
Technical Document: Top Down Review

2023-27 Transmission Revenue Reset

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1 PURPOSE

This document describes the top-down review that AusNet Services' has applied to forecast Capital Expenditure for the regulatory period 2023-27. It investigates areas of potential overlap between various line items of the capital forecast to establish if expenditure has been double counted, or if overlaps have been removed. The outcome of the review is the removal of two sets of assets from their corresponding replacement programs. As a result, no additional downward adjustment to total CAPEX is necessary.

2 SCOPE

The scope of this document is the CAPEX forecast for the TRR regulatory period 2023-27. It includes network and non-network components across projects and programs.

This document does not provide any justification of proposed expenditure.

3 ABBREVIATIONS AND DEFINITIONS

Term	Definition
CAPEX	Capital Expenditure
CB	Circuit Breaker
CT	Current Transformer
CVT	Capacitive Voltage Transformer
EDPR	Electricity Distribution Price Review
ES	Earth Switch
HV	High Voltage
IT	Instrument Transformer
LV	Low Voltage
PT	Power Transformer
VT	Voltage Transformer

4 BACKGROUND

AusNet Services has built up its CAPEX forecast using a bottom-up approach. A series of projects and programs are proposed to address various drivers. (Major) Projects address issues at specific geographical locations and may require work on a range of different asset classes. Meanwhile, programs typically address one specific asset class where the individual assets are located across multiple locations.

Each program or project identifies a driver for expenditure and estimates the volume and cost of assets required. The identification of assets for some programs is based on asset or fleet specific information and may not take into account interrelationships with other works being proposed or conducted. There is therefore the potential for overlap and synergies between programs and projects where two or more bodies of work are undertaken at the same location or propose to replace the same asset. In some cases, the replacement of one asset class may require the replacement of other physically or electrically connected assets. In other cases, it is economically efficient to bring forward non-essential replacements to coincide with required work.

AusNet Services has therefore conducted a top-down adjustment to its programs and projects to ensure that any overlap between components of the program are accounted for in the CAPEX forecast. The

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interrelationship between components of the program have been accounted for in two ways; by adjusting the forecast during the bottom-up build and if necessary, by application of a top-down adjustment following this review. As the majority of major projects are initiated as a result of multiple closely identified replacements, much of the overlap has already been removed during the bottom up build. This document systematically reviews the various line items of the CAPEX forecast to identify any residual overlaps.

5 ASSET LOCATIONS

AusNet Services' Transmission Network assets can generally be classified as either "Stations", "Lines", "Protection", or "Communications". These categories are mutually exclusive and in terms of the replacement programs listed in the CAPEX forecast, are also collectively exhaustive. As each replacement program targets specific asset classes, they are within themselves mutually exclusive. It is uncommon that replacement of an asset in one category relies upon or necessitates the replacement of an asset in another.

When large amounts of deteriorated assets are identified in close proximity to each other, a Major Project is initiated to replace multiple assets or asset classes at once. This achieves delivery efficiencies as resources can be engaged to replace multiple assets without needing to remobilise. This approach also improves customer outcomes as the availability of terminal stations is increased when multiple assets are replaced during the same outage. This leads to an improvement in reliability and system security. There are 22 Major Projects included in the CAPEX forecast. Inspection of these 22 line items shows that they only relate to stations assets. This is depicted in a Venn diagram in Figure 1 below.

Other types of projects which might require multiple asset classes to be replaced simultaneously include REFCL or Augmentation projects. However, these are not relevant to the TRR and are thus out of scope for this review.

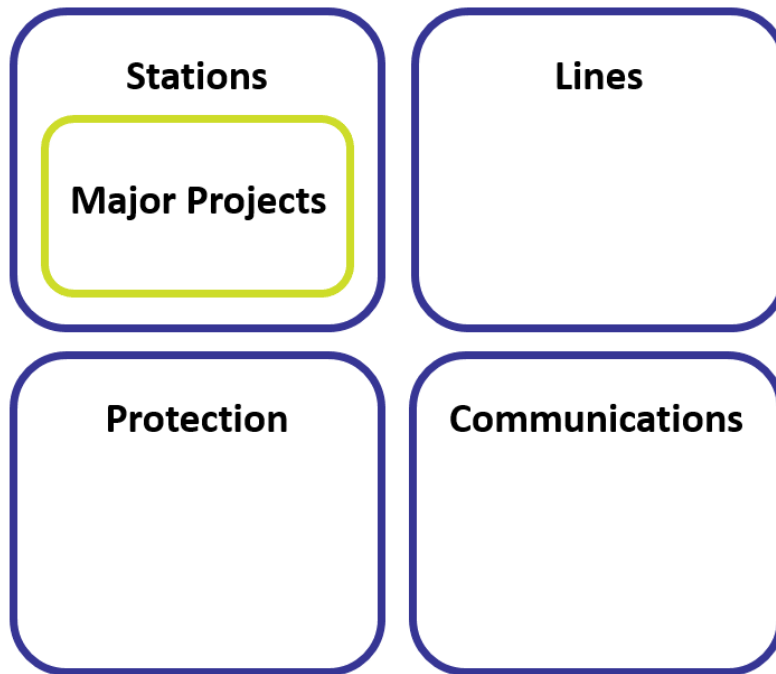


Figure 1. Major Projects only relate to Stations asset classes

It is therefore sufficient to focus on potential overlaps between the Major Projects and the replacement programs for Stations assets. A review of the Major Project scopes reveals that the asset classes being

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targeted are limited to Circuit Breakers, Disconnectors & Earth Switches, Power Transformers and Instrument Transformers. Figure 2 below displays the relevant stations affected by these projects and programs. As mentioned earlier, asset replacement programs are mutually exclusive so even if they affect the same Terminal Station, they are replacing different assets. Thus, the only stations requiring investigation are the 8 shown in red where at least one program is at the same station as a Major Project.

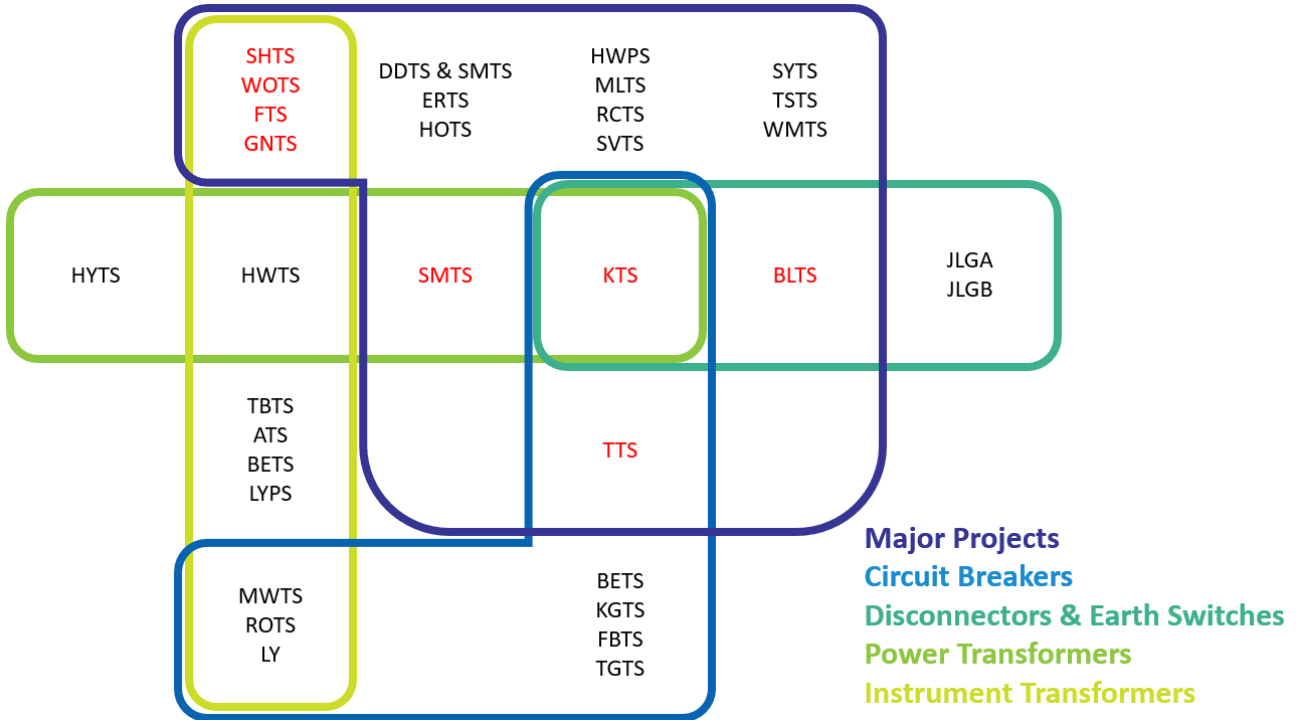


Figure 2. Locations affected by Major Projects and Replacement Programs

6 STATION ANALYSIS

In this section, the scopes of Major Projects and asset replacement programs at each station are reviewed one at a time.

6.1 BLTS

Major Project Scope: 66kV and 22kV Circuit Breakers

Disconnector and Earth Switch Scope: 220kV HPV isolators on 220kV lines to ATS, FBTS, KTS and NPSD

The assets included in the Major Project are located in the 22kV and 66kV switchyard. Hence, there is no overlap with the 220kV isolators.

6.2 FTS

Major Project Scope: 66kV Bus and Feeder Circuit Breakers

Instrument Transformer Scope: 66kV Bus VT

The assets included in the Major Project are exclusively Circuit Breakers. Whilst some Circuit Breakers have a CT function incorporated into them, there is no overlap with the 66kV VT.

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6.3 GNTS

Major Project Scope: BN1, BN2 and WN1 66kV Feeder Circuit Breakers

Instrument Transformer Scope: WN1 66kV Feeder CVT

The assets included in the Major Project are exclusively Circuit Breakers. Hence, there is no overlap with the 66kV VT. Furthermore, the assets are all located on different feeders.

6.4 KTS

Major Project Scope: 3 x 750MVA 500/220kV Power Transformers, Capacitor Bank Circuit Breakers

Power Transformer Scope: 500kV Bushings and 220kV Bushings

Circuit Breaker Scope: Capacitor Bank Circuit Breakers

Disconnecter and Earth Switch Scope: 500kV HPV Bus, Line and Transformer Earth Switches and Isolators

It is expected that the Major Project to replace the A4 transformer at KTS will be pushed back to 2024. Hence, the EHV bushing replacements in the Power Transformer scope are necessary to mitigate safety risks until the Major Project is complete. These activities are not an overlap but rather complimentary. There is an overlap between the Major Project transformers and the Capacitor Bank Circuit Breakers. The relevant circuit breakers have been removed from the Circuit Breaker Scope. The Disconnecter and Earth Switch Scope should prioritise replacement of assets which avoid overlap with the KTS transformer replacements.

6.5 SHTS

Major Project Scope: B2 and B3 Power Transformers, 66kV Bulk Oil Circuit Breakers

Instrument Transformer Scope: 66kV Bus VT

The assets included in the Major Project are exclusively Power Transformers and Circuit Breakers. Hence, there is no overlap with the 66kV Bus VT.

6.6 SMTS

Major Project Scope: GIS switchgear, H1 Transformer, Earth Switch and Disconnectors

Power Transformer Scope: Bushing Monitoring on F1, H1 or H2

Bushing Monitoring is a technology trial which can be carried out regardless of whether the asset being monitored is replaced or not. Furthermore, the H2 and F1 transformers are still available for bushing monitoring if a deteriorated asset is required for the trial.

6.7 TTS

Major Project Scope: B4 Transformer, 220kV Cap Bank & 66kV Circuit Breaker

Circuit Breaker Scope: 220kV Cap Bank Circuit Breaker

During the top down review, an overlap was identified between the Circuit Breaker replacement program and the Major Project at TTS. As a result, the 220kV Cap Bank Circuit Breaker at TTS has been removed from the Circuit Breaker Scope.

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6.8 WOTS

Major Project Scope: Spare Power Transformer, 440kV and 66kV Circuit Breakers

Instrument Transformer Scope: 66kV Line, Bus and Reactor VT

The assets included in the Major Project are exclusively Power Transformers and Circuit Breakers. Hence, there is no overlap with the 66kV Line, Bus or Reactor VT.

7 ADJUSTMENTS

The following overlaps were identified during the top down review and the relevant programs were adjusted in the CAPEX forecast.

- 220kV Cap Bank Circuit Breaker at TTS removed from Circuit Breaker Scope.
- KTS Transformer Disconnectors and Earth Switches removed from Disconnector and Earth Switch Scope.
- 66kV and 220kV Cap Bank Circuit Breakers at KTS removed from Circuit Breaker Scope

Figure 3 below shows the new overlaps between TRR Projects and Programs. The 7 stations highlighted in red were reviewed in section 6 above to ensure there are no overlaps in scope. Other amendments to the replacement programs which do not affect overlaps have also been updated in this diagram.

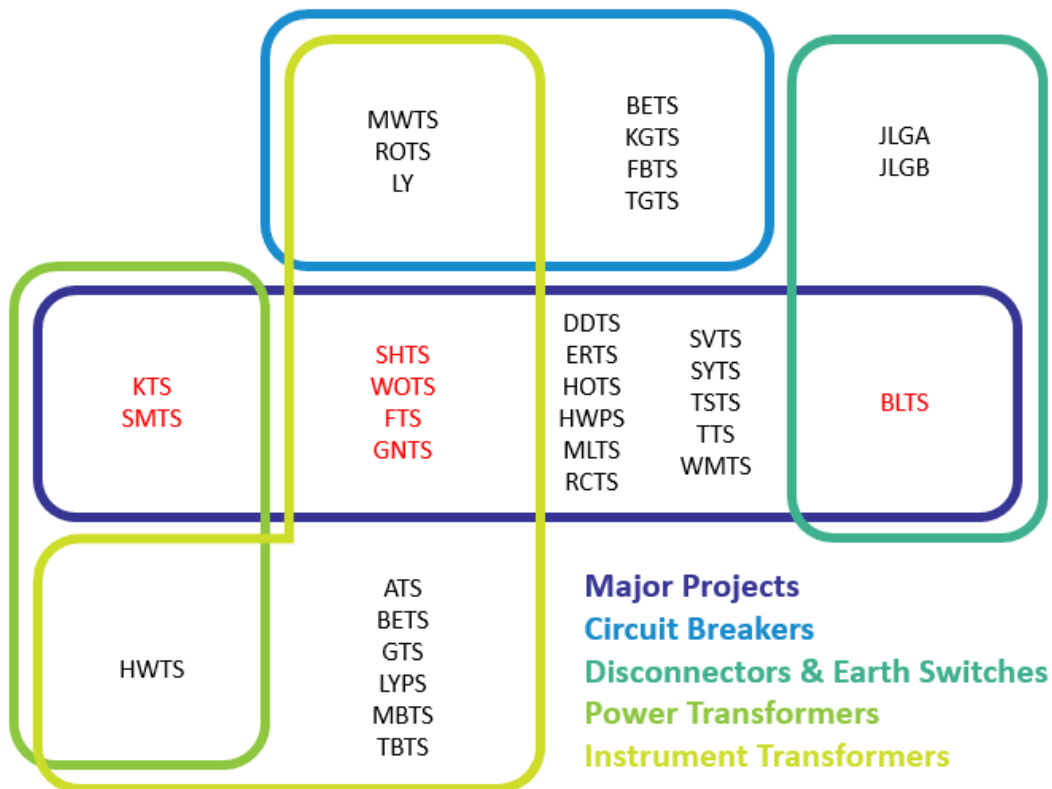


Figure 3. Locations affected by Major Projects and Replacement Programs after adjustments

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8 SCHEDULE OF REVISIONS

Issue	Date	Author	Details of Change
0.1	31/08/2020	Jensen Lai	Initial document
1	07/10/2020	Jensen Lai	Version 1 reviewed after finalisation of CAPEX forecast