TRANSPOWER

Upper South Island Stage 1: Major Capex Proposal

Attachment 5 - Costing

August 2025

Introduction

This attachment forms part of our Upper South Island (**USI**) Upgrade Stage 1 Major Capex Proposal (**MCP**) application.

The purpose of this attachment is to provide an overview of our preparation of costs. It focuses on how we have assessed the costs of the short-list options and the proposed major capex allowance (**MCA**) for the proposed stage 1 investment.

1 Approach to estimating capex

We use Transpower's Enterprise Estimating System (**TEES**) to estimate the cost of all capex projects.

TEES produces cost estimates for a project based on the historical rates from past projects or known current rates, as well as information from consultants and/or potential vendors (e.g., RFPs, concept design and solution study exercises).

It also factors in changes in foreign exchange rates and costs of key commodities such as external labour, copper, steel and aluminium.

TEES provides several key benefits:

- Instant access to the best available, up-to-date information for all users.
- The ability to apply cost escalation (commodity input prices and exchange rates).
- Consistency of cost estimation across the business.
- Easy updates incorporating lessons learned from past projects.
- High quality and detailed spend forecasting capability (spend curves which determine when spend will occur over the project duration).
- Links to and interfaces with key cost forecast information in Transpower's financial management system (**FMIS**).
- An opportunity to include environmental, legal, property and stakeholder costs.
- An opportunity to include a risk adjustment – to account for cost uncertainty not represented in our lower and upper bound estimates.

This structured approach ensures that our capex estimates are accurate, consistent, and reflective of real-world conditions.

1.1 Our cost estimates are P50 values

The cost estimates used in the Investment Test and for determining our proposed MCA are P50 estimates. This means there is an equal probability (50%) that the actual cost will be higher or lower than our estimate.

For all capex categories except risk adjustment, the P50 estimates are calculated using

- a lower bound (minimum expected cost);
- an upper bound (maximum expected cost); and
- a most likely outcome (mode).

For risk adjustment, we take a probabilistic approach:

- each identified risk item is assigned a probability of occurrence;
- each risk item is modelled as having an independent binomial distribution;
- the P50 value for each risk item is calculated as the product of the risk impact and its probability; and
- the total P50 risk adjustment is the sum of all individual risk P50 values.

Our project cost estimates are expressed in real 2025 NZ dollars. To calculate the nominal MCA, we apply:

- inflation adjustments to reflect expected cost increases over time; and
- interest during construction (**IDC**) to account for financing costs.

This structured approach ensures our estimates are transparent, probabilistically sound, and aligned with industry best practices.

2 Capex categories

In Table 1 we describe the high-level cost categories used for this MCP.

Table 1: Cost category descriptions

Investigation	Investigation costs cover the development of the scope, timeline and costs for the preferred option and the development of this MCP. These costs are capitalised and include expenses related to consenting and designation.
Transmission lines construction works	This includes material costs such as conductors, earth wires, towers, poles and foundations, insulators and hardware. This cost category captures all other major construction costs such as stringing costs (the labour and associated tools and machinery hire).
Civil works	Civil works are the costs to build foundations and other associated costs required for the primary plant to be installed and commissioned. The costs also include associated civil costs for this project such as oil containment, security fencing, earthworks, underground services and drainage.
Overheads consultants and contractors	Overhead costs are the Transpower staff and contractor overhead costs to deliver this project, and some contractor overheads such as insurance, project management, health and safety plans.
Design	Design costs are the costs for detailed design and the technical investigations and studies required to implement the preferred option. This category includes consultant support (e.g., environmental, noise) and commissioning consultants.
Primary plant works	Primary plant works are the costs of transformer supply and installation as well as associated equipment such as circuit breakers and bus modifications.
Cable works	Cable works are the costs of supplying and installing underground cable including the required trenching of the cable.
Protection works	Protection works are the costs to supply and install protection schemes related to this project.
Communications	This includes material costs such as bespoke type LCM cabinets and racks, fibre cables. This cost category captures construction costs associated with transmitting data and control signals in a substation (the labour and associated tools and machinery hire).
Secondary works	Secondary works include the design, install and commissioning of SCADA and communication devices.

Miscellaneous works	Miscellaneous works include any associated project costs not covered elsewhere.
Switching Cost	Switching cost includes all required labour and equipment to turn on and off HV circuit/power.
Freight	Freight costs cover the delivery of physical assets to the site.
Legal	Legal costs include all required legal expenses for the project.
Property	Property costs include expenses related to land purchases and easements.
Environmental costs	Environmental costs cover the expenses required to meet environmental obligations.
Community Care Fund	Transpower's Community Care Fund supports local projects in communities directly affected by the tactical thermal uprating of the lines, new towers and new switching stations being developed as part of this MCP.
Stakeholder costs	Stakeholder costs include expenses associated with obtaining stakeholder approval for the project works.
Risk allowance	This category includes all foreseeable risks that may impact project costs at a P50 confidence level.

3 USI MCP Stage 1 Capex estimate

Our estimated project costs for the proposed Stage 1 investment are detailed in Table 2 to Table 4. The project investigation cost is estimated at $1.5m (real 2025), with expenditure planned between 2025 and 2026.

We have also estimated $1.0m (real 2025) for implementing an automatic over-voltage shunt capacitor and shunt reactor switching scheme. This includes provisions for modifications to the Upper South Island Reactive Power Controller (**USI RPC**) to limit additional capacitor switching by the RPC after the scheme has been activated. This does not include the cost to replace capacitor protection relays, which will already be covered as part of our RCP4 work (in 2025-2030).

Table 2: TEES cost estimate (switching stations), NZ$'000 real 2025

Description	Orari	Rangitata
Civil Works	8,158	5,291
Primary Plant	11,394	7,049
Protection	2,305	1,250
Secondary Equipment	744	308
Communications	2,502	3,170
Digital Substation	1,651	1,651

Description	Orari	Rangitata
Miscellaneous and minor Works	93	93
Switching Cost	22	13
Freight on Materials	488	323
Design Allowance	2,264	1,600
Transpower Overhead	3,688	2,722
Contractor's Overhead	5,118	3,751
Environmental Costs	155	155
Risk Allowance	2,781	2,387
Total Project Cost (P50 unless stated otherwise)	**41,363**	**29,763**
Project Upper Bound	53,772	38,692
Project Lower Bound	33,091	23,810

Table 3: TEES cost estimate (lines), NZ$'000 real 2025

Description	Line connections for switching stations	TTU of Norwood-Rangitata and Orari-Rangitata[1]
Clearance Rectifications	8,169	10,203
Tower strengthening enabling works	603	1,432
Foundation strengthening	3,798	5987
Stringing	1,816	822
Protection and Temporary Work	186	1,627
Earth Potential Rise (EPR)	22	75
Access	880	7,349
Materials	1,087	709
Demolition costs	1,207	19
Miscellaneous	565	474
Freight on Materials	386	71
Design Allowance	1,575	2,455
Transpower Overheads	3,453	5,382

1 This estimate covers the TTU scope to be funded by this MCP only. The upper and lower bound reflect the potential range of upgrades and project risk required for that scope only also. Section 3.1 covers this in more detail.

Description	Line connections for switching stations	TTU of Norwood-Rangitata and Orari-Rangitata[1]
Contractor Overheads	4,051	8,502
Property and/or Easements and Acquisition	142	649
Environmental Costs	83	123
Community Care Fund	180	143
Mana Whenua	133	278
Communication and Iwi / Stakeholder Liaison costs	40	31
Risk Allowance	3,477	3,739
Total Project Cost (P50 unless stated otherwise)	**31,853**	**50,070**
Project Upper Bound	41,409	65,091
Project Lower Bound	25,482	40,056

Table 4: TEES cost estimate (shunt capacitors), NZ$'000 real 2025

Description	Amount ($)
Primary Plant	6,567
Switching Cost	22
Freight on Materials	434
Design Allowance	1,180
Transpower Overhead	1,340
Contractor's Overhead	582
Risk Allowance	1,285
Total Project Cost (P50 unless stated otherwise)	**11,411**
Project Upper Bound	14,834
Project Lower Bound	9,128

3.1 Reduced clearances resulting from transmission line upgrades

As part of the Transmission Thermal Upgrade (**TTU**) in the proposed Stage 1 investment, further study since our short-list consultation has identified reduced ground to conductor clearances (under clearance) that will need to be remediated or mitigated. Under clearance occurs where the physical distance between a Transpower transmission line conductor and another object does not meet the minimum threshold as defined in the New Zealand Electrical Code of Practice for Electrical Safe

Distances (**NZECP 34:001**). This is a standard we are required to meet under the Electricity (Safety) Regulations 2010.

Transpower undertakes LIDAR surveys of all our lines, to determine spans that have ground or third-party violations, as assessed against NZECP34:001 guidelines. Any violations identified are recorded in our under-clearance register and managed as part of our under-clearance programme. As a PCBU[2], we are legally obligated to remediate/rectify these where *reasonably practicable,* and there is a programme in place nationally to do so.

One of the key factors influencing under clearance is conductor sag, which increases as the temperature of the line rises due to higher electrical loading. This means that as we upgrade the line's capacity, the additional thermal expansion of the conductors can introduce clearance issues, making it necessary to address any non-compliant spans.

Regarding the TTU of transmission lines in the proposed Stage 1 investment, we have identified both existing and new under clearances issues. Existing under clearance issues refer to the clearance violations currently breaching NZECP 34, while new under clearance issues are those resulting from this MCP.

As part of delivering this project, we plan to remedy or mitigate both existing and new under clearances in a prioritised manner, in line with Transpower's policy/strategy. Only under clearance issues arising from the upgrade will be funded through this MCP. Resolving the existing issues will likely be funded through either opex or by landowners, depending on the nature of the under-clearance violation and in accordance with Transpower's under clearance rectification policy. A proposed framework is discussed below.

Treatment of Pivot Irrigators

A particular concern in the USI region is the presence of pivot irrigators, which are mobile plant. These can sometimes be installed and operated under transmission lines. The presence of these large, rotating irrigation systems can potentially pose clearance and safety risks if their height or operational movement brings them too close to conductors. Our under-clearance register does not include violations involving non-fixed objects, such as pivot irrigators. To accurately assess these, LIDAR mapping would need to capture the irrigator at all points where it crosses beneath our span (to determine the lowest clearance point). A key limitation is that at the time of the LIDAR survey, the irrigator may not be positioned under the span at all.

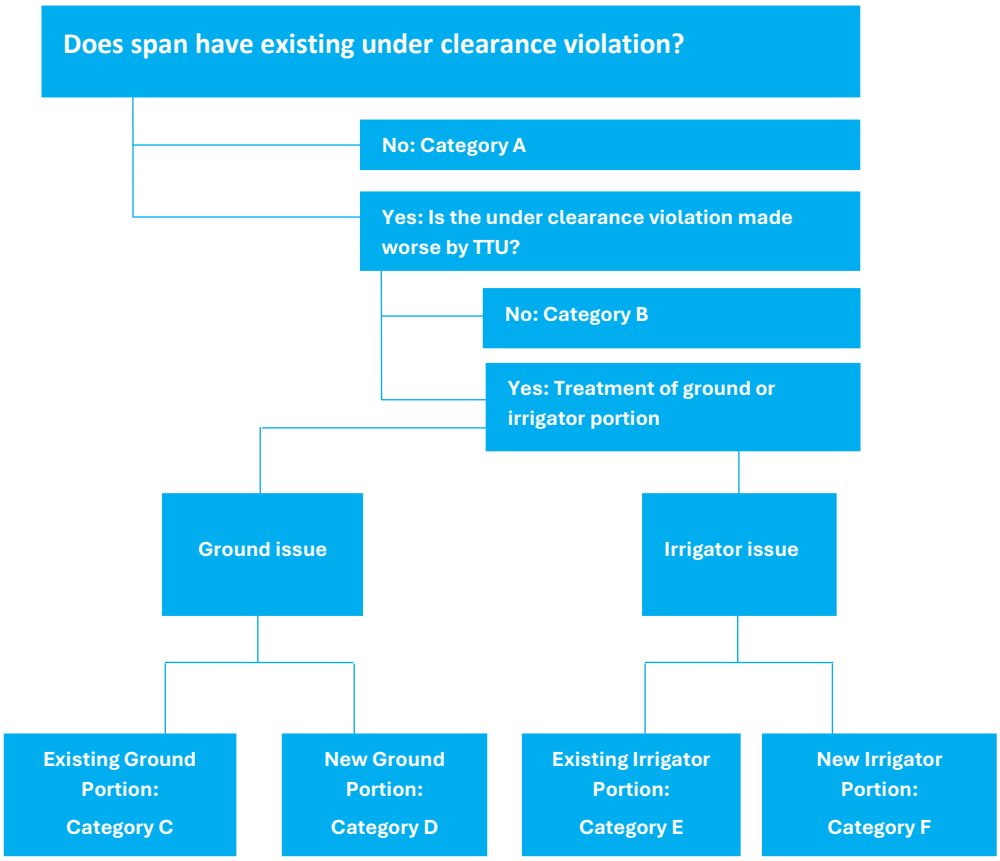
A more detailed study was done post our original short-list consultation, which identified potential clearance violations involving pivot irrigators.

Proposed Framework for Funding Required Under Clearance Violations

The diagram below proposes a framework to identify the appropriate source of funding for addressing each violation.

[2] Person Conducting a Business or Undertaking

Figure 1: Framework to address under clearance violations



Where an existing issue is made worse (ground or irrigator), based on our approach in related situations, we propose that this cost is split equally between the relevant "new" and "existing" categories.

For Norwood–Rangitata and Orari–Rangitata, we identified 96 spans with possible existing clearance violations prior to the TTU and 218 spans with possible clearance violations after the TTU.

Table 5 sets out the estimated TTU cost and funding source for each category. Note that a span could have both ground and irrigator clearance violations, meaning that the total number of violations is greater than the number of affected spans.

Table 5: Clearance violations by new/existing violation and ground/irrigator violation

Category	Description	Potential Number of Clearance Issues	TTU cost (P50)	Funding source
A	New Under Clearance Violation: On Span where previously there was no under clearance violation	157	$27.49m	MCP
B	Span Has Existing Under Clearance Violation: No Change (not made worse by TTU)	0	$0.00m	Opex or landowners

Category	Description	Potential Number of Clearance Issues	TTU cost (P50)	Funding source
C	Span Has Existing Under Clearance Violation: Existing to Ground Portion	1	$0.09m	Opex
D	Span Has Existing Under Clearance Violation: New to Ground Portion	90	$16.78m	MCP
E	Span Has Existing Under Clearance Violation: Existing to Irrigator Portion	95	$5.80m	Opex or landowners[3]
F	Span Has Existing Under Clearance Violation: New to Irrigator Portion	95	$5.80m	MCP
A+B+C +D+E+F	Total		$55.97	MCP, Opex or landowners
A+D+F	Proposed MCP costs (in MCA)		$50.07	MCP

It is difficult to accurately estimate the precise number of clearance issues and the individual solution required at each span without site visits. Our cost estimate takes a risk based approach and accounts for a range of solutions, depending on the nature of the violation. We believe this is appropriate for this stage of the project. Site visits will be undertaken as part of the detailed design process, and we will refine the number of impacted spans and the nature of each solution required.

We are committed to managing costs prudently while ensuring compliance and safety. Where remediation or mitigation is required, potential measures may include:

- adjusting conductor tensions
- raising transmission structures or modifying tower heights
- implementing operational controls or restrictions in affected areas, or
- modification or removal of non-Transpower assets

We do not anticipate any tower replacements are required.

3.2 Cost changes from initial short list consultation to proposal

Since our shortlist consultation in December 2024, our cost estimate for the proposed Stage 1 investment has changed significantly, which was one of the reasons we reconsulted in April 2025. Table 6 summarises these cost changes.

Our December 2024 cost estimate did not include risk allowance, which is included in the April 2025 consultation and this proposal. Overall, inclusion of risk allowance increased the cost for the April re-consultation by approximately $13.8m.

[3] Split of cost between Opex and landowners dependant on discussions and solution agreed with affected Landowners.

With the exception of the shunt capacitor banks and thermal upgrade, the cost change since April 2025 (re-consultation) and this proposal is due to an update in our cost database to $2025 including service provider resource rates for the new contract year.

Table 6: Summary of cost changes

Investment	Consultation - Dec 2024 Cost (real 2024 $m)	Consultation - Apr 2025 Cost (real 2024 $m)	Proposal - Aug 2025 (real 2025 $m)	Comment
Switching station at Orari	28.6	38.5	41.4	Primary plant costs increased significantly in our December and July TEES cost database updates, impacting the April re-consultation costs and proposal costs respectively. Prior to the April re-consultation, we increased the height of the station platforms following the receipt of flood modelling information. At that time additional costs were identified for fibre connections, buildings, and remote protection equipment.
Switching station at Rangitata	20.5	29.3	29.8	
Orari and Rangitata line turn ins	0.0	30.2	31.9	This item was inadvertently excluded from our December 2024 short-list consultation. It is a required element of the project, and once we identified that it was missing from our consultation we included it in our April 2025 consultation.
Thermal upgrade of the Norwood–Rangitata circuit to 90°C and Orari-Rangitata circuit to 100°C	13.1	56.2	50.1	The initial consultation in December 2024 was based on a TTU of the Norwood-Rangitata and Orari-Rangitata circuits to 90°. We identified 75 violations to ground as part of a desktop study, including 1 existing violation to ground. Further investigation prior to the April 2025 re-consultation resulted in the identification of 342 violations made up of 204 ground violations and 138 irrigator violations post TTU. This is inclusive of the 8 additional violations to increase the Orari-Rangitata upgrade from 90°C to 100°C). The Orari-Rangitata upgrade also increases the number of towers requiring minor strengthening from 1 to 2 and the number of towers requiring foundation strengthening from 6 to 8. The April consultation included the costs associated with addressing existing violations. These costs to fix existing violations have been removed from the funding approval requested in this proposal (the MCA), as per the approach described in Section 3.1 above.

Investment	Consultation - Dec 2024 Cost (real 2024 $m)	Consultation - Apr 2025 Cost (real 2024 $m)	Proposal - Aug 2025 (real 2025 $m)	Comment
A total of 150 Mvar shunt capacitor banks at Orari 220 kV	14.5	8.8	11.4	In our April re-consultation, the land/platform development costs were moved into the Orari switching station project which will build the platform. Further efficiency is achieved by installing 2 x 75 Mvar rather than 3 x 50 Mvar. More recently for our proposal, we refined our cost estimate with C-type filters included for our shunt capacitor.
Automatic over-voltage capacitor switching scheme (AOVCS)	0.5	1.0	1.0	Refined cost estimate post approval of concept statement with input from protection and automation SMEs and system planning.
Total	77.2	164.0	165.5	

4 Cost estimate of potential USI MCP Stage 2

Our P50 estimates for the potential future USI MCP Stage 2 projects are provided in Table 7. We are not seeking approval for USI Stage 2 investments as part of this proposal.

Table 7: Estimate of future USI MCP Stage 2 (P50 cost excl. IDC and inflation)[4]

Estimate of future Stage 2 Investments	Estimated P50 cost ($m, real 2025)
Thermal upgrade of Opihi–Twizel circuit sections to 90°C	17.0
150 Mvar STATCOM at Ashburton 220 kV	67.2
Thermal upgrade of Rangitata–Tekapo B–1 to 90°C	25.3
100 Mvar of shunt capacitor at Ashburton 220 kV	11.8
Thermal upgrade Ashburton–Orari–1 and 2 to 90°C	19.2
150 Mvar STATCOM at Orari 220 kV	62.1

[4] Expected timings of these investments are discussed in Attachment 3.

5 Major capex allowance

If approved by the Commerce Commission, the costs of this project will be recovered through regulated transmission charges. The Commerce Commission also sets a maximum expenditure amount, known as the Major Capex Allowance (**MCA**).

Table 8 provides a summary of our MCA calculation which includes adjustments for inflation and interest, along with an annual expenditure breakdown.

The MCA is based on our P50 estimate of project costs for the proposed Stage 1 investment, meaning there is an equal chance that nominal capex plus IDC for the proposed Stage 1 investment will be higher or lower than the MCA. Consistent with the incentive regime, we are committed to delivering this project as efficiently as possible. As outlined in this application, we propose applying the default major capex incentive rate of 15% to this project.

Table 8: Derivation of MCA and annual allocation, NZ$'000

	2025	2026	2027	2028	2029	2030	Total
Capex (real 2025)	1,250	8,955	18,269	73,314	49,873	15,300	166,961
Inflation	8	224	852	4,968	4,445	1,697	12,194
Capex (nominal)	1,258	9,180	19,121	78,282	54,318	16,997	179,155
Interest during construction (IDC)	23	287	908	3,317	6,609	2,702	13,846
Major Capex Allowance (MCA)							193,001

Table 9 summarises the expected cost and resulting MCA for this application.

Table 9: Proposed Stage 1 investment major capex project outputs

Project output	Expected cost ($k, real 2025)	MCA (incl. inflation and IDC, $k, nominal)	Planned commissioning date
Switching station at Orari	41,363	47,599	2029
Switching station at Rangitata	29,763	34,249	2029
Switching stations line turn-in connections	31,853	36,560	2029
Thermal upgrade of the Norwood–Rangitata circuit to 90°C and Orari–Rangitata circuit to 100°C[5]	50,071	58,437	2030
2 x 75 Mvar shunt capacitor banks at Orari 220 kV	11,411	13,399	2030
Automatic over-voltage shunt capacitor and shunt capacitor switching scheme	1,000	1,151	2030
Investigation cost	1,500	1,606	-

5 This is the amount included in our MCA. The total project cost including upgrades not funded by this MCP is approximately $56m (in real $2025), as described in Section 3.1.

Project output	Expected cost ($k, real 2025)	MCA (incl. inflation and IDC, $k, nominal)	Planned commissioning date
Total	166,961	193,001	

6 Project requirements and project management approach to achieve proposed MCP outputs

At a high level, the requirements to complete the installation of the shunt capacitor includes:

- Detailed design.
- Regional Council resource consents (if required).
- Civil works for the platform construction.
- Structural works including equipment support structures and foundations.
- Electrical site works.
- Supply and installation of protection relays, auxiliary relays, cabinets/panels and circuits as well as underground cables and transformers as required.
- Station services.
- Communication and Human-Machine Interface (HMI) works.

The requirements to complete the installation of equipment for the automatic over-voltage shunt capacitor and shunt reactor switching scheme includes:

- Detailed design and functional statement.
- Installation of new relays.
- Application of relay settings.

The requirements to complete the installation of equipment for the switching station related work includes:

- Detailed design.
- Regional council consents (if required).
- Civil site works for platform modification or construction.
- Construction of control and facilities buildings.
- Electrical site works.
- Supply and Installation of station buswork and gantries as required.
- Supply and installation of primary equipment including disconnectors, circuit breakers, current transformers and outdoor junction boxes.
- Supply and installation of secondary equipment including protection relays, cabinets and associated communications equipment as required.
- Equipment testing and commissioning.

The key requirements for completing the transmission lines upgrades include:

- Detailed design.
- Regional council consents (as required).
- Environmental and sustainability impact assessments.
- Landowner agreements.
- Access track construction (as required).
- Tower foundation strengthening.
- Tower raising and strengthening.
- Reconfiguration of conductor tensions.
- Modification and replacement of supplementary tower hardware including insulators.
- Construction of new tower foundations and towers for the line deviations into the new switching stations.
- Installation of new conductor.

The proposed Stage 1 investment components will be managed using Transpower's standard project delivery framework, which includes:

- Governance oversight.
- Project planning and scheduling.
- Contract management.
- Cost and risk management.
- Technical reviews.
- Performance monitoring and reporting.

Transpower will allocate experienced management and technical resources to:

- Monitor cost performance against budget.
- Track project milestones to ensure timely delivery.
- Ensure the scope and quality of deliverables meet the required standards.

Factors that may affect Transpower's ability to achieve the proposed MCP outputs include:

- Failure to secure required consents for the project. This is largely outside Transpower's control. Transpower has significant experience in council and RMA applications.
- Unforeseen changes to electricity market operations limiting our ability to secure the required system outages. This is largely outside Transpower's control, but we consider it highly unlikely to impact this project as we plan and forecast outage requirements to the market in advance.
- Major disruptions to global supply chains impacting our ability to secure internationally sourced materials. This is largely outside of Transpower's control but can be partially mitigated by ensuring long lead-time items are ordered sufficiently far in advance to not impact delivery timelines.

By applying robust project management practices and proactively mitigating risks, Transpower aims to deliver this project on time, within budget, and to the required quality standards.

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