
AusNet Transmission Group Pty Ltd

Transmission Revenue Review 2017-2022

Revised Revenue Proposal

**Appendix 3D: Assessment of alternative
project options and hazard zones**

Submitted: 21 September 2016

AusNet Transmission Group Pty Ltd

Transmission Revenue Reset 2017-22

**Additional Information on Capital
Expenditure Program – Assessment of
Alternative Project Options**

1 Overview

This document provides additional information on AusNet Services' forecast asset replacement programs. It describes why the planned brownfield rebuilds and major replacement projects are the most prudent and efficient asset replacement project options for AusNet Services' network.

The Draft Decision materially reduced the value of safety risk underpinning the assessment of AusNet Services' proposed major replacement projects. Under AusNet Services' planning approach, a lower value of safety risk would lead to a substantial deferral of these projects. However, given the condition of the assets to be replaced, deferring these replacement projects would increase safety risk at sites to a level which would make it necessary for workers to implement extra safety precautions to undertake the project. These additional precautions would impact the duration, complexity and cost of the proposed replacement projects and reduce the ability to provide a reliable supply from the affected terminal stations.

The document contains details on alternative project scopes which would need to be considered to meet our safety obligations should the proposed projects be deferred. The alternative scopes may include:

- Undertaking brownfield replacement projects with enhanced safety precautions;
- Undertaking brownfield replacement projects by de-energising the most risky assets to enable safe work to proceed; and
- Undertaking greenfield replacement projects.

The following projects are considered:

- West Melbourne Terminal Station rebuild
- Templestowe Terminal Station major replacement project
- Fisherman's Bend Terminal Station major replacement project
- Springvale Terminal Station rebuild
- East Rowville Terminal Station major replacement project

It concludes that the brownfield replacement projects included in AusNet Services' Revenue Proposal are the most prudent and efficient options to replace the assets targeted by AusNet Services' capex program. It follows that these projects should be undertaken before asset condition deteriorates beyond the point at which it is safe to work at the site.

AusNet Services would be happy to provide the AER further analysis of the information presented below.

2 Background

When the condition of transmission assets deteriorates, the risk of an explosive failure of one, or more, of these assets may increase to a level whereby it would be unsafe for workers to undertake the brownfield replacement projects included in AusNet Services' submission. These replacement projects last for up to six years and will require teams of multiple (up to 50) workers to be located within the proximity of these assets for long periods of time. For some projects, teams will be located on site both during working hours and also at weekends, as it can be preferable to take assets out of service at weekends.

The scope of AusNet Services' proposed replacement projects have been developed assuming that the sites will be safe for workers at all times. However, if the projects are deferred, this can no longer be assumed. In order to comply with legislative safety obligations, the project scopes would need to be revisited, and the options below considered.

3 Brownfield Replacements with Safety Precautions

Installing barriers around the most at-risk assets is an option to shield workers from potential explosive failures during replacement projects. AusNet Services has explored whether this is a viable option should its major replacement projects be deferred.

However, the CBD and metropolitan terminal stations where the major replacement projects are proposed are among the most space constrained sites on the network. There is limited room to bring in and install safety barriers around the most risky assets. In some cases, other assets would need to be physically removed to enable barriers to be installed around assets presenting a high risk of explosive failure.

In addition, the number of assets to be replaced as part of some of these projects (i.e. 90% of the switchgear will be replaced at WMTS) severely limit the effectiveness of this approach. The space taken up by the barriers on these space-constrained sites will severely impede project delivery. This is highly likely to increase the duration and complexity of projects.

The physical impediment of the barriers at WMTS is shown in the Figures below.

Figure 1: West Melbourne Terminal Station (WMTS) 220kV Switchyard

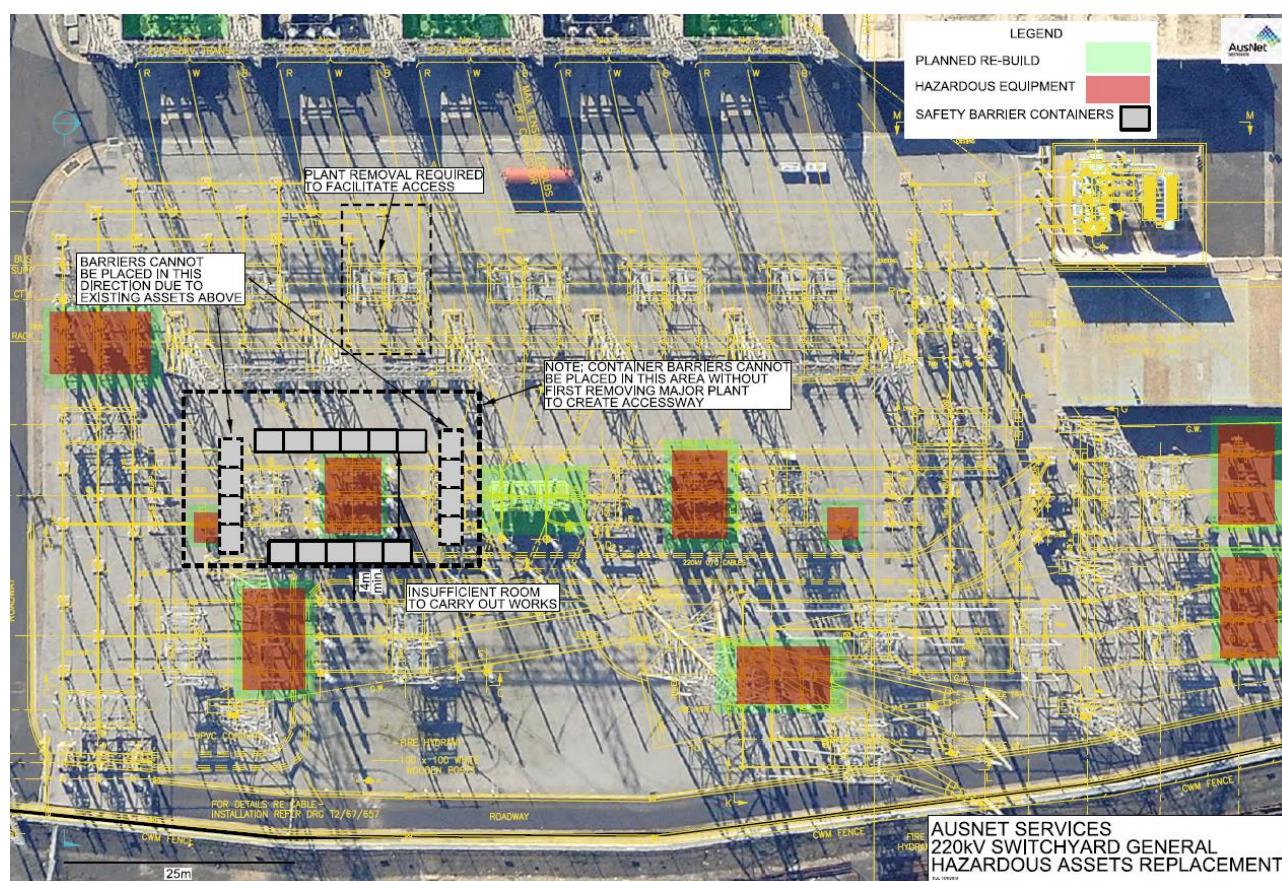
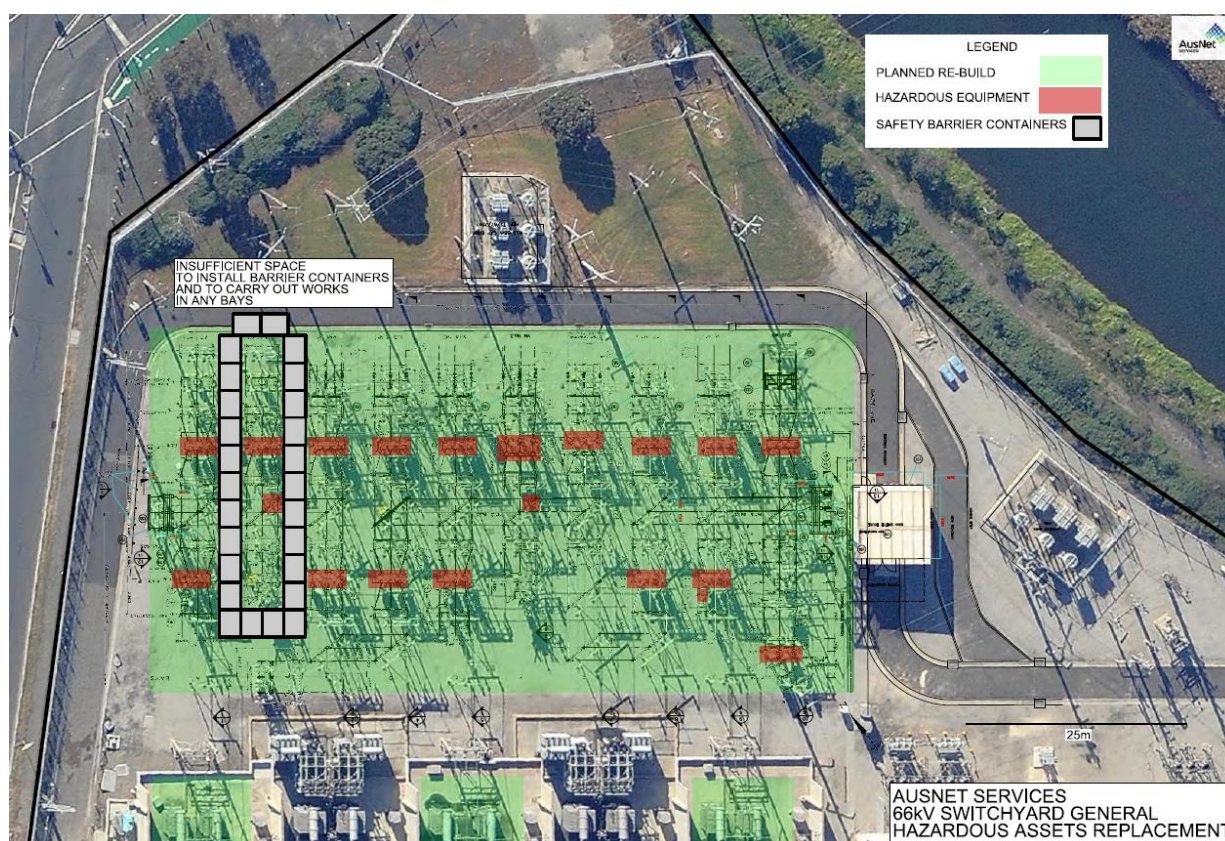


Figure 2: West Melbourne Terminal Station (WMTS) 66kV Switchyard



The assets that are required to be replaced are highlighted in green. The extent of asset replacement planned to occur and the small distances between the assets and switchbays severely limit the practicality of using barriers to address safety risk.

In the 66kV switchyard the distances between the assets and switchbays are too small, meaning that barriers could not be installed either between individual assets or to barricade the entire switchbay as illustrated above. Instead, they would need to barricade the entire switchyard. This would prevent workers from working within the 66kV switchyard and will make it impossible to undertake a brownfield replacement of the 66kV assets with Air Insulated Switchgear (AIS), as currently planned. This is also the case at Springvale Terminal Station.

Many of the older assets require manual operation to isolate and switch the equipment. They cannot be remotely operated like more modern switchgear. If the assets are barricaded off, we will not be able to continue to operate this equipment. Inspection, monitoring and maintenance activity would also be severely restricted, leading to deterioration in asset condition and reliability. In addition, AusNet Services would have restricted ability to restore supply following a fault, significantly increasing the expected supply risk.

It would be impractical to rely on barriers to insulate workers from an explosive failure of these assets.

Other limitations with using barriers to reduce explosive failure risk include:

- The height of the barriers is restricted as electrical clearances from interplant connections and overhead lines need to be maintained. Therefore, barriers will not provide shielding above a certain height.
- Site restriction and limited space may require installing barricades on site access roads, which will block access to cranes, vehicles and other equipment that may be required to attend to assets for restoration, maintenance or inspection
- Limited space around some high risk assets may necessitate some civil works at significant cost to install barriers in these locations

AusNet Services understands that barricading assets as a safety hazard is not applied anywhere in the world at the scale outlined above.

4 Brownfield Replacements by De-Energising At-Risk Equipment

Another option to enable brownfield replacement projects to proceed at a time where the assets present a high risk of explosive failure includes de-energising the most at risk equipment during the project.

However, this would not be practical. There are a large number of assets that are proposed for replacement at these sites, particularly at West Melbourne and Springvale Terminal Stations, which are proposed to be rebuilt. The Victorian transmission network, which has been planned under a probabilistic planning approach (not N-1 or N-2) does not have sufficient built-in redundancy to allow these assets to be switched off for a sufficient time period to carry out a replacement project. These outages would either result in a very severe reliability risk to customers or widespread outages. The cost to customers of this approach would be extremely high, particularly because these terminal stations serve CBD or metropolitan Melbourne load.

5 Greenfield Replacements are not Economic

If the replacement projects were deferred to the point where the risk of explosive failure increased to the point at which a brownfield project (even with enhanced safety measures) was no longer feasible, then a greenfield replacement project may be the only remaining option. This would involve identifying an alternative site and installing new equipment at this site. This would then be connected to the network. The current terminal station would be decommissioned and retired.

This approach has significant limitations. Firstly, it is extremely difficult (if not impossible) to locate suitable land for this to proceed, particularly in the metropolitan areas where the proposed replacement projects are located. In addition to an alternative terminal station site, land for connecting line and underground cable easements is also required, worsening this problem. There is therefore no guarantee a greenfield option is technically feasible.

Secondly, the cost of greenfield replacement projects is prohibitively high – up to 3 times the cost of the most prudent, brownfield replacement project. AusNet Services does consider whether greenfield rebuilds are viable options as part of its planning process. The cost of the greenfield redevelopment options scoped and provided to the AER during the 2014-17 revenue review for the West Melbourne and Springvale Terminal Station rebuild projects are presented in the Table below. As greenfield solutions were not identified as efficient options for these rebuilds, they are not included in planning assessments for the 2017-22 regulatory period.

Table 1: Comparison of Brownfield and Greenfield Rebuild Costs

\$m, real 2012		Preferred (brownfield) option	Greenfield option	Difference
West Melbourne Terminal Rebuild*		175.6	380.6	2.2x
Springvale Terminal Station Rebuild		98.7	222.3	2.3x

* The options presented for West Melbourne are GIS rebuilds. These were the preferred option at the time of submission of AusNet Services' Revenue Proposal for the 2014-17 regulatory period

Our analysis shows that, if existing levels of risk (including reliability, safety, environmental and collateral damage) are assumed to remain constant into the future (which is highly unrealistic), the greenfield project would always have a higher present value cost than the brownfield project¹.

If the level of risk is assumed to be increasing (this reflects reality), then the greenfield project will be justified sooner, but the NPV cost to customers will be far greater than if the brownfield replacement project had gone ahead.

The implication of the analysis described above is that, where greenfield replacement projects are 2.2 times the cost of brownfield replacement projects, they cannot provide the lowest cost outcome for consumers.

6 Conclusion

In summary, AusNet Services considers that its planned brownfield replacement program is the most prudent and efficient way to address network replacement needs. Deferring replacement beyond the point at which the work can be delivered without modifying the scope to protect the safety of workers is not efficient for the following reasons:

- Space limitations at metropolitan terminal station sites mean using barriers to contain explosive failure risk during brownfield replacement would increase project duration and complexity, resulting in increased costs;
- De-energising at-risk assets to increase site safety would not be possible to the extent required without increasing reliability risk to unacceptable levels; and
- The high cost of greenfield replacement options render these uneconomic compared to brownfield replacements. In addition, in metropolitan areas their feasibility is severely limited by land availability.

¹ The large difference in the initial capital cost of the greenfield versus brownfield project (greenfield cost 2.2 times brownfield) means that the present value cost of the two option will only break even when the greenfield project happens eleven years after the brownfield project, ignoring any risk cost, for a real discount rate of 7.5%. The brownfield project has the lowest present value cost over 45 years when risk cost is included in the present value analysis, assuming the risk cost is a uniform series fixed at the risk levels that apply when the brownfield project becomes economic. This is a conservative assumption as the risk cost is likely to increase exponentially as the condition of the assets deteriorates.