with involuntary load curtailment representing the largest component of this risk exposure.

The project CAPEX will be distributed over the current (2022 to 2027) and next (2027 to 2032) regulatory control periods, with $58 M expected to be spent from a total allowance of $77.6 M included in the current period. It is expected that the AER will approve the forecast expenditure due to its alignment with regulatory expectations, further reinforced by the project's status as a committed investment. The AER's final revenue decision will be published January 2027. The project forecast spend for 2025 is $0.8 million.

The RIT-T for this project is progressing, with the final report - the Project Assessment Conclusions Report (PACR) expected to be published by end September 2025. No non-network options are expected to be identified as feasible alternatives.

It is considered that the new transformers will not increase the noise level as there is a lot of background noise (including from the freeway) and residents are not near the station. The transformer foundation design however allows for transformer walls to be installed should it be needed. The business case includes an allowance for a noise study.

Why is this project required? What is the value that this business case will deliver?

KTS is one of the major terminal stations in Victoria 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 approximately 196,275 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, Fisherman's Bend, Altona, Brooklyn, and Newport Power Station.

The condition of the three 500/220 kV transformers (A2, A3 and A4) and one of the 220/66 kV transformers (B4) is poor to very poor with increased risk of failure. Refurbishment is not an option as the core and windings of these transformers have been assessed to be in a poor to very poor condition.

A risk analysis shows that it is no longer economical to continue to provide transmission network services with these assets as the failure risk has increased to a level where investment to replace the selected transformers presents a more economical option.

Replacement of the three 500/220 kV and one 220/66 kV transformer reduce the risk of involuntary load curtailment, safety hazards, environmental impact, and collateral damage associated with asset failure. AEMO and VicGrid supports replacement of the three 750 MVA 500/220 kV transformers with larger 1000 MVA transformers. The RIT-T also identified replacement with larger transformers as the preferred option as it will deliver higher economic benefits than the alternative option of replacing the 500/220 kV transformers with the same size (750 MVA).

Is this project part of the 5-year Reg Reset submission?	☒ Yes / ☐ No If Yes please select: ☐ EDPR / ☒ TRR / ☐ GAAR Reg Reset Category: Tx - Replacement Major Station Reset Amount: $77.6M (2022-2027 Regulatory control period, $nominal)

Is this forecast in the current FY Plan?	☒ Yes / ☐ No
Incremental change in Opex	Opex change is negligibile

Project Expenditure Forecast (CY)

Project Expenditure for approval (nominal)	Calendar year (first 5 years)					Lifecycle Total
	2025	2026	2027	2028	2029	
Direct Capital expenditure	0.7	36.8	65.1	68.0	49.7	267.7
Overheads	0.0	1.8	3.3	3.4	2.5	13.4
Capitalised Finance Charges	0.0	0.8	3.3	6.6	7.1	19.6
Project Delivery Budget (SAP Capex budget)	**0.8**	**39.5**	**71.7**	**78.0**	**59.2**	300.7
Management Reserve	-	-	-	-	-	28.4
Total CAPEX for Approval (incl risk, CFCs & OHs)	**0.8**	**39.5**	**71.7**	**78.0**	**59.2**	329.1
Operating Expenditure for approval (Project Opex)	-	-	-	-	-	-
Written down value of assets retired/sold	-	-	-	-	-	4.2
Total Estimated expenditure for approval (nominal)	**0.8**	**39.5**	**71.7**	**78.0**	**59.2**	**333.3**

Analysis of investment options

Analysis of investment options ($m - Present Value)	Capex	Opex	Total Financial Costs	Potential Costs	Other Economic Costs & (Benefits)	Total PV Cost	PV Cost Ratio (compared to BAU)	Financial outcome (in present value terms) - compared to BAU - excl non cash costs and benefits	
BAU	-	-	-	-	3,443.1	3,443.1	1.00		
Option 1	259.4	-	259.4	-	325.1	**584.5**	**0.17**	***Excluding Economic costs and benefits, this Option spends $m more Capex compared to BAU***	✓
Option 2	262.1	-	262.1	-	1,143.3	1,405.4	0.41	***Excluding Economic costs and benefits, this Option spends $m more Capex compared to BAU***	×

Options considered	• BAU: Do nothing • Option 1 (Recommended): Replace with 1000 MVA transformers • Option 2: Replace with 750 MVA transformers	
Preferred option	Option 1 has the highest net benefits for all scenarios and sensitivity studies. Option 2 cost almost $3 M more than Option 1, as Option 1 leverages an exiting spare transformer phase located at MLTS, whilst Option 2 will have to procure a dedicated spare transformer phase to manage transformer failure risk. The present value of avoided market impact costs for Option 1 far outweigh those of Option 2. As such, Option 1 presents a robust investment decision to reduce the asset failure risk at KTS.	
Key benefit	**Total value**	**Overview**
	Avoided market impact cost of almost $32M p.a. from the first year of the investment	The avoided market impact cost results largely from avoided involuntary load curtailment risk.
Key implementation/delivery risks	• Availability of planned outages impacting project delivery • Human error incident during project delivery that impacts customers supplied from KTS	

Project Sponsor	Project Initiator & Dept	Prepared by	Date BC submitted
[C.I.C] EGM (Transmission)	[C.I.C] Transmission Network Development & Planning	[C.I.C] Transmission Network Development & Planning	28/07/2025

Business Case e-sign-off

Project # / Title / Version	TD-0003454 – KTS Transformer Replacement Project			
Name	**Title**	**Signature**	**Date Approved**	**Comments**
Delivery Review				
[C.I.C]	Group Leader, Company Works	 FW_ TD3454 business case.msg	13/08/2025	Endorsed.
Endorsements				
[C.I.C]	GM, Regulated Finance	Via RPF	18/08/2025	Endorsed.
[C.I.C]	GM Network Management (Transmission)	Via RPF	18/08/2025	Endorsed.
[C.I.C]	GM Engineering & Asset Management	Via RPF	18/08/2025	Endorsed.
[C.I.C]	GM Project Delivery (Transmission)	Via RPF	18/08/2025	Endorsed.
DOA Approvals				
[C.I.C]	EGM Group Operations (Acting)	Via RIC	22/08/2025	Endorsed
[C.I.C]	EGM Transmission	Via RIC	22/08/2025	Endorsed
[C.I.C]	Chief Financial Officer	Via RIC	22/08/2025	Endorsed
Board	Board			

1. Project Background

KTS is owned and operated by AusNet Services and is located northwest of Greater Melbourne. KTS is one of the major terminal stations in Victoria 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 196,275 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.

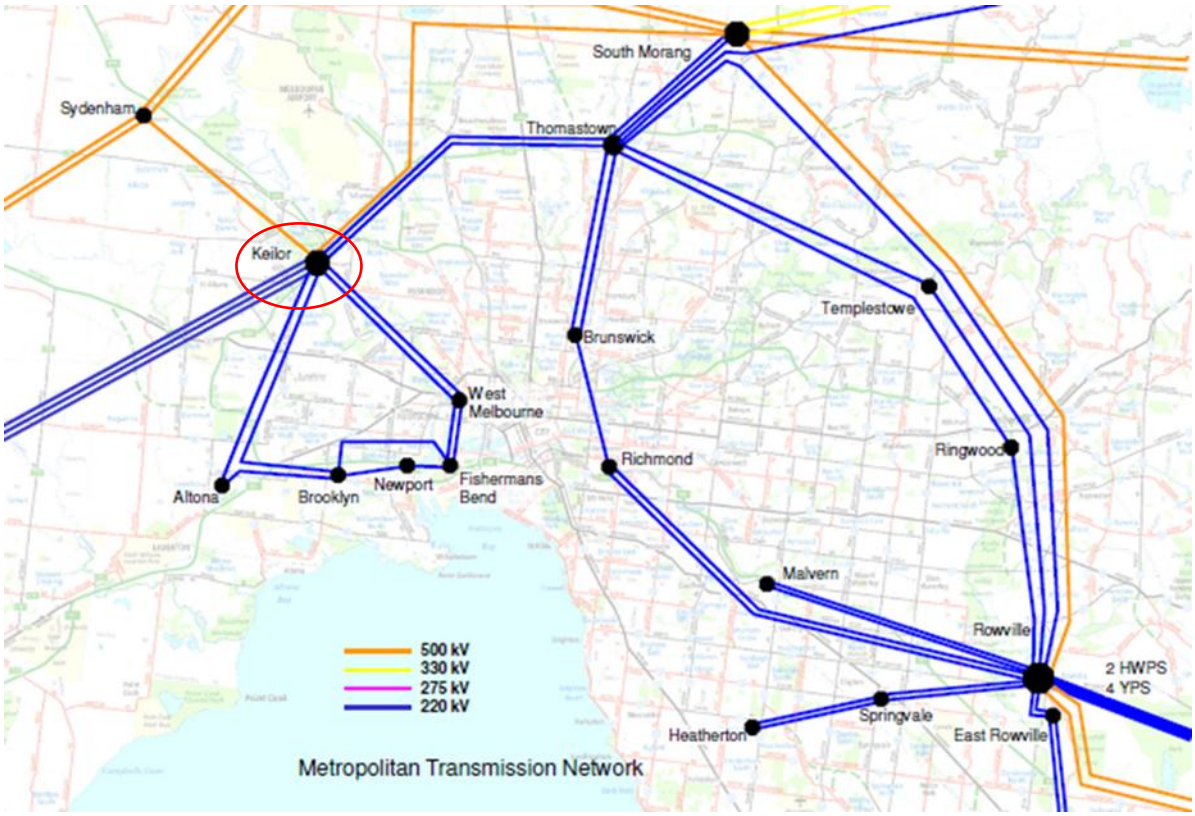

Figure 1: KTS and the Metropolitan Melbourn Transmission network

1.1. Asset Condition

The condition of the three 500/220 kV transformers (A2, A3 and A4) and one of the 220/66 kV transformers (B4) are poor to very poor condition with increased risk of failure With service ages of between 54 and 55 years the three 500/220 kV and one 220/66 kV transformer have reached the end of their service life of 45 years as reflected in the assessed condition of these assets.

Refurbishment is not a viable option, as the core and windings of these transformers have been assessed to be in a poor to very poor condition. Australia lacks the specialized facilities required to undertake major refurbishment works on large 500/220 kV transformers, such as replacement of windings. Undertaking refurbishment overseas would be prohibitively expensive, and it is highly unlikely that any manufacturer would agree to perform such work. Refurbishment is thus not considered a credible option due to multiple factors, including excessive cost (exceeding the cost of procuring a new transformer), technical limitations[1] and practical feasibility.

[1] The 500/220 kV transformers will be close to 60 years old at the end of the project which is well beyond their expected technical life with no possibility of achieving a life extension by refurbishment. They have a voltage limitation and can only be operated up to 525 kV, and an unique bushing design which suggest it would be better to design a new transformer that will meet the functional specification, which includes operation up to 550 kV, as agreed with AEMO and VicGrid.

1.2. Identified need

KTS is part of the main transmission network which provides major transmission network services in Victoria. The services that the terminal station provides will continue to be required given the transmission network developments that are foreshadowed in AEMO's Integrated System Plan and Victorian Annual Planning Report (VAPR), VicGrid's Victorian Transmission Plan (VTP), and the Distribution Business' Transmission Connection Planning Report (TCPR).

The poor condition of some of the assets at the terminal station has increased the likelihood of asset failures. Such failures would result in prolonged outages. Without remedial action, other than ongoing maintenance practice (business-as-usual), affected assets are expected to deteriorate further and more rapidly. This will increase the probability of asset failure resulting in a higher likelihood of an impact on users of the transmission network, heightened safety risks, increased environment risks, increased collateral damage risks to adjacent plant, and the risk of increased costs resulting from the need for emergency asset replacements and reactive repairs.

The 'identified need' this business case intends to address is to maintain reliable transmission network services at KTS and to mitigate risks from asset failures.

AusNet Services calculated the present value of the baseline risk costs to be more than $2 billion from 2025. The key elements of these risk costs are shown in Figure 2. The largest component of the baseline risk costs is the supply interruption risk, which is borne by electricity consumers.

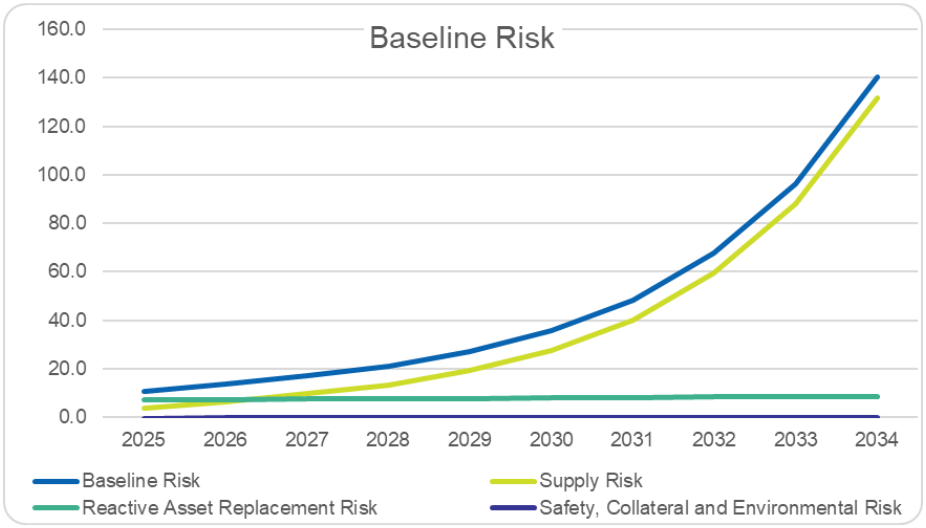

Figure 2: Baseline risk and key risk elements

1.3. Rationale for choosing Option 1

Risk analysis shows that continued provision of transmission services using the existing transformers, identified to be in poor condition, is no longer economically viable. The asset failure risk has increased to a level where investment to replace the selected assets presents a more economical and prudent solution.

Option 1 has been selected as it delivers the highest net benefits across a range of sensitivity studies, where key input variables are varied individually. Figure 3 shows, both options yield benefits that exceed their respective investment costs under all the sensitivities. However, Option 1 consistently demonstrates superior economic performance, making it the preferred solution.

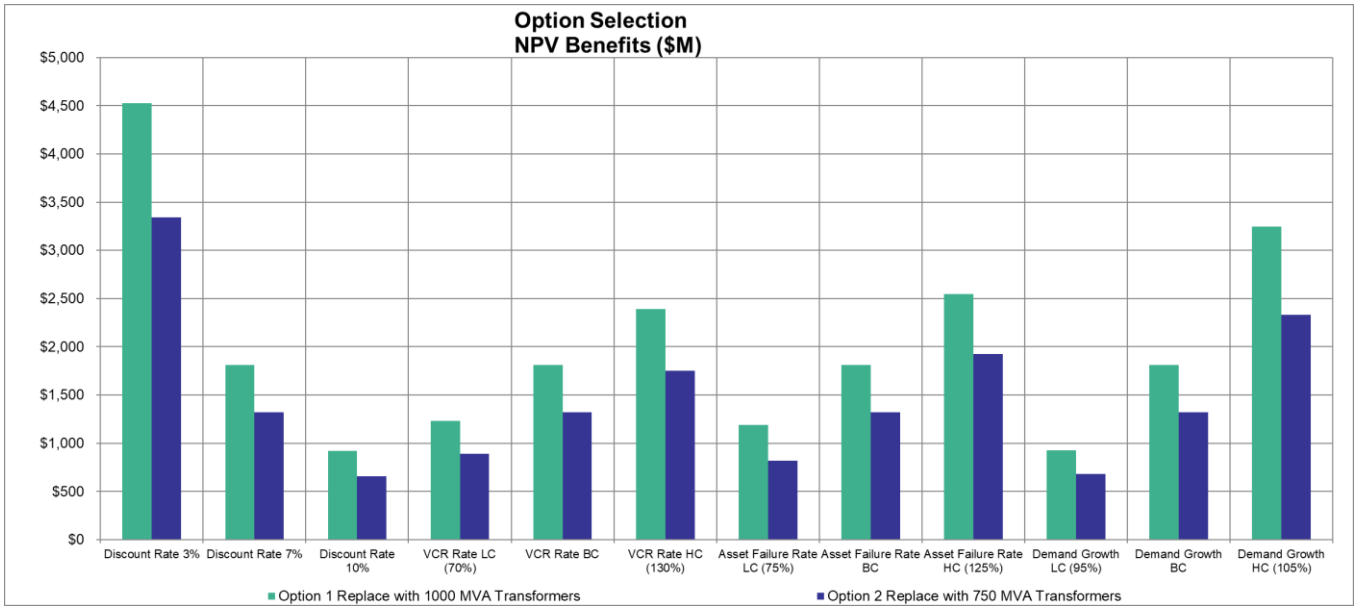

Figure 3: Option selection - NPV benefits

The economic timing of Option 1 is 2029 when the annual project benefits exceed the annualised cost as shown in Figure 4.

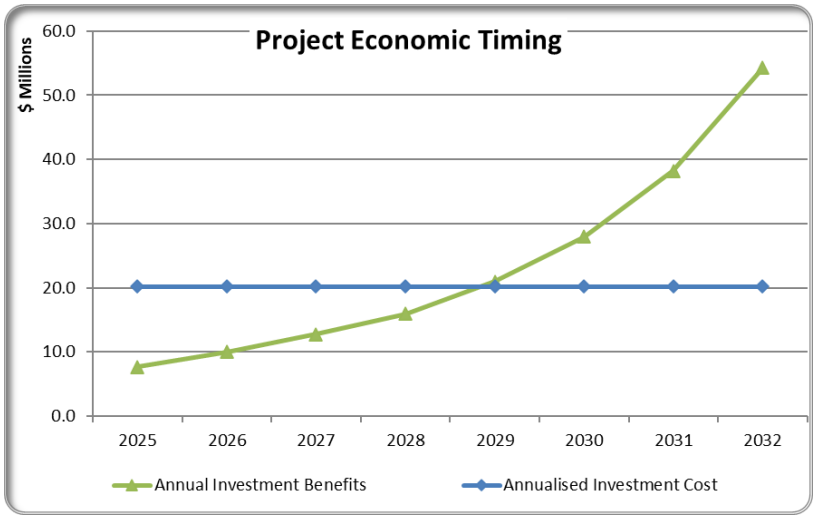

Figure 4: Economic timing for investment

1.4. Rationale for why Option 2 was not chosen

The economic cost benefit analysis shows that Option 2 has lower net economic benefits compared with Option 1 for all the sensitivity studies. Option 1 will furthermore increase the 500/220 kV transformation capacity at KTS and hence support the forecast increased demand in Western Metropolitan Melbourne which includes potential new data centres.

2. Project Scope

2.1. In Scope

Item No	In Scope
IS-1	Replace the A2, A3 and A4 transformers with 1000 MVA 500/220 kV transformers
IS-2	Replace the B4 transformer with a 150 MVA 220/66 kV transformer

IS-3	Establish new 500 kV and 220 kV switch bays and busbar extensions to allow for the first A transformer to be replaced in a new transformer bay.
IS-4	Replace the KTS 220 kV busbars with busbars rated for 6000 A continuous current and fault rating of 50 kA

2.2. Dependencies

Item No	Project Dependency Details and Description
D-1	Jemena plans to augment KTS with several 220/66 kV transformers. This is not a committed project yet but will need to be considered should it proceed. The business will have a better view of the likelihood and scope of Jemena's projects by the end of the year. Network outages will have to be coordinated should Jemena's projects proceed. No other synergies are expected.

3. Key Benefit and Assumptions

Option	Benefit Detail	Key Benefit Category	Key Benefit Value ($)	Key Benefit Assumptions (Baseline and Measurement)	Benefit Start to Full Realisation Date
Option 1	Is there a direct bottom line budget impact? ☐ Yes / ☒ No Cost Centre: N/A CPX: N/A OPX (per annum): N/A	**Incentives & Customer**	$31.9M in the first year. PV of avoided risk cost is about $2 billion.	Reduction in involuntary load curtailment risks is valued at **$31.9M** from the first year that the project goes into service (PV of about $2 billion) based on a Value of Customer Reliability (VCR) of $35.78k/MWh. Calculation of the involuntary load curtailment has been done according to industry standard practice[2] and according to AusNet's approved asset management strategy framework[3].	Benefit start 20/12/2029 Full Realisation 20/12/2030
Option 2	Is there a direct bottom line budget impact? ☐ Yes / ☒ No Cost Centre: N/A CPX: N/A OPX (per annum): N/A	**Incentives & Customer**	$27.1M in the first year PV of avoided risk cost is around $1.5 billion	Reduction in involuntary load curtailment risks is valued at **$27.1M** from the first year that the project goes into service (PV of about $1.5 billion) based on a Value of Customer Reliability (VCR) of $35.78k/MWh. Calculation of the involuntary load curtailment has been done according to industry standard practice[4] and according to AusNet's approved asset management strategy framework[5].	Benefit start 20/12/2029 Full Realisation 20/12/2030

[2] Australian Energy Regulator, "Industry practice application note - Asset replacement planning"
[3] AusNet, "AMS 10-24 - Asset Renewal Planning Guide"
[4] Australian Energy Regulator, "Industry practice application note - Asset replacement planning"
[5] AusNet, "AMS 10-24 - Asset Renewal Planning Guide"

4. Financials

4.1. Opex Breakdown

Opex excl Project implementation (nominal)	Calendar year (first 5 years)					Lifecycle Total
	2025	2026	2027	2028	2029	
BAU Total Opex	-	-	-	-	-	-
Incremental Opex Costs - Option 1	-	-	-	-	-	-
Opex Savings - Option 1	-	-	-	-	-	-
Net Budget impact (split by division below)	-	-	-	-	-	-
New Cost profile	**-**	**-**	**-**	**-**	**-**	**-**

Note: The divisional impact is 100% allocated to the Transmission Line of Business.

4.2. Capex Breakdown

Capex Breakdown (incl mngt reserve - nominal)	Calendar year (first 5 years)					Lifecycle Total
	2025	2026	2027	2028	2029	
Design	-	2.7	2.7	-	-	5.5
Internal Labour	0.7	1.0	2.6	3.5	3.5	17.2
Materials	-	33.1	47.5	37.5	14.3	136.8
Plant & Equipment	-	-	0.4	0.9	1.1	3.7
Contracts	-	-	12.0	26.0	30.9	104.6
Meter Costs	-	-	-	-	-	-
Other	-	-	-	-	-	-
Management Reserve (incl Risk)	-	-	-	-	-	28.4
Total Capex	0.7	36.8	65.1	68.0	49.7	296.1

5. Schedule

Key Milestone and Deliverables (Waterfall)	Planned Completion Date
Approval of Stage Gate 2	24/02/2023
Approval of Business Case	21/10/2025
Approval of RIT ☐ N/A	31/10/2025
Construction Commencement	9/09/2027
Commissioning Readiness Complete	20/12/2030
Project Completion - Stage Gate 6 Approval	29/08/2031

6. Risk Identification

A preliminary risk assessment has been completed, with more detailed review and planning to follow as the delivery plan is developed. This will include application of Utility Risk Management principles to identify all critical safety hazards and validate that effective barriers are in place.

A preliminary risk assessment identified that planned outage cancellation and supply chain constraints have the highest residual risk ratings and are common causes of project delays and cost over-runs. Environmental risks (oil leaks) and safety risks (lifting, electrical hazards) remain significant but manageable. Design related risks are moderate to high and stakeholder and regulatory risks are lower but still important.

AusNet has deep experience undertaking similar projects and the delivery team is confident that with proper planning, project management and safety controls the risks can be managed within AusNet's risk appetite and the budget requested.

Project Risk	What could occur?	Consequence Rating 1-5	Likelihood Rating (Almost Certain - Rare)	Current Risk Rating A-E	Actions and controls in place to manage/ reduce risk	Target Risk Level A-E
Construction risks: Availability of planned outages impacting project delivery	Project delays	2	Possible	D	Planned outages have been minimised as far as possible for the planned scope.	E
Human error incident that impacts the transmission system	Customers impacted because of involuntary load shedding	2	Unlikely	D	Project reviews and detailed scope preparation to minimise risks for all project stages. Training, etc.	E
Supply chain constraints including design partner availability	Project delays	2	Possible	D	Transformer procurement for the project is being actively managed through a strategic planning process to ensure timely delivery and alignment with overall TRR needs.	E
Actual costs exceed Business Case estimate	Require a drawdown of the management reserve or revision of the business case	1	Unlikely	E	The cost estimate has been based on recent 500 kV construction tender pricing. Estimate to be reviewed upon completion of Construction Tender. Management Reserve of $28.4 allocated for cost escalation risk	E
The AER partially or wholly rejects the project	Deferral of other impacted projects, project cancellation, cost write-offs	2	Unlikely	D	Finalisation of the RIT-T for this project, along with an approved business case, will demonstrate to the AER that it is a committed project. The project will also seek endorsement from the Transmission Stakeholder Advisory Panel (TSAP), through AusNet's TRR 2027-2032 customer and stakeholder engagement activities. The project is also included in VicGrid' s VTP.	E

Refer to Risk Assessment Criteria Summary

7. Sustainability

List the changes to sustainability this project will deliver in the table below.

Sustainability Consideration	Impact from this project	Comments
Greenhouse gas emissions ☒ N/A	☐ Increase ☐ Neutral ☐ Decrease	
Waste ☐ N/A	☒ Waste reduction strategies to be implemented	Consideration has been given to the disposal of transformer oil and scrap metals in this business case. Where possible materials will be recycled (most metal major plant) or disposed of using authorised contractors who have proven track records in the industry.
Social procurement ☒ N/A	☐ Purchases from social enterprises [6] ☐ Purchases from Aboriginal and Torres Strait Islander-owned businesses [7] ☐ Purchases from Australian Disability Enterprises [8] ☐ Purchases from local suppliers [9]	
Community ☐ N/A	☒ Community consultation required ☐ Community benefits actions	Community consultation on traffic, noise, and dust controls

8. Corporate Accounting Considerations

Capex profit centre	13260
Propex profit centre	N/A
Opex (BAU) owner & cost centre	[C.I.C], 13945
Transmission Regulatory Key	Prescribed Shared (PS)

Note: OPEX owner assumes responsibility for any write off costs should the project be cancelled.

8.1. Asset Retirements

The total asset write-down amount is $4.2M as per the fixed assets report attached. Of this amount, $3.9M can be attributed to transformer bushings that were replaced recently to address safety and supply risks presented by the old transformer bushings. The replacement of the bushings was essential to manage the risk of a transformer bushings

[6] See The Loop for access to potential supplier lists from social enterprises on the "Suppliers" tab How to purchase (sharepoint.com).
[7] See The Loop for access to potential supplier lists from Aboriginal and Torres Strait Islander businesses on the "Suppliers" tab How to purchase (sharepoint.com).
[8] Australian Disability Enterprises ADE
[9] Local suppliers, as defined by the State government for the purchase. See Local Jobs First - Glossary for Victorian Government definition of "local"

failure and consequent safety and supply reliability risks and the asset management strategy was to replace the bushings first given the long lead time to replace these major transformers.

Finance introduced a Service Life Review process to allow for changes to be made to an asset's financial life and to apply accelerated depreciation over a shorter timeframe once it has been confirmed that an asset is not going to reach its expected life. This may be due to planned replacements, technology improvements, or site / industry decisions such as site closures. Assets adjusted this way will depreciate to zero by the project end date, resulting in a favourable financial outcome compared with not making the adjustment. The depreciation of the assets mentioned above will be accelerated as part of the Service Life Review conducted in December 2025.

8.2. Contributed (Gifted) Assets

N/A

8.3. Assets to be created

Description of Asset	Quantity	Estimated Cost (total)	Expected Asset Life
1000 MVA 500/220 kV transformer bank	3	$180 M	45 years
150 MVA 220/66 kV transformer	1	$35 M	45 years
Protection & Control Equipment for all transformers		$25M	15 years
Busbars	1	$30 M	45 years
500 kV Circuit breakers	2	$20.7 M	45 years
220 kV Circuit breakers	2	$10 M	45 years
Totals			

9. Checklist

For transmission network projects, is there a market impact in the delivery of the project?	☒ N/A / ☐ Yes / ☐ No In April 2025, the AER published Version 6 of the Service Target Performance Incentive Scheme (STPIS) in which it suspended the Market Impact Component (MIC) and removing penalties until a new scheme is developed.
Has a Value Engineering Workshop been conducted?	☐ N/A / ☒ Yes / ☐ No No significant savings identified
For the purposes of RIT, have you considered all credible options including non-network options?	☐ N/A / ☒ Yes / ☐ No

10. Appendix A - Attachments

Attach files as objects. Asterisks (*) are mandatory documents.

Document Title	Attachment (Embedded document)
Scope of Works / Initiative Brief *	DCS - TD-0003454 KTS Transformer Opti
Financial Model with NPV*	GPMO Business-Case-Evaluat
Detailed Cost Estimate and Benefit Assumptions*	KTS Economic Model_2025 v2.xlsm; KTS Transformer Replacement NPV Mo
Write Down Value (WDV) details	TD-3454 WDV.xlsx
Approved Seed Funding Request	TD-0003454_KTS_Tx_ Replacement_Seed_Fu