TRANSEND

APPENDIX 24

Sinclair Knight Merz, *Assessment of Economic Lives for Transend Regulatory Classes,* April 2008

TRANSEND

Assessment of Economic Lives for Transend Regulatory Asset Classes

- Final (Version 3.1)
- 29 April 2008

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Executive Summary

Transend asked SKM to:

> *Provide a report that includes an assessment of Transend's transmission equipment standard asset lives for each asset category. The lives must satisfy the National Electricity Rules that the depreciation profile reflects the nature of the assets (or category of assets) over the economic life of that asset (or category of assets).*

Transend has proposed 13 Regulatory Asset Classes (RAC) with three economic class lives: long term (60 years), medium term (40 or 45 years) and short term (3, 5, 10 or 15 years) as shown in Table 1. It is further proposed that each asset class be broken down into 83 asset categories.

Table 1 – Proposed Number of Asset Categories

Regulatory Asset Class	Economic class life	Number of Asset Categories
Transmission line assets	Long life (60)	6
	Medium life (45)	8
	Short life (10)	5
Substation assets	Long life (60)	5
	Medium life (45)	27
	Short life (15)	9
Protection and Control	Short life (15)	8
	Short life (3)	2
Transmission operations	Short life (10)	3
	Short life (3)	1
Other	Medium life (40)	1
	Short life (5)	5
	Short life (3)	3

In principle, SKM supports the approach adopted by Transend. In general, transmission utility asset classes have asset categories that can be clearly identified and accounted for and SKM has adopted this approach in other assignments; e.g. for the valuation of transmission substation bays.

The asset categories are summarised in Section 1.5. Detailed descriptions of the asset categories are found in Appendix A.

In carrying out the assignment, SKM reviewed Transend's Transmission System Management Plan 2006/11 and a sample of Asset Management Plans and held discussions with Transend staff. SKM also relied on knowledge obtained during other Transend assignments in relation to Transend's policies and practices in network design and specification of equipment and the design,

construction, maintenance and operation of the transmission network. Data from recent SKM assignments with transmission utilities that involved an assessment of asset economic lives and published data in Australian Energy Regulator (AER) determinations were also considered.

SKM considers that the asset category economic lives proposed by Transend satisfy the National Electricity Rules in that the proposed lives will provide depreciation profiles that reflect the nature of the asset categories.

Approach to the Assignment

1.1 The Assignment

Transend asked SKM to:

> *Provide a report that includes an assessment of Transend's transmission equipment standard asset lives for each asset category. The lives must satisfy the National Electricity Rules that the depreciation profile reflects the nature of the assets (or category of assets) over the economic life of that asset (or category of assets).*
>
> *In compiling this assessment, the following should be undertaken and reported on:*
>
> *1) review Transend's proposed regulatory asset lives;*
>
> *2) endorse the findings as meeting the requirements; or*
>
> *3) suggest any appropriate changes to standard asset lives with supporting justification based on industry practice, the Tasmanian environment and conditions and technological changes and improvements.*

The National Electricity Rules, Version 16, Section 6A.6.3 sets out the requirements for dealing with depreciation and economic life.

1.2 Approach

In carrying out the assignment, SKM compared Transend's Regulatory Asset Class (RAC) economic lives with other transmission utilities, asset valuation guidelines, AER determinations and CIGRE data.

The general approach was to assess, in some detail, the economic lives of key asset categories in each asset class taking into account:

- Transend's transmission system environment – climate, terrain, configuration;
- Transend's policies and practices in relation to the specification of equipment and the design, construction, operation and maintenance of the assets;
- Transend's asset replacement and refurbishment policies and practices; and
- data compiled by SKM for assignments with transmission utilities in all states and territories of Australia, New Zealand, South Africa, Philippines and Canada.

The outcomes of the detailed assessments of key asset categories were relied on as the basis for assessing the remaining asset categories in each asset class.

Activities included:

- review of the Transmission System Management Plan 2006/11;
- review of a sample of Asset Management Plans; and
- discussions with Transend staff.

Review of RAC Economic Lives

In general, the asset classes of transmission utilities can be broken down into asset categories that can be clearly identified and accounted for.

With the rapid expansion of networks following World War 2, utilities are now finding that significant portions of their networks are reaching the end of what was considered their economic lives.

However, retiring assets that have reached the end of their economic lives is proving difficult as the creation of new replacement assets is constrained by resource and environmental issues. As a result, utilities are looking increasingly at extending the life of existing assets. In many cases this can be achieved by replacing one or more asset categories that may have shorter economic lives than the parent asset. This has led to a number of utilities adopting asset categories as the basic unit so that asset categories that have been replaced can be recognised in the regulated asset base. Transend has proposed this approach.

The regulatory asset classes and categories together with the nominal economic lives proposed by Transend are set out in detail in Appendix A.

1.3 The Transend Environment

Section 1.3 reviews the operating environment for the Transend transmission system to assess whether there are any environmental conditions specific to Tasmanian that should be considered when comparing the Transend economic lives with other transmission utilities and asset valuation guidelines.

1.3.1 Climate/Terrain

It is considered that the range of climatic conditions experienced in Tasmania generally reflects conditions found in other transmission utilities.

The Tasmanian atmosphere is clean with little atmospheric pollution except for small areas around major industrial areas and some easements in coastal areas in the North-West. This, coupled with good rainfall, provides a good natural environment for the transmission system.

In general terms, the terrain provides no significant transmission system construction or maintenance issues. In some areas access to Transend's assets is difficult. However this should not affect the economic lives of the assets in these areas.

It is concluded that, when considering climate and terrain, the Transend assets should have economic lives at least as long as found generally in other transmission utilities.

1.3.2 Transmission System Configuration

Transend's planning criteria for transmission system reliability and security and its policies and practices for the specification of plant and equipment and the design, construction, maintenance and operation of transmission assets reflect good industry practice.

It is concluded that, in considering the Transend transmission system configuration, there are no issues specific to the Transend transmission system that would impact Transend economic lives when compared with other transmission utilities.

1.4 Asset Management Plans

Transend produces annually a Transmission System Management Plan (TSMP). In addition, Transend has produced a set of Asset Management Plans (AMPs) for specific asset categories.

The TSMP addresses all aspects of asset management. It includes a section on Transmission System Management that sets out asset management principles and policies, transmission system management and development processes and asset management drivers. In general, maintenance and refurbishment/replacement programs are driven by asset condition assessment and asset performance.

A list of Transend's AMPs is found in Appendix B.

The AMPs set out:

- Asset details – age profiles and condition assessment;
- Risk management – analysis and mitigating strategies;
- Demand analysis – planned augmentations;
- Life-cycle management plans; and
- Estimates of future Opex and Capex requirements.

The AMPs provide an overview of the condition of Transend's assets and future directions for asset management. It is considered that they reflect good industry practice. The documents will need to be revised regularly to account for new assets as they are installed on the network and as the existing assets age and are refurbished or replaced.

1.5 Assessment of Transend RAC Economic Lives

This assessment of the proposed transmission RAC economic lives is based on a review of the TSMP – 2006/11 and the sample of AMPs for key asset categories, a comparison with the practices of other transmission utilities and SKM's experience in similar assignments.

Transend proposes three economic lives; long life, medium life and short life for application to all asset classes on the transmission network. The proposed economic life of long life asset classes is 60 years. For the medium life class the proposed economic life is 40 or 45 years. For the short life class the proposed economic life varies between 3 and 15 years.

1.5.1 Transmission Lines

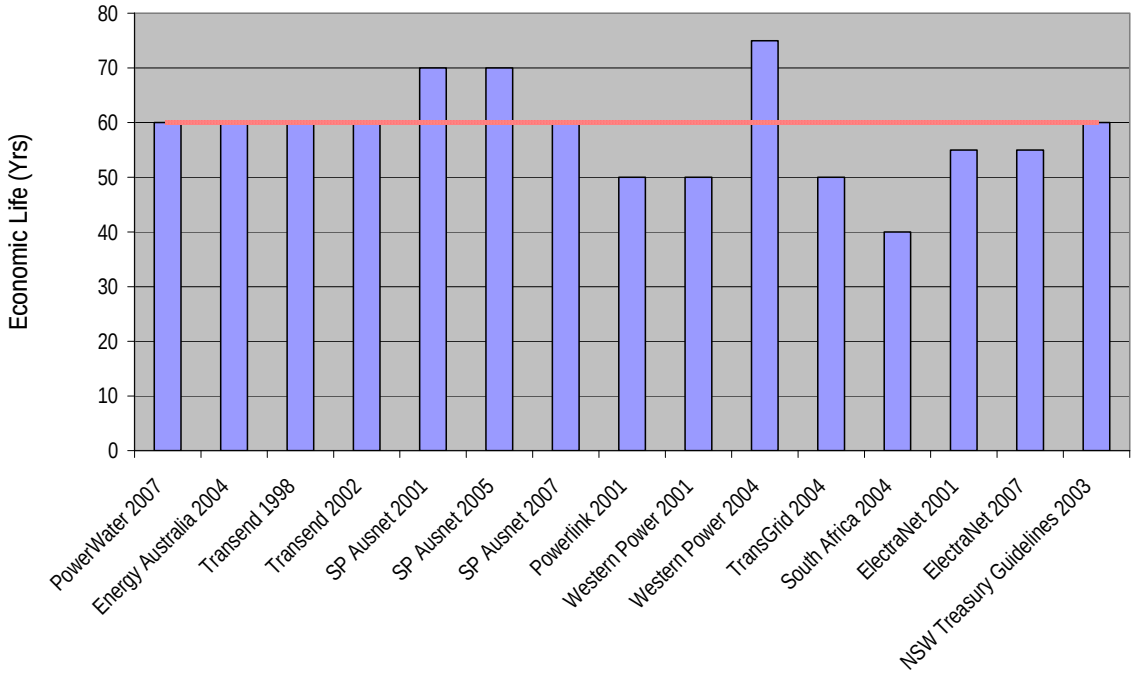
The Regulatory Asset Classes economic lives proposed by Transend for the overhead transmission lines are shown in Table 2. Further details are shown in Appendix A.

Table 2 – Transmission Line RAC Economic Lives

Regulatory Asset Class (RAC)	Regulatory Asset Category – (RACT)	Economic Life (yrs)
Transmission Line		
Long Life	▪ Tracks ▪ Support structures – steel ▪ Foundations ▪ Conductor ▪ Earthwire including OPGW (Optical Fibre Ground Wire)	60
Medium Life	▪ Support Structures – wood ▪ Galvanised steel earthwires ▪ Bridges for access tracks ▪ Insulator assemblies ▪ Dampers ▪ ADSS – All-dielectric, self supporting optic fibre	45
Short Life	▪ Anodes ▪ Gates, locks and keys ▪ Markers ▪ Weather stations ▪ Tension monitors	10

The current Transend regulatory decision (2004 – 2009) adopts a life of 60 years for steel tower transmission lines and all steel tower transmission line categories. This reflects the practice of several transmission utilities, refer Figure 1.

- **Figure 1 – Utility Economic Lives – Steel tower transmission lines**



Transend has proposed that the steel tower transmission lines assets be broken down into three RACs with economic lives of 60, 45 and 10 years. Each RAC contains asset categories that have the same economic life.

It is noted that CIGRE Study Committee B2 supports this view. In a paper (Reference 265) "Life Cycle Assessment (LCA) for Overhead Lines – WG B2.15", December 2002, it is stated:

- *The lifetime of steel towers was indicated between 40 and 100 years.*
- *A survey among members of WG 15 showed that the lifetime of insulators is estimated as between 35 and 70 years. The same may be supposed for fittings.*
- *The lifetime of conductors and earthwire may be estimated to be approximately 60 years (ACSR, AAAC and similar) provided vibrations or other destructive phenomena do not occur or are suppressed.*

In principle, SKM supports the approach adopted by Transend for asset classes that have asset categories that can be clearly identified and accounted for and has adopted it in other assignments; e.g. for the valuation of transmission substation bays.

1.5.1.1 Long life asset class – overhead transmission lines

Transend has proposed economic lives of 60 years for foundations, steel structures, conductor and earthwire (ACSR, AAAC or similar).

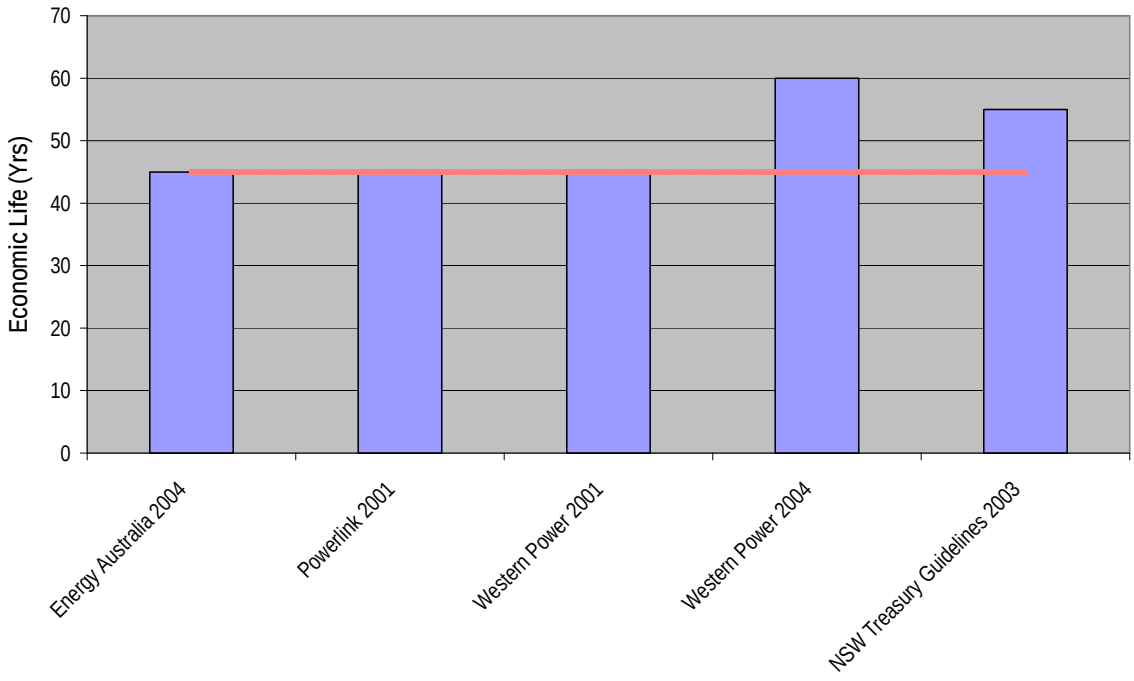
The economic lives proposed for the transmission line long life asset category are considered appropriate compared with other utilities and are supported by data available in the TSMP – 2006/11, the sample of AMPs reviewed and the CIGRE paper.

1.5.1.2 Medium life asset class – overhead transmission lines

Wood pole structures

Transend has proposed an economic life of 45 years for wood pole structures. This reflects the practice of most transmission utilities with wood pole structures, refer Figure 2.

- **Figure 2 – Utility Economic Lives – Wood pole transmission lines***



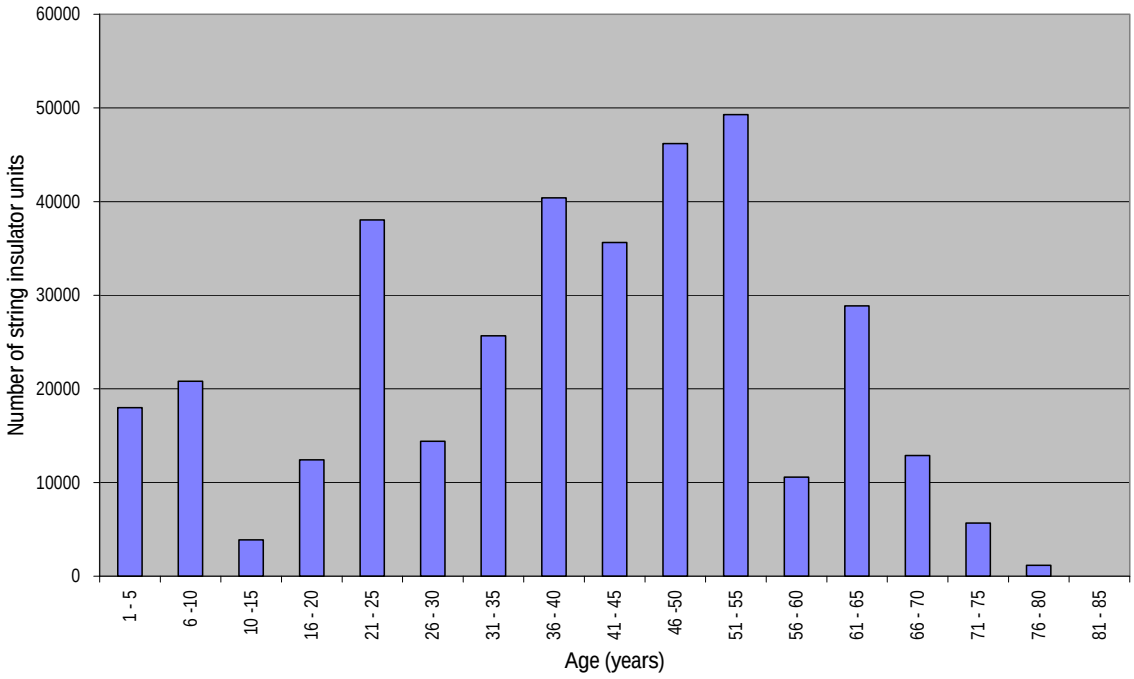
* Note that the NSW Treasury Guidelines specify an economic life of 55 years for dry conditions and 45 years for wet conditions.

Insulator assemblies

Insulator assemblies are made up of string of insulator units (13 insulators for 220 kV circuits and 7 insulators for 110 kV circuits) and associated conductor and tower attachment hardware fittings. In general, the hardware fittings reflect the condition of the insulators on a line.

Transend has approximately 360,000 insulators on their network. The age profile for insulators is shown in Figure 3. Forty-two percent of the insulator population is aged over 45 years. Fourteen percent of the population is aged over 60 years. This is typical of an asset with an economic life of 60 years.

- **Figure 3 – Age profile for insulators**



Transend has proposed an economic life of 45 years for insulator assemblies. This is based on ongoing condition assessments of its transmission lines that resulted in Transend replacing a significant number of insulators over the past few years. In addition, it is understood that Transend plans to replace approximately 90,000 insulators over the next 4 to 5 years. This will reduce the number of insulators aged over 45 years to less than 30% of the population and replace all of the insulators aged over 60 years. The result will be an insulator age profile that reflects an economic life of the order of 45 years.

Taking into account the relatively high insulator replacement rate programmed for the next 4 to 5 years as a result of condition assessment, it is considered that an economic life of 45 years is appropriate for insulator assemblies.

Dampers

No assessment was made for dampers. However, based on Transend's experience with insulator assemblies and SKM's experience an economic life of 45 years is considered appropriate.

Galvanised steel earthwires

Transend has proposed an economic life of 45 years for galvanised steel earthwires. It is understood that this is in response to the ongoing replacement programmes for galvanised steel earthhwires on the Transend network. No assessment was made for galvanised steel earthwires. However, based on SKM's experience an economic life of 45 years is considered appropriate.

1.5.1.3 Short life asset class – overhead transmission lines

These assets categories represent minor plant and equipment. A 10 year economic life is considered appropriate.

1.5.2 Transmission cables

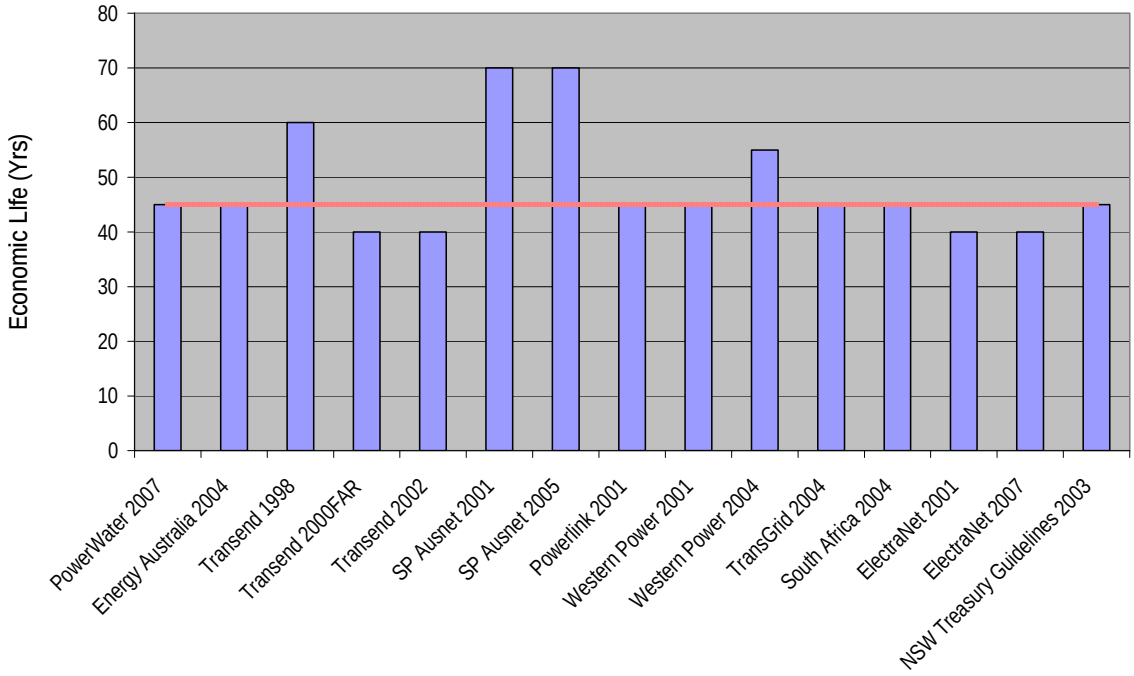
The Regulatory Asset Classes economic life proposed by Transend for transmission cables are shown in Table 3. Further details are shown in Appendix A.

Table 3 – Proposed Transmission Cable RAC Economic Lives

Regulatory Asset Class (RAC)	Regulatory Asset Category – (RACT)	Economic Life (yrs)
Transmission Cables Medium Life	▪ Transmission cable ▪ OPUC – (Optical fibre underground cable)	45

Figure 4 shows the economic lives used by the various transmission utilities for transmission cable compared to the life proposed by Transend.

- **Figure 4 – Utility Economic Lives – Transmission Cables**



The economic lives proposed for the transmission cables category is considered appropriate when compared with the practices of other utilities and are supported by data available in the TSMP – 2006/11 and the Power Cable AMP.

1.5.3 Transmission Substations

The Regulatory Asset Classes economic lives proposed by Transend for transmission substations are shown in Table 4. Further details are shown in Appendix A.

Table 4 – Proposed Transmission Substations RAC Economic Lives

Regulatory Asset Class (RAC)	Regulatory Asset Category – (RACT)	Economic Life (yrs)
Transmission Substation		
Long Life	■ Foundations ■ Structures ■ Grounds ■ Oil containment system ■ Cranes	60
Medium Life	■ Switchyard bays ■ Grounds and buildings (including fences) ■ Power transformers, reactors ■ Instrument transformers ■ Switchgear ■ Earthing transformers ■ Switchboard panels ■ String insulators ■ Detuning and damping reactors, fuses switches, wave traps	45
Short Life	■ Security systems ■ Heating, ventilation, air conditioning ■ DC supply systems ■ Fire protection systems ■ Operational equipment	15

The current Transend regulatory decision (2004 – 2009) adopts a life of 50 years for transmission substation categories not including protection and control.

1.5.3.1 Long life asset class –transmission substations

Foundations and structures

The adoption of a 60 year economic life for substation foundations and major structures represents a consistent approach to the economic lives for all major steel structures and foundations on the Transend transmission network and is considered appropriate.

Other

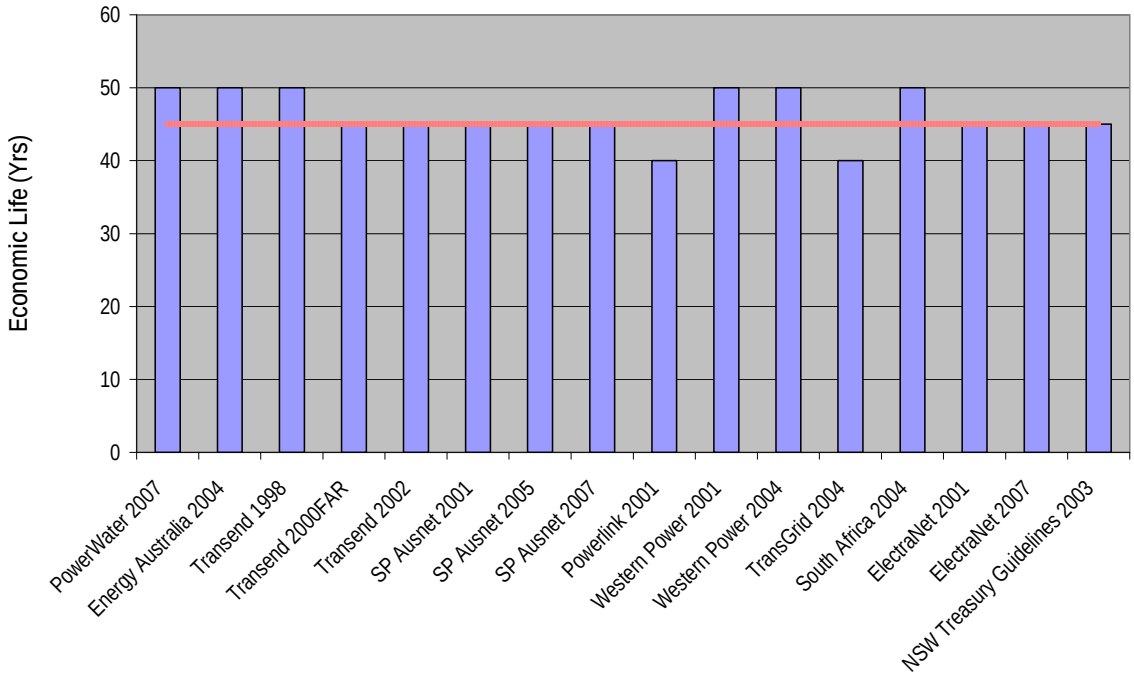
The other asset categories in this class represent civil works and the proposed economic lives are considered reasonable.

1.5.3.2 Medium life asset class – transmission substations

Power Transformers

Figure 5 shows the economic lives used by the various utilities for power transformers compared with the economic life proposed by Transend.

- **Figure 5 – Utility Economic Lives – Power Transformers**



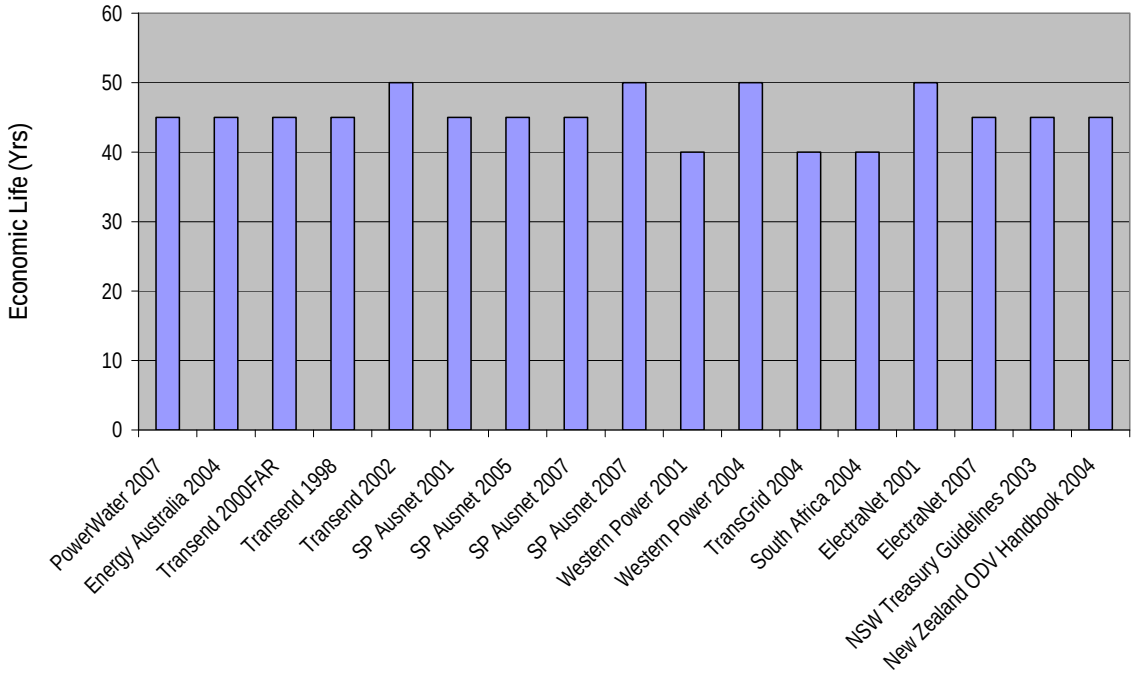
The economic life proposed for the power transformers is considered appropriate when compared with the practices of other utilities. The current age profile and a programme to overhaul or replace two to four transformers over the next few years support the proposed economic life of 45 years for power transformers.

Substation Bays

In general, utilities apply the same substation bay economic life to all asset categories that make up the substation bay including the supply and erection of electrical equipment and associated foundations and support structures. It is noted that the supply and erection of the electrical equipment represents the greatest proportion of the capital value of a substation bay.

Figure 6 shows the economic lives used by the various utilities for substation bays.

- **Figure 6 – Utility Economic Lives – Substation Bays**



As shown in Figure 6 economic lives of between 40 and 50 years are generally adopted by transmission utilities.

Table 5 shows the percentage of key substation bay categories aged over 40 and 50 years.

- **Table 5 – Percentage of key substation asset categories aged over 40 and 50 years**

Substation Category	Age > 40 years	Age > 50 years	Data source	Comment
Circuit breakers	16%	0	TSMP	
Current transformers	18%	0	AMP	5% age > 45 years
Voltage transformers	10%	1%	TSMP	

CIGRE also indicates an economic life for circuit breakers of 40 years. In the CIGRE paper (Reference 165) "Life Management of Circuit Breakers" WG 13.08 – August 2000, it is stated;

> *Due to low capital cost and operating cost levels of new equipment, life extensions beyond 40 years are exceptional. Obsolete technology, the lack of spare parts, tools and know-how, and the relatively low availability also contribute to the choice for replacement rather than refurbishment.*

The proposed economic life of 45 years for equipment supply and erection is considered reasonable taking into account age profiles of the key substation bay asset categories and the programs proposed in the TSMP 2006/11 and Current Transformer AMP for the enhancement and replacement of aged and defective assets. The proposed economic life of 45 years also reflects the practice of other transmission utilities.

1.5.3.3 Short life asset class – transmission substations

Transend has proposed an economic life of 15 years for a range of substation categories including security systems, heating, ventilation and air-conditioning, fire protection and operational equipment. SKM understands that economic lives of 15 years for these asset types reflect ordinary business practice and the economic lives proposed are considered appropriate.

1.5.4 Substation Protection and Control

The Regulatory Asset Classes economic lives proposed by Transend for substation protection and control are shown in Table 6. Further details are shown in Appendix A.

- **Table 6 – Proposed Protection and Control RAC Economic Lives**

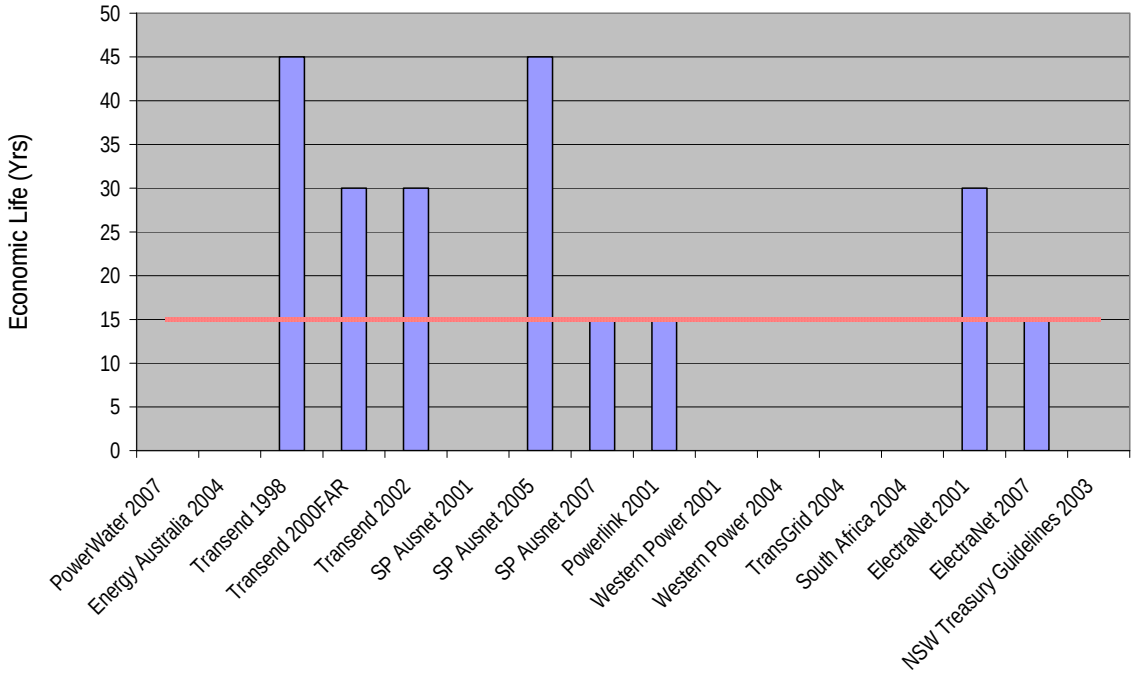
Regulatory Asset Class (RAC)	Regulated Asset Category – (RACT)	Economic Life (yrs)
Protection and control Short Life	▪ Protection and control schemes ▪ Metering ▪ Monitoring ▪ SCADA ▪ Telecommunications	15
	▪ SCADA HMI ▪ Interrogation PCs and test equipment	3

The current Transend regulatory decision (2004 – 2009) adopts a life of 15 years for substation protection and control.

1.5.4.1 Short life (15 years) – protection and control

Figure 7 shows the economic lives used by the various utilities for protection and control compared with the economic life proposed by Transend. It indicates that a number of utilities adopt the same economic life that is used for the substation bay. Where no economic life is shown for a utility it is assumed that they also use the substation bay economic life for protection and control.

- **Figure 7 – Utility Economic Lives – Protection and Control**



Economic lives of between 30 and 45 years reflect the older electro-mechanical relay technology. Recent trends in protection and control schemes for both new projects and replacement of existing electro-mechanical relays has been to systems using digital technology with in-built intelligence. Industry practice for digital technology is to adopt an economic life of 15 years. The trend to digital technology is reflected in Figure 7 where SP AusNet, Powerlink and ElectraNet now use an economic life of 15 years.

Transend has adopted these practices and the bulk of their protection and control schemes are either static or micro-processor technologies.

Transend's proposal to adopt an economic life of 15 years for protection and control, metering, monitoring, SCADA NOCS and telecommunications schemes reflects industry practice and is considered appropriate.

1.5.4.2 Short life (3 years) –protection and control

Transend has proposed an economic life of 3 years for computer based equipment associated with SCADA and test equipment. This reflects ordinary business practice and is considered appropriate for these asset categories.

1.5.5 Other Assets

1.5.5.1 Medium life asset class – non-network buildings

This category includes control centre buildings, office buildings, archive buildings and houses on Transend land but does not include substation buildings.

The current Transend regulatory decision (2004 – 2009) adopts a life of 40 years for buildings

SKM understands that the economic lives of 40 years for these asset types reflect ordinary business practice and are therefore considered appropriate for these asset classes.

1.5.5.2 Short life asset class – information technology systems

This category covers the corporate computer network, IT systems and personal computers.

The current Transend regulatory decision (2004 – 2009) adopts a life of 3 years for this category.

SKM's advice is that the economic lives of 3 years for these asset types reflect ordinary business practice and are therefore considered appropriate for these asset classes.

1.5.5.3 Short life asset class – operational information systems

This category covers software, operational information systems and asset management information systems. Transend proposes economic lives of 10 years for these asset categories.

SKM's advice is that the economic lives of 10 years for these asset types reflect ordinary business practice and are therefore considered appropriate for these asset classes.

1.5.5.4 Short life asset class – hardware

This category covers computer based hardware. Transend proposes an economic life of 3 years for this asset category.

SKM's advice is that the economic lives of 3 years for these asset types reflect ordinary business practice and are therefore considered appropriate for these asset classes.

1.5.5.5 Short life asset class – general

This category covers mobile telephones, office equipment and furniture, motor vehicles and trailers.

The current Transend regulatory decision (2004 – 2009) adopts a life of 5 years for this category.

SKM's advice is that the economic lives of 5 years for these asset types reflect ordinary business practice and are therefore considered appropriate for these asset classes.

Appendix A Proposed RACs and Nominal Economic Lives

A.1 Proposed Regulatory Asset Classes

Regulatory Asset Class (RAC)	Economic Life (yrs)	RAC
Transmission line assets - long life (60)	60	TL60
Transmission line assets - medium life (45)	45	TL45
Transmission line assets - short life (10)	10	TL10
Substation assets - long life (60)	60	SS60
Substation assets - medium life (45)	45	SS45
Substation assets - short life (15)	15	SS15
Protection and control - short life (15)	15	PC15
Protection and control - short life (3)	3	PC03
Transmission operations - short life (10)	10	TO10
Transmission operations - short life (3)	3	TO03
Other - medium life (40)	40	OT40
Other - short life (5)	5	OT05
Other - short life (3)	3	OT03
Land	n/a	LB

A.2 Proposed Economic Lives

RAC	Financial Asset Category (FAC)	Asset Breakdown Structure (ABS)	Regulatory Asset Category (RACT)	RACT Definition
			TRANSMISSION LINE	
TL60	TLI	TL	Transmission Lines (TL)	*including* labour & material, (was Tower Line) that is specific to the implementation of each transmission line and its components. Generally includes labour and material for foundations, tower erection, and transmission line stringing. "Transmission lin
TL60	TAT	TRA	TL - Tracks	*including* labour & material; tracks
TL60	TWW	SS	TL - Support Structure - steel	*including* labour (erection) & material; towers, poles, steelwork only
TL60	TLF	FND	TL - Foundations	*including* labour & material; concrete, reinforcing, leg, (not including anode)
		CONA	***CONDUCTOR ASSEMBLY***	
TL60	CON	SEC, ISF	TL - Conductor	*including* labour (stringing) & material; conductor, conductor clamps (AGSU, dead-end, strain or suspension clamp) and in-span fittings (mid-span joint, mid-span repair fitting)
TL60	TLE (OPGW)	UGEW, OHEW, OPGW	TL - Earth Wire including OPGW	*including* labour & material; underground and Aluminium overhead earthwire, and OPGW

RAC	Financial Asset Category (FAC)	Asset Breakdown Structure (ABS)	Regulatory Asset Category (RACT)	RACT Definition
			TRANSMISSION LINE	
TL45		SS	TL - Support Structure - wood	*including* labour & material; wood H-poles, wood poles (including cross-arm)
TL45			TL - Galvanised Steel earth wire	*including* labour & material; Galvanised Steel (GZ) overhead earthwire
TL45		BRI	TL - Bridges	*including* labour & material; bridges on access tracks
			INSULATOR ASSEMBLY	
TL45	TLIN	INSA, WEIG	TL - Insulator assembly	*including* labour & material; insulator assembly, including string insulator, clips, shackles and weights
TL45		DAMP	TL - Damper	*including* labour & material; damper
			TRANSMISSION CABLE	
TL45	TUC	TC	TL - Transmission Cable (TC)	*including* labour & material; that is specific to the implementation of each Transmission Cables (power cable above 33 kV) and its components, such as pressure cylinders, cable section (CASE), cable joints, terminations (CTER), link boxes and conduits. (th
TL45	ADSS	ADSS, PWC	TL - ADSS (Optical Fibre - All-dielectric self-supporting)	*including* labour & material; all-dielectric self-supporting optical-fibre cable, and pilot-wire cables.
TL45			TL - OPUC (Optical Fibre Underground Cable)	*including* labour & material; optical fibre underground cables, including splice boxes
			TRANSMISSION LINE	
TL10		ANOD	TL - Anode	*including* labour & material; anode
TL10	TLA	GATE, LOC, KEY	TL - Access and ID	*including* labour & material; fences, gates, locks, keys, signage
		ISF	TL - Markers	*including* labour & material; aircraft marker ball, bird warning marker
			REAL-TIME MONITORING EQUIPMENT	
TL10	TWS	WEAT	TL - Weather Stations	*including* labour & material; weather station (includes weather stations located within substations)
TL10	TLM	TENM	TL - Tension monitors	*including* labour & material; tension monitor

RAC	Financial Asset Category (FAC)	Asset Breakdown Structure (ABS)	Regulatory Asset Category (RACT)	RACT Definition
			GROUNDS AND BUILDINGS	
SS60		PLI	SS Foundations	*including* labour & material; to be listed as transformer, capacitor bank and bay specific; for each transformer and capacitor bank plinth, together with civil foundations for each bay's devices, such as pedestals and support structures and substation towe
SS60		TWR	SS Structures	*including* labour & material; major bus structures and line termination towers, but excluding pedestals and support structures for individual primary devices
SS60	SGS	ARTT, BOLL, CDUC, SEWR, TUNN, WASU, EAGB	SS Grounds	*including* labour & material; site specific; for access tracks, transformer tracks and driveways, bollards, concrete cable ducts, sewerage, storm-water, tunnels, water supply, grounds - earthworks, gravel surfacing, landscaping, underground earth-mat - but
SS60	BUN	BLA, NOIS, OILS, CRAN	SS Oil containment system	*including* labour & material; site specific; for blast wall, noise containment, oil separation tank and oil bunding
SS60	CRN		SS Cranes	*including* labour & material; cranes

RAC	Financial Asset Category (FAC)	Asset Breakdown Structure (ABS)	Regulatory Asset Category (RACT)	RACT Definition
			SUBSTATION BAY	
SS45	SWE, SWO	BAY	Bay (**)	*including* labour and material; that is specific to each bay eg. device prefixes A1, A2, A4, A5, A6, A7, A8. Includes implementation costs of primary equipment and earthing system within bay, excluding Station Services Transformer, Power Transformer or Ca
			GROUNDS AND BUILDINGS	
SS45	NBD	INFR	SS Buildings (was Network Buildings)	*including* labour & material; site specific; for each substation building including high bays, but excluding air-conditioning/heating systems and indoor cable tray
SS45	FEN	SFGT, FENC, GATE	Fences and gates	*including* labour & material; site specific; security fence and gate, includes plinth, but excludes powered fencing
			OTHER ASSETS	
SS45	BUS	BCON, BBAR, COMF, RBB, SCON	Busbar and conductor (**)	*including* labour & material; site and bay specific for bay conductor, includes rigid or strung conductor, and compression or bolted fittings. Site, voltage and bus specific for busbar, includes rigid or strung busbar, and compression or bolted fittings
SS45		NET*, NER*	Earthing transformer	*including* labour & material; neutral earthing transformer, reactor and resistor
SS45	SWI	PAN	Switchboard panels - HV (6.6, 11, 22 & 33 kV) (**PN)	*including* labour & material; for HV & GIS switchboard panel (effectively each 'bay'); *excluding* separately listed major plant and associated protection and control - feeder scheme
SS45	IES	INSP	Post Insulators	*including* labour & material; support structure for free-standing post insulators
SS45	PCB	**PC	Power Cables (**PC)	*including* labour & material; power cables greater than 1 kV to 33 kV
SS45		INST	String Insulators (**)	*including* labour & material; string insulator
SS45	SDV	**SD	Surge Diverters (**SD)	*including* labour & material; for surge diverters; support structure, comprising three (3) x single phase units
SS45			***AC SUPPLY SYSTEM***	
SS45	SST	TFSS - ST**	Transformers - Station Service (ST**)	*including* labour and material; for station services transformer
SS45	SDG	GEN	Generator	*including* labour and material; for standby diesel generator
SS45		ACDB, LTAP, DCAC, LVC	AC Supply system	*including* labour & material; site specific; AC switchboard, light and power distribution system, DC/AC inverters and LV supply cables
SS45	ADC	DCSB, DCDC,	DC Supply System	*including* labour and material; site specific; DC fuse-switchboard, DC distribution board, DC/DC converter, but *excluding battery and* battery charger (separate listing)

RAC	Financial Asset Category (FAC)	Asset Breakdown Structure (ABS)	Regulatory Asset Category (RACT)	RACT Definition
			AIR SYSTEM	
SS45	ASS	COMP, PRRV, REC,	Air Supply System	*including* labour & material; site specific; air compressors, pressure valves (reducing, release), receivers, control system
			EARTHING SYSTEM	
SS45	ERS	EABG, LIMA, OHEW	Earthing systems	*including* labour & material;site specific; above-ground earthing, lightning masts, overhead earth-wire (substation) - but excluding underground earth-mat (separately listed within SS grounds)
			REACTIVE COMPENSATION SYSTEM	
SS45		DEDR, REAC, L**	Detuning and Damping Reactors (L*)	*including* labour and material; for each reactor; support structure, comprising three (3) x single phase units
SS45	RCT	C**	Shunt Capacitors (C*)	*including* labour and material; for each capacitor; support structure, comprising a 3 phase bank of capacitor cans
			SWITCHGEAR	
SS45	CBK	**52	Circuit Breakers (**52; CB)	*including* labour & material; for circuit breaker; support structure, including bushing CTs in DTCB
SS45	DIS	**29/**31	Disconnectors and earth switches (**29/**31; DS/ES)	*including* labour & material; support structure, isolators, earth switches, disconnectors, and post insulators, also including free-standing earth switches
SS45		**89 or **29, FUSE	Fuse-switch (**89; FS)	*including* labour & material; for fuse-switch panel; including fuse
			POWER TRANSFORMER	
SS45	PWT	T**, CONM, CONT, COOL, MECH, T84T, TNNT	Transformers - Network and Supply (T*)	*including* labour and material; for each transformer, includes transport and on-site assembly cost; includes condition monitoring, control system, cooling equipment, mechanical protection, tap changer, and transformer bushings
			INSTRUMENT TRANSFORMER	
SS45	CLT	**CC	Carrier Coupling Capacitor (**CC)	*including* labour & material; for carrier coupler; comprising two (2) or three (3) x single-phase units
SS45	CRT	**96	Transformers - Current (**96; CT)	*including* labour & material; for free-standing current transformer; comprising three (3) x single-phase units
SS45	VLT (CVT)	**97	Transformers - Voltage (**97;VT)	*including* labour & material; for voltage transformer (VT); comprising three (3) x single-phase units, electromagnetic VT and CVT units
SS45		**96/97	Transformers - Combined voltage and current transformer (**96/97; CVCT)	*including* labour & material; for combined voltage and current transformer; comprising three (3) x single-phase units
SS45	TLW	WAVT-**	Wave-trap (**WT)	*including* labour & material; for wave-trap; comprising two (2) or three (3) x single-phase units

RAC	Financial Asset Category (FAC)	Asset Breakdown Structure (ABS)	Regulatory Asset Category (RACT)	RACT Definition
			GROUNDS AND BUILDINGS	
SS15	SCS	INDE, SEEA, SEVD,	Security Systems	*including* labour & material only; site specific; for security electronic (SEEA) systems, including intruder detection (INDE), access control, powered fencing and video surveillance (SEVD)
SS15		HVAC, CTRA	Heating, Ventilation, Air-conditioning	*including* labour & material only; site specific; for heating, ventilation and air-conditioning and all cable-trays
			DC SUPPLY SYSTEM	
SS15	BAT	BATT	Battery (B*)	*including* labour and material; site specific; battery racks and cubicle
SS15	BCH	BACH	Battery charger (BC*)	*including* labour and material; site specific; battery chargers
			FIRE PROTECTION SYSTEM	
SS15	FDS	FIDE	Fire detection system	*including* labour & material; site specific; for fire detection systems, eg. VESDA
SS15	FEX	FIEX	Fire extinguishers	*including* labour & material only; site specific; for fire extinguishers and fire-fighting equipment
SS15		FIME	Fire suppression system	*including* labour & material; site specific; for fire suppression system, includes fire mains; gas or deluge systems
			OPERATIONAL EQUIPMENT	
SS15	PEG	PGEN	Portable Emergency Generators	*including* labour and material
SS15	PTE	ERLD, MART, OPSI, OPST, POBO, PVDT, ROPE, SIGN	Operational Equipment and Tools	*including* labour and material; site specific; for earth lead, maintenance and repair tool, operational sign, operational stick, portable bollard, portable voltage detection (Modie-wark), rope, sign, eg. SF6 gas-filling & detection equipment, SF6 gas stora

RAC	Financial Asset Category (FAC)	Asset Breakdown Structure (ABS)	Regulatory Asset Category (RACT)	RACT Definition
PC15		PC	P&C Scheme (**)	*including* labour and material; that is specific to each bay eg. device prefixes A1, A2, A4, A5, A6, A7, A8; Includes implemtentation costs of secondary equipment within scheme, including control cables. Includes transmission line, feeder, transformer HV
PC15	SBB	SCBZ	P&C Scheme - Bus zone	*including* labour & material; site and bus specific; bus zone scheme - integrated CB fail protection and control cables
PC15	SPU	SCLS	P&C Scheme - Load Shedding	*including* labour & material; site specific; under frequency scheme (UFLS) and control cables
PC15		SCME	P&C Scheme - Metering	*including* labour & material; site specific; metering panels (wholesale) and control cables, normally excludes meters
PC15		SCMO	P&C Scheme - Monitoring	*including* labour & material; site specific; monitoring equipment and control cables, Integrated Data Monitors (IDM) & stand-alone fault locators
PC15	SPS	SCSP	P&C Scheme - Special Protection Schemes	*including* labour & material; site specific; *SSPS, NCSPS, FCSPS, BNCSPS* and associated control cables
PC15	SCA (RTU)	SCAD	P&C Scheme - SCADA	*including* labour & material; site specific; SCADA - RTU hardware and control cables, excludes RTU devices installed in parent scheme's panels.
PC15	MPLX		P&C Scheme - Telecommunications	*including* labour & material; site specific; Transend telecommunications termination equipment for telecommunications bearers (eg OPGW, ADSS, PLC and microwave, including WAN)
PC03	SCAH (RTAH)	SCHM	P&C - SCADA HMI	*including* labour & material; site specific; desktop or industrial PCs for local station control
PC03		SCTE	P&C - Interrogation PCs & test equipment	*including* labour & material; portable equipment; laptops and test equipment

RAC	Financial Asset Category (FAC)	Asset Breakdown Structure (ABS)	Regulatory Asset Category (RACT)	RACT Definition
TO10	NOC		NOCS software	*excluding* hardware
TO10			Operational Information Systems	*including* PROMS, DMS (Drawing Management System), RIS (Rating Information System), ODS (Operational Diagram Systems), TRCalc (real-time ratings), Thermal Rating Calculator
TO10	AMIS		AMIS (Asset Management Information System)	*excluding* hardware
TO03	NOCH		NOCS hardware	*including* PCs, servers and networking equipment
OT40	BLD		Non-network buildings	*including* system control centre building, office buildings, archives building, houses on Transend land, *and* *excluding* substation buildings
OT	LEAS		Leasehold improvements	*including* building improvements, for life of lease
OT05	MOT		Mobile telephones	
OT05	OEQ		Office equipment	
OT05	OFF		Office furniture	
OT05	MVH		Motor vehicles	
OT05	TRL		Trailers	
OT03	CCN		Corporate computer network	
OT03	ITS		IT systems	
OT03	PCO		Personal computers	
LB	SLD	LAND	Network Land	Land for Substations or to secure transmission line easements
LB	NSL		Non-Network Land	Land for Administration and/or Storage purposes

Appendix B Transend Asset Management Plans

Document No.	Title	Rev No.	Issue Date
TNM-SY-808-0221	Circuit Rating and Weather Monitoring System	0.1	Nov-06
TNM-SY-808-0220	Transmission Line Conductor Assemblies	2.0	Jul-07
TNM-SY-808-0223	Transmission Line Support Structure - AMP	2.0	Jul-07
TNM-SY-808-0219	Transmission Line Insulator String Assemblies	1.1	Nov-06
TNM-SY-808-0218	Transmission Line Support Structure Foundations - AMP	2.0	Jul-07
TNM-PL-809-0602	Power Cable Asset Management Plan	0.1	Sep-07
TNM-PL-809-0603	AC Distribution System Asset Management Plan	0.1	Sep-07
TNM-PL-809-0604	Capacitor Bank Asset Management Plan	0.1	May-06
TNM-PL-809-0605	Current Transformer Asset Management Plan	0.5	Sep-07
TNM-PL-809-0606	Disconnector and Earth Switch Asset Management Plan	0.3	May-06
TNM-PL-809-0607	Substation Lightning Protection Systems Asset Management Plan	0.1	Sep-07
TNM-PL-809-0608	Gas-insulated Switchgear Asset Management Plan	0.1	Sep-07
TNM-PL-809-0609	Structures and Busbars Asset Management Plan	0.1	May-06
TNM-PL-809-0610	Post Insulator Asset Management Plan	0.1	Sep-07
TNM-PL-809-0611	High Voltage Switchgear Asset Management Plan	0.1	Sep-07
TNM-PL-809-0612	Supply Transformer Asset Management Plan	0.1	May-06
TNM-PL-809-0613	Surge Arrester Asset Management Plan	0.1	May-06
TNM-PL-809-0614	Voltage Transformer Asset Management Plan	0.1	Sep-07
TNM-PL-809-0700	Secondary Systems Asset Management Plan	0.1	Aug-06
TNM-PL-809-0701	EHV Transmission Line Protection Asset Management Plan	0.9	Sep-07
TNM-PL-809-0702	EHV Busbar Protection Asset Management Plan	0.1	Sep-07
TNM-PL-809-0703	Network & Supply Transformers Protection Asset Management Plan	0.1	Sep-07
TNM-PL-809-0704	Supply Transformers Protection Asset Management Plan	0.1	Aug-06
TNM-PL-809-0705	Capacitor Bank Protection	0.1	Sep-07
TNM-PL-809-0706	HV Feeder & Incomer Asset Management Plan	0.1	Sep-07
TNM-PL-809-0709	SCADA and Substation Automation Asset Management Plan	0.1	Sep-07
TNM-PL-809-0710	Communications Asset Management Plan	0.1	Aug-06
TNM-PL-809-0711	Monitoring Schemes Asset Management Plan	0.1	Aug-06
TNM-PL-809-0712	System Protection Schemes Asset Management Plan	0.1	Aug-06
TNM-SY-808-0033	Transmission Line Easements Asset Management Plan	2.1	Sep-07
TNM-SY-809-0641	Substation Support Structures and Busbar	0.1	Jan-07
TNM-PL-809-0541	EHV Circuit Breaker Asset Management Plan	0.5	Sep-07
TNM-SY-809-0622	Strategic Asset Management - 2006 Review	0.1	Apr-07
TNM-PL-809-0690	DC Distribution System Asset Management Plan	0.1	Oct-07