TRANSGRID REVISED REVENUE PROPOSAL

Standard asset lives for replacement asset classes

Prepared for

AUSTRALIAN ENERGY REGULATOR

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SECTIONS

1. INTRODUCTION

In this section of the report, PB provides some background to the review, an overview of the project scope, and we describe the use of the terms economic and technical asset life used in this report. We also set out the structure of this report.

1.1 BACKGROUND TO THE REVIEW

On 14 January 2009, TransGrid submitted a revised revenue proposal[1] to the Australian Energy Regulator (AER). The revised proposal provides additional information to address matters raised in the AER's draft decision[2] and to demonstrate that the revised proposal satisfies the requirements of the National Electricity Rules.

In relation to the standard lives of replacement assets, TransGrid has not accepted the AER's draft decision to treat these in a similar manner to augmentation assets for regulatory depreciation purposes. TransGrid maintains that its proposal for replacement assets better reflects the expected economic or technical life of such assets, and that replacement assets should take on the weighted average notional remaining life of the existing assets. TransGrid therefore proposes replacement asset categories covering four asset classes with standard asset lives that are different to those for the corresponding type of asset classes in the augmentation asset category, as shown in Table 1-1

Table 1-1 – TransGrid's proposed standard asset lives for new assets

Asset class	Standard asset lives for new replacement assets	Standard asset lives for new augmentation assets	Original replacement capex allocation May 2008 ($m, real 07/08)	Revised replacement capex allocation January 2009 ($m, real 07/08)
Transmission lines & cables	26	50	26.4	51.6
Substations	30	40	160.1	356.3
Secondary systems	30	35	34.2	62.2
Communications	12	35	12.0	45.5
Total			**232.7**	**515.6**

Source: TransGrid's respective Capital Accumulation Models.

Table 1-1 also indicates that within TransGrid's most recent capital expenditure (capex) accumulation model (January 2009), the replacement programs and projects have the majority of their expenditure allocated to TransGrid's replacement asset classes, suggesting the materiality of the proposed depreciation changes may be significant. It is also noted that this is a significant change compared with TransGrid's original submission (May 2008).

1.2 PROJECT SCOPE

The AER has engaged PB Strategic Consulting (PB) to provide technical advice on TransGrid's replacement program and projects, and the associated impact to the standard lives of replacement assets. Specifically, PB has been required to undertake a desktop review and provide:

1 TransGrid, Revised Revenue Proposal 1 June 2009 – 30 June 2014, January 2009

2 AER, TransGrid Transmission Determination 2009-10 to 2013-14 Draft Decision, 31 October 2008.

- high level comments on whether replacement assets in respect of replacement projects and programs, covering the four replacement category of asset classes, would achieve their typical/technical asset lives as represented by the augmentation category of asset lives
- a brief summary of the most significant line items in the capital expenditure accumulation model of TransGrid to support the above comments, with a view on whether the majority of assets (by expenditure) should achieve typical/technical lives, and why — and using these as examples of why the high level view is correct.

In undertaking its review PB is required to assess whether the replacement assets in the projects/programs, or elements of the projects/programs, are likely to achieve a reduced life equivalent to TransGrid's methodology for calculating the life for the four replacement category of asset classes.

This review is required to draw upon PB's review of TransGrid's 2008 revenue proposal, and any knowledge of TransGrid's asset management practices and plans gained through that review. Explicit reference to TransGrid information that supports PB's views should be provided.

1.3 ECONOMIC AND TECHNICAL ASSET LIVES

In this report PB uses the terms "economic" and "technical" life. Electricity transmission assets are generally replaced when one of the following conditions occurs:

- the cost of maintenance exceeds the cost of replacing the asset
- the asset can no longer be maintained (due to a factor such as spare parts are no longer available)
- the risk associated with a failure of the asset has increased to an unacceptable level.

When an asset is replaced due to one of these conditions occurring, PB considers that the asset has reached the end of its technical life. That is, it is no longer technically feasible to keep the asset in service. Keeping an asset in service when it is not technically feasible to do so is almost always uneconomic and therefore it can be said that the asset has reached the end of its technical life, and also its economic life.

Assets may also be replaced before they reach the end of their technical life. For example, a relatively new item of plant may be located within a substation that is to be rebuilt and, as part of the substation replacement, the relatively new item of plant may be retired along with the remainder of the plant that has reached the end of its technical life. In this situation the rebuild of the substation may be economically justified and therefore it can be said that the assets retired from the substation (including the relatively new item of plant) have reached the end of their economic life.

There are therefore two situations where the same asset may have a different economic life. In this report we use the term "technical life" to describe the economic life of an asset where the asset is replaced due to one of the conditions described in the points above.

1.4 REPORT STRUCTURE

The content of this report is as follows:

Section 2 outlines PB's high-level comments on TransGrid's proposal, insights captured from our review of TransGrid's asset management approach, and our consideration of the actual projects and programs proposed by TransGrid.

Section 3 summarises PB's high level conclusions and advice to the AER.

2. PB TECHNICAL ADVICE

This section outlines PB's high level comments with respect to TransGrid's proposal to reduce the asset lives for new replacement assets compared with new augmentation assets; provides some relevant comments with respect to TransGrid's asset management processes; and considers the nature of TransGrid's replacement projects and programs of investments.

2.1 HIGH-LEVEL COMMENTS

As part of TransGrid's revenue proposal submission to the AER, TransGrid allocates its forecast asset replacement capex into two categories:

- project based asset replacement, which occurs for significant refurbishment of specific parts of the transmission system (such as substation renewals, transmission line reconstructions, transformer and capacitor replacements, control rooms, etc). This work is non-routine and site specific.
- program based asset replacement, such as the targeted replacement of circuit breakers or protection relays, which is performed in a systematic way across the entire network based on the type and classes of equipment.

In PB's view, and in the context of the specialist plant and equipment associated with electricity transmission infrastructure, it can be reasonably expected that the capitalised replacement assets associated with each of these categories of work will achieve a typical economic life consistent with identical assets installed for the purposes of augmentation. However, PB does expect that as an exception, some minor components across such a large portfolio of works may assume an economic life that is less than the anticipated technical life.

Any advanced replacement of assets should be achieved through a detailed economic business case assessment, and we have not seen any evidence to suggest that TransGrid is presently, and systematically, replacing assets prior to the expiration of their technical lives, nor have we seen any examples of forecast new replacement assets that TransGrid expects to replace before the end of the assets technical life.

The basis for PB's position on this matter is outlined in the remaining sections of this report, and includes the following observations:

- with the exception of some specific process criticisms, TransGrid has been identified as a prudent and contemporary electricity transmission network asset owner and operator – it adopts modern condition-based asset management and replacement approaches that aim to optimise the life-cycle costs and this tends to have the affect of extending the life of critical assets
- TransGrid's approach to asset management (and therefore asset replacement) is undertaken at a much lower resolution than the defined asset classes for the purposes of depreciation, and this raises a divergence between the regulatory approach and the actual practical treatment of the assets.
- it appears that TransGrid's application of shortened asset lives for replacement assets appears disparate compared to its documented Network 30-year Asset Management Plan 2009-2039, and its inherent strategies for key asset classes (this is discussed further in section 2.2)
- Under TransGrid's capitalisation policy the replacement of a substantial part of a unit of plant is treated as capital where the replacement will result in an extension in the unit's predetermined useful life. A substantial part of a unit is defined as 40% of the value or physical components of the unit of plant – where units of plant are subsets of the asset categories. For example a unit of plant can be a power transformer or switchbay. Under the policy minor expenditure (including that associated with materials) that does not significantly extend the technical life of

assets (or improve the unit's overall design) should be categorised as opex. This reinforces the principle that new replacement assets should not be systematically considered as elements of larger assets – but discrete investments in their own right.

- In PB's view, the costs of operating and maintaining assets should not exceed the costs of replacing those assets prior to the end of their technical lives if the assets have been selected properly in the first instance. Furthermore, should advanced replacement be required at a wholesale level across key new asset categories[3], then this suggests a critical weakness in the overall asset management practices adopted. Given TransGrid's long standing experience and approach to selecting new replacement assets, which are procured in accordance with modern standards and established procurement policies, PB considers that the tendency for the advanced replacement of assets should be diminishing over time. Specifically, TransGrid's Network Management Plan 2009-2014 refers to the principle that "..TransGrid's asset procurement policy ensures that, for reasons of economy, there is a reasonable degree of plant commonality across the state.."[4]
- TransGrid's proposed approach to regulatory depreciation is underpinned by the assumption that TransGrid will dispose of a replacement asset (e.g. switchgear) that forms part of a larger unit (e.g. substation) in its entirety at the end of the larger unit's life. In PB's view, TransGrid's asset management practices suggest it does not do this, and that it considers the retirement and disposal of each bit of serviceable plant in turn. Furthermore, TransGrid's asset base is larger than most other TNSP's - this supports the concept that new replacement assets will have a greater opportunity to be used elsewhere in the network, thereby achieving typical technical lives expected of similar augmentation based assets.
- TransGrid accepts that for large assets such as transformers and reactors it would be expected that the economic life of the replaced asset would be equal to a new development[5], however it does not consider that ageing plant such as switchgear can be relocated from one location to another. In PB's view, modern, compact and standardised SF_6 switchgear (which almost exclusively makes up the new purchases under TransGrid's current orders) will be much more amenable to relocation and serviceable application across the wider network, and comparisons with previous experience are not entirely relevant
- as an outcome of PB's review of TransGrid's documented policies, procedures, strategies, processes and a sample of its detailed projects and programs of investment, PB has not identified any recognition of the principle that new replacement assets would not achieve the life of identical assets installed for the purposes of augmentation. This indicates a gap between the regulatory depreciation practices and the practical management of the assets.
- Further to this point, PB has also identified a degree of augmentation associated with some replacement projects (i.e. cap banks and transformers). In PB's view, any projects that have a material degree of augmentation included should be excluded from the replacement asset class in principle – otherwise a perverse incentive may be established that will increase the components of augmentation in replacement projects.

PB makes the following observations regarding the circumstances in which it considers some replacement assets may not achieve an economic life that is consistent with the technical lives associated with similar assets installed for the purposes of augmentation:

- when compared to replacement projects, assets replaced as part of programs (which are targeted based on poor performance and condition) are more susceptible to advanced replacement in the future due to the specific nature of this

[3] As implied by TransGrid's allocation of the majority of its project and program replacement capex into the four replacement asset classes

[4] TransGrid, Network Management Plan 2009-2014, p. 42.

[5] TransGrid, Revised Revenue Proposal 1 June 2009 – 30 June 2014, January 2009, p. 91.

expenditure. Having increased numbers of unique asset types at a given site provides incentives to replace these in the future along with the other assets for the purposes of standardisation

- where an asset that forms part of a larger unit (such as a protection system or a communication component in a substation) is replaced when the entire substation is rebuilt and the asset originally included a high labour and design component. The cost of the labour and design component of the original asset is not reusable even where the plant can be reused and therefore a significant part of the asset cost does not achieve the technical life of the plant
- in some cases practical considerations associated with working at a live site may require an entire switchbay to be replaced to maintain continuity of supply. This practicality could result in a preference for new plant to be installed, rather then the re-use of existing components that are still serviceable
- technological advancement and obsolescence could also influence the timing of asset replacement, however in PB's view this would represent only a very small proportion of assets procured to a modern standard.

Whilst PB has highlighted that there may be a higher likelihood that assets classified as secondary and communication equipment will experience reduced lives compared to primary plant and lines (due to their higher volumes and higher labour and design components), PB considers the number should only be a small proportion of the total volume of these assets identified for replacement. PB also notes that TransGrid's secondary and communication replacement programs make up only a very small proportion of the overall replacement capex over the 2009-2014 regulatory period, and that it is not clear to PB where TransGrid has provided any specific examples of new replacement assets that it considers will be likely candidates for advanced replacement.

2.2 TRANSGRID'S ASSET MANAGEMENT PRACTICES

As part of PB's original review of TransGrid's asset management practices, and the way these practices informed its forecast capex and opex requirements, PB concluded that:

> *"..the TransGrid asset management process is consistent with good industry practice and employs condition monitoring and condition based replacement triggers to maximise the life of assets. PB is of the opinion that TransGrid has well-structured and well-documented policies and processes to support its core transmission service provision role.*
>
> *Furthermore, based on the documentation presented, and interactions with staff during our review of TransGrid's revenue proposal, sufficient evidence exists to support the view that the documented asset management process and policies are very well implemented within the business."* [6]

In the context of reviewing the efficiency of TransGrid's 2006/07 opex base year, PB also concluded that:

> *"On balance PB has formed the view that TransGrid is currently a prudent and efficient provider of transmission network services, implementing prudent maintenance policies in a cost efficient manner."*[7]

No information contained within TransGrid's revised revenue proposal has led to PB modifying its views, and in the context of this engagement we also specifically note that one of the key aspects of TransGrid's asset management philosophies is to achieve the optimum life of

[6] PB, TransGrid revenue reset - an independent review, November 2008, p. 41.

[7] PB, TransGrid revenue reset - an independent review, November 2008, p. 208.

assets[8]. Furthermore, it endeavours to ensure new plant is of a proven, safe, reliable and low-maintenance design[9], and that a 40 year service life is targeted for all circuit breakers[10]. These asset management and technical based perspectives appear to conflict with the concept that the vast majority of TransGrid's replacement capex will not achieve their desired technical lives, consistent with identical asset installed for the purposes of augmentation to meet demand growth. TransGrid has a significant history of plant performance and condition records.

The documented evidence available to PB suggests that the vast majority, if not all, of new replacement based assets should achieve their intended technical lives. TransGrid leverages off its considerable experience, and information from manufacturers and other TNSP's as part of industry surveys to ensure asset management best practice is understood and reflected in its processes.

To reinforce this view, PB highlights that TransGrid's approach to asset replacement is fundamentally condition and reliability based, and this is generally well recognised as having the effect of extending asset lives compared with age-based replacement approaches. The suggestion that standard asset lives should be systematically reduced under a condition-based approach is counter-intuitive to good asset management practice and process. Most importantly, it also appears disparate compared to TransGrid's documented technical asset lives for different asset types used for asset replacement[11], as reproduced in Table 2-1.

Table 2-1 – TransGrid's documented standard asset lives for new replacement assets

Asset class	Technical asset life for replacement assets	Asset class	Technical asset life for replacement assets
Power Transformers	45	Aluminium Conductor – (inland)	80
Oil Filled Reactors	30	Aluminium Conductor – (coastal)	60
Circuit Breakers	40	Steel Conductor – (inland)	60
Instrument Transformers	40	Steel Conductor – (coastal)	40
Shunt Capacitors	30	Porcelain Disc Insulators – (inland)	65
Substation DC Systems	20	Porcelain Disc Insulators – (coastal)	40
Surge Arrestors	40	Underground Cables	60
Bushings	30	Protection Relays – electromechanical	40
Steel Towers – (inland)	75	Protection Relays – microprocessor	20
Steel Towers – (coastal)	40	Control Systems	10
Wood Poles	65	Communication Equipment	15
		Optical Fibre Network	15

Source: TransGrid, Network 30 Year Asset Management Plan 2009-2039, p. 24.

8 TransGrid, GM AS S5 001 – Asset Management Strategy – Substations, 03 June 2008, p. 4.

9 ibid, p.6.

10 ibid, p.16.

11 TransGrid, Network 30 Year Asset Management Plan 2009-2039, p. 24.

2.3 REPLACEMENT CAPEX OVER THE 2009-2014 PERIOD

As part of its revised revenue proposal, TransGrid is proposing $483.8m (real, 2007/08) for non-load driven replacement capex, and has allocated $515.6m across the four asset classes described as replacement categories.

PB notes that from a review of the submission templates[12], it is apparent that TransGrid is also allocating some of its Security/Compliance defined expenditure into the replacement categories. In the first instance, it is not transparent or documented why TransGrid is adopting this approach rather than allocating some of this expenditure to the augmentation categories.

The following sections outline PB's insights from our high-level review of TransGrid's replacement projects and programs, and they capture some relevant information from PB's original review of a sample of projects and programs selected for detailed review.

2.3.1 Proposed replacement projects

TransGrid has proposed 31 discrete replacement projects, as grouped into the types outlined in Table 2-2.

Table 2-2 – TransGrid's replacement project expenditure

Asset class	Number of programs	Capex, $m, (real 07/08)
Transformers	9	71.8
Tech services - communications, controls and SCADA	10	49.3
Substations	6	133.5
Lines	1	12.4
Capacitor banks	5	16.0
Total	31	283

Source: TransGrid's CAM model 21b.

In PB's view:

- All of the transformer replacement projects include large assets that are expected to achieve their technical life (consistent with augmentation based units) as they form key and integral components of the substations, and they are amenable to refurbishment and relocation given the standardised nature of modern units. PB also notes from the available options evaluation documentation that in six cases, augmentation of the transformer capacity is captured as part of the replacement (typically the case with the 132/66 kV and 132/33kV units). PB can identify no basis for TransGrid to accelerate the depreciation of all its replacement transformers, particularly given its acceptance that these are large assets that can be refurbished[13] and relocated to maximise serviceable life.

  PB understands that TransGrid has only allocated the capex for transformers it is refurbishing into the augmentation asset class, as opposed to the capex for all of its replacement transformers.

- It is possible that given the nature of the technical services related projects (communications, SCADA and SVC control upgrades) some of these may not achieve the full service life expected for augmentation assets as the standard life for such assets is relatively long – 35 years. TransGrid is proposing that replacement driven

12 TransGrid, "*snap_CAM V1.8_Combined Output deliverables 21bB.xls*"

13 Eight separate refurbishment programs are documented by TransGrid on p. 50 of its 30-year NAMP.

assets of the same type will only achieve an economic life of 12 years. However, it is also noted that in many cases the works are planned to be co-ordinated with other projects at the sites, indicating that there are long term interests in retaining the existing sites. In the case of the most expensive projects:

- The Kemps Creek SVC controls upgrade will virtually replace all the key components (both valves and controls) except for the capacitor and reactors (installed in 1989), thereby extending the life of the overall asset such that the replaced components should achieve the life of comparable plant installed for the purposes of augmentation. Specifically TransGrid highlights that it anticipates to replace its SVC controls every 20 years, which is roughly half way between the augmentation and asset replacement asset class values[14].

- The situation with the Broken Hill SVC is identical to the Kemps Creek SVC, except the reactors and capacitors were installed in 1986.[15]

- With respect to the North Coast microwave replacement investment, PB notes that the project covers sixteen sites, affecting eight TransGrid substations. PB can identify no basis for replaced assets covering such a diverse set of sites to not achieve the typical technical lives of similar assets installed for augmentation purposes – however we do note that the 35 year standard life for augmented communications equipment is a relatively long term for equipment of this type.

- With respect to the six substation replacement projects, PB is of the view that four are switchyard rebuilds that should achieve the typical technical lives of the similar assets installed for augmentation purposes (two of these are discussed further by PB as part of our detailed project reviews in section 2.3.2), one is a control room rebuild at a critical substation site, and the other is a tunnel board replacement at Canberra that will be "suitable for application at other key 330kV Substations[16]". In PB's view, all of these assets should therefore achieve their expected lives.

- With respect to the six capacitor bank replacements, PB has identified that a number of these investments are co-ordinated with related and inter-dependant projects (such as the transformer replacements at Coffs Harbour) at the substation sites, suggesting that the integrated approach to these sites is based on a long term approach to service provision. PB also notes that in four of the six cases where documentation was available, it was evident that augmentation of the capacitor bank was proposed in three cases. PB has identified no basis for the replacement capacitor banks to take on an economic life that it less than the technical life of similar augmentation driven assets – but highlights that shunt capacitor banks have been assigned a technical life of only 30 years by TransGrid.

PB also highlights that TransGrid adopts a general principle that it applied in developing TransGrid's asset replacement plans is to efficiently bundle works into one package to avoid repeated visits to site with the attendant costs. In general, the target is to only visit any site once within a five year period for asset replacement projects.

2.3.2 Selected project reviews

As part of PB's original review of TransGrid's forecast capex program, a sample of projects and programs of expenditure were selected for detailed investigation. PB provides the

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14 TransGrid, Network 30 Year Asset Management Plan 2009-2039, p. 65.

15 With regard to the three SVC control systems upgrade projects (Kemps Creek, Broken Hill and Armidale, PB highlights that it appears that TransGrid has allocated these into the 'communications replacement' asset class - and this appears to be an error as these works are fundamentally 'secondary system replacements'.

16 TransGrid, 6025 Canberra 330kV Substation - 330kV Tunnel Board Replacement ARPE.doc, p. 4.

following comments in regards to these projects and an informed opinion on whether the new assets are expected to achieve typical technical lives consistent with the augmentation category of asset lives.

Beaconsfield West 132 kV GIS Replacement project (Project ID 6378)

TransGrid has included an allowance of $51.1m (real 07/08) as part of its revised revenue in order to replace the entire 132kV switchyard at Beaconsfield West by 2012/13. The base cost for this project has been assigned into the proposed regulatory asset classes in the proportion of 91%, 8% and 1% for substations (replacement), secondary (replacement) and communications (replacement), respectively.

Given the comprehensive nature of the project, in PB's view, we can identify no basis for any component of this wholesale switchyard rebuild to adopt a life that is less than that which should apply if the assets were installed for augmentation purposes. This switchyard is not a component of a larger asset. The expected life of this switchyard should not be influenced by the weighted remaining life of all substation assets in the TransGrid regulatory asset base, and if anything it would be expected that the remaining life of directly associated assets such as the 330kV switchyard, incoming and outgoing lines and the 330/220 kV transformers would be extended by TransGrid's decision to rebuild the existing switchyard.

PB also notes that the drive for the early replacement of the Beaconsfield 132 kV switchyard was associated with a number of design and/or manufacturing deficiencies with the un-proven equipment used at the time. PB would only expect a similar scenario to unfold as an exception, rather then a reasonable expectation given TransGrid's procurement practices with modern plant.

Cooma 132 kV substation replacement (Project ID 6194)

TransGrid has included an allowance of $40.0m (real 07/08) as part of its revised revenue in order to replace the entire 132kV switchyard at Cooma at a new site by 2013/14. The base cost for this project has been assigned into the proposed regulatory asset classes in the proportion of 6%, 85%, 5% and 4% for transmission lines (replacement), substations (replacement), secondary (replacement) and communications (replacement), respectively.

As part of PB's review of the revised proposal, it concluded[17]:

- the revised options analysis does not reasonably demonstrate that TransGrid's preferred option 1 (remote reconstruction option - Cooma North) is the most efficient option identified
- the revised option analysis, as undertaken by PB, indicates that option 3 (in-situ project package excluding busbars) is the economic option when supportable brownfield adjustments are included.

The scope of work for the recommended option includes property acquisition; civil works; building works; plant and procurement including one 132kV switchbay; one 132kV bus section; two 60MVA 132/66kV transformers; two 10MVA 66/11kV transformers; one 66kV transformer bay; one 8MVAr 66kV Capacitor bank; replacement of all secondary systems; and in-situ costs.

Given the comprehensive nature of the project, including the procurement and installation of new transformers, in PB's view, we can identify no basis for any component of this switchyard rebuild to adopt a life that is less than that which should apply if the assets were installed for augmentation purposes. Whilst the new plant is a component of a larger asset, it is the vast majority of the larger asset and the balance of equipment such as busbars are not of sufficient value in proportion to the new equipment to suggest that their future condition-based replacement would warrant the advanced replacement of the newer assets.

17 PB, TransGrid revised revenue reset - an independent review, March 2009, p. 24.

PB also highlights that TransGrid acknowledges that substation infrastructure items such as steel works, earth grids, foundations, and buildings are assumed to have a life expectancy in the order of 80-100 years[18], and that consideration of the deferral of the busbar replacements is indicative of the more granular treatment of TransGrid's assets than is recognised by the proposed replacement asset lives.

Wallerawang No. 1 & 2 transformers project (Project ID 5625)

TransGrid has included an allowance of $18.7m (real 07/08) as part of its revised revenue proposal in order to replace both the No 1 and 2 transformers at Wallerawang with new 375 MVA units by 2009/10. The base cost for this project has been assigned into the proposed regulatory asset classes in the proportion of 99% and 1% for substations (replacement) and secondary (replacement), respectively.

Given the transformer-based replacement nature of the project, in PB's view there is no basis for these transformers to adopt a life that is less than that which should apply if the assets were installed for augmentation purposes. In particular, and as recognised and accepted by TransGrid as part of its revised revenue proposal, transformers are large assets that could be refurbished and re-located.

Furthermore, PB also notes that TransGrid is also proposing to rebuild the 132 kV switchyard at Wallerwarang as part of its 2009-2014 forecast capex (Project ID 6208), and this further supports the expectation that these transformers will last for their entire technical life and at their originally installed location.

Newcastle Transformers Replacement project (Project ID 5622)

TransGrid has included an allowance of $8.4m (real 07/08) as part of its revised revenue proposal in order to replace three of the single phase transformer units with one new three phase unit at Newcastle by 2012/13. The base cost for this project has been assigned into the proposed regulatory asset classes in the proportion of 99% and 1% for substations (augmentation) and secondary (augmentation), respectively.

On this basis, this project is not affected by TransGrid's proposal relating to standard lives of replacement asset classes, and it also highlights an inconsistency in TransGrid's process of allocating projects into its asset classes.

2.3.3 Proposed replacement programs

TransGrid has included an allowance of $156.6m (real 07/08) as part of its revised revenue proposal to account for a series of replacement programs, as described in Table 2-3.

Table 2-3 – TransGrid's replacement program expenditure

Asset class	Number of programs	Capex, $m, (real 07/08)
Transmission lines & cables	9	24.8
Substations	33	95.0
Secondary systems	28	26.9
Communications	6	10.0
Total	76	156.7

Source: TransGrid's CAM model 21b.

18 TransGrid, Network 30 Year Asset Management Plan 2009-2039, p. 32.

PB considers each of TransGrid's defined asset classes in turn.

Transmission lines and cables

The majority of TransGrid's proposed capex is associated with wood pole replacements, and it is noted that TransGrid's approach is to replace these with concrete poles. TransGrid states that experience to date indicates that these assets perform well in service and a life in excess of 75 years could be realistically achieved[19].

There is also evidence as part of its documented strategies and through insights from detailed assessments, that TransGrid separates its consideration and treatment of poles, insulators and conductor replacements. Specifically the following observations are drawn from TransGrid's documented asset management strategies[20]:

- the replacement of wood-poles by a single steel or concrete pole structure provides an economic long-term life extension
- painting towers in coastal areas considerably extends the life of the asset
- insulator replacement projects can considerably extend the life of steel tower and pole lines
- with respect to conductor's, recent lines have been constructed with rubber clamp inserts and as such are expected to have much longer conductor lives.

In PB's view, these approaches indicate that component assets that comprise TransGrid's transmission lines will likely continue to operate 'in perpetuity' with ongoing renewal and refurbishment. Therefore, TransGrid's approach to transmission line replacement capex will most likely result in all the assets achieving lives similar to those associated with augmentation driven investment. This position is further supported by the tendency of TNSP's to place particular importance on maintaining existing easements for electricity transmission lines.

Substations

TransGrid's substation replacement programs comprise a series of targeted replacements for primary switchgear such as circuit breakers, instrument transformers, power transformers, disconnectors, ancillary equipment, as well as investment in buildings, back-up batteries, security fences, and fire protection systems, etc.

In principle, PB considers each of these items are reasonably stand alone and that new assets procured under modern, standardised processes should achieve technical asset lives consistent with the same plant procured for the purposes of augmentation projects. To support this position, PB highlights TransGrid's statements regarding circuit breakers that:

- modern SF6 circuit breakers are proving very reliable and need very little maintenance[21]
- online continuous condition monitoring systems are now available to monitor the condition and performance of all circuit breakers

Given these matters, PB expects that any new circuit breaker installed, irrespective of whether it is driven by replacement or augmentation needs, should achieve its expected technical life and only in exceptional circumstances will the circuit breaker not achieve its expected technical life.

With respect to the current transformers, TransGrid states that future replacement programs will be affected by an increasing use of SF6 insulated types that (and while they may develop some problems over time) are of an inherently safer design compared to conventional units. In

19 ibid, p. 81.

20 ibid, p. 36.

21 ibid, p. 56.

PB's view, such units should achieve their expected technical lives. Furthermore, evidence exists that indicates TransGrid has accepted the principle that a number of aged instrument transformers could be relocated to provide a service at a different location – the tendency would be for this principle to grow given that TransGrid is procuring new contemporary plant to a defined standard.

As a general comment, PB also acknowledges TransGrid's conclusions that historically the efficient approach to substation replacement has focussed on strategically replacing individual items as reliability, performance or safety issues have arisen, and that there are likely to be potential efficiencies in project delivery obtained by increasing the scope of work when the number of issues at a site increases over time[22]. However, PB also maintains that the vast majority of substation plant is reasonably discrete in nature and wide-scale advanced replacement of such assets is not reflective of prudent and efficient asset management practices.

PB also notes that substation-classified capex associated with material items such as environmental protection structures, disconnectors, surge arrestors, and batteries and charges included in this category are all discrete items focussed on existing sites where there is a locational and strategic initiative to maintain long term serviceable substations.

<u>Secondary systems</u>

Program related capex in this category is associated with protection and metering assets and fundamentally all expenditure in this category is replacement-based in nature, with only some minor capex allocated to the augmentation driven category for customer related protection changes.

In PB's view, while the standard life of either 30 or 35 years assigned to secondary systems is high for microprocessor based equipment which is typically expected to have a standard life of around 15-20 years[23], we recognise TransGrid's pragmatic approach of treating these devices in a discrete manner in that "*all relays will be assessed based on condition, performance, maintainability, spares availability and manufacturer support, and scheduled for replacement on a priority basis*"[24]. This suggests that there should not be any systematic expectation or reason for replacement driven units not to achieve the assigned life of augmentation driven units.

<u>Communications</u>

Program related capex in this category is associated with communications equipment that is all replacement-based in nature. While the standard life of augmentation driven communications assets is relatively long (35 years), PB has not identified any factors that lead us to expect that replacement driven expenditure should not achieve the technical life of augmentation-driven units given TransGrid's targeted asset management approach to this asset class.

2.3.4 Selected program reviews

PB reviewed a sample of ten of TransGrid's material replacement programs as part of its original review and provides the following comments in regards to some of the more expensive programs, as well as an informed opinion on whether the new assets are expected to achieve typical technical lives consistent with the augmentation category of asset lives.

22 ibid, p. 33.

23 ibid, p. 24.

24 ibid, p. 92.

Tx Replacement & Additions: Tx/Rx Fail/Replace (4884)

This capex is associated with procuring approximately six spare transformers to allow for the immediate replacement of units that fail in service. PB is of the view that these new transformers should achieve the technical life of similar units procured for the purposes of augmentation, especially given that they will not be placed into service.

Instrument Transformer replacements (4910, 5085, 5086, 5087)

TransGrid included a total of seven instrument transformer replacement programs as part of its forecast capex allowance. As part of PB's review, TransGrid identified that a proportion of the units it was proposing to replace were serviceable and could be used as spares or they could be relocated to other sites. In PB's view this provides evidence that replacement -driven assets could reasonably be expected to achieve the life of augmentation driven assets of a similar type.

SS Projects- Building: Subs building & property (5201)

The majority of this capex is associated with improving the oil containment bunding for transformer installations at a number of critical sites across the TransGrid network. PB is of the view that given this investment is associated with transformers at critical sites, it is reasonable to expect the technical life of the bunding to approach that assigned to augmentation driven assets. It is expected that good practice will ensure the bunding will be designed to accommodate any future replacement of transformers.

RTU (MITS MD1000) replacement – communications and control (4978)

The scope of the program covers the replacement of 275 Logica MITS MD1000 frames across 50 sites to a value of around $4.6m, where the age of the equipment is approaching 20 years. 100% of the base cost for this program has been assigned into the proposed regulatory asset class of communications (replacement).

TransGrid's documentation has not identified any units that were replaced prior to their expected technical life.

Given the high volume of frames being replaced, PB acknowledges that some of these may require advanced replacement in the future and potentially not achieve the technical life of similar units installed for augmentation purposes. However, given the standard-conforming nature of the replacement units, they could also be suitably adopted as spares for similar units. On this basis, PB concludes that TransGrid's proposal of reducing the life of the replacement units as a rule rather than as an exception appears unreasonable.

3. CONCLUSIONS

PB provides the following advice to the AER in relation to TransGrid's proposed treatment of the standard asset lives to be adopted for its replacement capex:

- in our view, the vast majority of capitalised replacement assets should achieve technical lives consistent with identical assets installed for augmentation purposes across the asset types defined by TransGrid
- minor expenditure that does not extend asset lives materially should not be classified as capex in accordance with TransGrid's capitalisation policy and expensed. PB considers this should adequately cover a large proportion of minor component replacements
- PB accepts that some minor components may require advanced replacement and this should be justified on a case by case basis in an economic manner. However, we consider this would be by exception as most modern, standardised assets will not require advanced replacement. Advanced replacement would be more applicable to the asset classes of secondary systems and communications, which include high labour and design costs
- TransGrid's proposed approach to depreciating all of its replacement assets for regulatory purposes appears disparate compared with its documented asset management plans and expectations for replacement assets – it targets replacements in a discrete manner at a low-level of asset class
- at a project and program level, TransGrid has not substantiated its systemic treatment of replacement assets in terms of allocating these to asset classes with lower standard asset lives through relevant and tangible examples

In providing the advice detailed above, PB also makes the following observations:

- generally, TransGrid is a prudent and contemporary asset owner and operator, adopting condition-based replacements which should tend to extend the lives of its assets
- PB considers that TransGrid selects and procures specialist electrical plant in accordance with well defined standards. Any systemic advanced replacement of such assets undermines TransGrid's asset management capabilities and suggest a critical weakness in TransGrid's approach that does not reconcile with PB's perspective of this business
- PB also maintains that the vast majority of substation plant is reasonably discrete in nature and wide-scale advanced replacement of such assets is not reflective of prudent and efficient asset management practices
- in considering the specific content of TransGrid's forecast capex replacement projects and programs over the 2009-2014 regulatory period, PB identified:
  - no evidence to suggest that the replacement assets would not achieve the typical technical life of similar augmentation driven assets
  - given the wholesale nature of the various switchyard rebuilds, the assets should achieve standard technical lives equivalent to augmentation asset lives
  - there was reasonable evidence that a number of the projects included augmentation assets
  - there were a number of examples where TransGrid is relocating transformers and switchgear to make use of serviceable equipment at alternative locations
  - the options analysis approach adopted by TransGrid clearly indicates it considers the condition and performance of each piece of equipment.

PB's advice and observations in respect of TransGrid's proposed treatment of new replacement assets has drawn upon our review of TransGrid's 2008 revenue proposal, and knowledge of TransGrid's asset management practices and plans gained through that review.