

# **Nuttall Consulting**

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*Regulation and business strategy*

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## **SP AusNet Revised Proposal Review of selected ex ante projects**

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**A report to Australian Energy Regulator**

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**Draft**

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**26 November 2007**

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# 1. Introduction

The Australian Energy Regulator (AER), in accordance with its responsibilities under Chapter 6A of the National Electricity Rules (NER), is determining SP AusNet's maximum allowed revenue for its prescribed transmission services during the 2008/09 to 2013/14 period. In accordance with the NER, SP AusNet has submitted a revenue proposal to the AER that sets out SP AusNet's revenue requirements for this period.

The AER engaged PB Strategic Consulting (PB) to review the proposal. The findings of PB's review lead to the AER making a number of adjustments to SP AusNet's forecast capital expenditure allowance in its draft decision.

Some of these adjustments were based upon the AER's own analysis, which was based upon an extrapolation of PB's findings. Prior to the release of the draft decision, the AER engaged Nuttall Consulting to review the AER analysis and associated adjustments. The main findings of this review were that SP AusNet had not presented information that reasonably justified that the AER's adjustments, via its analysis, were not appropriate.

In response to the draft decision, SP AusNet has submitted a revised proposal requesting the reinstatement of a number of the adjustments in the draft decision, including a number of those related to the AER analysis. SP AusNet has also provided significant levels of new information in support of its revised proposal.

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## 1.1. Terms of reference

The AER has engaged Nuttall Consulting to review SP AusNet's revised proposal. The Nuttall Consulting review only covers those projects disputed by SP AusNet, where the adjustments in the AER's draft decision are based upon its own analysis. These projects are:

- Replacement of 66 kV circuit breakers (Morwell Terminal Station and Horsham terminal Station)
- Redevelopment of Brooklyn Terminal Station
- Refurbishment of Thomastown Terminal Station
- Refurbishment of Glenrowan Terminal Station
- Refurbishment of Keilor Terminal Station
- Replacement of 500 kV circuit breakers

The main aim of this review has been to determine whether SP AusNet's revised proposal, with respect to the above project only, reasonably reflects the following criteria:

- the efficient costs of achieving the capital expenditure objectives set out in the National Electricity Rules (NER); and
- the cost that a prudent operator in the circumstances of SP AusNet would require to achieve the objectives.

Where Nuttall Consulting considers that SP AusNet's revised proposal does not meet the criteria, Nuttall Consulting has recommended an expenditure allowance that it considers reasonably reflects the criteria.

It is important to note that this review has not been a formal detailed project review, as had been undertaken by PB on other projects prior to the draft decision. Rather, the primary aim of this review has been an assessment of the new information provided by SP AusNet in support of its revised proposal, and in particular the basis for its reinstatement of those elements of the projects not allowed for in the AER's draft decision.

Although detailed consultations with SP AusNet have not been allowed for in this review, a meeting has been held with SP AusNet. The main aims of this meeting were:

- to allow SP AusNet to present the key factors underpinning its revised proposal; and
- to allow Nuttall Consulting to seek clarifications on the factors raised in its revised proposal.

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## 1.2. Structure of report

The report is structured as follows:

- Section 2 provides further background information on the AER's adjustments and SP AusNet's revised proposal;
- Section 3 sets out Nuttall Consulting's considerations and findings on its review of each project; and
- Section 4 summarises the review and the overall findings.

It should be noted that all project costs provided in this report do not include the adjustments made by the AER related to price escalations and the removal of project contingency. These adjustments will need to be performed to the costs quoted in this report, dependent on the AER's final position on these matters.

## 2. Appreciation and background

The purpose of this section is to set out Nuttall Consulting's appreciation of the AER draft decision concerning the projects under review here. The section also provides an overview of SP AusNet's revised proposal and the supporting information, covering:

- a summary of the new information provided by SP AusNet; and
- a background discussion on some of the technical issues raised by SP AusNet.

The aim of this section is not to consider the merits of the AER's decision or SP AusNet's revised proposal, but rather highlight the key factors relevant to the detailed discussions in the project review sections that follow.

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### 2.1. The AER adjustments in the draft decision

The PB review found that SP AusNet's projects had a good technical/risk basis, but the timing was aggressive and there were opportunities to prioritise and defer some works<sup>1</sup>. Unfortunately, PB did not consider it possible to extrapolate the detailed project review findings across the remainder of the ex ante program.

Therefore, the AER undertook further analysis to extrapolate PB's findings. The AER's analysis was based upon SP AusNet's asset risk models that had been provided in support of its capital expenditure forecast. In this regard, the AER considered that the condition of the assets was a key driver of SP AusNet's proposed replacement programs, and the SP AusNet risk models were a critical input into these plans.

This analysis by the AER of SP AusNet's risk models indicated that certain works did not appear to be justified based upon the apparent good condition of the assets in SP AusNet's models. These findings on the *apparent* condition of assets were the basis of the AER's adjustments in its draft decision. These adjustments impacted the following projects:

- Replacement of 66 kV circuit breakers (Morwell Terminal Station and Horsham Terminal Station)
- Redevelopment of Brooklyn Terminal Station
- Refurbishment of Thomastown Terminal Station
- Refurbishment of Glenrowan Terminal Station
- Refurbishment of Keilor Terminal Station
- Refurbishment of Geelong Terminal Station
- Replacement of two 500 kV circuit breakers

The AER requested Nuttall Consulting to review their analysis, and the project data provided by SP AusNet. The aim of this review was to determine whether SP AusNet had

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<sup>1</sup> PB Strategic Consulting, SP AusNet AusNet Revenue Reset: An Independent Review, Final report, 3 August 2007, pp. 103-104.

presented any technical reasons why the AER's adjustments may not be appropriate. The findings of this review were<sup>2</sup> as follows:

- There were a number of significant technical matters raised by SP AusNet AusNet in support of its proposed capital expenditure. Whilst these matters were appropriate in principle, Nuttall Consulting did not consider that SP AusNet's documentation provided sufficient evidence in support of these technical matters to reasonably justify that its proposed expenditure was prudent and efficient.
- Further, Nuttall Consulting found nothing in the information presented to confirm that the basis of the AER's adjustments would not allow SP AusNet to maintain the quality, reliability and security of the transmission network.

It is important to note that the Nuttall Consulting review was not a detailed project review of the form conducted by PB, and specifically did not allow for further data requests or discussions with SP AusNet. The key SP AusNet information used by the AER and Nuttall Consulting included:

- Circuit breaker, current transformer, and transformer risk model data;
- project summary documents;
- project option NPV analysis spreadsheets; and
- asset management strategy documents, particularly the circuit breaker strategy documents.

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## 2.2. Information supporting SP AusNet AusNet's revised proposal

In large, SP AusNet has disagreed with the AER's adjustments, and has proposed the reinstatement of the projects as in their original proposal. The only project adjustments SP AusNet has accepted are those related to the Geelong Terminal Station development.

In support of the reinstatements, SP AusNet has provided significant levels of new documentation for each project. Nuttall Consulting considers there to be a number of significant factors within this documentation that impact its considerations and findings in this review, including:

- **SP AusNet Risk model and asset condition.** SP AusNet considers that the condition of key assets is poorer than indicated in the SP AusNet risk models used by the AER in its analysis. This has impacted a large number of the 66 kV and 220 kV circuit breakers and the transformer that appeared to be in relatively good condition in the SP AusNet risk models. Noting that it was the apparent good condition that was the main basis for the AER's adjustments.
- **Project driver and justification clarifications.** SP AusNet has provided clarifications on the main drivers of the projects. In some cases, new information that was not raised in the original documentation has been introduced. In others, a more explicit statement of the significance of particular factors has been provided.

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<sup>2</sup> Provided as a letter to the AER, dated 22 August 2007.

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## 2.3. Overview of SP AusNet's case for its 66 kV replacements

The AER's adjustments to SP AusNet's 66 kV works impacted the majority of projects reviewed. These adjustments were largely based upon the AER's view that SP AusNet's primary driver for the level of 66 kV replacement was a "fleet management" strategy. However, the AER's analysis of SP AusNet's risk model did not indicate that the condition of these assets was sufficiently poor to merit replacement in the next period to the extent proposed by SP AusNet.

SP AusNet has provided further information supporting its 66 kV works, which clarifies the condition of the 66 kV circuit breakers and a range of other drivers of the need for each project. As many of these matters are generic across all projects involving 66 kV works, this section introduces these factors and draws out the key issues, before the more detailed project level discussions in the following sections.

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### 2.3.1. Significant 66 kV circuit breakers types and issues

The 66 kV works in SP AusNet's project predominantly replace two main circuit breaker types.

- **LG4C.** The majority of SP AusNet's 66 kV circuit breakers are an old *bulk oil* type installed in the 1960s, known as LG4C. SP AusNet has 208 of these circuit breakers in service and was proposing to replace 81 in the next regulatory period.
- **Specher and Schuh HPF 509 (S&S).** SP AusNet also has a number of old *minimum oil* S&S HPF 509 circuit breakers also installed in the 1960s. These are a smaller fleet than the LG4C but are often used to switch reactive plant, resulting in higher switching duty (up to one or two time per day) and higher maintenance costs. SP AusNet was proposing to replace 11 of these circuit breakers in the next regulatory period

Both circuit breakers have similar general issues, related to older *bulk oil* and *minimum oil* circuit breakers, including oil leakage, deteriorating bushings, wear, and corrosion. These breakers are also an obsolete design and no longer supported by the manufacturer. Therefore, sourcing spares to maintain the fleet can be costly. These factors impact the costs to maintain the fleet, and SP AusNet's concerns on the management of the fleet.

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### 2.3.2. Key drivers of SP AusNet's 66 kV replacements

SP AusNet has provided the clarifications on the various drivers of its 66 kV replacement needs. It is important to note that all of these drivers are not relevant to each project, or even each circuit breaker within a project. The drivers are summarised below, highlighting the important factors SP AusNet has advised on each driver.

#### *Asset condition*

Asset condition was the primary consideration of the AER in determining its adjustment. The AER determined the condition of the 66 kV circuit breakers from SP AusNet's circuit breaker risk model.



SP AusNet has stated that this risk model only indicates the average condition of the LG4C and S&S fleets. Therefore, it masks what it terms “poor fleet cohorts”. These are the circuit breakers at various substations that are in a condition significantly poorer than the average.

SP AusNet has provided information indicating the substations where “poor fleet cohorts” exists, and the relative ranking of these substations<sup>3</sup>. This is provided as the maintenance frequency of these circuit breakers as a percentage of a new breaker.

### ***Fault current***

This driver relates to the need to ensure the electrical current under short circuit conditions is within the breaker's short circuit ratings. In this regard, SP AusNet has highlighted the fault level at each substation, noting those where the fault level is near the circuit breaker rating.

### ***Compliance***

The compliance driver is similar in nature to the fault current driver, whereby it relates to the need to ensure the electrical current under normal and outage conditions is within the breaker's ratings<sup>4</sup>.

SP AusNet has highlighted a number of 66 kV breakers where the existing circuit breaker rating may be exceeded following the substation rebuilds. This is most notably with respect to circumstances where transformers are being replaced with units with higher continuous and cyclic ratings.

### ***Health and safety***

SP AusNet has also raised health and safety as a driver of its replacements. In this regard, it does not consider it prudent to have personnel directly exposed to circuit breakers where:

- the short circuit currents may be above the circuit breaker rating; or
- the circuit breaker is in a poor performing fleet cohort.

This obviously impacts those substations where either the fault level is near the circuit breaker rating, or the condition of the breaker is poor.

### ***Efficiency***

The efficiency driver relates to the economic efficiency of undertaking the replacement at the time proposed. Obviously, this is a key consideration in ensuring the proposed project meets the NER objectives on efficiency.

SP AusNet has undertaken some economic analysis to determine the optimal life for:

- the poor performing LG4C fleet cohorts; and
- the average CB of the LG4C.

This modelling assessed the ongoing maintenance and risk costs (probability of failure and consequence) of an LG4C CB against the capital cost of replacing the circuit breaker. The findings of this analysis were that the optimal life for a circuit breaker in poor condition is

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<sup>3</sup> SP AusNet revised project summary “Replacement program for 66 kV switch-bays”

<sup>4</sup> Note: the ratings related to this load current are different to those discussed for short circuit currents.

between 45 to 50 years, whereas the optimal life for the average fleet of circuit breakers was between 55 to 60 years.

SP AusNet has also provided NPV analysis of the individual substation rebuild projects. A key determinant in the efficiency of these substation rebuilds is the overall capital cost reduction that SP AusNet considers can be achieved by undertaking the 66 kV replacements with other proposed works at these substations. The other works at the substations are normally the 220 kV switchyard rebuilds, and transformer replacements that have been largely accepted by the AER. In this regard, SP AusNet considers there to be a significant capital cost increase when deferring the 66 kV works to a later period when they will need to be undertaken independently from other substation works.

#### ***Fleet management***

The fleet management driver is not specific to individual projects. Rather it relates to the general strategy across the fleet to replace circuit breakers. This can be important if a large portion of a fleet approaches its technical life at a similar time.

SP AusNet considers this to be a specific issue with the LG4C fleet as it represents a large portion of the 66 kV CBs. The fleet management driver was considered by the AER to be a primary driver of much of SP AusNet's plans to replace its 66 kV circuit breakers.

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#### **2.3.3. General comments on SP AusNet's driver**

In general, SP AusNet's classification of drivers is appropriate. However, Nuttall Consulting makes the following observations:

- condition is a major variable in the efficiency driver with respect to defining the economic life of a circuit breaker, as such, the two are highly related;
- SP AusNet's analysis of the economic life appears reasonable, and the lives resulting from analysis are broadly in line with what may be expected;
- the health and safety driver is related to the condition and fault level drivers, and as such, this can be considered in tandem with these drivers, rather than an independent driver; and
- replacing assets primarily for fault level and load current compliance reasons would be normally considered an augmentation, which is the role of VENCORP for the shared network and the DBs for the connection assets. As such, it should not be a primary driver for SP AusNet works, but would need to be a secondary factor in the efficiency of the overall replacement project i.e. through the avoidance of prospective augmentation works.

## 3. Project Reviews

The main purpose of this section is to present Nuttall Consulting's considerations and findings on each of the 6 projects reviewed. It is important to note that Nuttall Consulting has not undertaken detailed project reviews of each project. Rather the focus is on the elements of the project where SP AusNet disagrees with the AER's draft decision. As such, a significant component of Nuttall Consulting's considerations is:

- SP AusNet's basis for the reinstatement of the works in the context of other works accepted or rejected by the AER in its draft decision; and
- the context of this basis and supporting information with regards to what was available to the AER in making its draft decisions.

The section is structured such that each project is considered in turn, as follows:

- an overview of the project is provided, setting out the components of the project accepted and rejected by the AER, and the main basis for the works that were rejected;
- an overview of SP AusNet's revised proposal is provided, setting out the main basis for SP AusNet's reinstatement of the works rejected by the AER; and
- Nuttall Consulting's considerations and findings are presented.

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### 3.1. Replacement of 66 kV circuit breakers at Morwell and Horsham Terminal Stations

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#### 3.1.1. Overview of the project and the AER's adjustments in the draft decision

The SP AusNet project entails the targeted replacement of the LG4C 66 kV circuit breakers (CBs) at Morwell Terminal Station (MWTS) and Horsham Terminal Station (HOTS). This involved the replacement of 8 circuit breakers at MWTS and 5 at HOTS (plus other related works) for a total cost of \$3.49 million.

The AER considered that SP AusNet had not demonstrated a clear need for the replacement of any of these breakers, and as such, did not provide any allowance for this project.

The main basis for the AER's decision was its analysis of the SP AusNet risk model outputs for the CBs associated with this project. The SP AusNet data indicated that all of the CBs were in a relatively good condition, with an SP AusNet risk ranking of "medium" to "low", indicating mean time between failures (MTBF) of 24 to 27 years.

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#### 3.1.2. SP AusNet's revised proposal

SP AusNet has proposed the reinstatement of the full amount in its original proposal (\$3.49 million) to cover the replacement of all the CBs originally proposed.

The main basis for SP AusNet's reinstatement relates to the issues introduced in Section 2.3, including:

- The SP AusNet risk model only included averaged condition data across the LG4C populations, and as such, did not adequately indicate the condition of the CBs at MWTS and HOTS; and
- The AER did not adequately allow for the other drivers of the 66 kV CB replacement.

The various drivers for MWTS and HOTS are summarised in Table 1.

**Table 1 Summary of MWTS and HOTS 66 kV drivers**

	No. Of LG4C	Ave. Age	Drivers					
			Condition Main. Freq.	Condition Priority	Efficiency	Fault Level	H & S	Compliance
MWTS	8	43	205%	3 (of 16)	yes	99%	Yes	
HOTS	5	43	<140%	6 (of 16)	yes			

SP AusNet has also provided some information on poor performing protection relays at MWTS and HOTS, which it is proposing to replace with the CBs in the next period. In this regard, SP AusNet considers there to be some efficiency in undertaking these protection replacements with the CB. SP AusNet has indicated 5 CBs are impacted by these protection relays at MWTS and 1 at HOTS.

### **3.1.3. Nuttall Consulting's considerations**

#### ***MWTS***

Based upon the supporting information provided with SP AusNet's revised proposal, it would appear that the key driver of the CB replacements at MWTS is SP AusNet's view of the condition of the LG4C CBs at MWTS.

Although efficiency is cited as a separate driver, the condition of the CBs appears to be the main factor defining the efficiency of this project, whereby the condition of the CB is the key variable that defines its economic life (see section 2.3.2). As noted above, SP AusNet has raised some additional benefits of these replacements, due to the ability to undertake the protection replacements required for 5 of the 8 CBs with the CB replacement. However, Nuttall Consulting considers this to be secondary to that of condition in defining the efficiency i.e. the protection issue on its own could not drive the need for the CB replacements, however, the condition may.

On the fault level driver and related health and safety matters, although it is accepted that the existing high fault levels may be a consideration of SP AusNet's on the need for this project, Nuttall Consulting does not deem this issue to be a primary driver of the project. That is, if the condition of the assets *was* acceptable then it would be the role of the network planner to determine whether the CBs should be replaced for fault level reasons.

Therefore, the key considerations here are whether the CBs are in a poor condition, and if so, the optimal timing for the project.

On the condition of the CBs, the original project summary information provided by SP AusNet prior to the AER's draft decision did not explicitly raise the condition of the LG4C CBs at MWTS as being a primary driver of these replacements. The main discussion centred on the need to release spares for fleet management purposes. As such, SP AusNet's position that the LG4C CBs at MWTS are in such a poor condition that it is prudent and efficient to replace them, effectively excluding the fleet management issue, is considered new.

The new information provided by SP AusNet indicates MWTS to have the 3<sup>rd</sup> worst LG4C CBs in terms of their maintenance frequency, which is over double that for new breakers and significantly poorer than the average fleets. This supports the view that the CBs are in a poor condition. However, counter to this, Shepparton Terminal Station (SHTS) has the 2<sup>nd</sup> worst LG4C CBs with a maintenance frequency similar to the MWTS CBs, but SP AusNet has not proposed the replacement of these CBs in the next period. Furthermore, SP AusNet has undertaken a refurbishment of SHTS during this period, and did not deem the condition of these CBs to be sufficiently poor to merit their replacement as part of this project either. This supports the view that, although the LG4C CBs at MWTS are in a poorer condition than the average fleet, they may still not be in a sufficiently poor condition to merit a targeted replacement.

Unfortunately, the SP AusNet project information does not provide any discussion on why the replacements at SHTS are not needed, particularly with referenced to the differing circumstances at SHTS and MWTS. It is noted however that the relevant CBs at SHTS are predominately feeder CBs, whereas those at MWTS are predominately transformer and bus tie CBs. This indicates a possibly greater level of "lost load" following the failure of the CBs at MWTS, and hence, a greater risk associated with these CBs. As such, on balance, Nuttall Consulting is satisfied that SP AusNet has demonstrated that the condition of the MWTS LG4C CBs is sufficiently poor to justify a targeted replacement in the next period.

On the timing of the replacements, the SP AusNet proposal indicates that these will be undertaken between 2008/09 and 2009/10. SP AusNet's modelling of the economic life of the LG4C CBs (see Section 2.3.2) indicates an economic life of 45 to 50 years for poor LG4C CBs. Based upon this economic life and the age of these CBs (43 years), the efficient time for the CB replacements is between 2009 and 2014. As such, SP AusNet is proposing to replace the CBs earlier than its own economic modelling is suggesting.

Therefore, based upon the above, Nuttall Consulting considers that it will be prudent to replace the 8 LG4C CBs at MWTS during the next regulatory period, as proposed by SP AusNet. However, the efficient timing of the replacements should represent a deferral of two years from the timing proposed by SP AusNet, assuming that the most likely economic life of the CBs is 47 years.

Nuttall Consulting does not consider that this deferral for efficiency reasons will materially impact SP AusNet's risks related to this project due to the fault level and related health and safety concerns, or the efficient integration of this project with the protection upgrade works.

### ***HOTS***

Based upon the supporting information provided with SP AusNet's revised proposal, it is not clear whether there is a driver specific to the HOTS 66 KV CBs that justifies the need for the replacements in the next period.

With regards to the condition of the CBs, SP AusNet's maintenance frequency data appears to support that the LG4C CBs at HOTS are not poor performing, and may be closer to the average condition of the fleet than the poorer fleet.

The SP AusNet modelling of LG4C CBs in average condition (see section 2.3.2) indicates an economic life between 55 to 60 years. Therefore, based upon the existing age of these CBs (43 years) and SP AusNet's view of the economic life of LG4C CBs in average condition, it does not appear to be efficient to replace CBs during the next period.

These positions on condition and efficiency appear to be supported by the SP AusNet documentation provided with the revised proposal<sup>5</sup>. In this regard, SP AusNet's own summary of the relevance of the drivers to the HOTS replacement does not include the condition or the efficiency (via the economic life modelling) as a driver of the CB replacements at HOTS.

Efficiency benefits due to the coordination of the replacements with protection works is identified by SP AusNet for HOTS. However, the information supplied by SP AusNet<sup>6</sup> indicates that only one CB has poor performing protection. As such, it is not considered that this issue is sufficient to justify the replacement of the CBs.

Therefore, Nuttall Consulting does not consider it prudent and efficient to allow for the replacement of the 66 kV CBs at HOTS as proposed by SP AusNet.

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#### **3.1.4. Summary recommendations**

Nuttall Consulting agrees that it will be prudent to replace the 66 kV CBs at MWTS as proposed by SP AusNet, but considers the efficient timing represents a 2 year deferral from the timing proposed by SP AusNet.

This recommendation re-instates part of the project that was not allowed for in the AER's draft decision. The main basis for the reinstatement is the additional information provided by SP AusNet in support of its revised proposal, which indicates that the condition of the associated 66 kV CBs is poorer than indicated by the SP AusNet risk model provided in support of the original proposal.

Nuttall Consulting does not consider that SP AusNet's proposal to replace selected 66 kV CBs at HOTS is prudent and efficient, and has found no justification for recommending a change to the AER draft decision, which removed an allowance for these replacements.

Nuttall Consulting's recommendation on the prudent and efficient allowance for this project is summarise in Table 2 below. This table also indicates the adjustment from SP AusNet's revised proposal based upon Nuttall Consulting's recommendations.

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<sup>5</sup> SP AusNet revised project summary "Replacement program for 66 kV switch-bays", pg 21.

<sup>6</sup> Ibid Appendix B

**Table 2 Allowance for replacement of 66 kV CBs (\$m, 2007/08)**

	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	Total
SP AusNet Original proposal	1.27	2.06	0.14	0.02	0.00	0.00	3.49
AER draft decision	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP AusNet Revised proposal	1.27	2.06	0.14	0.02	0.00	0.00	3.49
NC recommendation	0.00	0.00	0.78	1.27	0.09	0.01	2.15
MWTS adjustment	-0.78	-1.27	0.70	1.26	0.09	0.01	0.00
HOTS adjustment	-0.49	-0.79	-0.05	-0.01	0.00	0.00	-1.34

## 3.2. Redevelopment of Brooklyn Terminal Station

### 3.2.1. Overview of the project and the AER's adjustments in the draft decision

SP AusNet's proposed redevelopment project at Brooklyn Terminal Station (BLTS) entails the replacement of the transformer, the redevelopment of the 220 kV switchyard, and the replacement of a number of 66 kV CBs for a total cost of \$51.85 million.

The AER accepted that the replacement of the transformers was justified, but considered that SP AusNet had not demonstrated a clear need for the replacement of the 220 kV and 66 kV switchyards.

The main basis for the AER's decision was its analysis of the SP AusNet risk model outputs for the CBs associated with this project. In this regard, the SP AusNet data indicated:

- the 220 kV CBs were in a relative good condition, with a mean time between failure of 20 years, which was much higher than other 220 kV CBs in SP AusNet's replacement programs; and
- the 66 kV CBs were in relatively good condition, with a mean time between failure of 25 to 26 years.

### 3.2.2. SP AusNet's revised proposal

SP AusNet has proposed the reinstatement of the full amount in its original proposal to cover the replacement of all the 220 kV and 66 kV CBs originally proposed.

The most significant factors SP AusNet has raised to support the reinstatement of these 220 kV and 66 kV works are discussed below.

#### *220 kV CB and switchyard condition*

SP AusNet has undertaken a further assessments of the information related to the BLTS 220 kV CBs in its risk model. This has uncovered the following:

- 4 of the 5 breakers were not identified correctly in the risk model, as such, the CBs due for replacement are not those assessed by the AER, but poorer performing assets; and
- 4 of the 5 breakers that require replacement do not have the correct age in the risk model, whereby the model indicates an age of 37 years whereas the actual age is 40 years.

The important point from this is that the mean time between failure for these four CBs is assessed as 14 years in SP AusNet's revised risk model, which is significantly shorter than the 20 years indicated in its original risk model. Furthermore, the mean time between failure is predicted by SP AusNet to reduce to 7-8 years by the end of the next period if these CBs are not replaced.

SP AusNet has also stated that there are a number of poor performing CT and disconnectors associated with these CBs, which it considers should be replaced during the next period.

#### ***Transformer replacement arrangements***

SP AusNet has clarified that it plans to replace the existing 9 transformers at BLTS with 5 transformers. SP AusNet considers this represents a more efficient arrangement than a like-for-like replacement of the transformers. However, this plan requires upgrades to some existing 220 kV and 66 kV CBs to allow for the higher ratings of the reduced number of transformers, and to minimise outages during the transformer replacement.

SP AusNet has also advised that the 5-transformer arrangement, with the redevelopment of the 220 kV switchyard, will release a substantial amount of land that can be used for future augmentations of BLTS.

#### ***66 kV CB condition and other drivers***

SP AusNet considers the condition of the LG4C breakers at BLTS to be in poorer condition than suggested by its risk model, and has provided information indicating that the LG4C breakers at BLTS are the 5<sup>th</sup> worst in its LG4C fleet.

SP AusNet has also noted the other 66 kV drivers discussed in section 2.3. The most notable of these are:

- the relatively high fault levels, which are at 98% of the CB rating, and the associated health and safety issue; and
- the compliance issues noted above related to the proposed transformer arrangement, which requires the replacement of 3 CBs associated with the switching of the new transformers, and 4 bus-tie CBs.

#### ***NPV analysis***

SP AusNet has undertaken further NPV analysis of a selection of options for the redevelopment of BLTS.

This indicates the following:

- the closest technically feasible like-for-like option, involving the replacement of the 9 transformers with 7, and a minimum level of 220 kV and 66 kV works, has an NPV significantly higher (~25% or \$10m) than options involving 5 transformers; and



- SP AusNet's proposed project has a marginally lower NPV than options with the deferral of some 66 kV and 220 kV works.

This analysis only examines capital and maintenance costs, and therefore, additional risk costs associated with the deferral options are not accounted for.

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### 3.2.3. Nuttall Consulting's considerations

The AER rejected the 66 kV and 220 kV works based largely upon its view that the information supplied by SP AusNet did not indicate that the CB's were in a poor condition.

Based upon the information supplied by SP AusNet in support of its revised proposal, Nuttall Consulting considered there to be two critical factors that now support SP AusNet's need for the 220 kV works, namely:

- The clarification by SP AusNet on its planned transformer arrangement at BLTS involving the replacement of the existing 9 transformers with 5, which Nuttall Consulting accepts is an efficient approach to the redevelopment of the BLTS; and
- The revised assessment of the condition of the 220 kV CBs, which now indicates that they will be in a condition at the time of replacement commensurate with other 220 kV CBs that the AER has accepted for replacement<sup>7</sup>.

Therefore, Nuttall Consulting accepts that it would be prudent and efficient to undertake the 220 kV works as proposed by SP.

With regards to the need for the 66 kV works, Nuttall Consulting accepts that it will be prudent and efficient to replace 8 x 66 kV CBs. This requirement allows the efficient management of outages during the transformer replacements, and allows compliance with the ratings of the new transformers.

However, Nuttall Consulting does not consider that the replacement of the remaining 10 LG4C CBs is so clear. Although SP AusNet has advised that the LG4C CBs at BLTS are the 5<sup>th</sup> worst performing in terms of maintenance frequency, the maintenance frequency is only approximately 140% of a new CB. This is significantly lower than poor performing CBs at MWTS and GNTS, which have a frequency above 200%. Possibly more significantly, it is also less than the frequency of the LG4C CBs at Geelong Terminal Station – which the AER rejected based upon its view that the condition was not poor, and SP AusNet has accepted in its revised proposal. As such, the LG4C CBs at BLTS are probably closer to the average fleet condition than the poorest CBs, and therefore, Nuttall Consulting does not consider that the condition alone warrants their replacement.

The main driver for the replacement of these remaining 10 CBs appears to be for efficiency reasons. In this regard, SP AusNet's NPV analysis supports the replacement of these CBs with the other redevelopment works, based upon the capital cost saving. In this regard, SP AusNet estimated that replacing the 10 CBs at a later date would increase the overall 66 kV works cost by 35%, which would require a deferral of the replacement of the 10 CBs until 2021 to be the most efficient option.

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<sup>7</sup> This is most notable with respect to the 220 kV CBs at Geelong Terminal Station (GTS), which have a mean time between failure of 12 years in SP AusNet's risk model and are proposed to be replaced in 2007/08.

On the issue of the ability to defer to this date, Nuttall Consulting considers that such a deferral may be possible based upon SP AusNet's own modelling of the optimal life (see section 2.3.2) for the average LG4C fleet. This SP AusNet modelling suggests a life in the order of 55 to 60 years may be efficient at the individual CB level. This would suggest a replacement date of 2021 to 2026 may be optimal for these CBs.

Furthermore, Nuttall Consulting has two other concerns with SP AusNet's NPV analysis. Firstly, it does not account for the price reductions in real terms that are forecast during the next period. This will increase the benefits of deferring the works. Secondly, it is not clear why such a significant increase in cost for deferring the works is required. Nuttall Consulting considers that these increases at a project level may be offset to a large extent by the saving due to the economies of scope and scale associated with the far more significant level of 66 kV replacement across the fleet that will be occurring over the next two regulatory periods.

Nuttall Consulting notes that the above may be counteracted to some extent by the fact that SP AusNet has not incorporated risk costs in its NPV analysis, and therefore, the deferral options will be understating the costs associated with these.

On balance however, Nuttall Consulting does not consider that SP AusNet has sufficiently justified that it would be prudent or efficient to replace the remaining 10 LG4C breakers during the next period.

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#### **3.2.4. Summary recommendations**

Nuttall Consulting agrees that it will be prudent and efficient to undertake the replacement of the transformers, the 220 kV works, and 8 of the LG4C CBs at BLTS as proposed by SP AusNet. However, Nuttall Consulting does not consider it will be prudent and efficient to replace the remaining 10 LG4C CBs at BLTS as proposed by SP AusNet.

This recommendation re-instates the 220 kV works and a portion of the 66 kV works that were not allowed for in the AER draft decision. The main basis for the reinstatement of these works is:

- The revised information that indicates the 220 kV CBs are in a poorer condition than indicated in the original proposal; and
- The clarifications from SP AusNet on its plan to replace the 9 transformers at BLTS with a more efficient arrangement involving 5 transformers.

Nuttall Consulting's recommendation on the prudent and efficient allowance for this project is summarised in Table 3 below. This table also indicates the adjustment from SP AusNet's revised proposal based upon Nuttall Consulting's recommendations.

**Table 3 Allowance for redevelopment of BLTS (\$m, 2007/08)**

	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	Total
SP AusNet Original proposal	0.00	0.00	5.19	29.87	16.80	0.00	51.86
AER draft decision	0.00	0.00	4.65	21.6	15.05	0.00	41.30
SP AusNet Revised proposal	0.00	0.00	5.19	29.87	16.80	0.00	51.86
NC recommendation	0.00	0.00	4.83	27.82	15.65	0.00	48.30
BLTS adjustment <sup>8</sup>	0.00	0.00	-0.36	-2.05	-1.15	0.00	-3.56

### 3.3. Redevelopment of Thomastown Terminal Station

#### 3.3.1. Overview of the project and the AER's adjustments in the draft decision

SP AusNet's proposed redevelopment project at Thomastown Terminal Station (TTS) entails the replacement of two transformers, the redevelopment of the 220 kV switchyard, and the replacement of 21 x 66 kV CBs for a total cost of \$43.73 million.

The AER accepted that the replacement of one of the transformers and the 220 kV switchyard redevelopment was justified, but considered that SP AusNet had not demonstrated a clear need for the other transformer and the replacement of the 66 kV CBs.

The main basis for the AER's decision was its analysis of the SP AusNet risk model outputs for the CBs and SP AusNet's condition model outputs for transformers associated with this project. In this regard, the SP AusNet models indicated:

- one transformer had poor condition commensurate with other transformers programmed for replacement, however, the condition of the other was far better than SP's stated criteria for replacement; and
- the 66 kV CBs were in relatively good condition, with a mean time between failure of 26 to 27 years.

#### 3.3.2. SP AusNet's revised proposal

SP AusNet has proposed the reinstatement of the full amount in its original proposal to cover the replacement of the two transformers, and the 220 kV and 66 kV works.

The most significant factors SP AusNet has raised to support the reinstatement of the 2<sup>nd</sup> transformer and 66 kV works are discussed below.

##### *Transformer condition*

SP AusNet has advised that it has improved its transformer condition model from that provided with the original proposal. In this regard, SP AusNet has advised that the original

<sup>8</sup> The recommended adjustment has been determined from SP AusNet's NPV capital cost for the option (Option 3) which deferred the replacement of the 10 LG4C CBs.

model only accounted for the transformer core and windings. The improved model now accounts for other factors, including oil, bushings, tap-changer, tank, and cooling system. The most significant of these appears to be the impact of oil results on the condition of the transformer at TTS.

These improvements have resulted in the transformer having a similar condition ranking to the other transformer at TTS that has been accepted by the AER. This condition is also commensurate with other transformers that have been accepted in SP AusNet's replacement program.

SP AusNet has also confirmed<sup>9</sup> that this condition represents what was known by its technical staff at the time of the original proposal, but not accounted for in the original condition model - rather than from a new condition assessment that has been performed since the AER's draft decision.

#### ***66 kV CB condition and other drivers***

SP AusNet has not raised the condition of the LG4C breakers at TTS to be a significant driver of the need for their replacement. SP AusNet has noted that the S&S 66 kV CBs are in a poorer condition than the average S&S fleet, however, it does not appear to have raised this as a significant issue requiring their replacement.

The main drivers SP AusNet has raised on the need to replace the 66 kV CBs are as follows:

- the compliance issues related to the proposed transformer rating, which requires the replacement of 2 CBs associated with the switching of the new transformers, and 3 bus-tie CBs;
- the relatively high fault levels, which are at 99% of the CB rating, and the associated health and safety issue; and
- the efficiency of 66 kV works via cost reductions through the integration with 66 kV protection needs and the other TTS redevelopment works.

#### ***NPV analysis***

SP AusNet has undertaken further NPV analysis of a selection of options for the redevelopment of TTS. This indicates that SP AusNet's proposed project has a marginally lower NPV than an option with the deferral of the majority of the 66 kV work by 7 years, to 2017. This analysis only examines capital and maintenance costs, and therefore, additional risk costs associated with the deferral options are not accounted for.

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#### **3.3.3. Nuttall Consulting's considerations**

The AER rejected the replacement of one of the transformers and all of the 66 kV works, based largely upon its view that the information supplied by SP AusNet did not indicate that these assets were in a poor condition.

With regards to the need for the replacement of the transformer, this is now supported by SP AusNet's revised proposal, which now states that the transformer is in a poor condition commensurate with other transformers, including the one at TTS, that the AER has accepted

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<sup>9</sup> Confirmed verbally during the meeting with SP AusNet, dated 29 October 2007.

in its draft decision. Although within the timeframe of this review it is impossible to confirm the accuracy of the revised condition of the transformer, Nuttall Consulting sees no reason to doubt SP AusNet's views on this matter.

Therefore, noting the risk of maintaining such a transformer in service during the next period, and the cost benefits of undertaking the replacement of this transformer with the other works that have been already accepted, Nuttall Consulting considers that SP AusNet has reasonably justified that it will be prudent and efficient to replace the second transformer in accordance with its proposal.

With regards to the need for the 66 kV works, Nuttall Consulting accepts that it will be prudent and efficient to replace the 5 x 66 kV CBs for compliance reasons. This should also allow for the efficient management of outages during the transformer replacement and the integration with protection needs.

However, for similar reasons to those discussed above on BLTS, Nuttall Consulting does not consider that the replacement of the remaining CBs has been justified. In this regard, the condition of the LG4C CBs appear to be better than the average fleet, with the TTS LG4C CBs being classified by SP AusNet as priority 11 out of 16. As such, based upon SP AusNet's modelling of the economic life for the average fleet, the efficient life (at the individual CB level) would be 55 to 60 years. This suggests that it is reasonable to expect that these CBs to continue to perform acceptably beyond 2020. This is well past the date that SP AusNet's NPV analysis indicated the deferral would be required to be the most efficient option (i.e. 2017).

SP AusNet has raised the high fault levels as a further driver for the replacement of the CBs. However, as discussed above with MWTS and BLTS, Nuttall Consulting considers that this cannot be the primary reason for SP AusNet replacing these CBs. If this was the case then the works should be considered an augmentation, and as such, the responsibility of the relevant "network planner".

Therefore, Nuttall Consulting does not consider that SP AusNet has sufficiently justified that it would be prudent or efficient to replace the remaining 66 kV CBs during the next period, as proposed by SP AusNet.

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#### **3.3.4. Summary recommendations**

Nuttall Consulting agrees that it will be prudent and efficient to undertake the replacement of the two transformers, the 220 kV works, and 5 of the LG4C CBs (and associated 66 kV secondary works) at TTS as proposed by SP AusNet. However, Nuttall Consulting does not consider it will be prudent and efficient to replace the remaining 66 kV CBs at TTS proposed by SP AusNet.

This recommendation re-instates the transformer and a portion of the 66 kV works that were not allowed for in the AER draft decision. The main basis for the reinstatement of these works is:

- revised information that indicates the transformer is in a poorer condition than indicated in the original proposal; and

- the clarifications from SP AusNet on the compliance needs related to the 5 x 66 kV CBs.

Nuttall Consulting's recommendation on the prudent and efficient allowance for this project is summarised in Table 4 below. This table also indicates the adjustment from SP AusNet's revised proposal based upon Nuttall Consulting's recommendations.

**Table 4 Allowance for redevelopment of TTS (\$m, 2007/08)**

	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	Total
SP AusNet Original proposal	3.9	22.92	15.37	1.54	0.00	0.00	43.73
AER draft decision	1.76	13.86	15.37	1.54	0.00	0.00	32.53
SP AusNet Revised proposal	3.9	22.92	15.37	1.54	0.00	0.00	43.73
NC recommendation	3.64	21.35	14.58	1.54	0.00	0.00	41.11
TTS adjustment <sup>10</sup>	-0.26	-1.57	-0.79	0.00	0.00	0.00	-2.62

### 3.4. Refurbishment of Glenrowan Terminal Station

#### 3.4.1. Overview of the project and the AER's adjustments in the draft decision

SP AusNet's proposed refurbishment project at Glenrowan Terminal Station (GNTS) entails the replacement of one transformer, the redevelopment of the 220 kV switchyard, and the replacement of 7 x 66 kV CBs (and associated 66 kV switchyard works) for a total cost of \$21.32 million.

The AER accepted that the replacement of the transformers and the 220 kV switchyard redevelopment was justified, but considered that SP AusNet had not demonstrated a clear need for the replacement of the 66 kV CBs and associated 66 kV works.

The main basis for the AER's decision to not allow for the 66 kV works was its analysis of the SP AusNet risk model outputs for the CBs. In this regard, the SP AusNet models indicated:

- the 66 kV CBs were in relatively good condition, with a mean time between failure of 26 to 27 years.

#### 3.4.2. SP AusNet's revised proposal

SP AusNet has proposed the reinstatement of the full amount in its original proposal to cover the replacement of all the 66 kV works originally proposed.

The most significant factors SP AusNet has raised to support the reinstatement of the 66 kV works are discussed below.

##### *66 kV CB condition and other drivers*

<sup>10</sup> The recommended adjustment has been determined from SP AusNet's NPV capital cost for the option (Option 3), which deferred the replacement of the 66 kV CBs.

SP AusNet has stated that the condition of the 66 kV CB proposed for replacement at GNTS is much poorer than that indicated in SP AusNet's CB risk model. This is due to the issues on SP AusNet's CB risk model discussed above, whereby it only indicates the average condition of the LG4C and S&S fleet.

SP AusNet has advised the following with respect to the condition of the CBs:

- the LG4C at GNTS are considered to be the worst in the LG4C fleet, with a maintenance frequency of 286% of a new CB and a MTBF of 7 years;
- the S&S CB at GNTS is the 2<sup>nd</sup> worst in the S&S fleet, with a maintenance frequency of 350% and a MTBF of 2 years; and
- the actual MTBF of these CBs (7 years and 2 years) is significantly shorter than the 26 to 27 years indicated in SP AusNet's CB risk model.

SP AusNet has also raised the following drivers with respect to the need to replace the proposed CBs at GNTS:

- the compliance issues related to the proposed transformer rating, which requires the replacement of certain CBs at GNTS;
- redevelopment arrangements and associated construction sequencing, which requires the retirement of an existing 66 kV CBs with its associated transformer; and
- the efficiency of 66 kV works, due to:
  - the economic life of the poor performing CBs as modelled by SP AusNet; and
  - cost reductions through the integration with 66 kV protection and CT needs, and the other GNTS redevelopment works.

#### ***NPV analysis***

SP AusNet has undertaken further NPV analysis of a selection of options for the redevelopment of GNTS, examining the 66 kV deferment options. This indicates the following:

- a deferment of nine years for all the 66 kV works would be required to achieve a lower NPV than SP AusNet's proposed project; and
- if the CBs required for compliance, construction and sequencing are allowed for, then a deferment in the order of 2 to 4 years would be required on the remaining 66 kV works to obtain a lower NPV than the SP AusNet's proposed project.

#### ***Error in the AER's adjustment***

SP AusNet has also advised that the AER has made an error in its calculation of the appropriate adjustment in SP AusNet's project cost for the removal of the 66 kV works. In this regard, the AER removed \$4.9 million, whereas SP AusNet has stated that only \$2.9 million was allowed for in its project cost for the 66 kV works.

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### 3.4.3. Nuttall Consulting's considerations

The critical factor that SP AusNet has raised supporting the need for the 66 kV works at GNTS is the condition of the 66 kV CBs. This indicates that the MTBF for these CBs may be 2 to 7 years, rather than the 27 years indicated in its risk model – and assumed by the AER in its draft decision.

Nuttall Consulting considers these MTBF are indicative of poor asset, and a strong indication that it may be prudent to replace these CBs in the next period.

Furthermore, SP AusNet's analysis of the economic life of the poor performing CBs indicates a life of 45 to 50 years would be efficient. SP AusNet's timing of this project from 2011/12 is in accordance with this analysis, assuming an economic life nearer 45 years is the most appropriate for these CBs, which are the poorest in the fleet.

Noting also, the other benefits in terms of cost and risk benefits of integrating these 66 kV works with the other works proposed at GNTS, and the compliance issues with some of the CBs, there appears to be a case to allow for these works as proposed by SP AusNet.

Therefore, Nuttall Consulting considers that SP AusNet has sufficiently justified that it would be prudent or efficient to undertake the 66 kV works during the next period, in accordance with its proposed refurbishment of GNTS.

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### 3.4.4. Summary recommendations

Nuttall Consulting agrees that it will be prudent and efficient to undertake the refurbishment works at GNTS as proposed by SP AusNet, including the replacement of the transformers, the 220 kV works, and 66 kV works.

This recommendation re-instates the 66 kV works that were not allowed for in the AER draft decision. The main basis for the reinstatement of these works is:

- the revised information that indicates the 66 kV CBs are in a significantly poorer condition than indicated in the original proposal.

Nuttall Consulting's recommendation on the prudent and efficient allowance for this project is summarise in Table 5 below.

**Table 5 Allowance for redevelopment of GNTS (\$m, 2007/08)**

	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	Total
SP AusNet Original proposal	0.00	0.00	0.00	0.43	6.82	14.07	21.32
AER draft decision	0.00	0.00	0.00	0.43	4.37	11.62	16.42
SP AusNet Revised proposal	0.00	0.00	0.00	0.43	6.82	14.07	21.32
NC recommendation	0.00	0.00	0.00	0.43	6.82	14.07	21.32
GNTS adjustment	0.00	0.00	0.00	0.00	0.00	0.00	0.00



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### 3.5. Refurbishment of Keilor Terminal Station

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#### 3.5.1. Overview of the project and the AER's adjustments in the draft decision

SP AusNet's proposed refurbishment project at Keilor Terminal Station (KTS) entails the refurbishments of the 500 kV, 220 kV and 66 kV switchyards for a total cost of \$39.6 million.

The AER accepted that the refurbishments of the 500 kV and 220 kV switchyards was justified, but considered that SP AusNet had not demonstrated a clear need for the 66 kV works, which included the replacement of 10 x 66 kV CBs.

The main basis for the AER's decision to not allow for the 66 kV works was its analysis of the SP AusNet risk model outputs for the CBs. In this regard, the SP AusNet models indicated:

- the 66 kV CBs were in relatively good condition, with a mean time between failure of 23 to 24 years.

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#### 3.5.2. SP AusNet's revised proposal

SP AusNet has proposed the reinstatement of the full amount in its original proposal to cover the replacement of all the 66 kV works originally proposed.

The most significant factors SP AusNet has raised to support the reinstatement of the 66 kV works are discussed below.

##### *66 kV CB condition and other drivers*

SP AusNet has not raised the condition of the 9 LG4C breakers at KTS to be a significant driver of the need for their replacement. SP AusNet has noted that the S&S 66 kV CB included for replacement is in a poorer condition than the average S&S fleet.

The main drivers SP AusNet has raised on the need to replace the 66 kV CBs are as follows:

- fault levels will be in excess of the CB ratings following the augmentation of the transformer capacity at the substation, which SP AusNet has advised may be in 2010;
- the health and safety issues associated with these high fault levels;
- the health and safety concerns relates to poor 66 kV equipment at KTS, including CTs, VTs and surge arrestors; and
- the efficiency of 66 kV works via cost reductions through the integration with 66 kV protection, CT, surge arrester, and VT needs, and the other KTS redevelopment works.

##### *NPV analysis*

SP AusNet has undertaken further NPV analysis of a selection of options for the redevelopment of KTS. This indicates that a deferral of the majority of the 66 kV work by

up to 8 years (2017) would be required to achieve a lower NPV than the SP AusNet's proposed project.

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### 3.5.3. Nuttall Consulting's considerations

Based upon the information supplied by SP AusNet, there still does not appear to be a compelling case for replacing the 66 kV CB based upon condition. In this regard, the condition of the 9 LG4C CBs appears to be better than the average fleet, with the KTS LG4C CBs being classified by SP AusNet as priority 13 out of 16. As such, based upon SP AusNet's modelling of the economic life for the average fleet, the efficient life (at the individual CB level) would be 55 to 60 years. This suggests that it is reasonable to expect that these CBs will continue to perform acceptably beyond 2018. This is past the date that SP AusNet's NPV analysis indicated the deferral would be required to be the most efficient option (i.e. 2017).

It is also important to note that there may be some question as to whether the 2017 deferral threshold date in SP AusNet's NPV analysis should be earlier. On this matter, SP Ausnet's analysis included \$400,000 of "sunk design costs" in 2007/08 for all options. It is not clear what specific elements of the 66 kV works these design costs relate to; however, noting the expected life discussed above, it could be that these sunk costs do not represent prudent and efficient expenditure. As such, it may not be appropriate in the context of this revenue proposal, to include them unadjusted in the options analysis i.e. including potentially inefficient sunk costs, biases the analysis against the deferral options.

Based upon the above, Nuttall Consulting does not consider that SP AusNet has justified that condition and its impact on the efficient timing is a driver of the need for the 66 kV works.

The most significant driver of the replacement appears to be SP AusNet's concerns of the impending fault level issue, and as such, the efficiency due to the advancement of the need to replace the CBs for fault level reasons to allow the integration with its 500 kV and 220 kV works at KTS.

On this matter, SP AusNet has indicated that a transformer augmentation at KTS, planned by the associated distributor, may be occurring in 2010 - it is this augmentation that may increase the fault level above the CB ratings. However, the timing of this augmentation does not appear to be known with any certainty at this stage<sup>11</sup>. As such, it appears that a significant level of joint planning is still required to determine the timing and most efficient option.

Noting that the condition of the CBs does not indicate an impending need to replace these CBs, then it appears that if these replacements are undertaken in the next period then it will be primarily for augmentation reasons. As such, the initiation, and more importantly revenue allowance, should reside with the relevant "network planner". Essentially, if the joint planning finds SP AusNet's KTS 66 kV refurbishment to be the most efficient option, then the revenue for this portion of the works would be provided under some form of connection services agreement.

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<sup>11</sup> SP AusNet advised verbally in the meeting, dated 29 October 2007, that a firm date for the augmentation had not been agreed.

Therefore, Nuttall Consulting does not consider that an allowance should be made for SP AusNet to replace the majority of 66 kV CBs during the next period, as proposed by SP AusNet. However, Nuttall Consulting accepts that it will be prudent and efficient to allow for the replacement of the poor performing 66 kV equipment, including the S&S CB, CTs, VTs, and surge arrestor, etc.

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### 3.5.4. Summary recommendations

Nuttall Consulting agrees that it will be prudent and efficient to undertake the refurbishment works at KTS as proposed by SP AusNet, to cover the 550 kV, 200 kV and part of 66 kV works. However, Nuttall Consulting considers that the majority of the 66 kV works should be considered to be an augmentation, and therefore, an allowance should not be made for these parts of the project in SP AusNet's revenue cap.

This recommendation re-instates a small portion of the 66 kV works that were not allowed for in the AER draft decision. The main basis for the reinstatement of these works is:

- the revised information that indicates health and safety issues with some poor performing 66 kV equipments, and the efficiency of undertaking these replacements with the other works at KTS.

Nuttall Consulting's recommendation on the prudent and efficient allowance for this project is summarise in Table 6 below.

**Table 6 Allowance for redevelopment of KTS (\$m, 2007/08)**

	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	Total
SP AusNet Original proposal	15.14	12.22	0.25	3.92	8.09	0.00	39.62
AER draft decision	13.58	8.58	0.25	3.92	8.09	0.00	34.42
SP AusNet Revised proposal	15.14	12.22	0.25	3.92	8.09	0.00	39.62
NC recommendation	15.55	8.98	0.25	3.92	8.09	0.00	36.79
KTS adjustment <sup>12</sup>	0.41	-3.24	0.00	0.00	0.00	0.00	-2.83

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## 3.6. Replacement of 500 kV circuit breakers

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### 3.6.1. Overview of the project and the AER's adjustments in the draft decision

SP AusNet proposed the replacement of two 500 kV circuit breakers for a total cost of \$4.2 million. These replacements were primarily required to release spares to allow SP AusNet to undertake its refurbishment of the fleet of a similar type of 500 kV circuit breaker.

The AER did not accept that SP AusNet had demonstrated a clear need for the replacement of the two CBs. However, the AER did allow for the replacement of one CB.

The main basis for the AER's decision to allow for only one CB was as follows:

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<sup>12</sup> The adjustment has been calculated based upon SP AusNet's cost for the 66 kV deferral option in its NPV analysis.

- it was not clear why two CBs were needed, noting the relatively good condition of the CBs in SP AusNet's CB risk model; and
- the need for the spares was not clear, noting that spare components were to be supplied as part of SP AusNet refurbishments program contract, of which the AER had made an allowance for.

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### 3.6.2. SP AusNet's revised proposal

SP AusNet has proposed the reinstatement of the full amount in its original proposal to cover the replacement of the two 500 kV CBs as originally proposed.

The most significant factors SP AusNet has raised to support the reinstatement of both 500 kV CBs are:

- only minor and consumable spares are to be provided as part of the refurbishments contract, and as such, the replacements are required to ensure major components are available for the refurbishments; and
- the associated CB fleet, consisting of 24 Siemens 3AT5 circuit breakers, encompasses two different type specifications (16 of an old specification and 6 of a newer specification), of which the main components are not interchangeable, and as such, the proposal allows for the replacement of one of each of these types to ensure spares of each type are available.

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### 3.6.3. Nuttall Consulting's considerations

Based upon the clarification supplied by SP AusNet, there appears to be a stronger case for allowing both CB replacements than in the original proposal. However, it is important to consider the particular circumstances of both types of CB specifications.

- **Old specification CBs.** SP AusNet has 16 of the older type CBs, which are between 25 and 29 year old<sup>13</sup>. SP AusNet undertook a replacement of one of the old specification CBs during this current regulatory period, and therefore, some spares are available from this replacement. On this matter, SP AusNet has advised<sup>14</sup> that the retired CB has been refurbished and is being used for the first changeover in the refurbishment project. However, SP AusNet still considers that it needs the additional CB to ensure it has adequate spares to cover defects and failures of the fleet of 16 older CBs.
- **Newer specification CBs.** SP AusNet has only 6 of the new specification CBs, which are around 15 years old, which is 10 years younger than the older specification CBs. SP AusNet has advised that it has no spares for this specification CB<sup>15</sup>.

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<sup>13</sup> It is noted that SP AusNet advised in its email, dated 2 November 2007, that it had 20 older specification CBs and 10 newer specification CBs. However, SP AusNet's project summary document states this to be 16 older specification CB and 6 newer specification CBs – this also corresponds with the information in SP AusNet's CB risk model.

<sup>14</sup> Advised in email from SP AusNet to AER, dated 2 November 2007.

<sup>15</sup> Ibid

Based upon the above it is marginal that either of the retired CBs will be required in their entirety to undertake the refurbishments. However, there is a reasonable likelihood that some major components will be required during the refurbishments, and as such, the availability of spares from both types is required. Therefore, it appears that the refurbishment program cannot be undertaken without the availability of retired CBs of each type.

There is possibly some question of the need for the refurbishment program on the new specification CBs during this period, as this appears to be the primary driver for the need for the 2<sup>nd</sup> replacement. However, as the program has been accepted by PB in its review, and has been allowed for in SP AusNet's operating expenditure in the AER's draft decision, Nuttall Consulting has not considered this matter further.

On the issue of options available to SP AusNet to retire the two CBs, SP AusNet appears to have only considered the option of replacing 2 CBs. However, Nuttall Consulting considers that a CB could be retired without the need for a new CB by converting an existing double switched arrangement to a single switched arrangement. A possible candidate for this would be the double switched No. 1 line at LYPS, which has the new CB that was replaced in this regulatory period plus an older type 3AT5 CB. The other lines connecting LYPS to HWTS are of a single switched arrangement at LYPS and so the resulting operational implications, noting the newer CB, should not be significantly different to these lines. In this way, the released older type 3AT5 can be used for spares for the refurbishment program. Other options also exist by using the other double switched arrangements at LYPS.

Nuttall Consulting accepts that such a solution may require some consultation with customers, such as VENCORP or generators. However, if deemed an efficient option without placing a material risk on the service to customers, then presumably this option can be agreed by all parties. It could also be argued that VENCORP is in the best position to undertake the market modelling to determine whether a 2<sup>nd</sup> CB should be replaced or the No. 1 line at LYPS should be converted to a single switched arrangement i.e. the need for it would pass the market benefits limb of the regulatory test.

Nuttall Consulting does not see how such options would not be a prudent and efficient approach to undertake the refurbishment program (if it *is* needed on the newer specification CBs), noting that a 15 year old CB will need to be retired at a cost of \$2.1 million to service a fleet of only 5 other CBs of a similar age. Therefore, Nuttall Consulting considers that an allowance should be made for SP AusNet to replace only one 500 kV CB.

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#### **3.6.4. Summary recommendations**

Nuttall Consulting considers that it will be prudent and efficient to replace only one 500 kV CB, which is a reduction from SP AusNet's proposed two CB replacements. This recommendation does not change the allowance in the AER's draft decision. However, the basis for this recommended adjustment has changed, whereby Nuttall Consulting has accepted SP AusNet's basis for the need to retire 2 CBs, but has not accepted that 2 CBs are needed to be replaced to achieve this.

Nuttall Consulting's recommendation on the prudent and efficient allowance for this project is summarised in Table 7 below.

**Table 7 Allowance for the 500 kV CB replacements (\$m, 2007/08)**

	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	Total
SP AusNet Original proposal	3.5	0.7	0.0	0.0	0.0	0.0	4.20
AER draft decision	0.0	2.1	0.0	0.0	0.0	0.0	2.10
SP AusNet Revised proposal	3.5	0.7	0.0	0.0	0.0	0.0	4.20
NC recommendation	2.1	0.0	0.0	0.0	0.0	0.0	2.10
500 kV CB adjustment <sup>16</sup>	-1.4	-0.7					-2.10

<sup>16</sup> The adjustment has been calculated assuming \$2.1 million for the cost of the replacement CB, as applied in the AER draft decision.

## 4. Summary

Nuttall Consulting has reviewed a number of projects associated with the capex forecast in SP AusNet's revised proposal, which was submitted in response to the AER's draft decision.

The project reviewed by Nuttall Consulting were:

- Replacement of 66 kV circuit breakers (Morwell Terminal Station and Horsham terminal Station)
- Redevelopment of Brooklyn Terminal Station
- Refurbishment of Thomastown Terminal Station
- Refurbishment of Glenrowan Terminal Station
- Refurbishment of Keilor Terminal Station
- Replacement of 500 kV circuit breakers

The main aim of this review was to consider the information provided by SP AusNet in support of its revised proposal, and particularly the basis for SP AusNet's proposed reinstatement of the project elements not allowed for in the AER's draft decision.

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### 4.1. Summary recommendations

Table 8 summarises Nuttall Consulting's recommended capital expenditure allowance associated with these projects. In Nuttall Consulting's opinion, based upon the information provided for this review, and only in relation to the projects reviewed, this allowance reasonably represents:

- the efficient costs of achieving the capital expenditure objectives set out in clause 6A6.7 (a) of the NER; and
- the costs that a prudent operator in the circumstances of SP AusNet would require to achieve the capital expenditure objectives.

**Table 8 Summary of recommended allowance**

	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	Total
SP AusNet Original proposal	23.81	37.90	20.95	35.78	31.71	14.07	164.22
AER draft decision	15.34	24.54	20.27	27.49	27.51	11.62	126.77
SP AusNet Revised proposal	23.81	37.90	20.95	35.78	31.71	14.07	164.22
NC recommendation	21.29	30.33	20.45	34.98	30.64	14.08	151.77

This recommendation represents a \$12.5 million (or 7.6%) reduction on the capital expenditure allowance in SP AusNet's revised proposal for these 6 projects. A significant portion of this reduction relates to the replacement of the 66 kV elements of the substation redevelopment/refurbishment projects. In this regard, Nuttall Consulting does not consider that SP AusNet has reasonably justified that some of its proposed 66 kV works would be

prudent and efficient. It is important to note that in making this recommendation, Nuttall Consulting has allowed for those elements of the projects identified by SP AusNet where there appears to be significant risks associated with poor performing assets. Furthermore, Nuttall Consulting has allowed for those assets identified by SP AusNet where significant compliance issues could arise due to other elements of its projects.

Although Nuttall Consulting is mindful of the fleet issue raised by SP AusNet with regards to its LG4C 66 kV circuit breakers, Nuttall Consulting considers that the level of replacements allowed for in this recommendation should adequately allow SP AusNet to manage these risks during the next regulatory period. This is particularly so noting that:

- The recommendation allows for the replacement of the poor performing LG4C circuit breakers;
- The recommendation includes other LG4C circuit breakers that will be replaced for other reasons;
- The AER's draft decision allowed for a number of LG4C circuit breakers at Ringwood Terminal Station, which are in average condition; and
- SP AusNet are replacing a number of the LG4C circuit breaker in this period.

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#### **4.2. Basis for the recommended changes to the AER's draft decision**

Nuttall Consulting's recommended allowance for these 6 projects represents a \$25.0 million increase from the allowance in the AER's draft decision. The majority of the increase from the AER's draft decision has resulted from information provided in support of the revised proposal. This new information indicates that the relevant assets are in a significantly poorer condition than indicated by information supplied in support of SP AusNet's original proposal. The main elements of each project not allowed for in the AER's draft decision but accepted by Nuttall Consulting, and the main basis for their acceptance, are summarised in Table 9.



**Table 9 Primary basis for Nuttall Consulting's adjustments**

<i>Project</i>	<i>Major adjustment</i>	<i>Basis for adjustment</i>
<b>Replacement of 66 kV circuit breakers (Morwell Terminal Station and Horsham terminal Station)</b>	66 kV works at Morwell (\$2 million)	<ul style="list-style-type: none"> <li>Revised asset condition information</li> </ul>
<b>Redevelopment of Brooklyn Terminal Station</b>	220 kV works (\$7 million)	<ul style="list-style-type: none"> <li>Revised asset condition information</li> <li>Clarification on the scope of the transformer works at Brooklyn</li> </ul>
<b>Refurbishment of Thomastown Terminal Station</b>	220/66 kV transformer (\$8 million)	<ul style="list-style-type: none"> <li>Revised asset condition information</li> </ul>
<b>Refurbishment of Glenrowan Terminal Station</b>	66 kV works (\$5 million)	<ul style="list-style-type: none"> <li>Revised asset condition information</li> </ul>
<b>Refurbishment of Keilor Terminal Station</b>	Some 66 kV works (\$2 million)	<ul style="list-style-type: none"> <li>Clarification on poor performing assets at Keilor</li> </ul>