AusNet

TD-0003597 TTS 66kV CB Replacement Business Case

LoB: Transmission

Sponsor & Benefit Owner: [C.I.C], EGM Transmission

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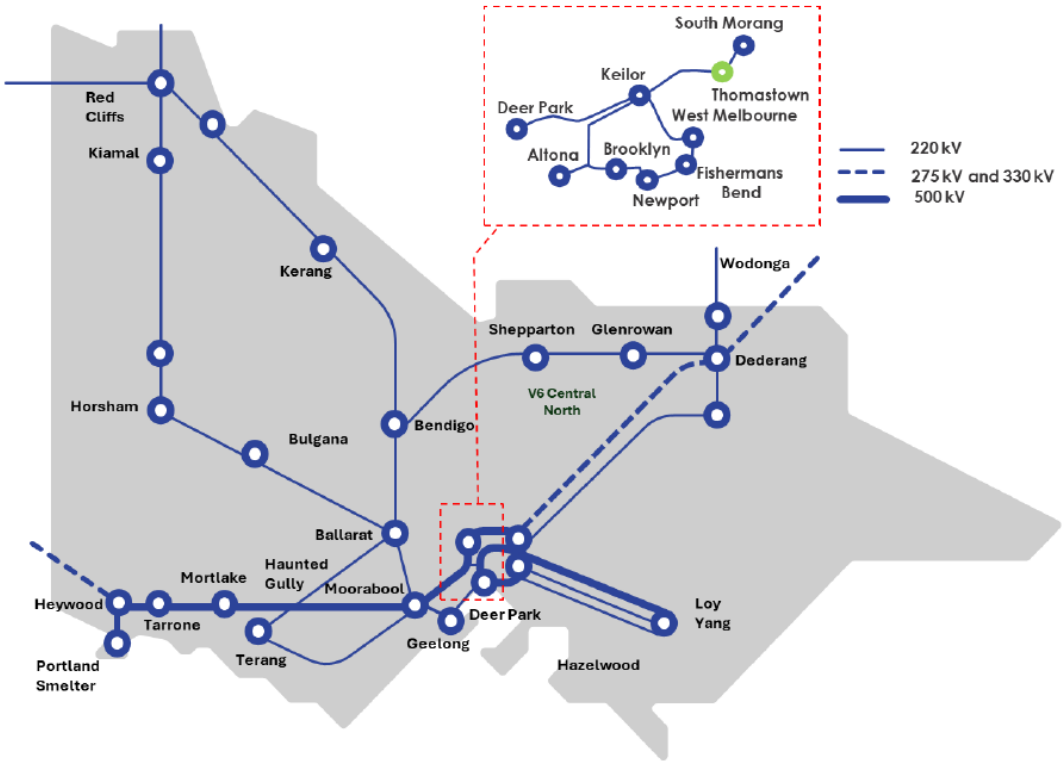
1. Executive Summary

1.1. Project Overview

This business case seeks a $46.9 million CAPEX investment to renew the 66kV switchyard at Thomastown Terminal Station (TTS). The scope covers the replacement of poor condition primary assets - including circuit breakers (CBs), instrument transformers, and disconnectors - in eleven 66 kV switch bays and one 220 kV capacitor bank CB. It also includes upgrading selected 66kV secondary equipment and DC supplies and relocating secondary systems to the new control building.

TTS is a critical hub within Victoria's electricity transmission network, supplying over 177,000 distribution customers across northern Melbourne. The continued reliability of TTS is essential for maintaining secure electricity supply to households, businesses, and essential services in the region. However, many key assets within the 66 kV switchyard are in very poor condition, exhibiting advanced signs of deterioration and increasing the likelihood of unexpected failures. This situation poses an escalating risk to network reliability, safety, and operational continuity, underscoring the need for targeted investment to renew and upgrade TTS infrastructure.



Asset Condition, Safety Risks, and Strategic Drivers

A range of critical assets at TTS, including nine 66 kV bulk oil CBs, two 66 kV minimum oil CBs, one 220 kV live tank CB for capacitor bank switching, associated underslung disconnectors, and instrument transformers—are now in poor condition. These switchgear assets are exhibiting substantial insulation degradation and mechanical wear, significantly increasing the risk of catastrophic failure.

Porcelain insulation, used in the bushings and instrument transformers, remains effective electrically but is inherently brittle and susceptible to explosive rupture. Such failures present severe hazards to personnel and nearby equipment, including the risk of flying debris and explosive rupture. Consequences of failure include:

- Serious safety incidents from explosive failures and flying debris
- Collateral damage to adjacent equipment and infrastructure
- Environmental hazards due to oil leaks
- Extended outages for distribution customers

- Escalating costs associated with emergency replacements and reactive repairs

With manufacturer support discontinued and spare parts only available via salvage, addressing any failure is increasingly challenging and costly. Without proactive intervention, asset deterioration will accelerate, heightening the likelihood of incidents and unplanned outages. A more comprehensive Asset Condition report is attached in the Appendix C documents.

Operational Constraints

The existing 66 kV bulk oil CBs at TTS have short circuit ratings that limit operational flexibility. When fault currents exceed these ratings, operational procedures require one of the five 220/66 kV transformers to be switched out to maintain safe system fault levels. This constraint increases exposure to contingent events and undermines system reliability. Timely replacement of these CBs will remove this operational limitation and restore full flexibility.

Obsolete Secondary Systems

Many secondary systems in the 66 kV panels rely on electromechanical relays that have been in service for over 30 years. These systems are increasingly difficult to maintain due to scarce spare parts and the absence of manufacturer support, resulting in elevated risks of prolonged outages and higher lifecycle costs. Upgrading to modern digital protection systems will enable advanced functionality, flexibility, and self-monitoring capabilities.

Occupational Health and Compliance Risks

The existing 66 kV control building is in poor internal condition and contains asbestos, as documented in the site register. This poses an occupational health risk to personnel. The proposed project includes relocating all secondary equipment to a new control building to eliminate this risk.

Strategic and Compliance Drivers

This investment is required to:

- Maintain reliable transmission network services at TTS
- Mitigate safety, environmental, and operational risks associated with asset failure
- Remove operational constraints on fault current capability
- Maintain compliance with network performance and safety standards

In summary: The proposed investment addresses end-of-life and high-risk assets, removes operational and safety constraints, modernises obsolete systems, and ensures compliance and ongoing reliability at TTS. This is essential to support the safe and reliable supply of electricity to more than 177,000 distribution customers and to meet all relevant regulatory and safety obligations.

1.2. Solution Recommendation

Results of project viability analysis indicate that CAPEX investment of $46.9 million for this project is the most economical by the end of 2028. With an estimated delivery lead time of three years, AusNet proposes to commence the project in 2026, complete the RIT-T process by mid-2026, sufficient regulatory allowance is allocated to begin the project within the current 2022–2027 regulatory period and sufficient regulatory allowance have been requested for the next 2027-2032 regulatory period.

The recommended solution is to replace deteriorating and high-risk primary equipment while simultaneously addressing secondary systems and the old control building. The high-level scope and detailed activities are outlined below:

- **Replacement of 66 kV Switchgear:**

  All deteriorated 66 kV switchgear will be replaced with modern equivalents that comply with current standards. The new equipment will support advanced protection schemes and reduce lifecycle costs through lower maintenance requirements and improved spare parts availability.

- **Replacement of 220 kV Capacitor Bank CB:**

  The existing heavily utilised circuit breaker will be replaced with a modern, type-tested circuit breaker featuring point-on-wave control, specifically designed for this application.

- **Upgrade and Relocation of Secondary Systems:**

  Outdated electromechanical relay and deteriorating battery systems will be replaced with digital protection technology compliant with IEC 61850, delivering enhanced protection, control, and monitoring capabilities. Additionally, remaining secondary equipment currently housed in the old building will be relocated to new control building.

- **New Control Building:**

  Secondary systems will be relocated in new centralised modern control building. These eliminating hazards associated with the existing old 66kV control building with deteriorating interior condition, asbestos containing materials and that would otherwise need to be upgraded for compliance for fire safety, climate control, and personnel health protection around asbestos. The new facility will centralize all protection and control schemes, and DC supply system in a controlled environment that improves equipment reliability and lifespan and simplifies future upgrades and reduces operational risk.

1.3. Solution Strategic Alignment

Strategic Pillar	Applicable <Y/N>
Safely deliver our customer's energy needs today Maing value-for-money investments to create resilient, reliable and safe networks and deliver a simple experience that customers can count on.	Y
Create the energy network of tomorrow Investing in network and non-network solutions to unlock renewables capacity and consumer energy resources, supporting electrification while responsibly decarbonising gas.	N
Enable the transition to a net zero future Building trust and delivering social value, reducing our environmental impact, and operating efficiently.	N

Funding Lines of Business	Work Category	Work Code	Work Code Name
Transmission % Split: Tx=100 Cost ($): Tx=46.9 million	Replacement	2002	Station Rebuilds

Project included in 5-year Regulatory Reset submission?	Reset Submission	Regulatory Reset Category	Reset Amount ($'000)
Y	TRR	Tx - Replacement Major Station	46,963

Title	Current Year (2025)	Outer Years	Total
Requested Funding ($'000)	43.4	44,824.1	44,867.5
Capital Plan ($'000)	-	43,471.0	43,471.0
Variance ($'000)	43.4	1,353.1	1,396.5

2. Investment Analysis

A total capital investment of $46.9 million (including CFCs, OHs, and Management Reserve) is required over the life of the project. This project requires no PROPEX. Additionally, no incremental ongoing operating expenditure is anticipated following completion.

The benefits delivered by this project are expected to offset the incremental capital investment, primarily through improved network reliability and reduced risk of costly unserved energy events. In addition, replacing aged assets will eliminate operational constraints, supporting long-term system integrity.

2.1. Total Estimated Expenditure

Project Expenditure for approval (nominal)	Calendar year (first 5 years)					Lifecycle Total
	2025	2026	2027	2028	2029	
Direct Capital expenditure	41.3	6,439.7	18,052.9	17,277.0	-	41,810.8
Overheads	2.1	323.3	906.3	867.3	-	2,098.9
Capitalised Finance Charges	-	147.7	414.0	396.2	-	957.8
Project Delivery Budget (SAP Capex budget)	**43.4**	**6,910.6**	**19,373.2**	**18,540.4**	**-**	44,867.5
Management Reserve	1.9	302.9	848.1	810.3	-	1,963.2
Total CAPEX for Approval (incl risk, CFCs & OHs)	**45.3**	**7,213.5**	**20,221.3**	**19,350.7**	**-**	46,830.8
Operating Expenditure for approval (Project Opex)	-	-	-	-	-	-
Written down value of assets retired/sold	-	-	-	132.7	-	132.7
Total Estimated expenditure for approval (nominal)	**45.3**	**7,213.5**	**20,221.3**	**19,483.4**	**-**	**46,963.4**

2.2. CAPEX Breakdown

Capex Breakdown (incl mngt reserve - nominal)	Calendar year (first 5 years)					Lifecycle Total
	2025	2026	2027	2028	2029	
Design	-	2,136.7	597.3	-	-	2,734.0
Internal Labour	41.3	352.6	1,214.3	1,303.9	-	2,912.1
Materials	-	3,827.4	2,615.4	-	-	6,442.8
Plant & Equipment	-	-	256.7	292.3	-	549.0
Contracts	-	-	12,618.0	14,370.5	-	26,988.5
Meter Costs	-	-	-	-	-	-
Other	-	123.0	751.3	1,310.2	-	2,184.4
Management Reserve (incl Risk)	1.9	302.9	848.1	810.3	-	1,963.2
Total Capex	43.2	6,742.5	18,901.0	18,087.3	-	43,774.1

2.3. OPEX Breakdown

Opex excl Project implementation (nominal)	Calendar year (first 5 years)					Lifecycle Total
	2025	2026	2027	2028	2029	
BAU Total Opex	10.7	10.9	11.2	11.5	11.8	347.9
Incremental Opex Costs - Option 1	-	-	-	-	-	-
Opex Savings - Option 1	-	-	-	(6.8)	(7.0)	(188.2)
Net Budget impact (split by division below)	-	-	-	(6.8)	(7.0)	(188.2)
New Cost profile	**10.7**	**10.9**	**11.2**	**4.6**	**4.7**	**159.7**

2.4. Benefits

Benefit Category	Benefit Description	Anticipated Benefit	Current Benefit Baseline	Benefit Assumptions	Benefit Realisation Start Date	Benefit Realisation End Date	Cost Centre	LOB Benefit Owner
Risk	Avoiding the Consequences of asset failure assessed across safety, environmental, collateral damage, and emergency replacement lenses.	$1.27M reduction in risk during the first-year post-implementation (2028)	The baseline risk (BAU) is valued at $1.28M in 2028	Post-project risk reduces to $0.8M	01/04/2027	30/11/2028	12825	[C.I.C]
Risk	Reducing the supply risk for unplanned customer outages caused by asset failure.	$0.43M reduction in supply risk in the first-year post-implementation (2028)	The baseline risk (BAU) is valued at $0.44M in 2028	Unserved energy calculated using VCR of $39.92k/MWh	01/04/2027	30/11/2028	12825	[C.I.C]
Risk	Removing growing fault current operational limitations at TTS.	Avoids a one off $ 7.2 M investment for fault level mitigation works by 2028	Current fault level constrained by 66kV CBs; operational procedures require switching off one 150MVA transformer	Fault-level mitigation would otherwise require installing up to two fault-limiting reactors	01/04/2027	30/11/2028	12825	[C.I.C]

3. Project Risks & Schedule

3.1. Risk Assessment

Project Risk	Possible Consequence	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
Delay in Primary Equipment procurement	Project completion delays, increased costs, potential outages due to overloading	3	Possible	B	Early tendering and manufacturer engagement; monitor construction progress; track FAT results	C
Scope change/ New Standards/ Plant unavailable	Design delays; need to comply with new standards	3	Unlikely	E	Update scope and design as required	E
Delayed Start (Project dev. delays /Customer delays/RIT-T extension/DDP engagement)	Extended pre-construction period leading to late completion	2	Unlikely	E	Monitor progress and update plans as necessary	D
Outage constraints CEOT/AEMO /Other network failure	Delayed completion of certain bays	1	Likely	C	Regular coordination with VNSC planning; track changes	D
Delayed Completion (Stage Gate Delays)	Increased costs	1	Likely	C	Adjust schedule and cost forecast as necessary	D
Safety Incident (asset failure during construction)	Cost escalation, time delays, personal injury	2	Possible	B	Conduct regular testing of high-risk bushings and replace any that show defects Maintain maintenance regime, high safety standards and audit schedule, prioritised replacement sequence	C
Concurrent Customer project at same station/period (Jemena) TC-14780 TTS Augmentation	Design delays Project completion delays	2	Likely	E	Maintain proactive communication between both projects Adjust schedule as necessary	D

Refer to Risk Assessment Criteria Summary

3.2. Project Schedule

Key Milestones	Planned Date	Actual Date
Project Selection (Stage Gate 2) (P&PE team to populate)	[DD/MM/YY]	[DD/MM/YY]
Business Case Approval (Stage Gate 3) (P&PE team to populate)	06/12/2025	TBC
Handover to Project Manager	31/01/2026	TBC
RIT-T/D Consultation Completed	22/06/2026	TBC
Design Complete (Stage Gate 4)	31/03/2027	TBC
Build Complete (Stage Gate 5)	31/10/2028	TBC
Asset In Service (AIS)/Go-Live	30/11/2028	TBC
Benefit Realisation Start Date	30/11/2028	TBC
Close (Stage Gate 6)	31/12/2028	TBC

4. Approvals

Title	Name	Date Approved	Evidence
LoB EGM Sponsor (Over $5M)	**[C.I.C]**	06/12/2025	-
CFO (Over $5M)	**[C.I.C]**	06/12/2025	-

A. Appendix A: Options Analysis

A.1. Options Considered

AusNet evaluated both network and non-network options to address the identified need but did not identify any suitable non-network solution. The table below outlines two options considered in comparison to the Business-as-Usual (BAU) approach.

Note: The BAU option refers to continuing normal operations without initiating a project. Routine maintenance and inspections would continue, and the existing risk of asset failure would remain.

Option 1 – Renew TTS 66kV switchyard through replacement and civil works (Recommended)	Option 2 - 5 year Deferral (Not recommended)
• Replace poor condition circuit breakers, deteriorating switchgear, obsolete secondary systems, and complete control room works by 2029. This major station project consolidates multiple asset replacements and upgrades, leveraging proximity to maximise efficiency. All construction work will be delivered within the next regulatory period. • Option 1 offers the most cost-effective solution to maintain reliable transmission service at TTS while mitigating safety, environmental, collateral, and supply risks. It strengthens resilience and reliability and reduces risk by at least $1.7 million per year following project implementation. • The upgrade will improve operational flexibility by removing a station fault current constraint, that will enhance system reliability, and resilience.	• Option 2 delivers the same technical scope and considerations as Option 1 but is deferred by five years by 2034. • While the capital cost of Option 2 matches Option 1, it requires an additional $7.2 million investment for fault level mitigation works by 2028. These works are necessary to address the current fault level constraint and include the installation of up to two fault-limiting reactors. • Deferral of this work heightens safety risks from potential catastrophic failures of CB bushings and CTs, and additional controls would need to be implemented to mitigate personnel safety risk. • The increased risk associated with a five-year deferral is valued at an additional $7.3 million compared to Option 1. AusNet and customers would carry this risk if Option 2 is selected.

A.2. Least Cost Analysis

Option 1 is the preferred solution as it offers the best balance between economic viability and risk mitigation. It considers the consequences of asset failure, monetised safety, environmental, collateral, emergency replacement and supply risks, and provides a full comparison against Business-as-Usual (BAU) and Option 2 (five-year deferral). This option incorporates all appropriate risk controls while ensuring value for money. Financial analysis indicates that Option 1 is approximately $18 million more cost-effective than BAU and $7 million more cost-effective than deferral, reinforcing its position as the most prudent and strategic choice.

Analysis of investment options ($'000 - 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	-	214.3	214.3	-	61,915.8	62,130.1	1.00	
Option 1	40,629.4	104.9	40,734.2	-	3,271.2	**44,005.4**	**0.71**	***Excluding Economic costs and benefits, this Option saves $109k Opex and spends $41m more Capex compared to BAU*** ✓
Option 2	41,995.5	132.3	42,127.9	-	9,579.6	51,707.4	0.83	***Excluding Economic costs and benefits, this Option saves $82k Opex and spends $42m more Capex compared to BAU*** ×

B. Appendix C: Attachments

Required Documentation (Networks only)

	Response (Y/N)	Attachment if applicable (Embedded document)
Financials		
Has a Financial Model with an NPV been completed?	Y	TD-0003597 - TTS CB Replacement_ NPV_V1
Has a detailed cost estimate and benefit assumptions assessment been completed?	Y	5.5.93 - AusNet Services - Project Eco
Has a **Customer Contributions Model** been completed?	N	-
Cultural Heritage		
Is a **Cultural Heritage Checklist** required for this project? If yes, please see additional documentation table.	Y	EMS 21-60-1A Cultural Heritage Che
Delivery		
Has a **Scope of Works / Initiative Brief /Business Requirements** been completed?	Y	DCS - TD-0003597 TTS CB Replacement F
Have the relevant project delivery team been engaged?	Y	<n/a>
Has a project manager been assigned?	Y	<n/a>
Environmental Sustainability		
Is **an Environmental Sustainability Checklist** required for this project? If yes, please see additional documentation table.	Y	Gate 2 Assessment - TD-0003597 TTS CB R
Technical		

Are there any additional technical documents to be included? E.g. Asset Condition Report, Asset Management Strategy, Network Planning Report.	Y	5.5.94 - AusNet Services - TRR 2027-3 5.5.92 - AusNet Services - TRR 2027-3

Additional Documentation

<<Guidance: Please update the below sections where applicable. >>

	Response (Y/N)	Attachment if applicable (Embedded document)
Change Impact Assessment		
Has a Change Impact Assessment been carried out?	N	<n/a>
Cultural Heritage		
Has a cultural heritage checklist been completed?	Y	See above
Have the relevant teams been engaged?	N	<n/a>
Customer and Community		
Is there an impact to Customer and/ or Community?	N	<n/a>
Have you engaged with the Customer and Community team?	N	<n/a>
Environment		
Has an Environmental Checklist been completed?	Y	See above
Have the relevant teams been engaged with?	N	<n/a>
Financials		
Will the project result in any Gifted Assets?	N	-
Have the Write Down Value (WDV) details been assessed?	Y	WDV - TD-3597 TTS CB Replacement.xlsx
Land and Property		
Have the Land and Property team been engaged with?	N	<n/a>
Are there any relevant documents to be added?	N	
Safety		

Have the HSEQ team been engaged with?	N	<n/a>
Other		
Are there any additional documents to be included?	N	<n/a>

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