TransGrid

Meeting customer needs for transmission services




TransGrid Revenue Proposal

1 July 2009 - 30 June 2014

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EXECUTIVE SUMMARY

The purpose of this document is to provide TransGrid's revenue proposal for the five year regulatory control period 1 July 2009 to 30 June 2014.

During this period the transmission system requires enhancement and progressive replacement to satisfy the existing and ongoing growth in demand to meet our customer's needs and to underpin the economic development of the state.

TransGrid will face challenges over the coming years from the maintenance of a growing and mature asset base and by rising input costs associated with tight labour and equipment supply markets.

This proposal should allow TransGrid to continue to meet its reliability obligations and to provide a high quality and cost-effective service to its customers in NSW. End users in NSW and the ACT will continue to receive the lowest cost transmission services in the National Electricity Market.

Meeting customer needs

TransGrid is the owner, operator and manager of one of the largest high-voltage transmission networks in Australia, connecting generators, distributors and major end users in NSW and the ACT.

TransGrid's customers are:

- The Distribution Network Service Providers (DNSPs) that distribute power to the majority of end users (ActewAGL, Country Energy, Energy Australia and Integral Energy);
- Connected generators (Delta Electricity, Eraring Energy, Macquarie Generation and Snowy Hydro Limited);
- Directly connected loads (Norske Skog, Tomago Aluminium and Visy Pulp & Paper); and
- Other intending market participants that seek to connect to TransGrid's network.

The network is designed and operated to meet customer requirements and legislative obligations of supply reliability and access.

TransGrid works with its customers to plan, develop and manage the network to meet customer service standards as set out in the National Electricity Rules, Connection Agreements, DNSP licence obligations and jurisdictional planning criteria.

The network is interconnected to Queensland and Victoria, making it the backbone of the National Electricity Market (NEM) and facilitating local and interstate energy trading.

TransGrid understands the importance of its network to participants trading in the NEM, and manages its network accordingly. TransGrid operates its network to a very high level of availability and plans outages to minimise the impact on market participants.

Underpinning the economic performance of the state

NSW is the most populous state in Australia. It has the largest city, Sydney, which is also internationally recognised as Australia's financial hub.

The state has by far the largest manufacturing base in Australia, with steel, aluminium and metal production centres the largest in the country.

NSW has a significant primary industry sector, particularly in the areas of agriculture and mining. This sector accounts for nearly a third of the state's exports and has a critical role in supporting regional economies.

The NSW Government's planning for the next 25 years is based on the population of Sydney growing by more than 1.1 million people. This is equivalent to adding a city the size of Adelaide to Sydney. Clearly, new residential, commercial and industrial developments will be associated with this growth leading to a significant growth in electricity demand.

The economic prosperity of the state depends on transmission services that are cost-effective and consistently provide high levels of performance. As the NSW Government states:

> *"ensuring a reliable and competitive electricity sector is considered essential for economic growth."*[1]

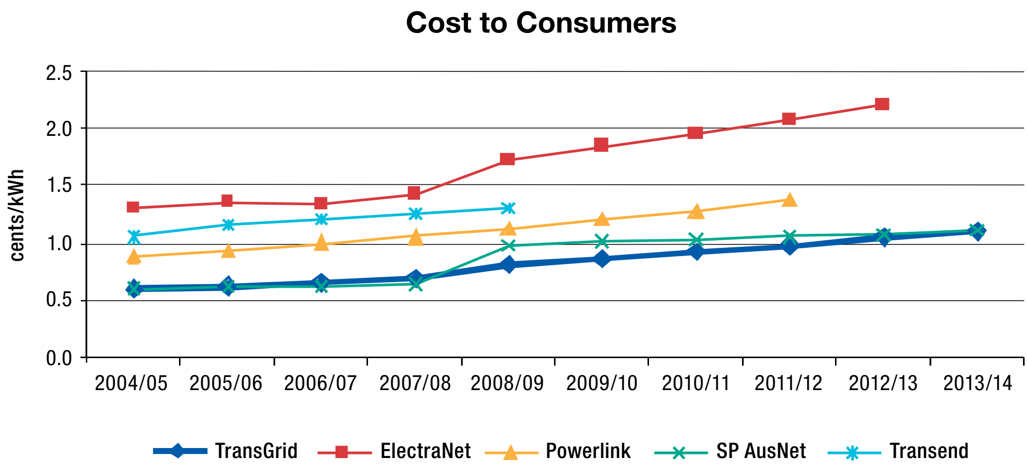
The transmission network will need to be developed to service the expected growth through to 2014.

This revenue proposal will allow TransGrid to continue to provide a reliable and cost-effective transmission service to underpin existing business activity and the economic growth of the state.

Delivering the lowest cost to consumers

TransGrid understands that its costs are ultimately met by end consumers, and it has for many years provided transmission services at the lowest cost to consumers in the NEM.

[1] State Infrastructure Strategy New South Wales 2006/07 to 2015/16, p6. NSW Treasury, 2006. http://www.treasury.nsw.gov.au/sis/sis-2006



Source: AER regulatory reports and decisions. TransGrid's figures from its proposal

This proposal is intended to ensure that NSW and ACT end users will continue to benefit from the lowest cost transmission services in Australia.

Delivering world-class service performance

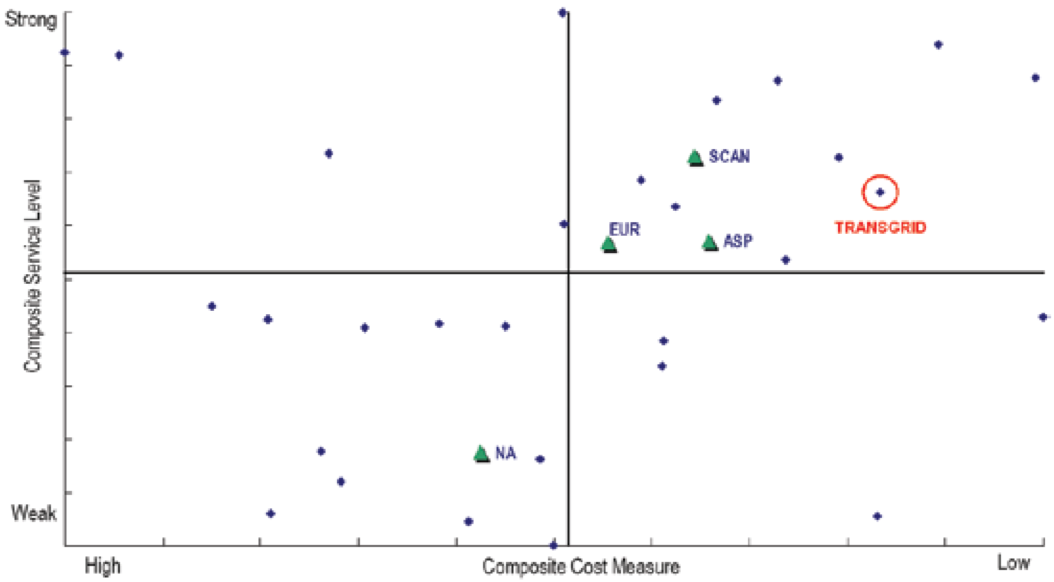
TransGrid's transmission network reliability exceeds 99.999%, which reflects the importance TransGrid places on maintaining a reliable supply of electricity to its customers and electricity end users. TransGrid has sustained this level of performance over many years.

TransGrid has regularly participated in international benchmarking exercises in order to drive improvements in its business. Consistently, the organisation has been identified as a leading performer internationally on both service and costs measures.

The most recent benchmarking study, ITOMS 2007, confirms this performance with TransGrid well positioned in the "best performer" quartile (lower-than-average cost and above-average reliability).

Comparison with the average result for the Asia Pacific region (shown by the "ASP" triangular mark, refer to ITOMS graph on the following page) shows TransGrid's network performance above the regional average, and with costs substantially lower than average.

Overall Composite Benchmark – Weighted Average**



A recent study conducted by UMS Group also found:

> *"TransGrid's operational efficiency and service levels are excellent by international standards."*[2]

This proposal sets out the revenue required to ensure that this high level of service is able to be maintained.

Service Target Performance Incentive Scheme

TransGrid has proposed a continuation, with some amendments, of its existing service incentive scheme. This scheme rewards TransGrid for delivering high service levels to its customers. TransGrid proposes that 1% of its revenue will continue to be "at risk" under the service standards component of the scheme.

While TransGrid has achieved a positive service outcome in the first three years of the present regulatory control period, the increasing number of outages necessary to meet the capital works program has seen a reduction in the availability of transformers and transmission lines in the past two years.

The scheme contains three measures of network availability relating to transformers, transmission lines and reactive plant. For the next regulatory period adjustments of availability targets are proposed to reflect the impact of the significant increases in the capital works program and past good performance.

The scheme also contains three measures of reliability and TransGrid has performed well against each of these measures. TransGrid expects it will be able to meet the challenge of even more demanding targets for these measures.

[2] UMS Group: TransGrid Transmission Efficiency Review – May 2008

TransGrid will be the first TNSP to come under the new Market Impact of Transmission Congestion (MITC) parameter, which is subject to an incentive of 2% of revenue each year.

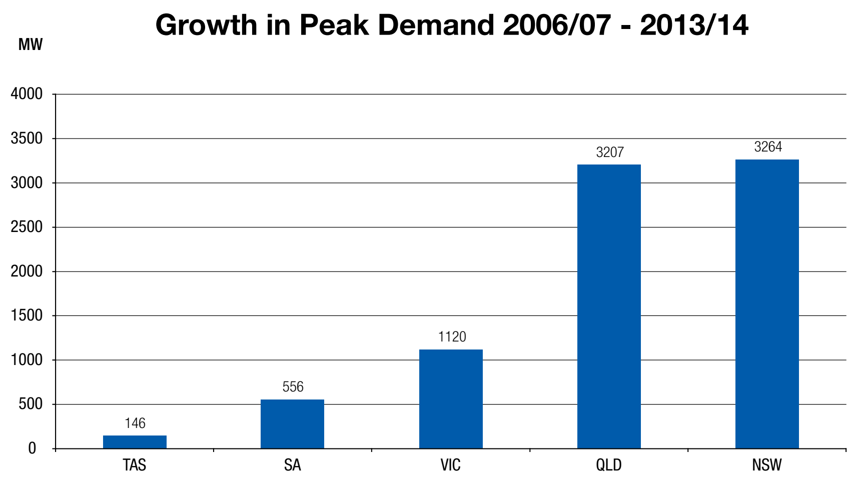
Meeting the challenges of our operating environment

TransGrid faces a number of challenges in maintaining its service performance to its customers. Some of the most significant challenges are described below.

Increasing demand and network utilisation

TransGrid's network services the highest demand in the NEM. The NSW network capability required over the coming years is projected to grow by a similar amount to Queensland's.

The information in the graph below is from NEMMCO's 2007 Statement of Opportunities.[3]



The continuation of the significant load growth experienced in NSW in recent decades is primarily driven by population growth and increasing per-capita consumption. With NSW now becoming a summer peaking network, principally due to the growth in air conditioning use, maximum summer demands are forecast to increase by some 440MW each year in the medium term.

The majority of the transmission network in NSW was built between the 1950s and 1980s. Over 40% of transmission lines and 35% of substations and switching stations were commissioned in the 1960s or earlier.

As an indication of the scale of the expected growth in assets to be managed over the next regulatory period, TransGrid is expecting a 24% increase in its asset base. This is expected to include about 900km of new high voltage transmission lines and 18 new substations.

The network has been managed to meet increasing loads and changing usage patterns, allowing a relatively conservative and stable level of capital investment on new assets over time. However, parts of the network are approaching full utilisation and major new infrastructure is needed to meet growing demand and to maintain service performance for our customers. As a consequence, TransGrid has identified the need for a significant increase in its capital program.

[3] 2007 Statement of Opportunities; NEMMCO; http://www.nemmco.com.au/nemgeneral/soo.2007.htm

Managing a growing and mature asset base

TransGrid must ensure its assets remain reliable, do not adversely affect the safety of its staff or the community, and meet all environmental standards imposed by legislation and by community expectations.

Plant installed in the 1950s and 1960s has reached or exceeded its expected service life. TransGrid will continue to apply sound asset management principles to identify those assets with deteriorating performance and/or unacceptable risk profiles, and prioritise them for replacement. TransGrid is therefore proposing a continuation of its existing asset replacement program.

TransGrid has also identified the need for an increase in the total amount of maintenance and asset management work necessary to ensure the performance of the asset base is maintained, driven by the growing size of the network.

Managing expenditure with a strong growth in input costs

The utilities sector has experienced above-average wage growth in the past 20 years. This is expected to continue due to a tight labour market generally and particularly in the electricity sector.

The price of plant and equipment has escalated significantly over recent years due to global demand, with these increases outstripping inflation.

Both transmission and distribution network companies in Australia have been reporting rapidly increasing costs for individual projects, reflecting both the labour and material input cost pressures.

These escalating input costs have an impact on the revenue TransGrid needs to prudently manage its operating activities and to fund its capital projects.

Providing adequate network capability

TransGrid is proposing a five-year ex-ante capital expenditure allowance of about $2.6 billion ($2008). The capital program is necessary to meet mandated reliability standards and customer requirements and to ensure the ongoing safe and reliable operation of the network, as outlined previously.

The proposed ex-ante allowance is a significant increase on the allowance for 2004/2009, which was $1.39 billion ($2008). The increase is driven principally by an increased number of large load-driven augmentation projects and by material input cost escalations.

The ex-ante capital expenditure proposal is made up of the following types of projects:

- Network asset replacements (about $490 million);
- Three major projects driven by reliability obligations (about $1.1 billion). These are the next stage of 500kV system development in NSW, Sydney inner-metropolitan network development, and a 330kV transmission line to supply the north coast of NSW;
- Other network augmentation projects driven by reliability obligations (about $900 million); and
- Non network projects such as information technology, motor vehicles and facilities (about $150 million).

A total of 14 projects (including the three largest), worth more than $20 million each, account for three-quarters of the total expenditure. These projects are spread across NSW, and support both urban and regional communities and businesses.

The total number of projects to be managed is, however, not significantly larger than that undertaken in the current regulatory control period.

TransGrid is on target to deliver its capital works program for the present regulatory period and is confident it has the capability to deliver the larger program identified for the period 2009/2014. TransGrid has realised considerable improvements in project delivery capability in the present regulatory control period through changes to governance arrangements and innovative project delivery models.

The augmentation projects in the ex-ante capital program are derived from a probability weighted set of economic, generation planting, water availability and greenhouse scenarios. This approach accounts for the inherent uncertainty in future network developments while ensuring TransGrid has sufficient funding to meet all reasonable scenarios during the coming regulatory period.

TransGrid's proposed ex-ante capital expenditure allowance for the period is given below.

Capex Program	2009/10	2010/11	2011/12	2012/13	2013/14
Real 2008 $m	536.8	495.9	748.0	523.8	322.3

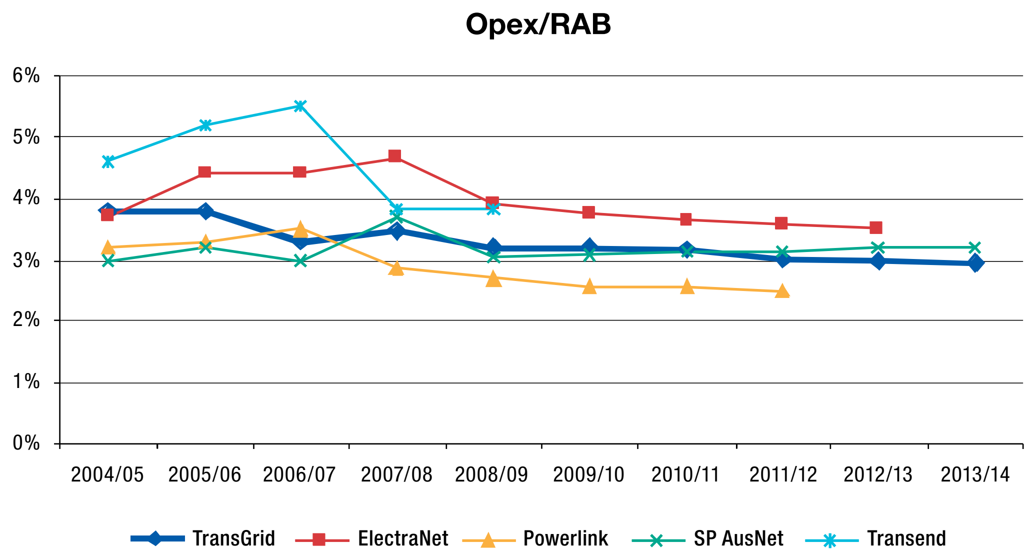
Continued operating efficiency improvements

The ACCC, in TransGrid's most recent regulatory decision, set challenging operating expenditure targets for the organisation.

TransGrid has managed its business within the approved operating allowance, delivering a real reduction in operating costs while absorbing additional maintenance workload from newly commissioned assets.

The challenge of decreasing total controllable operating costs is, however, becoming more difficult. With the significant increase to TransGrid's asset base and increases in input costs, a real increase in total operating expenditure will be needed to ensure the network continues to be managed safely and prudently.

Despite the increase in total controllable operating costs, TransGrid is proposing to continue delivering efficiency improvements. This is shown by the graph over of operating costs as a proportion of the Regulated Asset Base (RAB), which is a measure of efficiency and provides a comparison of Australian TNSPs.



Source: AER regulatory reports and decisions. TransGrid's figures from its proposal

The following table details TransGrid's forecast controllable operating expenditure for the coming regulatory control period.

Operating Expenses	2009/10	2010/11	2011/12	2012/13	2013/14
Real 2008 $m	135.2	144.4	149.7	161.8	166.5

The revenue proposal reinforces TransGrid's position as one of the most efficient TNSPs in Australia and the world.

Total revenue

TransGrid has estimated its total building-block revenue using the Australian Energy Regulator's post-tax revenue model.

This proposal provides TransGrid with a smoothed revenue stream to deliver its prescribed transmission services to its customers. Total revenue is provided in the table below.

Smoothed Revenue	2009/10	2010/11	2011/12	2012/13	2013/14
Nominal $m	670.2	725.6	785.5	850.3	920.5

Price impact of proposal

The impact on average transmission prices as a result of TransGrid's costs in meeting its customer's requirements and its mandated obligations is estimated as a real increase of about 3.9% a year.

As TransGrid's costs represent only about 6% of the total delivered price for the average energy user, the impact on the total delivered price is estimated to be about 0.25% a year.

This price rise is about $3.50 a year for a typical household in NSW and the ACT.

With this modest increase TransGrid's customers, and end users in NSW and the ACT, will continue to benefit from the lowest cost transmission service in Australia.

1. Introduction

1.1 About this document

The purpose of this document is to provide TransGrid's revenue proposal for the five year regulatory control period 1 July 2009 to 30 June 2014. The proposal and its supporting information comply with the requirements of the National Electricity Rules (Chapter 6A) and the guidelines specified by the Australian Energy Regulator (AER).

This document details the following information, as required by the submission guidelines:

- Capital Expenditure
- Operating Expenditure
- Interactions between capital and operating expenditure
- The performance incentive scheme parameters
- The Efficiency Benefits Sharing Scheme parameters
- Total revenue cap and maximum allowed revenue
- The regulatory asset base
- The nominal risk-free rate calculation period
- Depreciation schedules
- X-factors
- Length of the regulatory control period
- Proposed contingent projects
- WACC parameters
- Demand forecasts
- Corporate income tax
- Completed post-tax revenue model
- Completed roll forward model
- Cost pass-through rules
- Self-insurance details
- Services provided by the TNSPs
- A forecast map of the transmission system

1.2 Transmission services

As a Transmission Network Service Provider (TNSP), TransGrid's network is the backbone of the NSW electricity supply system, connecting together generation, Distribution Networks Service Providers (DNSPs) and large directly connected industrial loads. TransGrid's transmission network also interconnects with the transmission systems in other states which allows NSW customers to fully participate in the National Electricity Market (NEM).

This proposal covers TransGrid's revenue requirements for providing prescribed transmission services. These include:

- Providing connections with other transmission network service providers in NSW (prescribed TUOS services);
- Providing support to the electricity DNSPs by connecting their distribution networks to TransGrid's transmission network (prescribed exit services);
- Providing grandfathered connections to generators and directly connected customers to the network (prescribed entry and exit services); and
- Delivering common transmission services (e.g. maintaining power system security, providing reactive support and assisting in system planning) to ensure the integrity of the network and a high quality of electricity supply to customers.

Intending generation and directly connected load customers receive limited prescribed services through the connection inquiry process. The costs of these services are also factored into this proposal.

The costs to connect new generators and new customers to TransGrid's network are recovered through negotiated and non-regulated transmission services. Revenue and costs derived from these services have not been included in this revenue proposal.

2. Business and operating environment

TransGrid owns, operates, maintains and manages one of the largest high-voltage transmission networks in Australia. The energy delivered via TransGrid's network goes to more than 3 million households and businesses in NSW and the ACT, as well as to users in other states.

NSW, being the most populous state in the country and a financial and industrial centre for many businesses, requires a transmission delivery service that is able to meet the growing needs of its customers while maintaining high levels of reliability.

2.1 Transmission system characteristics and drivers

TransGrid's transmission system incorporates:

- 12,442 kilometres of high-voltage overhead transmission line and underground cable operating at voltages of up to 500kV;
- 83 substations and switching stations;
- 48 connection points to generators[4] , located in western NSW, the Central Coast, Hunter Valley and the Snowy Mountains;
- 325 distributor and direct-customer connection points; and
- five interconnectors to Victoria and Queensland.[5]

Approximately 60% of the energy generated in NSW is generated west of the Great Dividing Range but must be delivered to the east coast, where most of the state's load is located. Transmission access to major load centres is constrained by a number of National Parks and Wilderness areas. The geographical operating environment is a major factor in the historical development of the transmission system and in TransGrid's cost structure to operate and maintain it.

The NSW transmission network is shown in Figure 2.1 and 2.2.

[4] As at 31 May 2008. Connection of Uranquinty gas turbines in not scheduled until later in 2008
[5] The Snowy Region is to be abolished from 1 July 2008

Figure 2.1: TransGrid's extensive transmission network

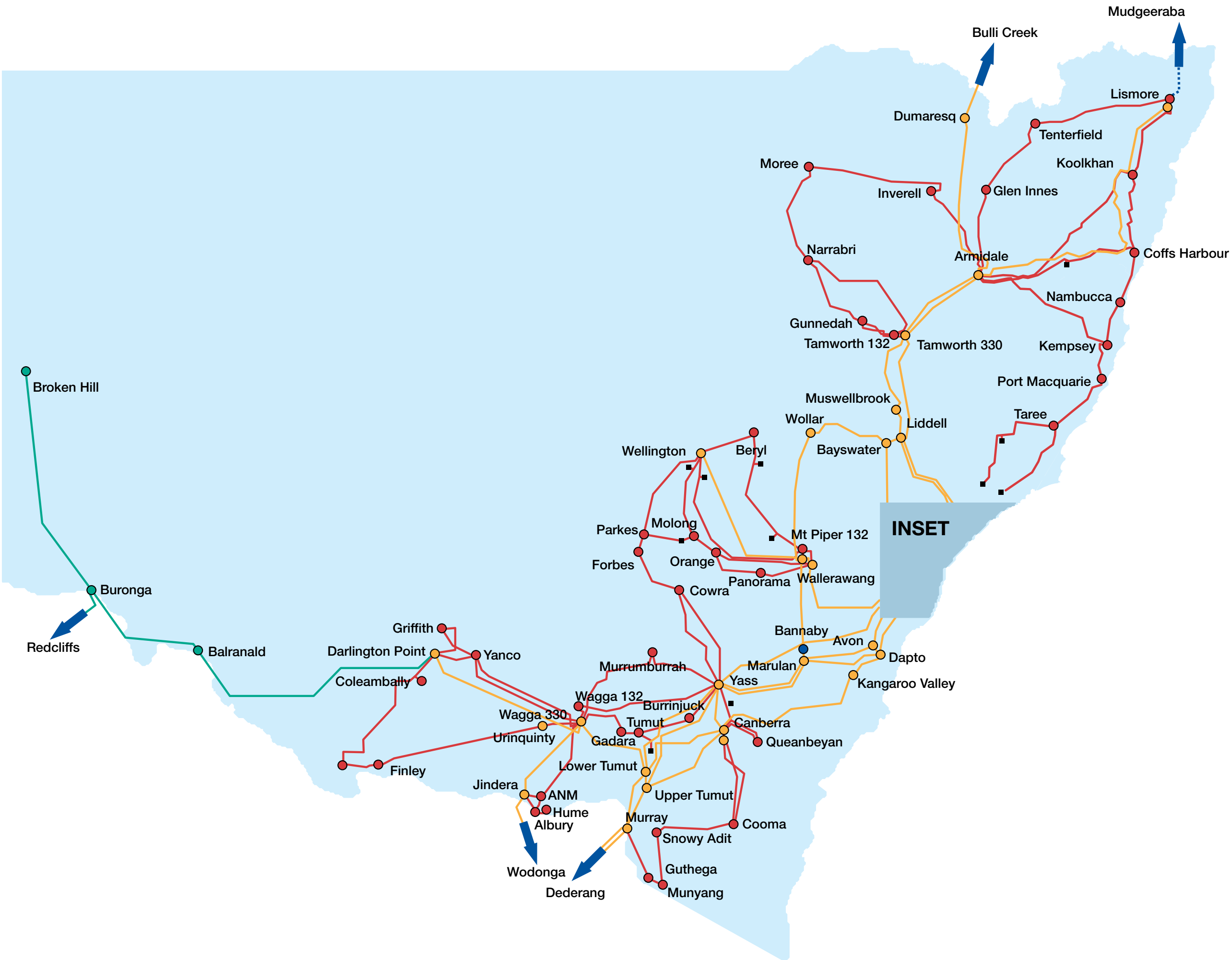
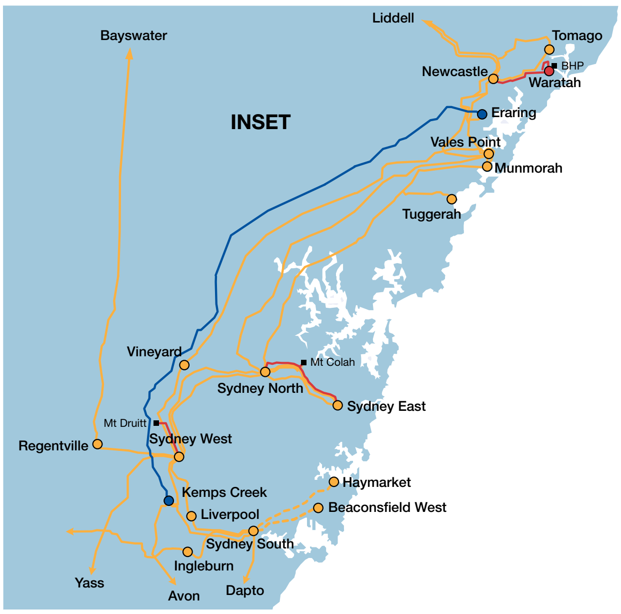


Figure 2.2 Inset



Operating System Voltages

- 500kV Transmission Line
- 330kV Transmission Line
- 220kV Transmission Line
- 132kV Transmission Line
- 66kV Transmission Line
- 330kV Underground Cable

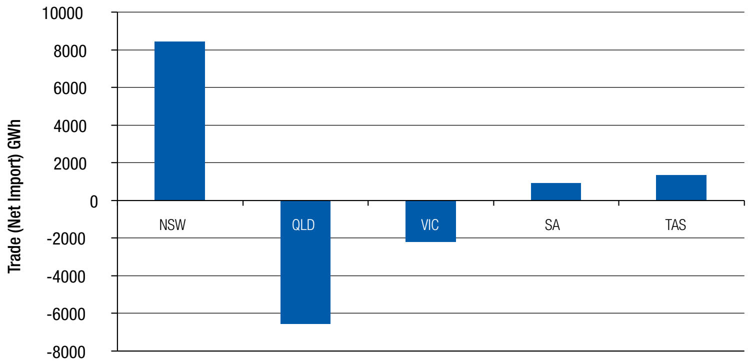
- 500kV Substation
- 330kV Substation
- 220kV Substation
- 132kV Substation

- Interstate Exchange Point

In 2006/07, NSW was the largest importer of electrical energy in the NEM, importing 10% of the total customer load as shown in Figures 2.3. As the AER pointed out:

> *"NSW is a net importer of electricity. It relies on local base load generation due to its low cost, but has limited peaking capacity at times of high demand. This puts upward pressure on prices in peak periods, making imports a cheaper alternative."*[6]

Figure 2.3: Net Import across NEM regions in 2006-07

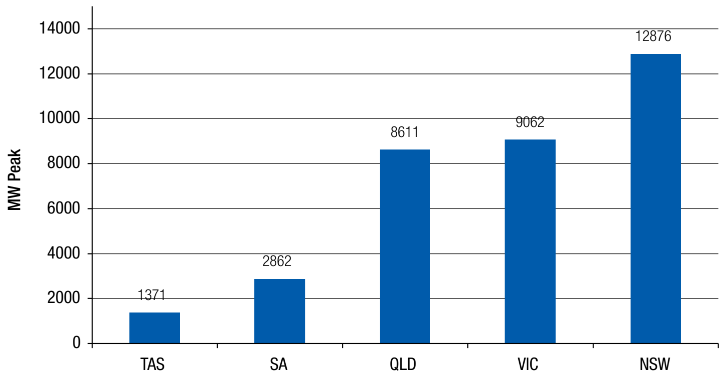


Source: AER State of the Energy Market 2007

The population of New South Wales makes up a third of Australia's population,[7] with more than 6.8 million residents, 4.3 million of whom live in Sydney. Victoria has the next largest population with 25%; Queensland has 20%, South Australia 7.6% and Tasmania at 2.4% of Australia's population.[8]

Because of this population base NSW has the largest summer peak demand in the NEM, as shown in Figure 2.4.

Figure 2.4 Summer peak demand in 2006/07 the NEM



Source: NEMMCO 2007 Energy Demand Projections

[6] AER, *State of the Energy Market 2007*
[7] Note: Other State and Territory Populations WA 10%, Australian Capital Territory 1.6%, Northern Territory 1.0%
[8] Source: ABS Cat No 3101.1 Australian Demographics Statistics December 2006

NSW is Australia's business and financial centre, with Sydney its financial hub. 45% of the top 500 companies in Australasia are located within the State. Sydney's expanding financial services sector is nearly half the size of London's and more than one-third the size of New York City's.

At an industry level, the NSW manufacturing base is significantly larger than that of the manufacturing bases in other states and is growing annually. The state's steel, aluminium and metal production sectors are the most significant in the country, and Newcastle is the largest coal export port in the world. The base metal and mining sectors are large consumers of electrical energy and periodically expand their plant to meet the market demand for increased production.

Primary industries are also large consumers of energy, and it is worth noting the importance of this sector as agriculture and mining account for nearly a third of the state's exports.

The economic performance of the state of NSW is underpinned by TransGrid's reliable and efficient transmission services. As the NSW Government has stated:

> *"ensuring a reliable and competitive electricity sector are also considered essential for economic growth."*[9]

2.2 TransGrid's key role in the National Electricity Market

Like transmission networks in other states, the NSW network was developed as a stand-alone system by a single organisation that was responsible for both generation and transmission planning. Its main aim was to provide reliable connections between power stations and the major NSW load centres and to provide reliable supplies to the more remote areas.

Over time, energy delivery capability and flexibility increased through network augmentations and interconnections with other states.

The introduction of the National Electricity Market has significantly changed the role of the NSW network, leading to generation scheduling and power flows quite different from those for which the network was originally planned. As a 2007 Australian Energy Regulator report stated:

> *"Electricity generators are usually located close to fuel sources such as natural gas pipelines, coalmines and hydro-electric water reservoirs. Most electricity customers, however, are located a long distance from these generators in cities, towns and regional communities. The electricity supply chain therefore requires networks to transport power from generators to customers. The networks also enhance the reliability of electricity supply by allowing a diversity of generators to supply electricity to end markets. In effect, the networks provide a mix of capacity that can be drawn on to help manage the risk of a power system failure."*[10]

[9] State Infrastructure Strategy New South Wales 2006/07 to 2015/16, p6. NSW Treasury, 2006. http://www.treasury.nsw.gov.au/sis/sis-2006
[10] AER, *State of the Energy Market 2007:* page 117

The NEM comprises five regions – Queensland, NSW (incorporating the ACT), Victoria, South Australia and Tasmania. The NSW transmission system is a key part of the NEM, not only serving the largest state in the NEM but interconnecting the two states with the next largest loads.

As the AER noted:

> *"The NEM promotes efficient generator use by allowing trade in electricity between the regions. The six regions of the NEM are linked by transmission interconnectors that make trade possible. This enhances the reliability of the power system by allowing the regions to pool their reserves to manage the risk of a system failure. Trade also provides economic benefits by allowing high-cost generating regions to import from lower-cost regions. For example, importing electricity from another region's base load generators may be cheaper than using local peaking generation."*

As stated in the quote above, interconnections with other regions give customers access to imported power during times of high demand. This imported power has significant implications for TransGrid's network, as it must be able to transmit the electricity over large distances from the NSW borders to the load centres and between regions.

Although TransGrid does not participate in the electricity market, the services it provides support substantial electricity sales and purchases in the NEM.

[11] From July 1, 2008 the NEM will comprise five regions after the abolition of the Snowy Region
[12] AER, *State of the Energy Market 2007*

3. Regulatory environment

TransGrid operates in the National Electricity Market and is bound by the National Electricity Rules. Within these Rules, TNSPs must comply with service standards linked to the technical requirements of Schedule 5.1 and also to "applicable regulatory instruments". Regulatory instruments for NSW include the Electricity Supply Act 1995 and all regulations made, and licences issued, under that Act.

3.1 National obligations - transmission reliability standards

TransGrid delivers a highly reliable transmission service to its customers and the National Electricity Market. Indeed, as a Transmission Network Service Provider, it is obliged to deliver a system that satisfies the standards of reliability and performance specified under the National Electricity Law.

In particular, it must meet the requirements of the National Electricity Rules:

> *"Network Service Providers must plan, design, maintain and operate their transmission networks…to allow the transfer of power from generating units to Customers with all facilities or equipment associated with the power system in service and may be required by a Registered Participant under a connection agreement to continue to allow the transfer of power with certain facilities or plant associated with the power system out of service, whether or not accompanied by the occurrence of certain faults (called 'credible contingency events')."*[13]

The Rules also set out processes for developing networks and specify the minimum performance requirements of the network and for connection to the network.

3.2 NSW obligations

3.2.1 Enabling legislation

TransGrid's enabling legislation is the Energy Services Corporations Act 1995. Section 6B of the Act states that the principal objectives of an energy transmission operator are:

"a) To be a successful business and, to this end:

- *(i) To operate at least as efficiently as any comparable businesses*
- *(ii) To maximise the net worth of the State's investment in it*
- *(iii) To exhibit a sense of social responsibility by having regard to the interests of the community in which it operates*

b) To protect the environment by conducting its operations in compliance with the principles of ecologically sustainable development contained in section 6 (2) of the Protection of the Environment Administration Act 1991

[13] National Electricity Rules, clause S5.1.2.1.

c) To exhibit a sense of responsibility towards regional development and decentralisation in the way in which it operates

d) To operate efficient, safe and reliable facilities for the transmission of electricity and other forms of energy

e) To promote effective access to those transmission facilities"[14]

3.2.2 Electricity Supply Act 1995

Under the Electricity Supply Act 1995, TransGrid is obliged to construct, operate, repair and maintain its electricity network with the aim of promoting the efficient, safe, reliable and environmentally responsible production and use of electricity.

The regulation made under the Act requires TransGrid to provide the state's Department of Water and Energy with plans for network management, public electrical safety awareness and bushfire risk management. The regulation describes the requirements for such management plans as:

"A network management plan must include (but is not limited to) the following:

(a) A commitment by the network operator to ensuring the safe operation of its transmission or distribution system, and to giving safety the highest priority over all other aspects of network management

(b) A description of the transmission or distribution system and its design, construction, operation and maintenance

(c) A description of the planning process employed for the purpose of assessing the adequacy of the transmission or distribution system and the need for development of the transmission or distribution system, including if appropriate:

(iv) Demand management methodologies, and

(v) System reliability planning standards on a customer class or group, or geographic basis, for each distinct voltage level

(d) A description of the asset management strategies employed for the purposes of the design, construction, operation and maintenance of the transmission or distribution system, including:

(i) Risk management and public liability insurance arrangements, and

(ii) Planned customer technical service standards for quality and reliability of supply

(e) A description of the safety management strategy employed for the purpose of ensuring the safe operation of the transmission or distribution system, including:

(i) An analysis of hazardous events, and

(ii) The procedures to be implemented in the event of an emergency, and

[14] Energy Services Corporations Act 1995.

(iii) The procedures and standards designed to ensure that the network operator's employees, contractors to the network operator and their employees and any other persons working on or near the system's electricity works have the competencies required to undertake the work safely, and

(iv) A strategy to ensure adherence to safe working procedures,

(f) A description of the plan's objectives and of appropriate performance indicators,

(g) A schedule of reports to be made to the Director-General in relation to the management and performance of the transmission or distribution system,

(h) A description of the codes, standards and guidelines that the network operator intends to follow in the design, installation, operation and maintenance of the transmission or distribution system."[15]

3.2.3 Occupational Health and Safety

TransGrid is bound by the following acts related to occupational health and safety:

- OHS Act 2000;
- Workers Compensation Act 1987;
- Workplace Injury Management and Workers Compensation Act 1998; and
- Workers Compensation (Dust Diseases) Act 1942.

It is also governed by the following regulations within those acts:

- OHS Regulation 2001;
- OHS Amendment (Dangerous Goods) Regulation 2005;
- Workers Compensation Regulation 2003;
- Workplace Injury Management and Workers Compensation Regulation 2002; and
- Workers Compensation (General) Regulation 1995;

3.2.4 Environmental obligations

TransGrid is bound by a range of NSW, ACT and Commonwealth legislation related to environmental protection and compliance with the most significant being:

- Environment Protection And Biodiversity Conservation Act 1999 - Commonwealth;
- Environmental Planning And Assessment Act 1979 - NSW;
- Heritage Act 1977 - NSW;
- National Parks And Wildlife Act 1974 - NSW;
- Protection Of The Environment Operations Act 1997- NSW;
- Water Management Act 2000 - NSW;

[15] NSW Electricity Supply (Safety and Network Management) Regulation 2002, Part 2, Section 6(2)

- Forestry Act 1916 - NSW;
- Native Vegetation Act 2003 - NSW;
- Threatened Species Conservation Act 1995 - NSW;
- Wilderness Act 1987- NSW;
- Environmentally Hazardous Chemicals Act 1985 - NSW;
- Pesticides Act 1999 - NSW;
- Contaminated Land Management Act 1997- NSW;
- Soil Conservation Act 1938 - NSW;
- Noxious Weeds Act 1993 - NSW;
- Environment And Protection Act 1997 - ACT;
- Nature Conservation Act 1980 - ACT;
- Water Resources Act 2007 - ACT; and
- Pest Plants And Animals Act 2005 - ACT;

TransGrid is also governed by a range of regulations, orders and agreements with the most significant being:

- Environment Protection and Biodiversity Conservation Regulations 2000 - Commonwealth;
- Agreement between the NSW National Parks and Wildlife Service and TransGrid for the Inspection and Maintenance of TransGrid Infrastructure on NPWS Areas - 2002;
- Polychlorinated Biphenyl Wastes (PCB) Chemical Control Order 1997 - NSW;
- Scheduled Chemical Wastes Chemical Control Order 2004 - NSW;
- Pesticides Regulation 1995 - NSW;
- Native Vegetation Regulation 2005 - NSW;
- Protection of the Environment Operations (Clean Air) Regulation 2002 - NSW;
- National Parks and Wildlife Regulation 2002 - NSW;
- Environmental Planning and Assessment Regulation 2000 - NSW; and
- Site Management Agreement for Public Land (Nature Reserves, Special Purpose Reserves, and National Parks) between the Conservator and TransGrid for the Inspection and Maintenance of TransGrid Infrastructure in the ACT 2007 – ACT.

4. Meeting customer needs

4.1 Responding to customer needs

TransGrid's customers fall into two broad categories: existing customers, who are already connected to the transmission network and receive the bulk of the prescribed transmission services from TransGrid, and intending customers, who wish to connect to the transmission network and some of whom will receive limited prescribed services.

A good understanding of the diverse needs of these groups facilitates TransGrid's commitment to customer responsiveness.

4.1.1 Existing customers

Existing customers fit into three different groups:

- Distribution Network Service Providers (DNSPs)
- Electricity generators
- Major industrial customers

Distribution Network Service Providers

TransGrid works closely with the NSW and ACT Electricity Distribution Network Service Providers (ActewAGL Distribution, Country Energy, EnergyAustralia and Integral Energy) to deliver a consistent and reliable level of service through a network that is managed and developed to meet load growth in an efficient, timely and cost-effective way.

Joint planning is undertaken with the DNSPs to ensure a co-ordinated approach to meeting their needs as loads grow and their networks change. The businesses also work together to set network prices that are fair, equitable and meet appropriate legislative requirements.

Electricity generators

Directly connected generators (Delta Electricity, Eraring Energy, Macquarie Generation and Snowy Hydro Limited) seek predictable levels of transmission access to assist in market trading. Generators are particularly affected by transmission outages that inhibit their access to the market.

Unplanned outages are not only potentially costly to the generators, hindering their ability to sell energy into the spot market and to meet their contractual obligations, but are likely to create market inefficiencies, as higher-priced generation alternatives are used instead.

TransGrid is very aware of the significance of transmission outages and of the need by generators for accurate and timely information on planned outages. TransGrid provides advance notice to market participants of its outage program. The organisation works closely with generators in regard to outages of connection assets or those parts of the shared network that materially reduces generator output.

One of TransGrid's prescribed transmission services is to provide reliable communication services to generators for market dispatch.

Major industrial customers

Directly connected electricity users have agreements with TransGrid for prescribed connection services. These customers (Norske Skog Paper Mills [Australia] Limited, Tomago Aluminium and Visy Pulp & Paper Pty Ltd) value TransGrid's high levels of network reliability as it minimises the potential for adverse impact to their production. They are also keen to ensure transmission services are provided at reasonable prices.

While these customers require information on future developments of shared transmission network capability and planned outages, they also value TransGrid's efficient responses to faults, emergencies and outages.

Connection agreements with both generators and major industrial customers cover issues such as service incentives and liability for failure of services. The cost of these services for existing customers is covered by this proposal.

4.1.2 Intending customers

One of TransGrid's prescribed services is to assist intending customers during the connection enquiry stage.

Directly connected electricity users often operate in highly competitive markets, and timely establishment of new facilities and reliable production at reasonable input costs are crucial to their competitive position. They want to be confident their transmission service provides reliable access to generation sources.

Directly connected generators, meanwhile, require timely and accurate information on access to, and the capability of, various connection points to guide their investment decisions. Early engagement with these customers helps TransGrid to understand and meet their needs.

Costs associated with the early stages of connection applications (as opposed to connection service costs and resulting shared network developments) are included in this proposal.

For intending customers generally, the market needs prompt and clear information on transmission development plans and outages. Information on future developments of shared transmission network capability and planned outages are part of the prescribed transmission services.

TransGrid is aware of the confidence NEM traders – including generators, retailers, and market intermediaries – must have in its transmission network when it comes to managing their risk. TransGrid is responsive to service incentives that leads to the delivery of more reliable transmission services.

The costs of these prescribed services, and appropriately designed incentive schemes, are included in this revenue proposal.

4.2 Working with other electricity transmission businesses

TransGrid works bilaterally with other TNSPs on interconnection opportunities, and collectively (with NEMMCO) to produce the Annual National Transmission Statement. All TNSPs work together to ensure efficient upgrades to interconnector capacity (for instance, TransGrid has been evaluating the possible upgrade to the Queensland-NSW interconnector with Powerlink Queensland).

TransGrid is also the co-ordinating TNSP for transmission pricing within NSW. In this role, it calculates the prices for revenue recovery of all prescribed transmission services supplied within NSW, including those provided by Energy Australia, Country Energy and Directlink.

Additionally, TransGrid plays a key role in studying and confirming the stability and reliability of the NEM network by advising adjoining TNSPs and DNSPs on the impact of proposed new generation and load.

The costs to meet these obligations are included in this proposal.

5. Challenges of our operating environment

TransGrid faces a number of challenges in maintaining its service performance to its customers.

With ongoing load growth, parts of the network are now operating near full capacity. Major new infrastructure is needed to meet growing demand and to maintain service quality to customers.

As a consequence, TransGrid has identified the need for a significant increase in its capital program.

A maturing asset base has also required TransGrid to implement an asset replacement program that identifies assets with deteriorating performance or risk of failure. In addition, with the maturing of the NSW transmission system and an increase in the total size of the network, an increase in the total maintenance workload is also needed to ensure reliability of supply.

TransGrid has worked efficiently to meet its service obligations to customers, within its allocated budgets, and will continue to do so. However, the work is becoming more expensive to undertake, especially in the light of a global spike in input costs and the costs associated with a growing asset base.

The community expects a highly reliable transmission system to support the electricity needs of the state, delivered with consideration of the environment. As such, TransGrid develops the system responsibly, ensuring that construction programs are carried out in an environmentally sensitive manner.

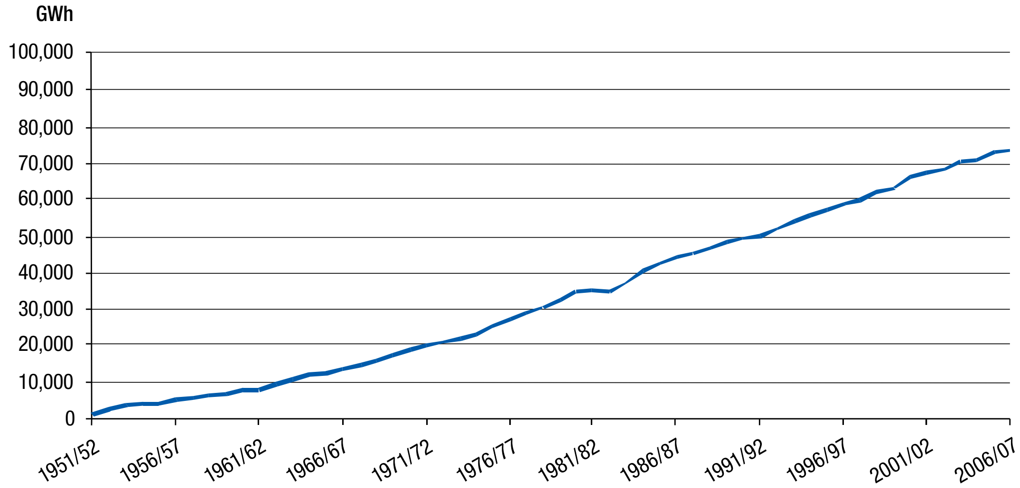
The following sections summarises the major challenges TransGrid faces in the coming regulatory control period, and outlines its proposed approach to dealing with them in an efficient and prudent manner.

5.1 Meeting the demands of increased electricity use

5.1.1 Forecast of load growth

NSW energy consumption has shown sustained annual increases over the last six decades growing from 1,180GWh in 1951/52 to 74,000GWh in 2006/07 as shown in Figure 5.1 below.

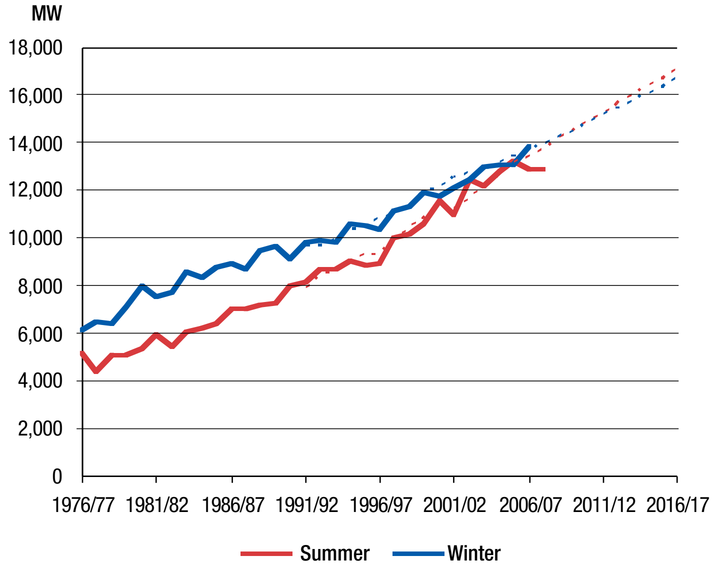
Figure 5.1: NSW annual energy consumption



Source: TransGrid 2007 Annual Planning Report and TransGrid Records

Both winter and summer demand peaks have grown over recent years, with the winter peaks increasing by an average 250MW a year and the summer peaks increasing by an average 440MW, as shown in Figure 5.2.

Figure 5.2: NSW peak demand growth

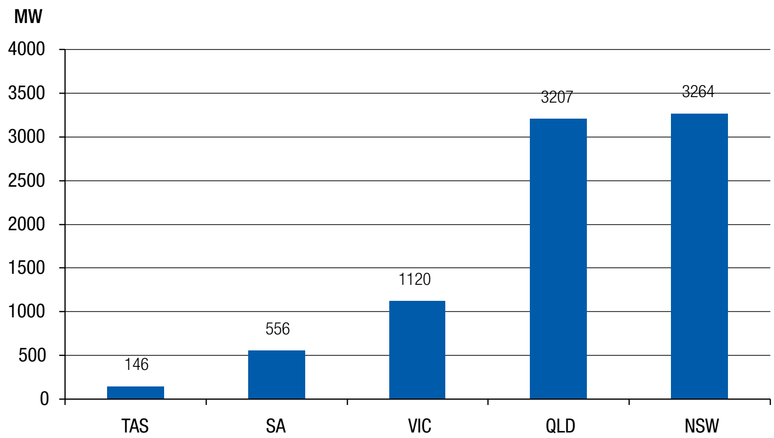


Source: TransGrid 2007 Annual Planning Report

At present, the summer and winter peak demands are similar in magnitude, however TransGrid's forecasts show that the summer peaks are expected to consistently exceed the winter peaks in about five years time. A move to a summer peaking system increases the demands placed on the network by load growth. This is due to the lower thermal capacity of most transmission equipment at times of higher ambient temperature.

For the period 2006/07 to 2013/14, it is forecast (using data from NEMMCO's 2007 Statement of Opportunities) that the growth in NSW demand will be the highest in the NEM, as shown in Figure 5.3 below.

Figure 5.3: Forecast demand growth in NEM, 2006/07 to 2013/14



Source: NEMMCO 2007 SOO, Energy and Demand Projections, median 50% POE

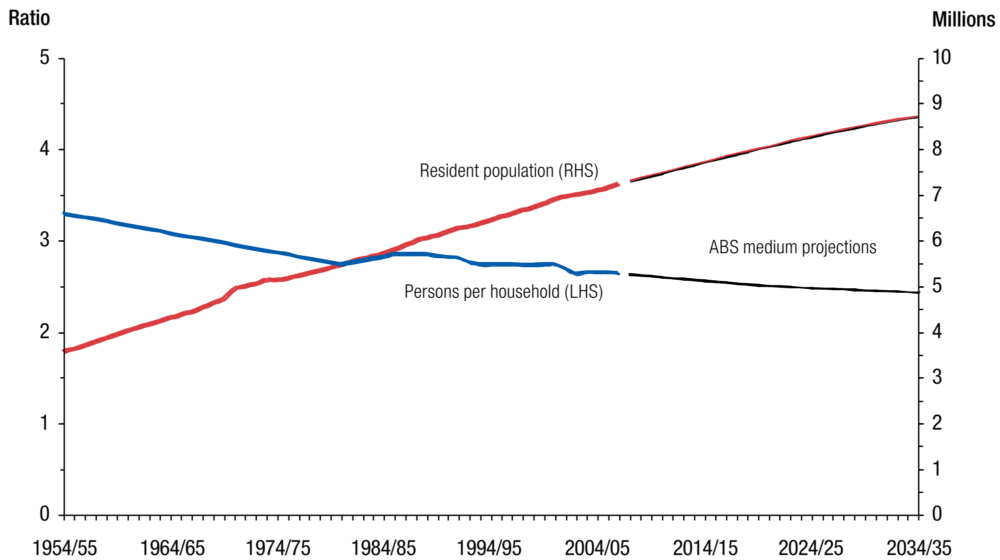
5.1.2 Factors influencing energy consumption

The trend of significant load growth in NSW in recent decades has been driven by population growth and increasing per-capital consumption. The dominant factor is the growth in population in the state.

Demand increase, however, is not driven simply by the growth in population, but the growth in energy each person uses. For instance, in the past 50 years the number of people per household in Sydney has fallen from about 3.5 to about 2.5. An increased number of households leads to more power consumption per capita, as each household requires heating, refrigeration and lighting.

Figure 5.4 below shows the trends in population growth and reducing number of people per household.

Figure 5.4: Number of people per household



Sources: ABS "Demographic Statistics", catalogue 3101.0, ABS "Population Projections, catalogue, ABS "Households, catalogue and TransGrid interpolations.

The increase in per-capita consumption is due mainly to changes in living patterns. Quality of life has also contributed to increased consumption, as more households invest in energy intensive items such as air-conditioning, multiple refrigerators, entertainment equipment and home office computer equipment.

5.1.3 NSW Government forecasts

In 2007, the Australian Bureau of Statistics (ABS) recorded the NSW population at about 6.8 million with 63% of the state's population living in the Sydney area. Further the ABS is forecasting that:

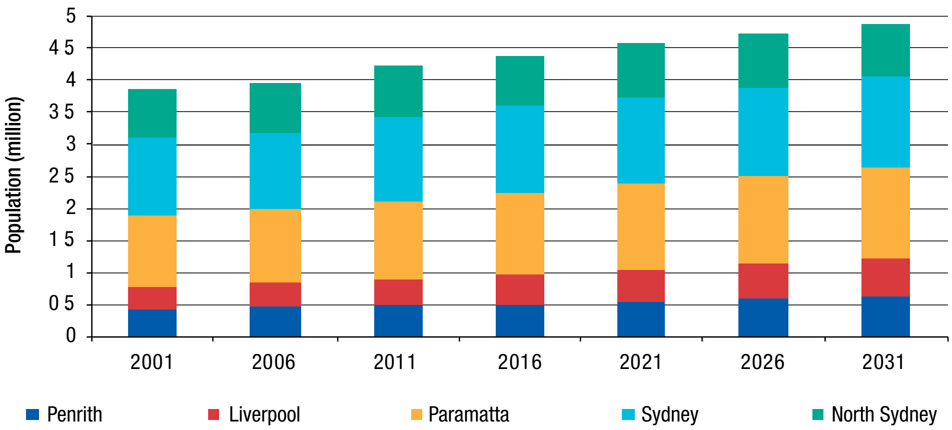
> *By 2051 the population of New South Wales is projected to reach 8.7 million people, an increase of 2 million (or 30%) since 2004.*[16]

[16] Australian Bureau of Statistics: 3222.0 - Population Projections,Australia,2004 to 2101

The NSW Government's planning for the next 25 years is based on the projected population trends in New South Wales and its regions growing by 1.1 million by 2031.[17]

Figure 5.5 below shows the estimated population growth in the greater Sydney area.

Figure 5.5: Sydney metropolitan population by location



This means that as some 640,000 new homes and 6.8 million square metres of additional commercial floor space will be required, the NSW transmission system will need to be augmented, maintained and operated carefully to support this growth.

An expanding economy will lead to population and industry growth - and therefore increased demand for electricity - not only in large cities such as Sydney, Newcastle and Wollongong, but also along the entire NSW coast. This growth will be seen in particular on the north coast.

The Government is also expecting significant development in mining, roads, rail, ports and water (including sewerage treatment plants and pumping stations).

5.1.4 State Government inquiry into electricity supply

Over the last 20 years, NSW has had surplus capacity in generation and the transmission capability to support its delivery to end users. However, economic and population growth has progressively reduced the extent of both the generation and transmission surplus capacity.

The 2007 NSW Government Inquiry into Electricity Supply in NSW (the "Owen Inquiry") highlighted the state is likely to need additional base load capacity power by 2013/14. As base load generation is connected at the transmission level, TransGrid needs to have a network capable of supporting this need.

The Inquiry forecasts that NSW will need about 91,000GWh of electrical energy by 2013/14. That is about 10,500GWh above the present annual consumption. Enhanced energy efficiency may slow consumption slightly but it is unlikely to obviate a need for investment in base-load generation in the short to medium term.

[17] NSW Department of Planning, New South Wales State and Regional Population Projections 2001-2051, 2005 Release, P11

The report of the Inquiry states:

> *"Most of NSW extra base-load energy needs are likely to be met by coal-fired and/or gas-fired generation as other technologies can only contribute on a relatively small scale or will not mature until 2020 at the earliest."*[18]

The challenge for TransGrid will be to deliver the potentially significant works required to develop the network to meet the generation developments that eventuate in the lead time available to undertake these works.

5.1.5 Impact of load growth

This growth in energy and demand has significant implications for the way the TransGrid network is maintained, operated and developed.

This impacts on TransGrid in three ways. TransGrid needs to further develop its network to cater for future load growth, to support higher peak load transfers from inter-regional trade with other states and to accommodate generation developments necessary for the provision of reliable transmission supply to customers.

The transmission network has been managed over time to maximise existing capability and to defer network augmentations. In itself, this is a good result for electricity consumers of NSW as it kept costs low and made best use of available resources. However as the load continues to grow throughout the next regulatory control period and beyond, TransGrid needs to take action to further develop the capability of the transmission system to ensure that the reliability of the network and service performance to customers is maintained.

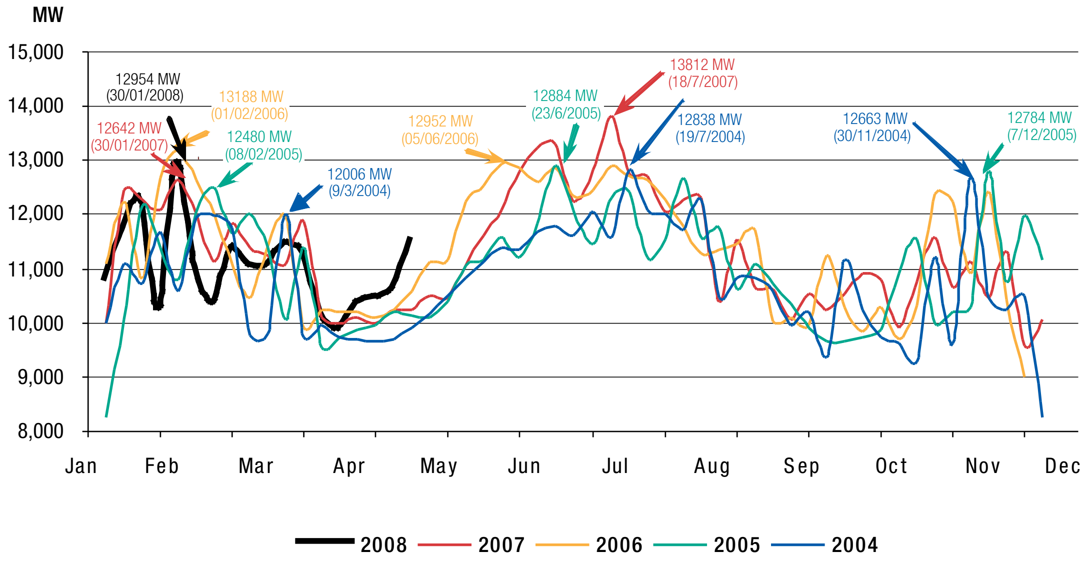
TransGrid's transmission system will need to accommodate increased power flows from the generation centres to the load centres without degradation in system reliability and while TransGrid manages planned system outages for maintenance and construction works.

The reliability of the transmission system in the longer term can only be maintained if adequate maintenance on the transmission system is performed and network upgrades are undertaken in a timely manner.

[18] Summary of Report of the Owen Inquiry into Electricity Supply in NSW, p3. Owen, A D. September 2007. http://www.nsw.gov.au/energy/

One complication of the increase in load growth, and hence the utilisation of the transmission network, is that scheduling outages for construction and maintenance has become increasingly difficult. This is because occurrences of high system demand have moved into the shoulder periods of spring and autumn, when such crucial work has traditionally been done. This is demonstrated in Figure 5.6 which shows the weekly NSW demand over a 12 month period for the years 2004 to 2008.

Figure 5.6: Weekly peak demands



Source: Based on TransGrid records

Historically, high load periods in a year occurred in the three months of summer and the three months of winter, with the winter peak demands being higher and driving system augmentation. However for 2004-2008, there is an emerging trend where the periods of high demand have extended from May to September for winter and November to March for summer. This trend means that the transmission system needs to be available with all critical elements in service for longer periods of time to avoid the risk of not being able to meet customer load requirements.

In summary, the transmission system needs to be available with high reliability for longer periods throughout the year, but with fewer windows of opportunity available to undertake essential maintenance or construction works.

Not only will the changing annual load profile impact on TransGrid and its connected customers, but also on TransGrid's intending customers planning to connect to the high voltage transmission network.

If the issues of load growth and the network being utilised near its capacity are not dealt with adequately in the short and long term, these issues will lead to congested flow paths, fewer outages for essential network augmentation and maintenance, and consequently a reduced reliability of supply to customers.

5.1.6 Responding to load growth

A range of solutions is available to manage an increase in load with parts of the network reaching its capacity.

TransGrid's first step is to identify possible operational changes to maximise the use of the existing network so it can continue to operate safely within its technical limits.

Once all operational measures are exhausted, capacity constraints are expected to occur more frequently as the load grows in the state. TransGrid identifies both non-network options, such as strategies for offsetting demand (e.g. embedded generation and demand management) and network options for addressing these emerging constraints. Network options include augmentations and where prudent, replacing existing plant with higher-capacity plant.

The benefits and efficiencies of each of these options is assessed to determine the most efficient and effective solution. Depending on the potential constraint being addressed, the solution may be a non-network option, a network option, or a combination of both. TransGrid will investigate and rank the most efficient non-network and network options to maximise the overall efficiency of the solution to best manage load growth and network capacity constraints.

Operational changes

Before major investments are considered, TransGrid looks at possible improvements to the way the system is operated and managed.

An example of an operational change is the implementation of protection or control schemes to automatically manage and mitigate the impact of electrical faults in the network (contingent events). Such events, depending on their location, can cause local or widespread outages.

Effective implementation of special protection systems provides higher power transfer levels, while operating within equipment capability limits. This allows the most efficient utilisation of the existing network at minimal cost.

Non-network solutions

TransGrid's Annual Planning Report published each year provides early information to the market on emerging constraints. This is to encourage external parties to propose feasible solutions including local generation and demand management initiatives. Such strategies may reduce, defer or eliminate the need for new transmission network investment.

TransGrid undertakes joint planning with the NSW distributors to identify emerging network constraints and opportunities for local generation (embedded generation) and demand management options. This joint approach provides the best overall solution for NSW consumers as it leverages the greater intelligence DNSPs have on demand reduction opportunities within their networks and their direct control on demand consumption through tariff and load reduction incentives.

TransGrid adopts the most efficient program of non-network and network solutions in its response to emerging constraints. As an example, TransGrid has contracted with several companies to put together embedded generation and demand-side response solutions for summer 2008/09 to postpone the Western 500kV Conversion transmission system augmentation to 2009/10. This is the largest non-network demand management initiative in Australia.

In some cases, investigations of non-network solutions eventually point to the need for network development or a combination of both. For instance, after testing for non-network alternatives to the Wollar-Wellington project for supporting load growth in central and far-western NSW, TransGrid found that it would not be efficient to defer augmentation of the network investment.

As a significant example of demand management planning, TransGrid has been working with Energy Australia on the Demand Management and Planning Project (DMPP) with the objective of slowing the growth in demand, and thus deferring or avoiding network expansion, in Sydney. Initiatives to gather information on opportunities for reducing demand have been instigated at more than 700 sites in St George/Sutherland, Sydney CBD, North Sydney, the Inner West and East Sydney.

The project, to be completed by June 2008, has produced a comprehensive database of opportunities for the reduction of peak demand.

TransGrid intends to continue this work with Energy Australia in the expectation of implementing initiatives that may defer capital works in the Sydney Metropolitan area. TransGrid also plans to co-operate in this way with the other NSW distributors, Integral Energy and Country Energy.

Network development

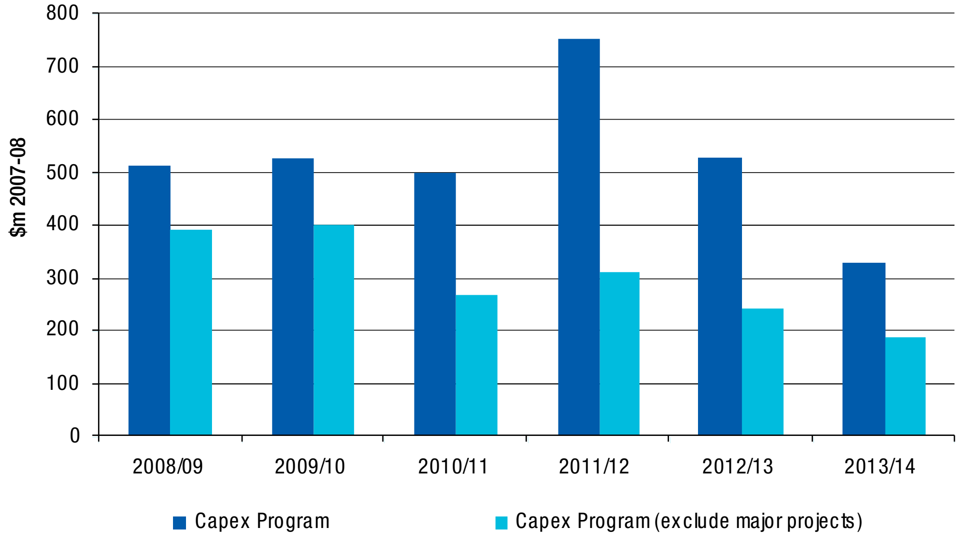
When operational and demand management initiatives have been exhausted and non-network solutions are not viable or efficient, network augmentation is planned to relieve emerging constraints caused by load growth.

5.2 Increased capital expenditure program

TransGrid's proposed capital expenditure allowance for the coming regulatory control period is significantly more than the allowance for 2004/09. This increase is due mainly to crucial augmentation projects and transmission network developments to ensure the reliability of the system is maintained and customer expectations for energy delivery will be met.

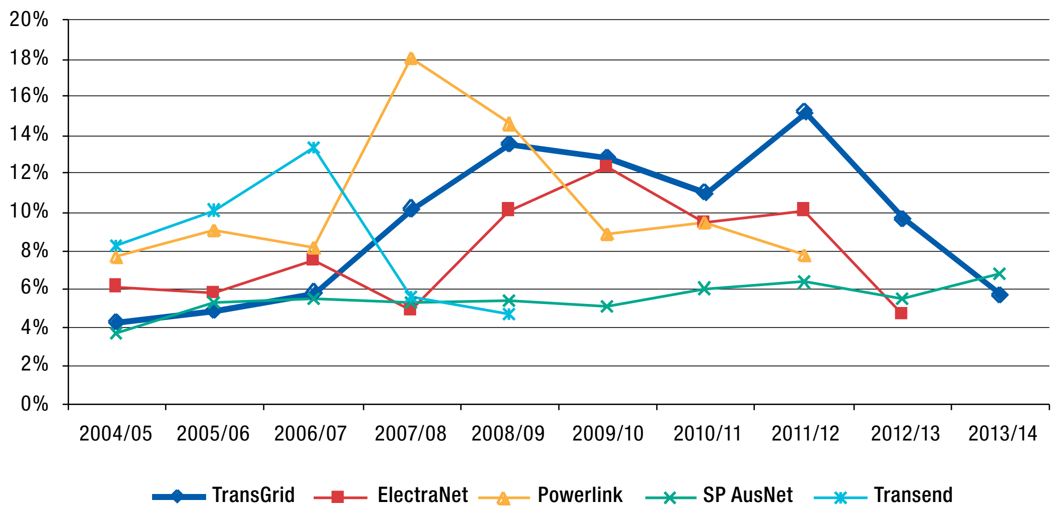
The capital works schedule for the last year in the current regulatory control period (2008/09) is equivalent to the average annual program for the next regulatory control period, as shown in Figure 5.7. Further, the underlying program (excluding the three largest proposed projects) is also very consistent with that currently being delivered.

Figure 5.7: Annual expenditure of forecast capital program



TransGrid is not alone amongst TNSPs in the NEM in identifying the need for an expanded capital works program. Figure 5.8 shows that the proposed capital expenditure is broadly in line with that of other TNSPs in the NEM, taking into account the size of the networks owned by the various companies.

Figure 5.8: Capex/RAB for NEM TNSPs



Source: AER regulatory reports and decisions. TransGrid's figures from its proposal

5.2.1 Delivering the capital expenditure program

Faced with significant capital expenditure in the present regulatory control period, TransGrid introduced a number of initiatives to deliver the projects on time, to budget and in an efficient manner. The focus has been both on the individual projects and on the overall program which is discussed in Chapter 7.

TransGrid is confident it will deliver its capital works program for the present regulatory period and in achieving this also demonstrate the ability to deliver the 2009/14 program. The fact TransGrid has already established contracts for nearly 85% of the capital works scheduled for 2008/09 which will see our ex-ante allowance for the 2004/09 period fully spent, indicates the size of the future capital program is deliverable.

Planning for delivery of some major projects for 2009/2014 is under way. Improvements to governance frameworks and project delivery models during the present regulatory control period have laid the foundations for the coming program.

To manage project delivery, TransGrid introduced a new Corporate Governance Framework in 2005. This included the creation of an executive-level Capital Works Program Steering Committee to assess and manage the risks associated with proposed projects and an enhanced project management process. The governance improvements also included improved Board visibility and oversight of the program. Details of the corporate governance framework are outlined in section 7.12 of this proposal.

TransGrid carefully manages the delivery of plant that has been identified as having critical lead-times due to high global demand. This means equipment with critical lead-times needed in the next regulatory control period have been ordered in the present period. Specifically, the wait for large power transformers is a key issue in the timely delivery of major projects. To counter this, TransGrid reserves production slots with major manufacturers before orders are placed, and seeks alternative suppliers as back-ups.

Also, TransGrid continually tests the market and reassesses sources of supply. It is now sourcing major equipment from a range of suppliers in countries such as China and Thailand.

From a resourcing perspective, period contracts for external engineering services related to jobs such as feasibility studies, cost estimations, major project designs and environmental impact assessments have been established. This enables TransGrid to supplement its internal skills by drawing from a wider pool of engineering resources.

5.3 A growing and mature asset base

TransGrid's network is one of the largest and one of the oldest in Australia. The size of the asset base has grown over the past 60 years and, as shown in Figure 5.9, is expected to grow even further to meet increasing customer load in the next regulatory period.

Figure 5.9: TransGrid asset growth

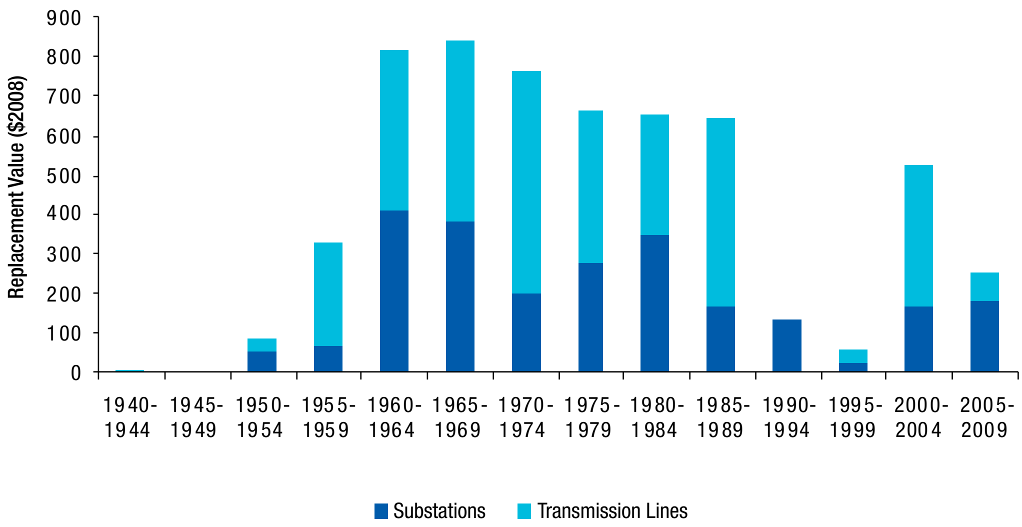
Period	Switchbays	Transformers	Reactors	Transmission Lines (km)	Cables (km)	Substations
2004-09	104	9	4	16	27	2
2009-14	215	23	11	876	26	18

For the network:

- 40% of the transmission lines were commissioned in the 1960s or earlier (the oldest in the 1940s);
- 35% of the substations and switching stations were commissioned in the 1960s or earlier (the oldest in 1950); and
- 25% of the power transformers were commissioned in the 1960s or earlier (the oldest units were made in 1952).

Figure 5.10 shows the commissioning of new assets since 1940. This graph clearly highlights that the majority of system development occurred between the 1960s and the 1980s. The rate of asset growth slowed down significantly since the late 1980s.

Figure 5.10: Commissioning of new network assets



5.3.1 Impact of a growing and mature asset base

The major impact for TransGrid in the next regulatory period will be the increasing operational expenditure required to maintain the reliability of the assets in the existing transmission system and the additional maintenance works needed to support the new assets associated with the capital works program in this proposal.

Condition and replacement

TransGrid's asset replacement programs are determined by asset condition, economic, safety and/or environmental considerations. For the longer term beyond 2014, projections are based initially on age coupled with known existing or emerging issues and anticipated deterioration mechanisms.

It is important to note that TransGrid has not adopted an age-based asset replacement policy. TransGrid's asset replacement program applies sound asset management principles to identify those assets with deteriorating performance and/or unacceptable risk profiles, and prioritises them for replacement.

TransGrid also closely monitors the performance of new equipment, particularly in relation to the risk of premature failure or warranty performance issues.

Maintenance

While the asset base to be maintained grew by almost 4% during the present regulatory control period, the additional cost to maintain these assets was absorbed by TransGrid through the delivery of efficiency gains. In the next regulatory period, TransGrid is expecting a 24% increase in its maintainable asset base. The maintenance costs for these new assets will not be able to be fully absorbed through similar efficiency improvements. However, TransGrid's efficiency will still be improving through economies of scale, which will be reflected in measures of operating efficiency such as opex/RAB.

TransGrid's experience has been that maintenance costs typically increase as assets get older. This is largely driven by the increase in non-routine maintenance as assets age, parts become harder to source and manufacturer support disappears.

The requirement for increased maintenance for older plant is a recognised phenomenon in the electricity industry. A CIGRE study noted:

> *"Failure to deal with future age-related failures can lead to a gradual decline in reliability and increase in operation and maintenance costs".*[19]

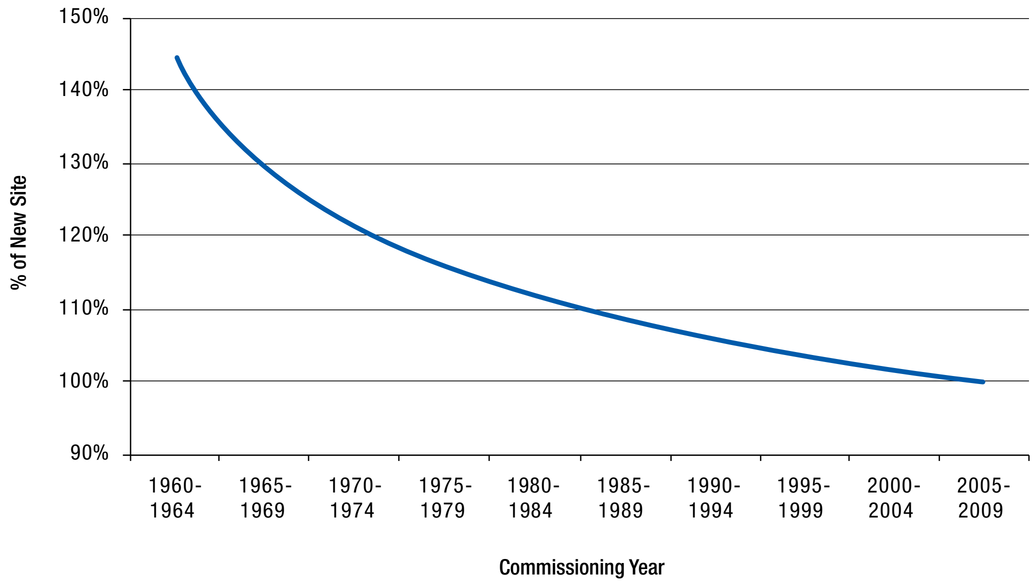
Reduced reliability caused by increased failure rates can also lead to increased operating expenditure and sub-optimal operation as planned work is cancelled to respond to faults.

[19] CIGRE Working Group, Ageing of the System Impact on Planning, CIGRE Working Group, December 2000)

Figure 5.11 charts the average annual maintenance cost per switchbay (including both routine and non-routine maintenance against substation age) for all substation-related assets. The substation assets include associated secondary systems and communications systems.

The graph shows maintenance costs rising significantly for substations over about 40 years of age.

Figure 5.11: Substation Maintenance Cost per Bay



5.3.2 Managing a growing and mature asset base

Consideration of asset replacements are triggered by:

- Asset condition;
- Equipment performance and reliability;
- Supportability of assets; and
- Compliance with safety and environmental obligations.

Asset management strategies are developed for each of the asset categories and well-established asset performance review processes ensure that any emerging performance issues feed into the strategy development. Asset replacement projects are evaluated by detailing the project need, identifying potential options, and comparing the risk and economic efficiency outcomes to ensure the most appropriate solutions are implemented.

The quality of TransGrid's asset management approach was recognised by the ACCC in its 2004 revenue decision:

> *"The ACCC understands that TransGrid has a well-developed asset management strategy with individual maintenance strategies for each category and class of electrical equipment."*[20]

TransGrid's success in managing these assets is reflected in its transmission reliability of over 99.999%, making it a leading performer among TNSPs.

[20] ACCC Supplementary Draft Decision: NSW and ACT Transmission TransGrid Network Revenue Cap, Forward Capital Expenditure 2004-05 to 2008-09; Dated 2 March 2005

A recent study conducted by UMS Group recognised TransGrid's response to the challenge of managing a growing and mature asset base:

> *"TransGrid's operational efficiency and service levels are excellent by international standards, measuring better than average against the superior performing Australian market, and global top quartile, in many areas benchmarked.*
>
> – *Operational efficiency is excellent by international standards, measuring global top quartile against comparable peer companies in half the operating functions benchmarked.*
>
> – *And is better than average among the tough Australian peer group. (The Australian transmission network companies are clearly superior performers [operators and maintainers] on the world stage, with performance levels that exceed global peers by a considerable margin.)*
>
> – *TransGrid's service quality is also superior in many areas of operation, with good availability, few unserved load events each year, equipment failure rates which are in line with industry norms, and good power quality (relatively few supply frequency or voltage variations each year).*
>
> *TransGrid's relatively heavy transmission loading and its operating and business environment impose numerous unique challenges that make these performance results even more impressive on a global basis. But based on our experience with transmission businesses around the world, maintaining this superior efficiency is likely to be more difficult over the next few years as asset ageing will present growing challenges to TransGrid."* [21]

The challenges of significant asset growth coupled with the ongoing consequences of managing end-of-life issues will put additional pressure on service performance. TransGrid's proposed capital program is necessary to ensure the ongoing reliability of the network. However, the construction program will inevitably have an impact on network availability.

5.4 Managing expenditure with strong growth in input costs

During the current regulatory period, TransGrid has worked hard towards managing expenditure in a global environment of rising input costs. This has been achieved through implementing an efficient business strategy, benchmarking to test our progress against other TNSPs and implementing a range of efficiency improvements to optimise our work practices and processes.

Both transmission and distribution network companies in Australia have been reporting rapidly increasing costs for individual projects, reflecting both the labour and material input cost pressures.

These escalating input costs have an impact on the revenue TransGrid needs to prudently manage its operating activities and to fund its capital projects.

[21] UMS Group: TransGrid Transmission Efficiency Review, May 2008

5.4.1 Business strategy

TransGrid has put in place processes to ensure its service delivery is cost effective. This is achieved by optimising the mix of in-house and outsourced services to best manage expenditure.

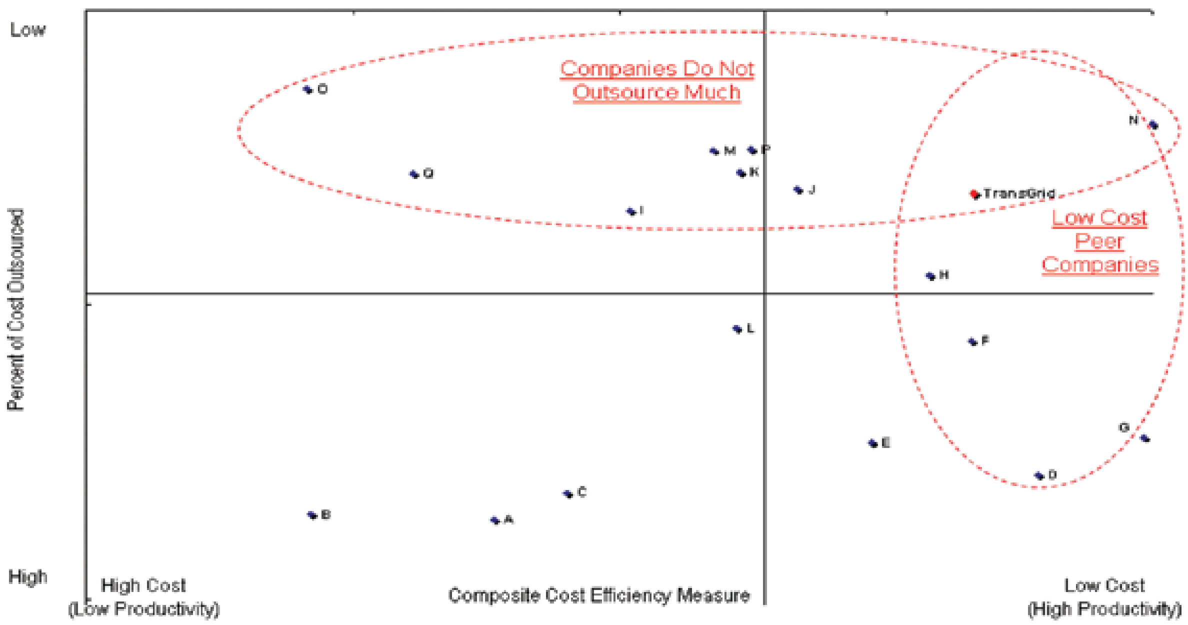
Where prudent, TransGrid outsources work – such as easement maintenance, high-voltage testing, environmental and design services, IT service delivery and construction services for major works. All this work is competitively tendered.

A recent study by the UMS Group[22] shows that the abovementioned strategy has resulted in TransGrid being a low-cost service provider when compared to peer companies internationally.

> *"Outsourcing strategies vary widely across the global transmission business. Some companies seek to outsource wherever they can, while others are committed to providing as much work with internal staff as possible.*
>
> *"UMS Group has studied various strategies across the world and the impact they have on efficiency and performance of the business. The evidence suggests that when appropriately applied, outsourcing can improve performance and efficiency of parts of the transmission business. This is almost universally true in selected areas such as tree trimming. But caution is indicated because there are many areas (such as asset management) in which outsourcing can increase costs. And if done poorly, outsourcing can result in loss of management control and reduced effectiveness in the business.*
>
> *''Reviewing service level and relative cost, UMS find no correlation between the degree of outsourcing and the effectiveness or cost of operations for a company."*[23]

Figure 5.12 from the UMS report indicates that there is no correlation in the transmission sector between choice of an insourced or outsourced business model and cost-effectiveness.

Figure 5.12: Overall cost performance vs percentage outsourced



[22] UMS Group: TransGrid Transmission Efficiency Review; May 2008
[23] ibid

TransGrid believes its demonstrated cost-effectiveness, on a range of measures, supports its position as an efficient TSNP. The challenge for TransGrid is to maintain this efficiency with increasing input costs and maintenance costs from a growing asset base over the next regulatory period.

5.4.2 Benchmarking

Since 1995 TransGrid has participated in the International Transmission Operations and Maintenance Study (ITOMS), which benchmarks the maintenance and asset management activities of high-voltage transmission utilities (about 25 transmission organisations from Australia, New Zealand, USA, Europe, UK and Scandinavia).

TransGrid uses the ITOMS results to compare the maintenance policies and strategies of both overseas and Australian utilities. ITOMS studies in the past decade have confirmed the effectiveness of TransGrid's maintenance policies and asset management processes, and have helped identify further maintenance improvements.

Figure 5.13 shows the overall composite benchmark from ITOMS 2007. It has TransGrid well positioned in the "best performer" quartile (lower-than-average cost and above-average reliability). The average result for the Asia Pacific region (shown by the "ASP" triangular mark) has TransGrid's network performance well above the regional average, and costs substantially lower than the average.

Figure 5.13: ITOMS 2007 - Overall composite benchmark

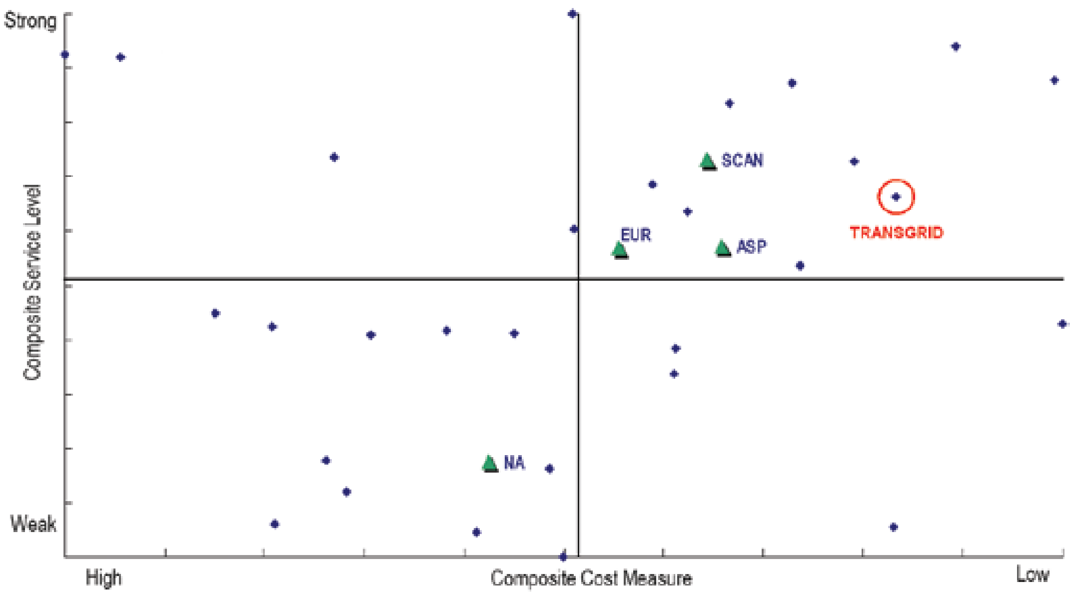
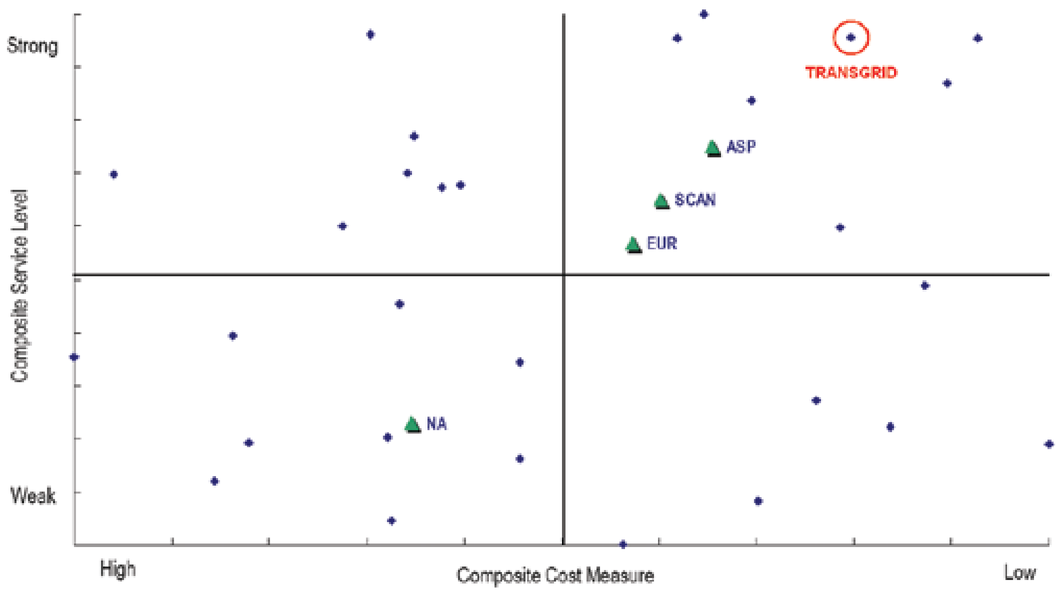


Figure 5.14 shows the transmission line composite benchmark. It has TransGrid high in the "best performer" quartile. Again, TransGrid's performance is well above the regional average, and costs are well below.

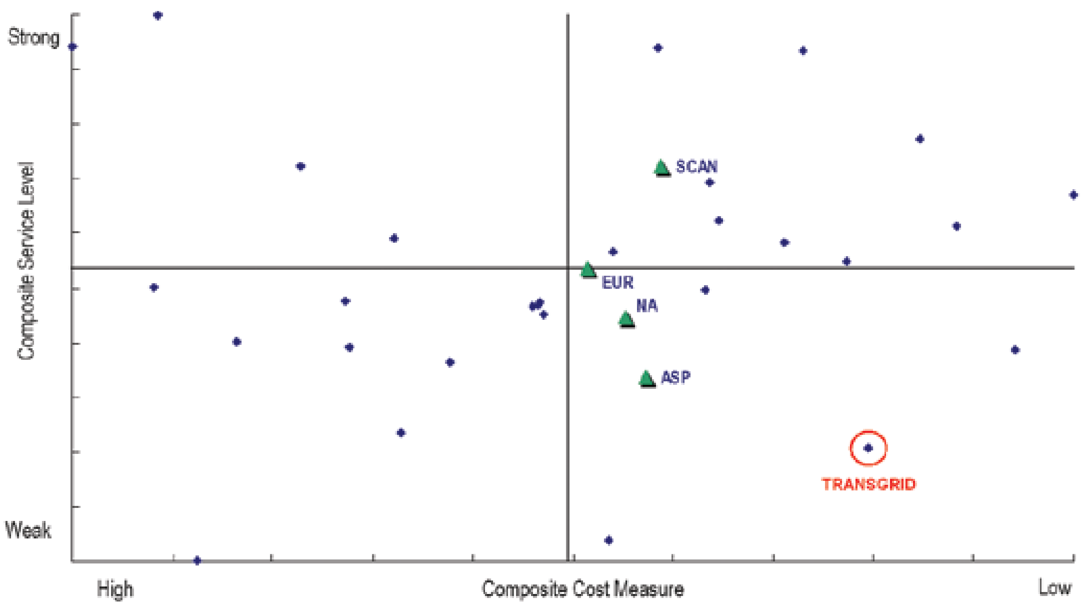
Figure 5.14: ITOMS 2007 - Transmission line maintenance



International benchmarking over time by ITOMS has consistently shown TransGrid to be in the top-performing quarter for mains maintenance work, and very close to the world's best practice.

Figure 5.15 shows TransGrid's substation maintenance cost performance is excellent compared to other entities. The service level is below average, though, and TransGrid is working on improvements. It is critical that TransGrid's asset replacement strategies continue to address these service levels. While larger assets (such as transformers, circuit breakers, current transformers and relays) are being progressively replaced, ancillary assets (such as cables, marshalling kiosks, wiring and steelwork) continue to age and need to be addressed through substation renewal projects.

Figure 5.15: ITOMS 2007 - Substation maintenance



TransGrid has also participated in benchmarking in other areas such as IT, risk and audit, supply management and human resources. TransGrid consistently performs well in these benchmarking exercises.

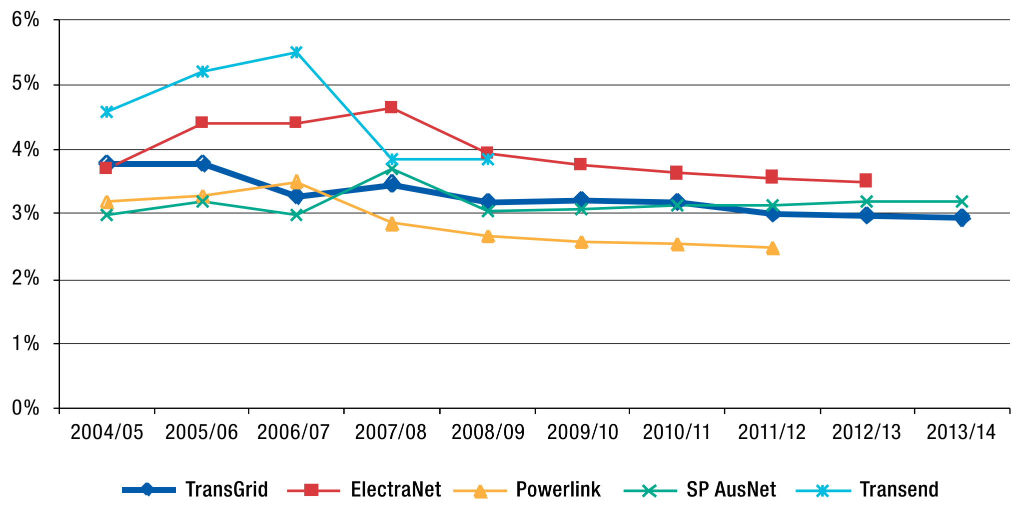
5.4.3 Efficiency improvements

TransGrid is committed to managing its business within the approved operating allowance for the present regulatory control period, but this challenge is becoming increasingly difficult. All reasonable efficiencies have been achieved and a real increase in operating expenditure will be needed to ensure the growing and ageing asset base is managed safely and prudently.

TransGrid has improved efficiency across the business. Some of the more significant changes relate to control room and shift staffing (leading to a "virtual control room" model), rationalising outsourced IT services to a single contractor, centralising the payroll and logistics function and introducing an Outage Management System (OMS) to improve the co-ordination of routine, defect and project work requiring outages.

In Figure 5.16, the AER benchmark of operating expenditure (Opex) versus regulatory asset base (RAB) indicates TransGrid's continuing improvement over the present regulatory control period, and forecasts the improvement to continue in the future.

Figure 5.16: AER benchmark - operating expenditure vs RAB



Source: AER regulatory reports and decisions. TransGrid's figures from its proposal.

5.5 Community and environmental obligations

The heightened awareness of environmental issues in the community has led to an increased expectation that electricity supply and construction will be undertaken in an environmentally sensitive manner. Areas of community concern include visual impact, noise, waste, conservation and preservation, and consideration of property owners.

These expectations are reflected in stringent environmental regulations that impact TransGrid's operations. These regulations have become progressively more prescriptive over time and there is no expectation that these standards will be relaxed in the future.

5.5.1 Impact of community and environmental obligations

As the community demands more social and environmental accountability, TransGrid will face greater challenges.

New line routes will be harder to acquire as supply of suitable land in NSW diminishes. Accordingly, lines may need to be reconstructed on the routes of older, lower-voltage lines, creating costs associated with limited outage windows, staggered construction, short recall times and removal of old lines.

The major cost from an environmental point of view is likely to be expenditure on measures to ensure compliance with tighter greenhouse gas emission controls, such as programs to minimise SF_6 losses.

5.5.2 Responding to community and environmental obligations

To meet environmental legislation and regulation requirements, TransGrid trains staff in environmental assessment and protection, and has developed an Environmental Management System to identify and manage potential issues.

TransGrid's long-term planning (five to 15 years) identifies emerging constraints and looks at future major developments in the light of issues such as community and environmental concerns. For instance, such planning may lead to a different approach to work in areas of high significance (such as National Parks and large population centres) from what might have been identified in shorter-term planning.

PriceWaterhouseCoopers has noted the value of this long-term planning:

> *"There are a range of technical options which are implemented by transmission operators with limited access to new line routes for major cities. However, there are often cost implications associated with these technical options and transmission operators operating under economic regulators develop a long-term strategic plan with which to explain investment plans, especially where investment choices at a short-term 'project' level may not readily appear to be the lowest-cost solution. International experience shows that regulators have allowed the costs of investments which are not the 'least cost' to be recovered."*[24]

Such planning ensures solutions take into account the eventual impact on the environment, the public and affected businesses. The timing and capital cost of possible solutions for constraints identified in long-term planning may change significantly as system conditions evolve.

[24] PriceWaterhouseCoopers, Review of International Practices in Planning Network Development for Major Load Centres, February 2008

6. Historical performance

This section sets out TransGrid's performance in the current regulatory control period in the areas of capital expenditure, operating expenditure and the service standards incentive scheme.

6.1 Capital expenditure

6.1.1 Ex-ante regime

TransGrid was the first TNSP granted an ex-ante capital expenditure allowance, which commenced with the current regulatory period. The objective of the ex ante regime was stated by the ACCC in their final decision published on 27 April 2005:

> *The objective of the ex ante allowance is to provide certainty and incentives for efficient investment. This requires the allowance to be reasonably aligned with efficient costs over the period, and requires an analysis of a TNSP's proposed investment program at the beginning of each regulatory period; and*
>
> *Although TransGrid has submitted a suite of projects in its forward capex application, there is no requirement that it spend the allowance allocated to it over the regulatory period on those particular projects, or according to the timeframe proposed…TransGrid may reallocate or reprioritise the ex ante allowance in any way it chooses.*[25]

TransGrid's original proposal for the 2004/09 regulatory period submitted in September 2003 was based on ex post capital expenditure compliance requirements. During the submission review process the decision was taken by TransGrid and the ACCC to change to an ex-ante capital expenditure regime. As a result of this change a second capital proposal was submitted by TransGrid and reviewed by the ACCC. Due to this change, TransGrid's revenue determination was not finalised until almost a year into the regulatory period (published on 27 April 2005).

6.1.2 Expenditure during 2004/09

Projects were selected and proceeded to expenditure commitment during the current regulatory control period through either:

- The "Regulatory Test" approval process for augmentation projects, or
- In accordance with TransGrid's asset management program, policies and procedures for asset replacement projects, or
- Through a business case process or other internal approval mechanism for support the business capital expenditure.

[25] ACCC 2004 Final Decision TransGrid's Revenue Cap

TransGrid's Capital Works Program Steering Committee oversees the delivery of the program. Its main objective is to facilitate the delivery of TransGrid's capital works program.

Figure 6.1 shows TransGrid's historical and expected capital expenditure for the current regulatory period.

Figure 6.1: Actual and expected capitalisations by category $2008

Real 2008 $m	Actual			Partial Forecast	Forecast	
Category	2004/05	2005/06	2006/07	2007/08	2008/09	Total
Augmentation	54.8	58.6	67.5	221.2	354.9	748.0
Property & Easements	9.9	7.9	34.4	21.9	42.2	116.3
Replacement	54.9	71.3	82.7	71.9	76.7	357.5
Security/Compliance	0.9	3.4	7.7	8.6	18.8	39.4
Information Technology	11.7	14.9	10.2	13.1	14.3	64.1
Facilities	1.5	1.1	10.8	9.0	12.7	35.1
Motor Vehicles	6.4	2.7	7.4	6.1	1.7	24.3
Other	3.5	0.9	1.7	1.9	1.6	9.6
Total	**143.6**	**160.9**	**222.4**	**353.7**	**513.8**	**1,394.4**

Figure 6.2 shows the variance of the expected total expenditure from the allowance granted by the ACCC.

Figure 6.2: Variance of Total Capital Expenditure $2008

Category	ACCC Decision	Actual/Forecast	Variance
Augmentation	828.0	748.0	-80.0
Replacement	314.6	396.9	82.3
Property & Easements	99.9	151.4	51.5
Support the Business	94.4	98.1	3.7
Total (Real 2008 $m)	**1336.9**	**1394.4**	**57.5**

** Replacement includes security/compliance.*

The variance summary in Figure 6.2 shows that TransGrid's expected actual capital expenditure for the present period is within 5% of the approved ex ante allowance.

TransGrid is confident it will efficiently expend the ex ante allowance given that about 85% of contracts for 2008-09 projects are currently in place.

The augmentation expenditure is slightly below the ACCC decision due to deferment of construction of the Wollar to Wellington transmission line whilst non-network solutions proposed by the market were being evaluated, and delays in obtaining development approvals in the ACT for the Williamsdale project.

The network replacement program is slightly above the ACCC decision due to replacement of a larger number of assets due to poor condition.

Property and easement expenditure is slightly over the ACCC decision due to a larger building and facilities construction program in the period.

The expenditure profile during the current regulatory period is different to that allowed for in the ACCC decision, with TransGrid spending later in the period. Apart from delays in the construction of some large projects a major reason is the uncertainty generated by the change from an ex post to an ex ante regime during the ACCC's determination period, with TransGrid not receiving the final ACCC decision until one year into the regulatory period.

6.1.3 Contingent projects

In addition to the ex ante capital expenditure incentive, the ACCC's Final Decision for TransGrid's 2004-09 revenue stated that:

> *"The second element of the capex incentive is an allowance for significant but uncertain investment (contingent projects) which is not included in the main ex ante capex allowance, but which will be allowed when a TNSP can demonstrate that the investment is required."*[26]

Once the trigger(s) for a contingent project has been met, the project would then become the subject of a further "mini" ex ante cap, commencing once the regulatory test assessment for that investment has been completed and investment in the project begins.

In the Final Decision there were five contingent projects. None of the contingent projects were invoked by TransGrid as the trigger events did not occur.

6.2 Operating expenditure

The actual operating expenditure incurred in the regulatory period is related to operational needs as they have arisen. TransGrid has not had any changes in policies, procedures or practice that amount to cost-shifting.

6.2.1 ACCC 2004-2009 allowance

The ACCC in its 2005 revenue decision factored an annual 2% efficiency adjustment into TransGrid's revenue cap for this period. In response to this target, TransGrid has implemented efficiencies to reduce expenditure while maintaining its record of high reliability.

6.2.2 Actual operating expenditure

Figure 6.3 provides a summary of the ACCC's operating expenditure allowance for TransGrid in its 2005 revenue cap decision, and TransGrid's estimate of its operating expenditure for the present regulatory control period.

Figure 6.3: Operating expenditure compared to ACCC decision

Opex Allowance (2008 $m)	2004/05	2005/06	2006/07	2007/08	2008/09	Total
ACCC's Final Decision	131.6	131.1	130.7	130.3	130.2	654.0
Actual/Forecast	128.9	128.9	128.3	123.9	124.6	634.7
Variance	**-2.7**	**-2.2**	**-2.4**	**-6.4**	**-5.7**	**-19.3**

[26] ACCC Final Decision TransGrid's Revenue Cap, page 26

As shown above in Figure 6.3, TransGrid's operating expenditure for the current period is expected to be below the ACCC allowance. This variation is due to two factors.

The first factor relates to TransGrid's targeted cost reduction program which in relation to its normal business activities has achieved cost reductions and as a result expenditure is slightly below the ACCC allowance. The ACCC set challenging expenditure targets for the organisation in its 2005 regulatory decision and all efforts have been made to contain its expenditure to within the allowance.

These cost reduction efforts have included a review of work processes across the organisation and the introduction of process improvements, which have reduced costs. Initiatives put in place to achieve these efficiencies include a review of the control room shift arrangements leading to a reduction in control room staff, centralisation of support functions and rationalisation of the IT outsourcing arrangements. These measures have reduced costs and led to increased productivity.

Significant pressure is continuing to be applied to operating costs and the organisation has achieved a result better than the regulatory allowance while also exceeding the Service Standard targets agreed with the Regulator.

The second factor is an abnormal item due to the occurrence of a "holiday" in superannuation contributions required from the organisation to fund a defined benefits (pension) superannuation scheme that applies to a number of its employees and ex-employees. Contributions are determined by the fund each year on an actuarial basis.

No contribution was required to be made to the scheme in 2007/08, or will be required to be made in 2008/09, due to the strong performance of the fund in the market over the preceding years. This holiday will lead to an abnormal reduction in operating costs in both 2007/08 and 2008/09.

Figure 6.4 shows a breakdown of TransGrid's operating expenditure in the current regulatory control period. The information is presented in the same categories that TransGrid has used to forecast its operating expenditure for the period 2009/14.

Figure 6.4: Operating expenditure in current regulatory period

OPEX by Category (2008 $m)	2004-05	2005-06	2006-07	2007-08	2008-09	TOTAL
Direct Maintenance	57.0	56.6	57.5	58.6	59.1	288.8
Maintenance Support & Asset Management	8.7	10.3	12.1	9.6	9.9	50.6
Operations	8.7	8.2	8.9	8.0	8.0	41.8
Grid Planning	4.6	5.1	3.9	3.5	3.6	20.8
Taxes & Insurance	8.0	9.3	9.2	8.3	8.7	43.6
Property Management	7.3	8.0	6.6	6.3	6.0	34.2
Corporate and Regulatory Management	15.2	11.6	11.7	11.8	11.2	61.5
Business Management	19.4	19.7	18.5	17.8	18.1	93.5
Total Opex	**128.9**	**128.9**	**128.3**	**123.9**	**124.6**	**634.7**

6.2.3 Network support

TransGrid entered into network support arrangements for two related needs in the regulatory period. Both arrangements are associated with TransGrid's Western 500kV Conversion project and both have had pass-through applications approved by the AER.

The first network support arrangement was with Macquarie Generation to fund the reconnection of two units at Bayswater power station to 500kV by the replacement of generator transformers. The cost for this is $5.7 million in 2007/08 and $24 million in 2008/09.

The second network support arrangement was a set of contracts for generation support and load curtailment for summer 2008/09 which allows the economically efficient deferment of the 500kV network upgrade. The implementation of these contracts will cost up to $21.9 million in 2008/09.

Total network support payments anticipated for the period are shown below in Figure 6.5.

Figure 6.5: Network support payments

($m nominal)	2004/05	2005/06	2006/07	2007/08	2008/09
Network Support Payment	-	-	-	5.7	45.9

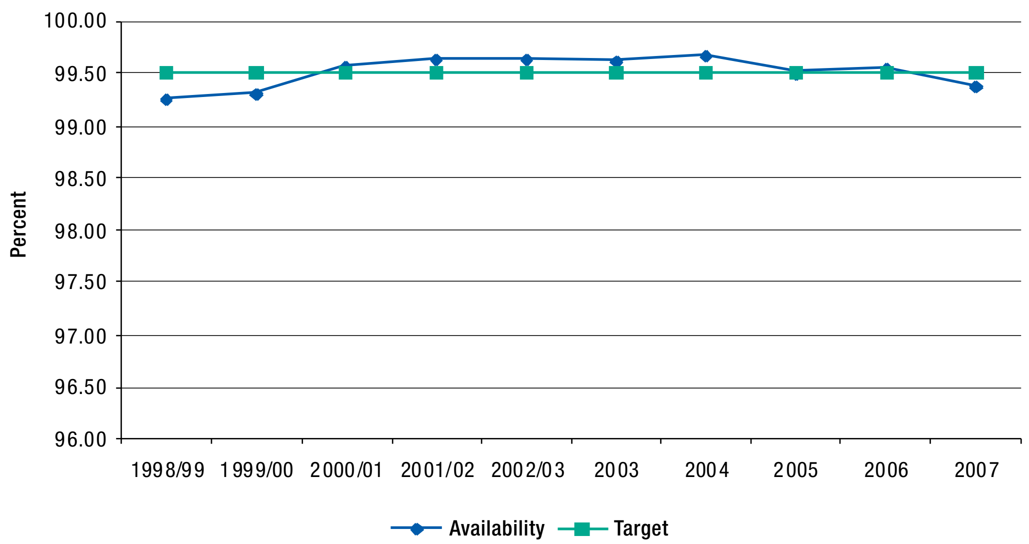
6.3 Service target performance

The Service Target Performance Incentive Scheme aims to provide appropriate incentives for TNSPs to improve or maintain levels of availability, reliability and restoration time after unplanned outages.

TransGrid has responded to the incentives with initiatives such as monthly outage-planning workshops (to co-ordinate and reduce outages), an outage management system (to automatically group outages on related plant), and a refinement of work practices to minimise the duration of outages.

TransGrid has been a consistently high performer in transmission line availability as shown in Figure 6.6 below.

Figure 6.6: Transmission line availability



Most outages on transmission lines in the past decade have been for capital work and scheduled maintenance. The drop in availability in 2007 is mainly due to outages associated with a growing program of capital works and wood pole replacements. The capital and replacement programs are set to increase in 2009-2014, further affecting availability. The target will need to be adjusted to reflect this.

The same is true for transformer and reactive plant availability as shown in Figures 6.7 and 6.8, where TransGrid has also been a strong performer. The replacement program that affected transformer availability last year will continue into the coming regulatory period, and few improvements can be made to reactive plant availability without compromising TransGrid's best-practice maintenance regime. Again, the target in the next regulatory period will need to reflect these difficulties.

Figure 6.7: Transformer availability

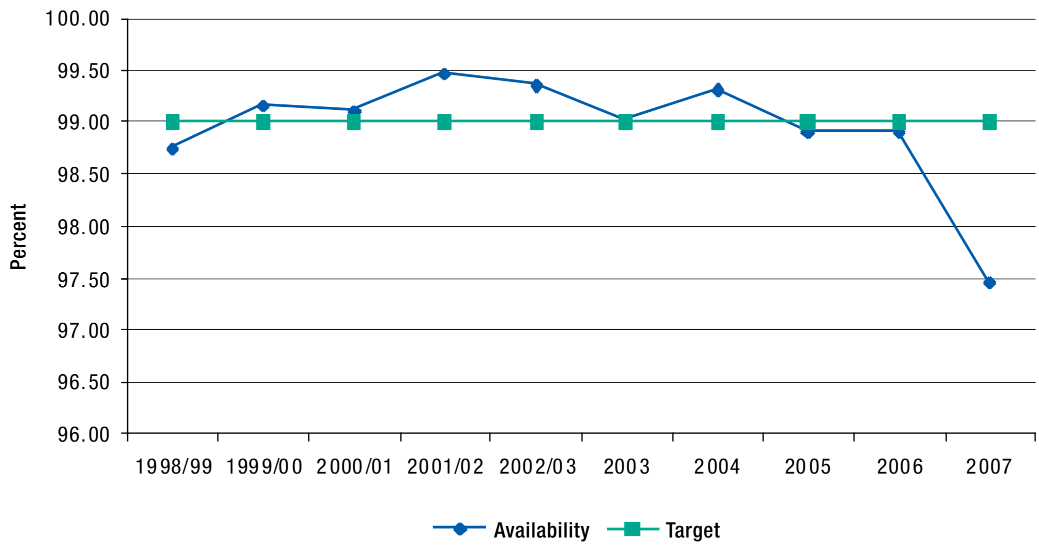
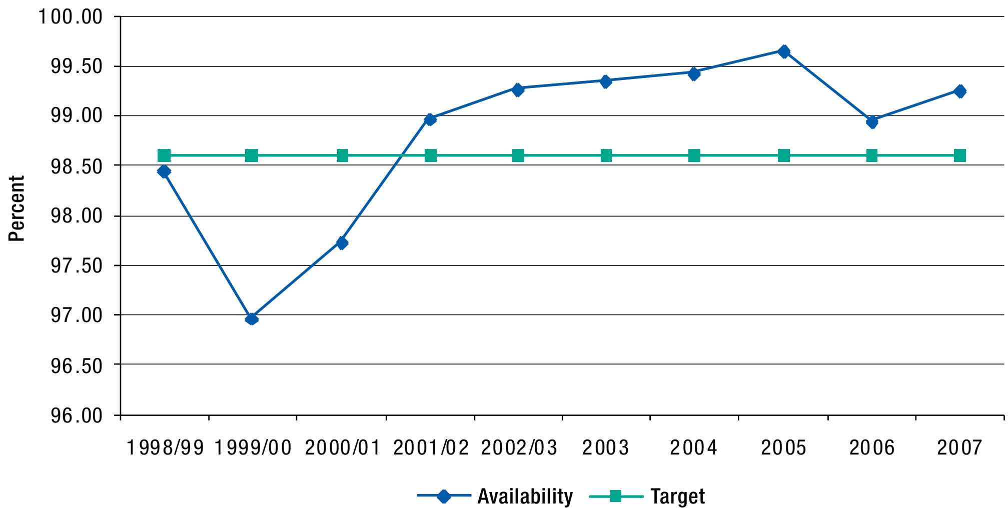


Figure 6.8: Reactive Plant availability



Expressed as a percentage of energy supplied, loss-of-supply results in the current period correspond with a reliability level of over 99.999% (refer to Figures 6.9 and 6.10).

TransGrid has improved its results for loss-of-supply events greater than 0.05 system minutes[27], as well as for those greater than 0.4 system minutes.

Figure 6.9: Loss of supply greater than 0.05 system minutes

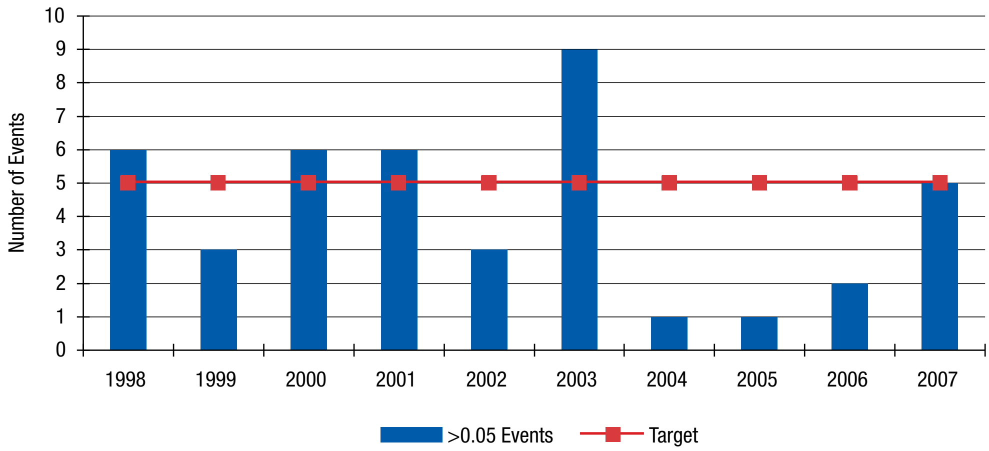
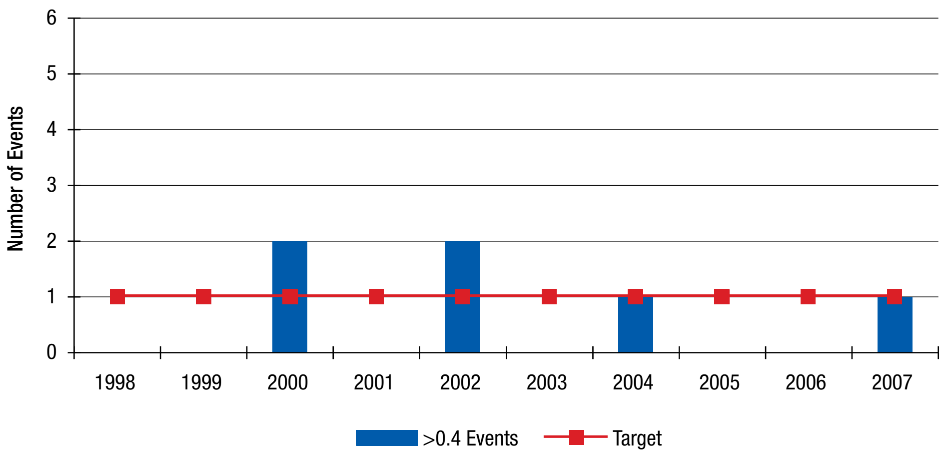


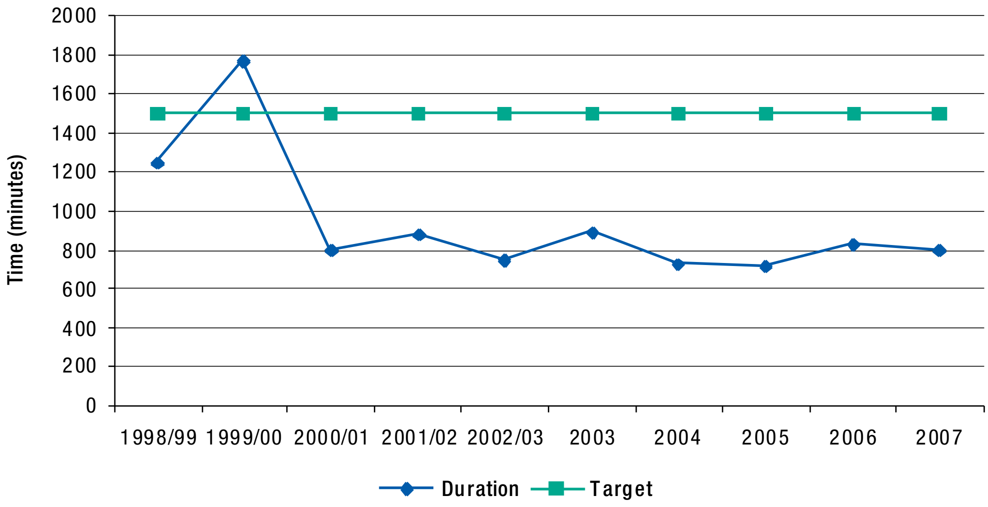
Figure 6.10: Loss of supply greater than 0.4 system minutes



[27] One system minute equates to the energy that would not be supplied if a total state shutdown occurred for one minute at the time of maximum demand for the year.

Figure 6.11 shows unplanned outage duration has also improved and TransGrid expects to maintain this level of performance.

Figure 6.11: Average outage duration



In summary, TransGrid has responded positively to the incentive scheme and has performed consistently to a high level.

TransGrid's increased capital works program over the next regulatory control period will mean that it will not be possible to maintain the high network availability achieved over recent years. It should be noted that this decrease in availability has not affected the reliability to TransGrid's customers. TransGrid will manage these outages to ensure ongoing reliability to customers and to minimise congestion impacts.

7. Forecast capital expenditure

The methodology used to develop TransGrid's capital expenditure forecasts is described in this chapter of the revenue proposal. The key assumptions used to develop TransGrid's capital expenditure forecasts relate to:

- Forecast demand as set out in TransGrid's 2007 Annual Planning Report;
- Scenario analysis that models key themes that will affect likely generation developments and consequently the development of the NSW transmission system;
- Transmission reliability standards required by the NER and the NSW Electricity Supply Act, as set out in the 2007 Annual Planning Report;
- Replacement of equipment in accordance with TransGrid's Network Asset Management Plan and related asset management strategies;
- Project scopes developed to meet the augmentation and replacement requirements;
- Project costs developed from TransGrid's cost estimating database; and
- Increases in costs based upon forecasts of wages growth, construction costs and cost risk analysis.

Based upon the methodology used and the key assumptions that underlie the capital forecasts TransGrid is of the view that the capital expenditure contained in this chapter is necessary to:

- Efficiently meet the expected demand for prescribed transmission services over the 2009/10 to 2013/14 regulatory control period;
- Comply with all applicable regulatory obligations associated with the provision of prescribed transmission services;
- Maintain the quality, reliability and security of supply of prescribed transmission services; and
- Maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

TransGrid considers that the capital expenditure forecasts in this chapter meet the capital expenditure objectives set out in the NER.

7.1 Capital Expenditure categories

TransGrid's capital expenditure categories for the 2009-2014 revenue proposal are:

- Augmentation: Projects to enlarge the network or increase its transmission capability;
- Replacement: Works to replace transmission lines, substation primary plant, secondary systems, communications equipment and other system assets;
- Land/easements: Acquisitions for future augmentation and connection projects;
- Security/compliance: Projects that ensure the physical security of critical infrastructure assets, and that ensure TransGrid complies with applicable regulatory obligations or requirements;
- Information technology: Development and maintenance of IT capacity and improvements to functionality of business systems;
- Facilities: Projects to replace and upgrade buildings to meet business requirements;
- Motor vehicles: The acquisition of fleet vehicles and mobile plant; and
- Office machines and miscellaneous plant.

7.2 Forecasting methodology

TransGrid's capital expenditure forecasting methodology as shown in Figure 7.1 consists of the following four forecasting processes which are discussed in detail in the next sections:

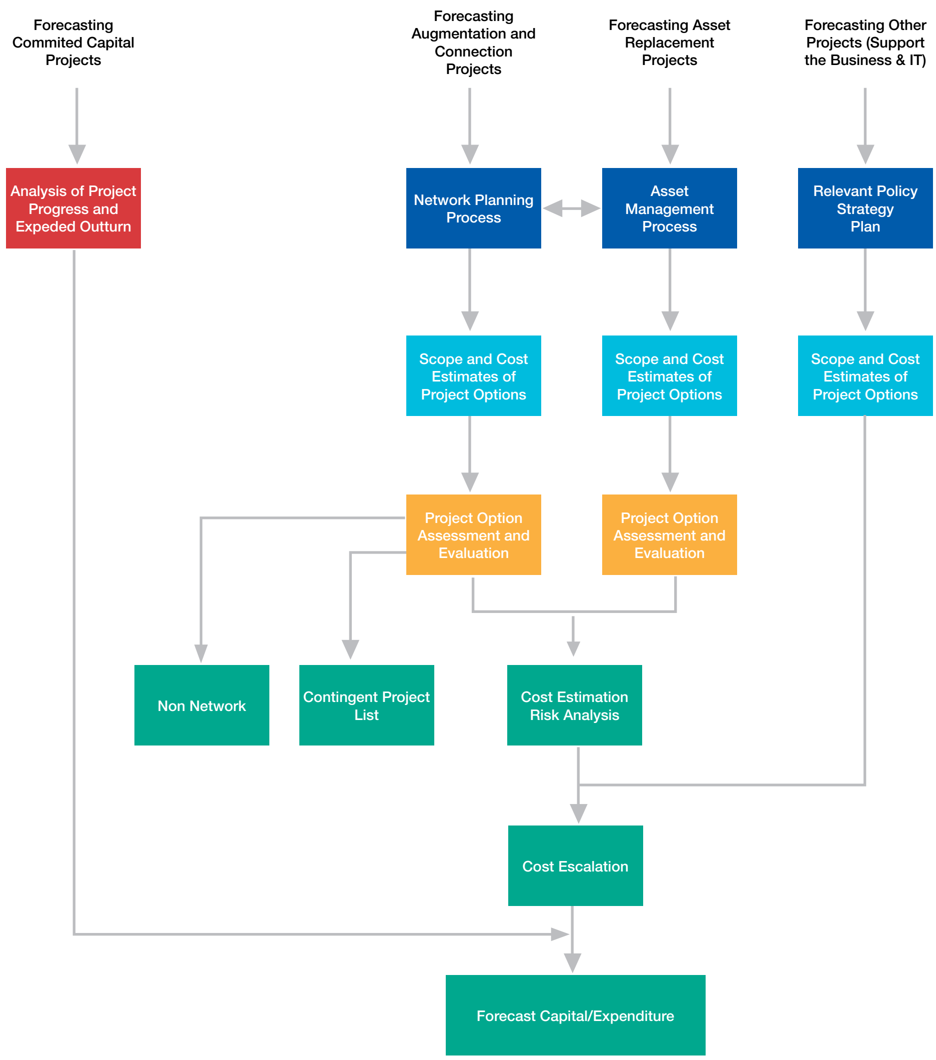
- Committed capital projects;
- Forecasting augmentation projects;
- Forecasting asset replacement projects; and
- Forecasting other capital expenditure projects.

7.3 Committed capital projects

These projects have been already contracted and expenditure committed for the next regulatory period. The expenditure forecasts are based on the committed contract payments.

These projects have been formally approved in accordance with TransGrid's capital expenditure governance processes described in Section 7.12. These projects have either completed the Regulatory Test, or in the case of non-augmentation projects, TransGrid's business-case or internal approval process.

Figure 7.1: Capital Expenditure Forecasting Methodology



7.4 Forecasting augmentation projects

7.4.1 Planning Obligations

The Rules set out the required processes for developing networks as well as minimum performance requirements of the network and connections to the network. They also require TransGrid to consult with market participants and interested parties and to apply the AER's Regulatory Test to development proposals.

As a TNSP TransGrid is obliged to meet the requirements of Schedule 5.1 of the Rules. In particular, TransGrid is obliged to meet the requirements of clause S5.1.2.1.

In addition to meeting the requirements of the Rules, environmental legislation and other statutory instruments, TransGrid is expected by the NSW jurisdiction to plan and develop its transmission network on an 'n-1' basis. That is, unless specifically agreed otherwise by TransGrid and the affected DNSP or major directly-connected end-use customer, there will be no inadvertent loss of load (other than load which is interruptible or dispatchable) following an outage of a single circuit (transmission line or cable) or transformer, during periods of forecast high load.

TransGrid's planning obligations are also linked with the licence obligations placed on DNSPs in NSW. NSW DNSPs are obliged to plan to 'n-1' for all loads greater than 15MVA. The DNSPs can only deliver 'n-1' reliability if TransGrid's network upstream of each connection point is similarly planned to 'n-1' standards.

TransGrid must also ensure that developments are undertaken in a socially and environmentally responsible manner.

7.4.2 Planning Processes

TransGrid has a 25-year strategic vision for its network, meaning longer-term issues can be taken into account when developing options for shorter-term requirements. Outline plans for the long term give a more detailed description of the network being considered, the load in an area, the potential for generation development, and possible limitations and solutions.

Through its planning processes, TransGrid identifies and assesses emerging network constraints and then evaluates the options to relieve the constraints. These processes are described in TransGrid's network planning processes and entails:

- identification of needs;
- identification of options;
- evaluation of options; and
- selection of the preferred option.

The planning process used to make this evaluation is shown in Figure 7.2 with the various inputs to the process described below.

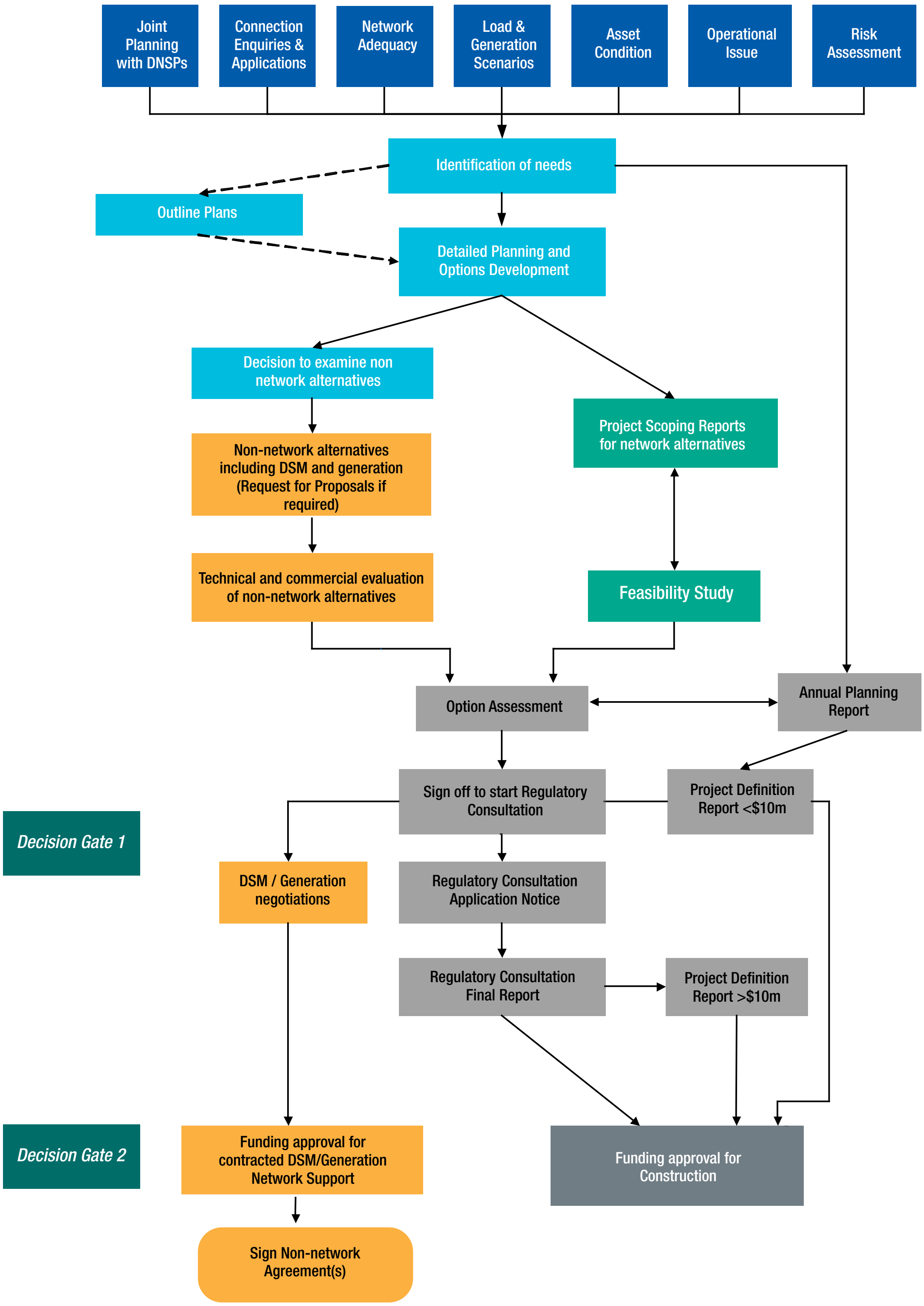
Where augmentation works by TransGrid and a DNSP are required, a needs and options paper is developed to cover the work of both companies. This ensures proposed development options are the most efficient possible and hence ultimately the least cost to the consumers. This is especially important when network augmentations involve more than one DNSP.

Network adequacy studies or load and generation scenario analyses are used in modelling the future network and testing for adequacy, which may be influenced by interstate power transfers.

When considering options for relieving constraints, TransGrid investigates operational demand side initiatives as described in Section 5.1.6.

Asset management and replacement programs are assessed and taken into consideration when analysing augmentation options to ensure the augmentation and asset replacement works are optimised.

Figure 7.2: TransGrid's planning processes



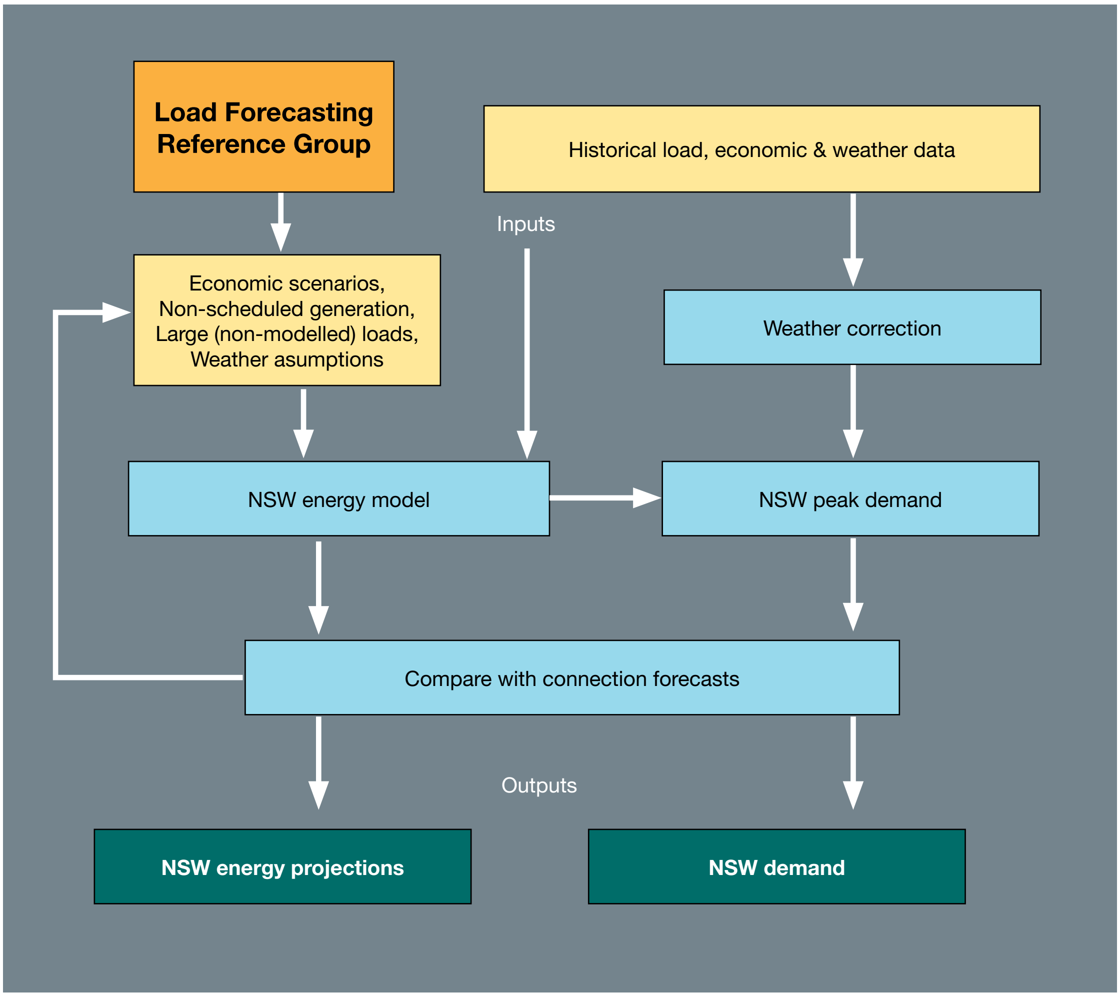
Note: Process within orange boxes relates to the non-network stream

7.4.3 Demand forecasts

One of the key drivers to network augmentation is the growth in customer load.

The process of formulating energy and demand projections for the NSW region of the NEM is illustrated in Figure 7.3.

Figure 7.3: Production of energy and demand projections



As shown in the diagram, NEMMCO's Load Forecasting Reference Group develops definitions and assumptions that form a major input into the forecasting process. The forecasts are based on information gathered by the National Institue for Economic and Industrial Research (NIEIR), on behalf of NEMMCO. In using the NIEIR reports, TransGrid ensures its load forecasts are based on assumptions consistent with those used for the rest of the NEM.

This data forms the input to the statistical models developed by TransGrid for load forecasting. These models include:

- The energy model, which relates electrical energy to demographic, economic and weather variables;

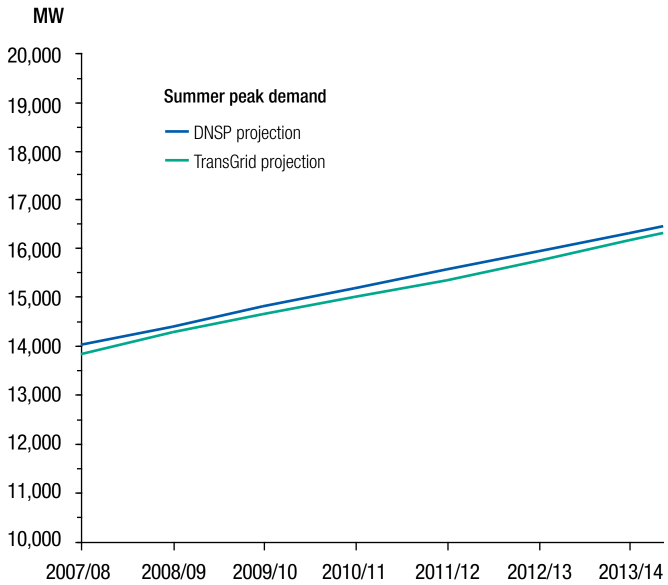
- The weather correction model which analyses historical demands and weather conditions to determine a probability distribution of demand for each season of each year, subject to a range of possible weather patterns; and
- The peak demand models which relate demand at the selected percentiles of the distribution to lagged demand and energy (the projected demands from each model are implicitly at their respective percentile, or Probability of Exceedance [POE] level).

The accuracy of TransGrid's state-wide load growth forecast and the underlying assumptions is assessed by comparison to the aggregation of forecasts provided by DNSPs of the summer and winter demand at individual connection points to the transmission system. The summer forecasts are shown as two separate trend lines in Figure 7.4.

This approach only demonstrates that the load forecasts produced by both TransGrid and the DNSPs (in aggregate) have the same consistent growth rates.

It is noted, however, when aggregating forecasts from the different DNSPs that service customer load in different parts of the state, some diversity of the timing of peak loads would be anticipated. This gives rise to the relatively constant difference between the two trends as shown.

Figure 7.4: Comparison of top down vs bottom up demand forecasts

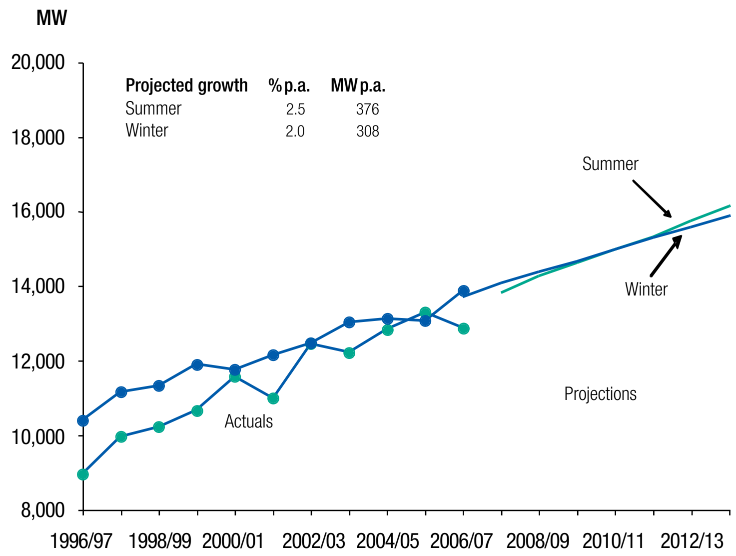


The top-down demand data is used for the main system planning studies as only aggregated loads at bulk supply points are needed to investigate the system adequacy of the interconnected transmission system. These type of studies deal with the transfer of power between generation and load areas an across regions, it is not required to model diversity of load at the customer connection point level.

However, the joint planning studies with DNSPs require diversified demand data at the substation and customer connection point level in order to assess the service and equipment adequacy at the level required by our customers. Hence, for this type of network studies, the bottom-up demand data is better suited.

The long term trend for NSW electricity demand shows a steady and consistent increase over time as shown in Figure 7.5. Although individual years may have some degree of variance from a straight line approximation, the overall trend shows little variance if such a model was adopted.

Figure 7.5: NSW peak demand projections



An independent review in 2007 by KEMA found that TransGrid's long-term forecasting process is consistent with best practice and can be relied upon to produce accurate forecasts.

KEMA supports TransGrid's approach:

> *"TransGrid's long-term load forecasting processes and methods use internationally recognised good practices, and can be relied upon to produce a realistic expectation of demand forecast. The overall approaches used in developing the forecasts process are sound, and combine good technical methods with good judgment and experience."*[28]

The energy and demand projections shown in Figure 7.6 are used in this proposal to forecast capital and operating expenditure.

Figure 7.6: Energy demand projections 2009/10 to 2013/14

Forecast	2009/10	2010/11	2011/12	2012/13	2013/14
Demand (MW)					
Low	14,500	14,810	15,100	15,440	15,750
Medium	14,620	14,970	15,320	15,740	16,140
High	14,810	15,240	15,650	16,170	16,660
Energy (GWh)					
Low	76,690	77,160	77,740	78,420	78,840
Medium	78,000	78,890	80,060	81,520	82,900
High	79,890	81,610	83,550	85,900	88,100

[28] KEMA Consulting: Review of TransGrid's Load Forecasting Methods: June 2007: 1.2 Key Findings p1

Revenue proposal estimates based on the 2007 Annual Planning Report

The capital expenditure forecast for augmentation projects is based on the demand forecasts in TransGrid's 2007 Annual Planning Report (APR). As there is a NER requirement that TransGrid's revenue proposal be lodged on 31 May 2008, the 2007 APR was the best source of transmission planning information available given the long lead times required to develop the capital program estimates for the revenue proposal. The 2008 APR will be issued in June 2008 and the AER will be advised of any changes to the capital expenditure forecast as a result of the new energy and demand forecasts.

Initial indications of forecasts for the 2008 APR suggest both energy and scheduled demand forecasts may be reduced relative to those published in the 2007 APR. It is unlikely that the changes will affect the timing of many projects or materially affect the quantum of capital expenditure for augmentation projects.

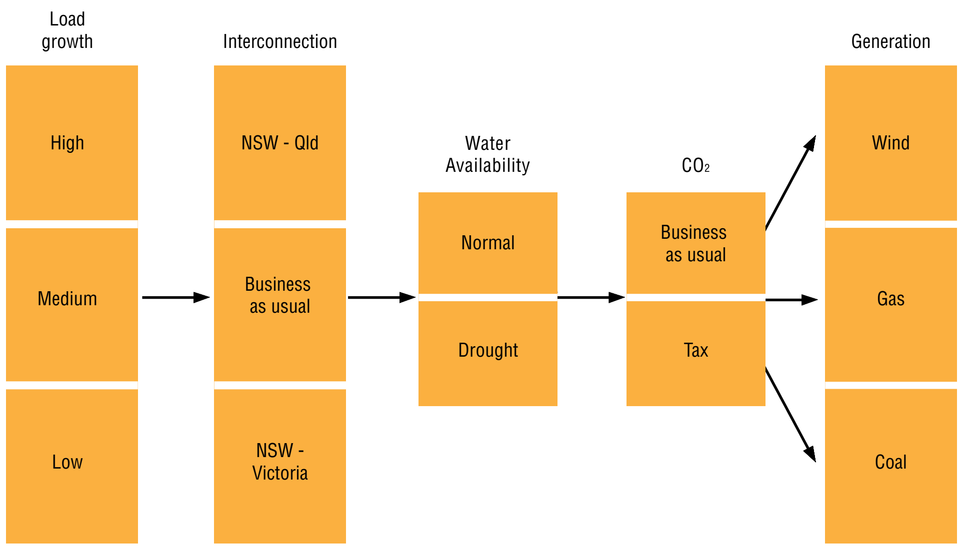
7.4.4 Scenario analysis

TransGrid's capital expenditure forecasting methodology for the next regulatory period includes a probabilistic assessment of potential generation development paths for New South Wales.

TransGrid engaged independent experts, ROAM Consulting, in early 2007 to start this assessment and the analysis was completed in August 2007. The methodology used in the ROAM assessment has been designed to deliver a forward-looking view of a number of plausible market development scenarios focusing on the New South Wales region. All inputs to the modelling were developed from publicly available information.

Figure 7.7 shows the scenario theme sets considered in the ROAM studies. The themes considered looked at load growth, the interconnection capabilities of the Queensland interconnector and the NSW to Victoria interconnectors, water availability and greenhouse policy.

Figure 7.7: Scenario themes (ROAM study)



The steps involved in this approach were:

1. Identifying theme sets that will affect the development of the NSW transmission system, including load growth, inter-regional trade, water availability and environmental emissions policies;
2. Identifying likely generation developments (renewable sources, gas-fired, coal-fired);
3. Developing scenarios based on combinations of the themes (different load growth and generation developments for each year) and the probability of the scenario eventuating;
4. Modelling the future system for each scenario;
5. Assessing the ability of the transmission system to support future patterns of load and generation (including applying TransGrid's reliability criteria to each scenario);
6. Developing options for addressing system limitations that emerged out of each scenario;
7. Formulating a preferred transmission development plan (aligned with the long-term plan for the system) for each scenario;
8. Calculating the capital costs of each component in the transmission development plans;
9. Identifying the contingent components, removing them from the development plans and adding them to the contingent list;
10. Incorporating the trimmed development plans in the Capital Accumulation Model to come up with the estimated capital requirement for each scenario in each year of the regulatory period; and
11. Weighing capital expenditure for each plan against probability, and aggregating the results to arrive at a forecast total.

Following receipt of the ROAM report TransGrid developed the scope and timing of each project necessary to address the different scenarios. This was a significant body of work which was only completed in the first quarter of 2008. Ordinarily, this would complete the probabilistic planning analysis underpinning a revenue submission.

At TransGrid's request, the ROAM Report was updated in February 2008 to take into consideration factors arising from the Owen Inquiry into the future of the NSW Electricity Industry and the signing of the Kyoto Protocol on greenhouse gas emissions. TransGrid wanted to ensure that these recent but major government policy initiatives were taken into account in the underlying assumptions used in the report.

Following an initial analysis of the updated ROAM report of February 2008, TransGrid amended the scenario probabilities, adopting a more conservative approach. The amended probabilities result in a deferral of some projects and a corresponding reduction in capital expenditure estimates.

The full analysis of the impact of the revised ROAM report date is a lengthy and complex process and is not completed at the time of this submission.

When TransGrid has completed the analysis of the latest ROAM report it will advise the AER of any changes to the proposed capital expenditure estimates.

Figures 7.8 and 7.9 show the probability of the scenarios modelled, using the updated ROAM report of February 2008 and TransGrid's interim analysis.

Figure 7.8: Comparative scenario probabilities

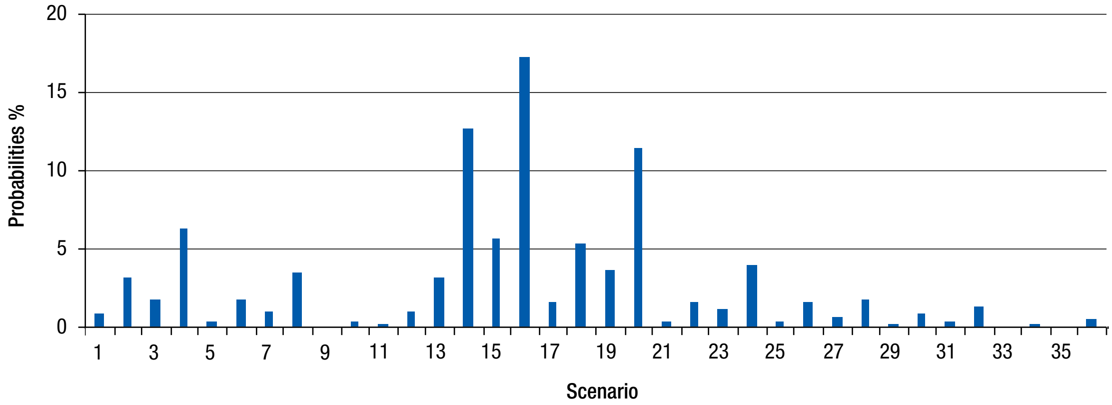
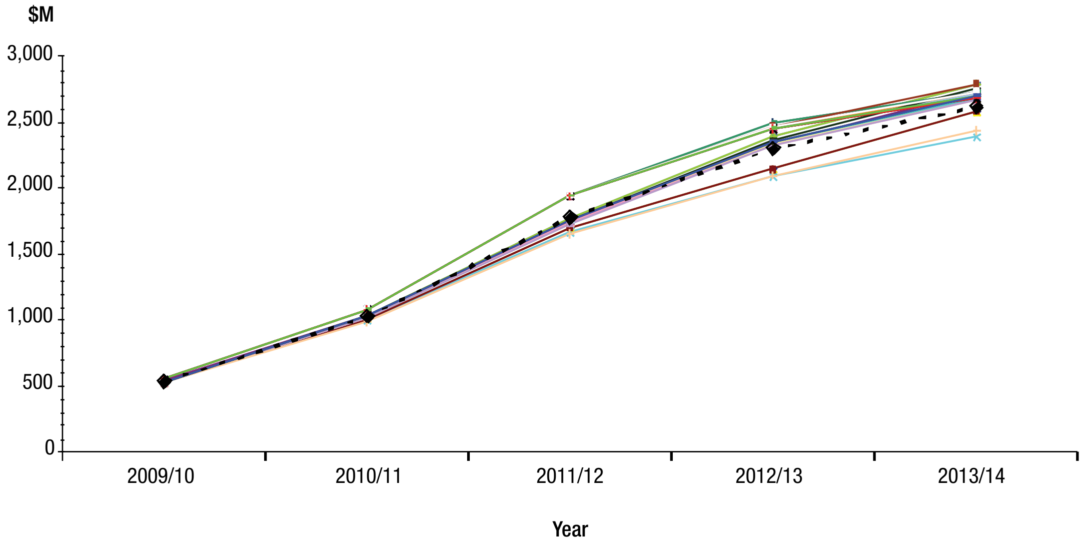


Figure 7.9: Details of scenarios

Scenario	Economic Growth	Inter-regional Trade	Water availability	Green house policy	Scenario Probabilities (%)
1	Low	BAU	BAU	BAU	1.0
2	Low	BAU	BAU	CO2 Tax	3.3
3	Low	BAU	Limited	BAU	1.9
4	Low	BAU	Limited	CO2 Tax	6.4
5	Low	QNI	BAU	BAU	0.5
6	Low	QNI	BAU	CO2 Tax	1.8
7	Low	QNI	Limited	BAU	1.0
8	Low	QNI	Limited	CO2 Tax	3.7
9	Low	NSW-SNO	BAU	BAU	0.1
10	Low	NSW-SNO	BAU	CO2 Tax	0.5
11	Low	NSW-SNO	Limited	BAU	0.3
12	Low	NSW-SNO	Limited	CO2 Tax	1.1
13	Medium	BAU	BAU	BAU	3.3
14	Medium	BAU	BAU	CO2 Tax	12.8
15	Medium	BAU	Limited	BAU	5.7
16	Medium	BAU	Limited	CO2 Tax	17.4
17	Medium	QNI	BAU	BAU	1.7
18	Medium	QNI	BAU	CO2 Tax	5.5
19	Medium	QNI	Limited	BAU	3.8
20	Medium	QNI	Limited	CO2 Tax	11.6
21	Medium	NSW-SNO	BAU	BAU	0.5
22	Medium	NSW-SNO	BAU	CO2 Tax	1.7
23	Medium	NSW-SNO	Limited	BAU	1.2
24	Medium	NSW-SNO	Limited	CO2 Tax	4.0
25	High	BAU	BAU	BAU	0.5
26	High	BAU	BAU	CO2 Tax	1.7
27	High	BAU	Limited	BAU	0.8
28	High	BAU	Limited	CO2 Tax	1.8
29	High	QNI	BAU	BAU	0.3
30	High	QNI	BAU	CO2 Tax	0.9
31	High	QNI	Limited	BAU	0.5
32	High	QNI	Limited	CO2 Tax	1.5
33	High	NSW-SNO	BAU	BAU	0.1
34	High	NSW-SNO	BAU	CO2 Tax	0.3
35	High	NSW-SNO	Limited	BAU	0.1
36	High	NSW-SNO	Limited	CO2 Tax	0.6

Figure 7.10 shows the capital expenditure forecast associated with network developments to cater for each of the scenarios. The dotted black line is the probability-weighted average of all scenarios.

Figure 7.10: Cumulative augmentation capital expenditure for all scenarios



The analysis of possible solutions and network constraints has involved consideration of non-network solutions. Where TransGrid is aware that a non-network solution will result in a more efficient outcome this has been taken into account. In most cases the cost of network support cannot be estimated at this time and TransGrid has taken a prudent approach and included a capital allowance for network solutions in the revenue proposal.

7.4.5 Summary of augmentation capital expenditure

For the 2009/14 regulatory control period, there is a total of 109 augmentation projects with a total expenditure of approximately $1966m (including associated easement costs).

Out of the 109 projects, 14 of the projects have estimated costs exceeding $20m each. The total cost for these projects, which are considered to be the material projects in the program, is $1529m, as shown Figure 7.11 below.

Figure 7.11: Augmentation projects estimated at more than $20 million (probability weighted estimates)

Projects	Class of Assets	Total Cost $million 2008
Holroyd / Chullora suite of works. (New cables and substation in metropolitan Sydney)	Shared network/ Connection	512
Bannaby-South Creek 500kV transmission line and substation to support southern portion of NSW network.	Shared network	394
Dumaresq-Lismore 330kV transmission lines supporting NSW North Coast.	Shared network	188
Western 500kV development to enhance the supply capability to Newcastle-Sydney-Wollongong load corridor.	Shared network	78
Tarro-Stroud 132kV transmission line construction forms part of a longer term plan to reinforce the transmission supply for the Lower to Mid North Coast area.	Shared network	52
Bamarang 330/132kV substations establishment to enhance supply to south coast.	Shared network/ Connection	48
Wallerawang to Orange 132kV transmission line rebuild.	Shared network	47
Orange North 132/66kV substation augmentation to relieve congestion. Involves establishing a 132kV busbar, 132kV bays, 132/66kV 60MVA transformers.	Shared network/ Connection	38
Kemps Creek-Liverpool 330kV transmission line to support power transfer to Southern Sydney.	Shared network	37
Snowy transmission 330kV line thermal rating upgrades to improve power transfers.	Shared network	34
Williamsdale 330kV substation to cater for load growth in south east Canberra and to prepare for a second supply to Canberra.	Shared network	31
Stroud-Taree 330 transmisson line development proposed to reinforce the transmission system supplying the lower Mid North Coast.	Shared network	27
Tomago 330kV Transformers to provide additional capacity to the Newcastle area.	Shared network	24
Manildra - Parkes 132kV transmission line to support the Cowra/Forbes/Parkes area.	Shared network	21

**Details of all projects included in the forecast capital expenditure are provided in the AER prescribed templates that accompany this proposal.*

The quantum of capital expenditure for augmentation in the next regulatory control period has increased over that in the present period because the transmission network serving a number of areas of the state has reached the limit of its capability and developments to address these emerging network constraints will require capital intensive solutions. The most significant projects from Figure 7.11 are:

- The 500kV and 330kV network supplying the Newcastle/Sydney/ Wollongong area (i.e Bannaby – Kemps Creek 500kV transmission line and substation);
- The 330kV and 132kV network supplying the North Coast. To accommodate the high load growth in this area, a number of developments are required to reinforce the network to and within the area (Lismore-Dumaresq 330kV transmission line); and
- Sydney West 330/132kV substation and the 330kV and 132kV networks owned by TransGrid and EnergyAustralia that supply the inner metropolitan area. To accommodate load growth in the inner metropolitan area and to offload Sydney West substation, 330/132kV substations are needed at Holroyd and Chullora (new cables and substations in metropolitan Sydney).

By comparison the ex-ante capital in the current regulatory period contains only one similarly capital intensive project, the Western 500kV Conversion project.

7.5 Forecasting asset replacement projects

7.5.1 Asset Management Process

TransGrid has a proven asset management process that identifies, evaluates and prioritises asset replacements, as shown in Figure 7.12.

TransGrid takes a proactive approach in assessing and monitoring the 'well-being' of the assets it manages. This involves taking into consideration a number of factors about the condition of the assets, ongoing serviceability, NER requirements for reliability, comparison to practices used by other TNSPs, safety and the environment in which it operates. The output from this assessment forms the input to the Network Asset Management Plan.

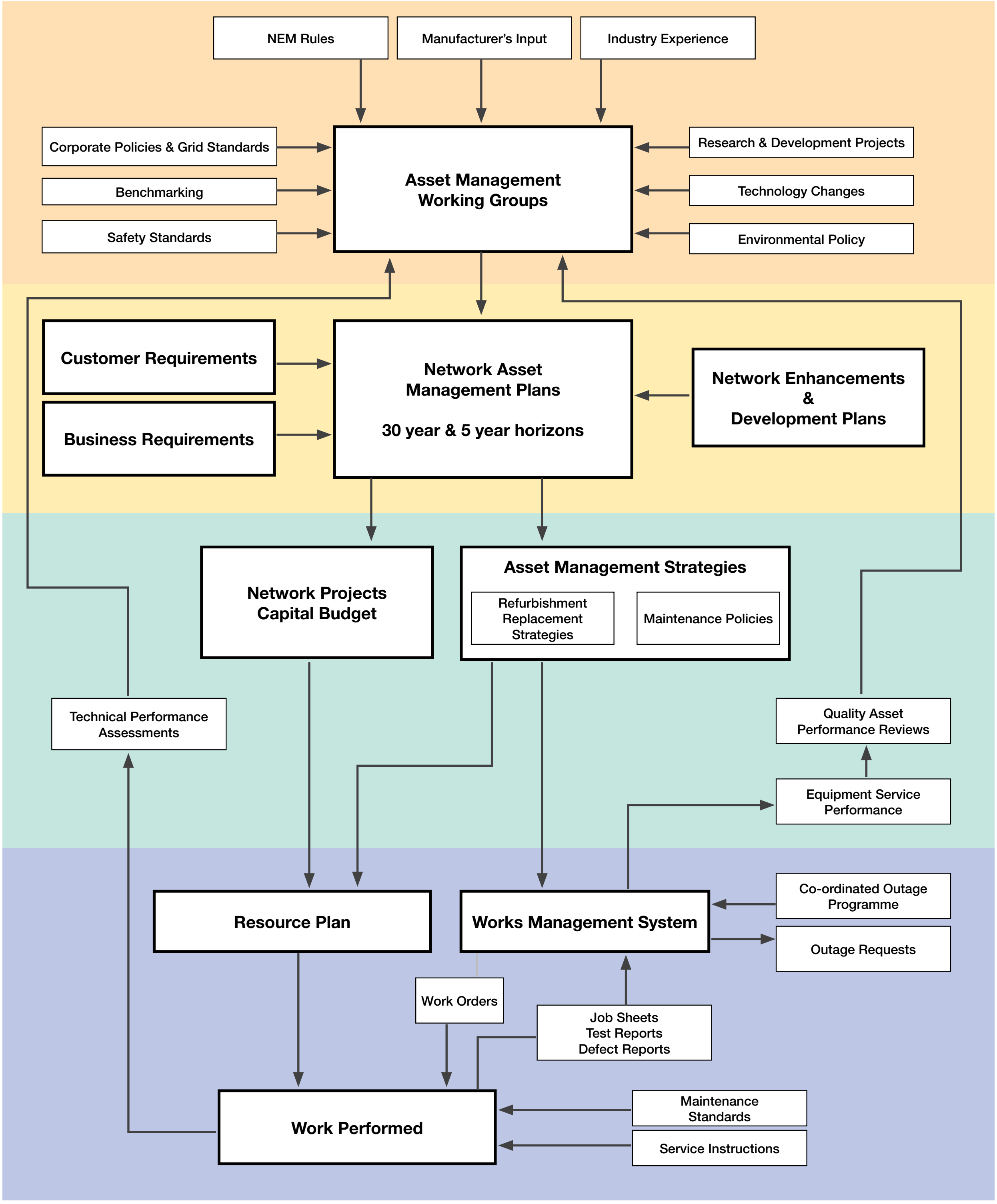
TransGrid produces 5 year and 30 year Asset Management Plans which allow short term maintenance requirements to be best managed while taking the long term issues into consideration. In forming these plans, TransGrid assesses and prioritises the present and future requirements of our customers, the required performance and reliability of the transmission system and future network development plans.

It is important to note, that in this stage, TransGrid co-ordinates the asset replacement requirements (driven by condition) with the augmentation capital works program (driven by load growth). This means that efficiencies in cost and delivery can be found where projects overlap in their nature, location or timing.

Asset Management Strategies are formed from the Asset Management Plans. In general, the strategies involve replacing assets on either a project basis, or a program basis.

Project based asset replacement occurs for significant refurbishments of specific parts of the transmission system, such as substation renewals, transmission line reconstructions, replacement transformers and capacitor banks, substation control rooms and telecommunication systems. This work is non-routine and is site specific.

Figure 7.12: TransGrid's asset management process



Program based asset replacements, such as replacing circuit breakers or protection relays, is performed in a systematic way throughout the transmission system by type of equipment.

Overall the Asset Management Plans and Asset Management Strategies prioritise asset replacement using a standard risk-management framework that looks at the possible consequences in areas such as safety, environment, system and operational impact and cost of failure or sub-optimal operation.

Following the condition assessment and replacement prioritisation, the works are scheduled for implementation and a compliance process reviews completion of all works on a progressive basis.

7.5.2 Condition Assessment

TransGrid does not replace specific assets based on age. Age is a leading indicator of possible performance deterioration and also that increased maintenance will be required to maintain the condition of the transmission assets.

With the ageing of TransGrid's transmission system, it is expected that over the next regulatory period significant investment will be required to retain the high reliability of the transmission system for TransGrid's customers. This coupled with the additional maintenance required for the future capital works program, will place significant burden on maintenance resources, asset reliability and the ability to schedule outages.

As an example, Figure 7.13 and 7.14 shows the date of commissioning for substations, switching stations and for transformers. The majority of the transmission network in NSW was built between the 1950s and 1980s. Over 40% of transmission lines and 35% of substations and switching stations were commissioned in the 1960s or earlier. These are the types of assets that are the focus of the asset replacement program.

Figure 7.13: Substation and switching station commissioning profile

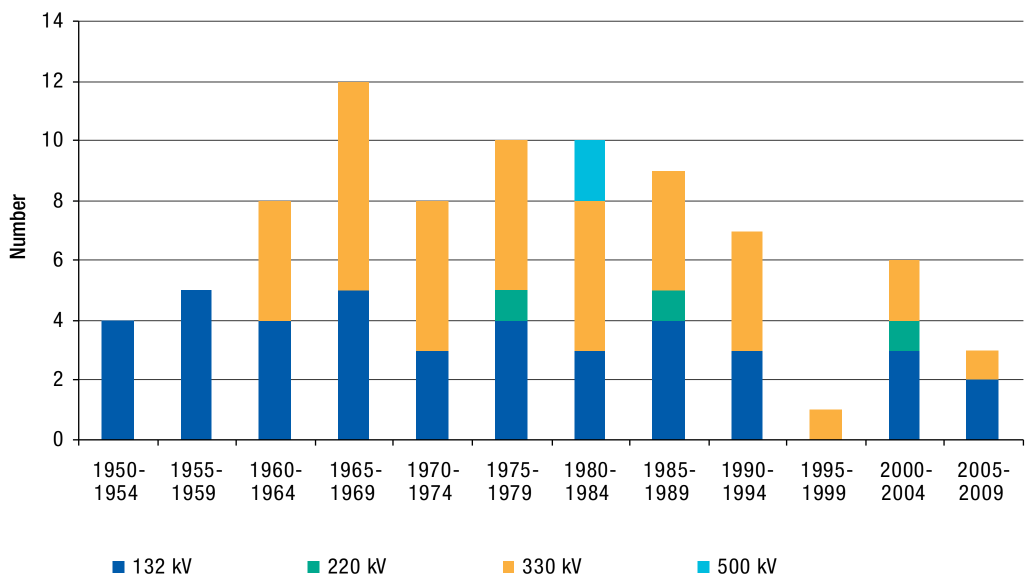
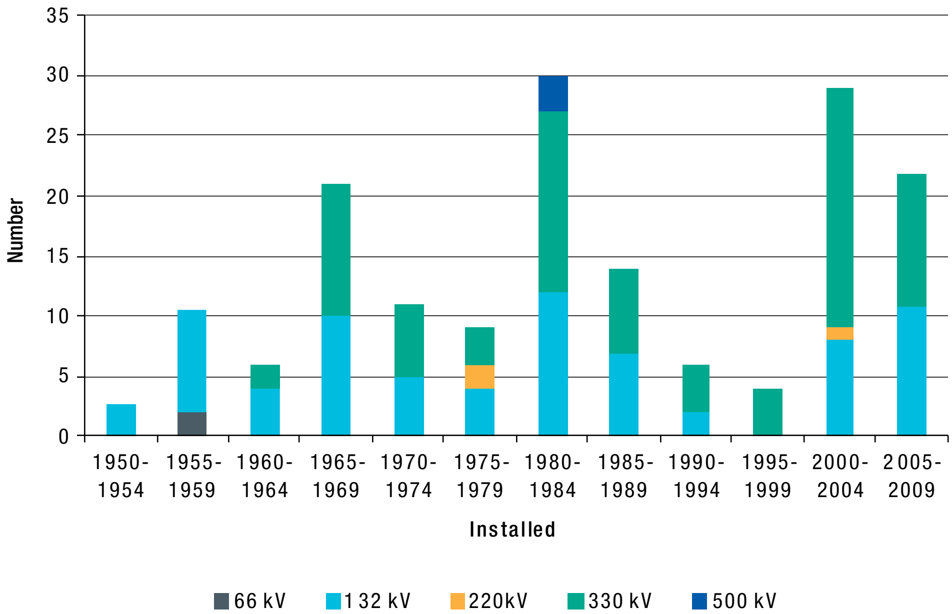


Figure 7.14: Transformer commissioning profile



TransGrid's condition-based replacement programs have kept the average transformer and circuit breaker ages relatively constant over the last ten years as shown in Figures 7.15 and 7.16.

Figure 7.15 also clearly highlights the effect of needing adequate investment in asset replacement. The three forecast trends shows the effect on the average transformer age if no asset replacements were made over the next regulatory period compared to replacing assets when taking into consideration load growth and maintaining system reliability (condition based replacement).

Figure 7.15: Transformer average age

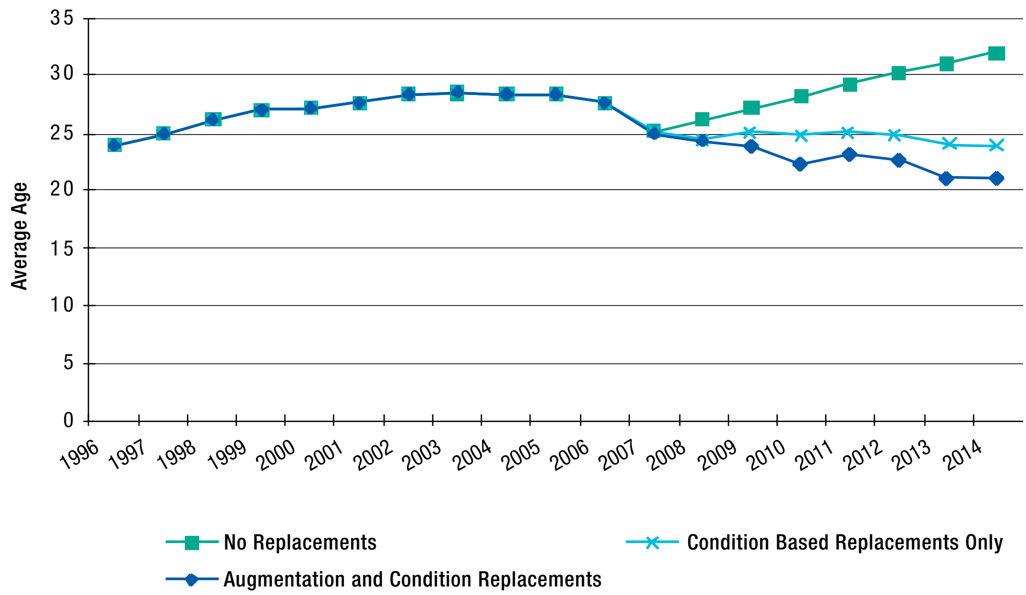
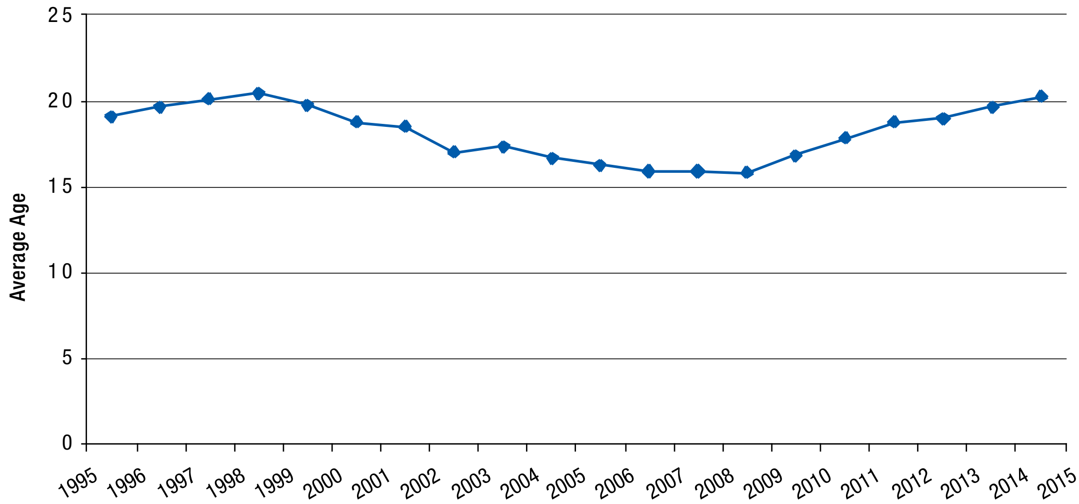


Figure 7.15 shows that without a replacement program, the average age of the transformer assets would increase progressively. As the age of an asset is an indicator of the level of maintenance required to maintain its serviceability, ultimately system reliability and security will be degraded and the availability of the transmission network to service NSW customers will be impacted upon.

Similarly, Figure 7.16 shows that, while there will be a well-structured program in place to replace assets due to condition in the next regulatory period, the average age of circuit breakers will increase slightly over the period. For the same reasons as mentioned above, the maintenance of circuit breakers during this period will need to be carefully monitored to ensure continued reliability of the system.

Figure 7.16: Circuit breaker average age



The level of expenditure proposed for asset replacement is prudent in that it ensures that the average life of the transmission assets remains relatively stable over the next regulatory period and that adequate resources are available to service the assets under TransGrid's maintenance program. The proposed balance between the asset replacement expenditure and asset maintenance program is structured to at least retain the level of system reliability, security and network availability that TransGrid's customers currently receive.

7.5.3 Summary of asset replacement capital expenditure

For the 2009/14 regulatory control period, there is a total of 38 replacement projects and a range of replacement programs with a total expenditure of approximately $520m. To reiterate, project based asset replacement occurs for significant refurbishments of specific parts of the transmission system, such as substation renewals, transmission line reconstructions, new transformers and capacitor banks, substation control rooms and telecommunication systems.

Three of the replacement projects have estimated costs exceeding $20 million. The total cost of these projects which are considered to be the material projects is approximately $114 million. These projects are shown in Figure 7.17 below.

Figure 7.17: Asset replacement estimated at more than $20 million

Replacement Projects	Cost $m 2008
Replacement of Beaconsfield West 330/132kV GIS	48
Replacement of Cooma substation	43
Replacement of Queanbeyan substation	23

* Details of all projects included in the forecast capital expenditure are provided in the AER prescribed templates that accompany this proposal.

7.6 Project cost estimates for major network projects

TransGrid has a database for estimating costs in the early stages of project conception. Estimates are developed mainly by selecting bundles of key project components, based on bays (or "base planning objects").

TransGrid regularly updates the cost values in the database and periodically asks external providers to review feasibility reports and develop independent cost estimates. It is noted that the estimates calculated by TransGrid and external providers for the same projects have all been within TransGrid's stated level of uncertainty.

The database produces expenditure S-curves. S-curves were developed from historical project expenditure profiles (plotting cumulative costs against time), and these are used to forecast annual capital expenditure for the suite of projects being undertaken.

Where needs are identified well before the solution is required, various aspects of the project options are subject to change and therefore the level of uncertainty in the estimates is high (typically as much as 25% at the concept phase). A large number of projects developed for this revenue submission are 'concept phase' projects and accordingly have these costs at this level of accuracy.

7.7 Forecasting input price escalation

TransGrid's future capital expenditure estimates include cost-escalation factors developed with the assistance of the Competition Economists Group (CEG).

The likely costs of plant and equipment (transformers, switchgear, high-voltage conductors and cable) take into account various forecasts for the materials used in producing this equipment, as well as trends in the global price of plant. An increase in producers' margins, by virtue of high demand and limited supply, is expected to be a main driver of plant cost escalation.

TransGrid's cost escalators are presented in Figure 7.18. The escalators have been calculated using the input weights and the input cost escalators contained in the CEG report in Attachment F.

Figure 7.18: TransGrid's cost escalators and weightings

Component	Weight	2009	2010	2011	2012	2013	2014
EGW Wages	15.65%	3.60%	3.90%	1.90%	2.80%	3.50%	3.70%
Structures and Fabricated Steel	1.34%	1.96%	0.86%	0.67%	1.04%	1.78%	2.43%
Primary Plant	13.28%	-0.22%	-0.38%	-0.25%	-0.17%	-0.19%	-0.19%
Secondary Systems	6.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Transformers	9.46%	1.30%	0.20%	0.56%	0.18%	0.32%	0.55%
Buildings	1.46%	2.10%	0.90%	0.70%	1.10%	1.90%	2.60%
Civil Construction	9.57%	2.10%	0.90%	0.70%	1.10%	1.90%	2.60%
Electrical Construction	1.66%	2.10%	0.90%	0.70%	1.10%	1.90%	2.60%
Transmission Towers	12.99%	1.93%	0.85%	0.66%	1.02%	1.76%	2.40%
Aluminium Conductor	5.67%	2.56%	0.36%	0.35%	0.77%	1.14%	1.56%
Concrete Pole	2.01%	0.89%	0.38%	0.30%	0.47%	0.80%	1.10%
Copper Cable	12.03%	0.14%	-0.66%	-0.32%	-0.28%	-0.31%	-0.27%
Wages General	4.75%	1.60%	2.40%	1.90%	1.80%	2.00%	2.00%
Miscellaneous Materials	4.12%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Weighted Average Escalation (Real)	**100.00%**	**1.46%**	**0.88%**	**0.58%**	**0.82%**	**1.19%**	**1.45%**
Weighted Average Escalation (Nominal)	**100.00%**	**4.26%**	**3.28%**	**2.98%**	**3.32%**	**3.69%**	**3.85%**
Property (Nominal)	**100.00%**	**6.90%**	**6.50%**	**6.50%**	**6.60%**	**6.60%**	**6.50%**

7.8 Grandfathered Assets

On 16 November 2006, the AEMC published a new Chapter 6A on transmission pricing and certain transitional provisions in Chapter 11 of the NER relating to prescribed transmission services. In order to provide price certainty for customers in the short term, the AEMC also introduced one transitional provision relating to grandfathered prescribed transmission services for connection assets that were existing or committed prior to 9 February 2006, Clause 11.6.11(a):

(a) References to prescribed transmission services in the new Chapter 6A include a service provided by an asset used in connection with, or

committed to be constructed for use in connection with, a transmission system as at 9 February 2006:

(1) to the extent that the value of the asset is included in the regulatory asset base for that transmission system under an existing revenue determination in force at that time; or

(2) if the price for that service has not been negotiated under a negotiating framework established pursuant to old clause 6.5.9, and, but for this clause, that service would not otherwise be a prescribed transmission service.

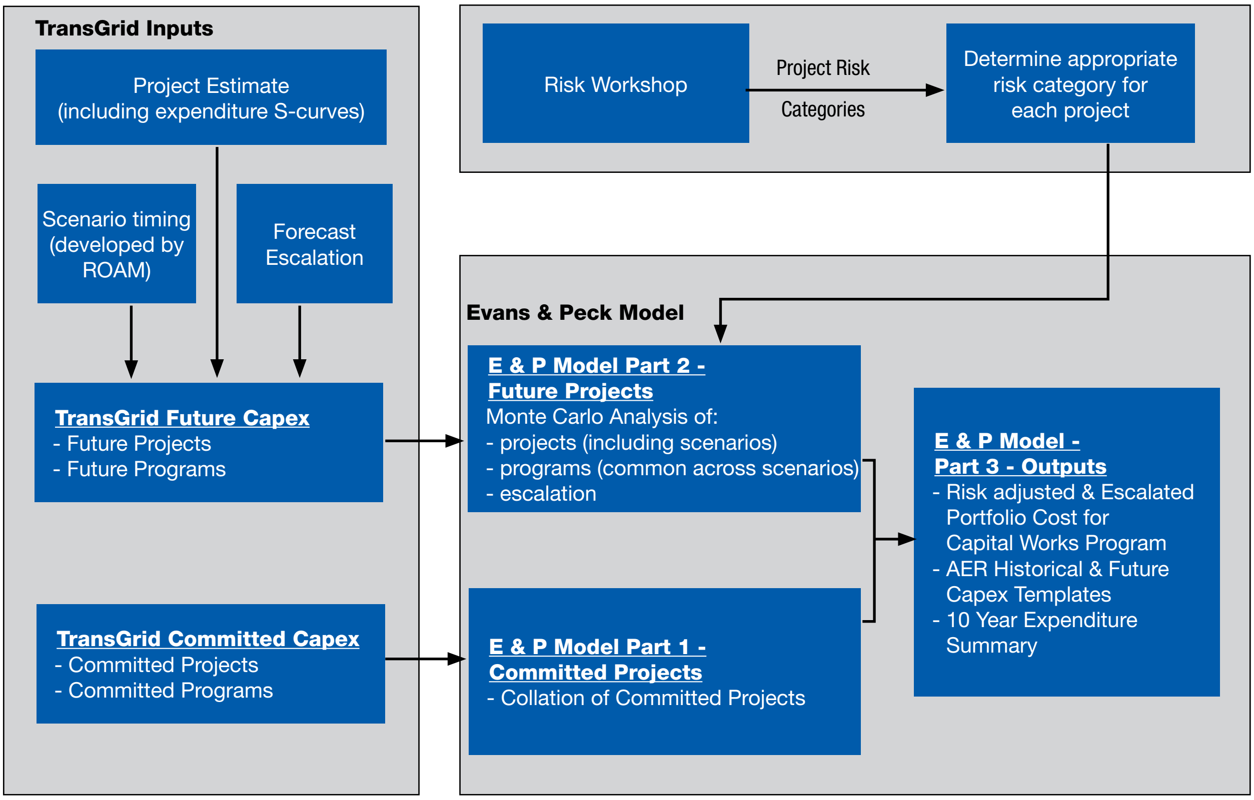
As mentioned in Chapter 1, the intention of this proposal is to recover revenue from the provision of prescribed transmission services to TransGrid's customers. To satisfy this requirement it is necessary to identify transmission services that do not form part of the prescribed transmission system. TransGrid has reviewed its capital projects in the current regulatory period and confirmed that all connection projects are appropriately covered by the transitional provisions and that no connection assets have been included that should be classified as negotiated transmission services.

For the 2009/10 to 2013/14 regulatory period TransGrid also confirms there are no connection projects that should be treated as negotiated transmission services.

7.9 Cost estimation risk analysis

TransGrid engaged Evans & Peck to assess and quantify the risks associated with TransGrid's capital works program for the regulatory period from 2009/10 to 2013/14. The method used to calculate risk is show in Figure 7.19

Figure 7.19: Evans and Peck's Portfolio cost estimation risk model



TransGrid has 147 future projects in its proposed 2009/14 Capital Works Program. These projects have been categorised into eleven groups with similar risk profiles.

For each group a representative project has been analysed to determine the inherent risk in the estimate of outturn cost for that project. Contingent risks were not considered.

By utilising the specialist skills of TransGrid personnel involved in the estimation and delivery of those projects, Evans & Peck has structured a risk profile for each representative project by looking at the potential variance in individual cost elements in the project. Monte Carlo simulation was then utilised to develop the diversified risk profile applicable to each project type.

The ratio of risk adjusted estimate of outturn cost to non-risk adjusted estimate of outturn cost typically varies between 1.02 and 1.07 depending on the nature of the project.

In addition to future projects, TransGrid has "committed" projects that are currently work in progress but will extend into the next regulatory period. In addition there are future and committed "programs". The term "programs" applies to smaller repetitive capital works (such as replacing a particular type of circuit breaker in a number of substations). Risk was not applied to any of these categories.

The Capital Accumulation Model captures expenditure from all augmentation and major asset replacement projects and applies Monte Carlo techniques to calculate the risk profile of the entire portfolio. The model also applies escalation, and captures the weighted impact of the planning scenarios inherent in TransGrid's works program. The output results arising from application of the modelling is shown in Figure 7.20.

Figure 7.20: Capital accumulation model output summary

Risk Simulation Output Regulatory Period Summary (2009/10 - 2013/14) - $2008						
	P50		P80		Mean	
Cost Component	($million)	(% of base estimate)	($million)	(% of base estimate)	($million)	(% of base estimate)
Base Estimates	$ 2,321.3	100.00%	$ 2,321.3	100.00%	$2,321.30	100.00%
Risk Adjustment	$ 76.5	3.30%	$ 89.9	3.87%	$77.10	3.32%
Escalation (net of CPI)	$ 228.4	9.80%	$ 230.0	9.90%	$228.40	9.80%
Total	**$2,626.20**	**113.10%**	**$2,641.20**	**113.80%**	**$2,626.80**	**113.20%**

The risk outcomes have been expressed in terms of the "P50" value and a "P80" value. There remains a 20% probability that the actual outcome will exceed the P80 value and a 50/50 chance that the outcome will be above or below the P50 value. In a commercial environment Evans & Peck would recommend that the P80 value be selected as the prudent value for budget approval. However, in a regulatory environment where a more conservative approach is applied to balancing the allocation of risk between the service provider and its customers, the P50 value is commonly applied.

The Mean is the best estimate of the expected outcome and is the value displayed in all risk adjusted outputs in the Capital Accumulation Model, including the "Risk Adjusted" AER templates. Given the closeness of the P50 and the Mean value in this model (3.30% vs. 3.32% of the capital program) Evans & Peck's recommendation is to apply a global risk adjustment based on the Mean value.

In summary, Evans & Peck recommends that a global risk adjustment of 3.32% be applied to TransGrid's 2009/10 to 2013/14 capital works program when determining an appropriate ex ante allowance risk.

7.10 Forecasting other capital expenditure

TransGrid's planning has also identified the need for capital expenditure in the areas of land and easements, information technology, vehicles and mobile plant, buildings and facilities and other assets. The basis for the estimates of these categories are set out in this section and the total costs in section 7.11.

Land and Easements

Forecasts of acquisition of land and easements are closely aligned to TransGrid's high voltage network augmentation program. TransGrid's equipment traverses a large part of the state and across many types of land usage. Estimates are prepared from land purchase costs and easement acquisition costs based on surrounding land usage.

Information Technology

The requirements for business information technology are set out in TransGrid's IT Strategic plan. Replacement of IT is determined by the asset replacement strategies set out in TransGrid's IT Asset Management Plan.

Vehicles and Mobile Plant

TransGrid's purchases of motor vehicles and mobile plant are determined by business requirements and replacement strategies. The capital estimates for these assets are set out in TransGrid's Fleet management plan.

Other Capital Expenditure

Estimates for capital expenditure for buildings and facilities are identified on a needs basis and individually assessed. Other capital expenditure including office machines and minor plant are assessed for new requirements and replacement based on obsolescence or withdrawal of manufacturer's support.

7.11 Total Ex-Ante Capital Allowance

Forecast Expenditure

The total forecast capital expenditure (shown by category in Figure 7.21) is approximately $2.6 billion for the next regulatory control period. Approximately 84% of the forecast capital expenditure is due to augmentations, easements and replacement projects. The capital estimates provided in the proposal are the weighted average of the probabilistic assessment of the scenarios modelling. The project listing in the AER templates provided with the proposal represent median commissioning dates of the projects.

Figure 7.21: Capital expenditure forecast by category ($2008)

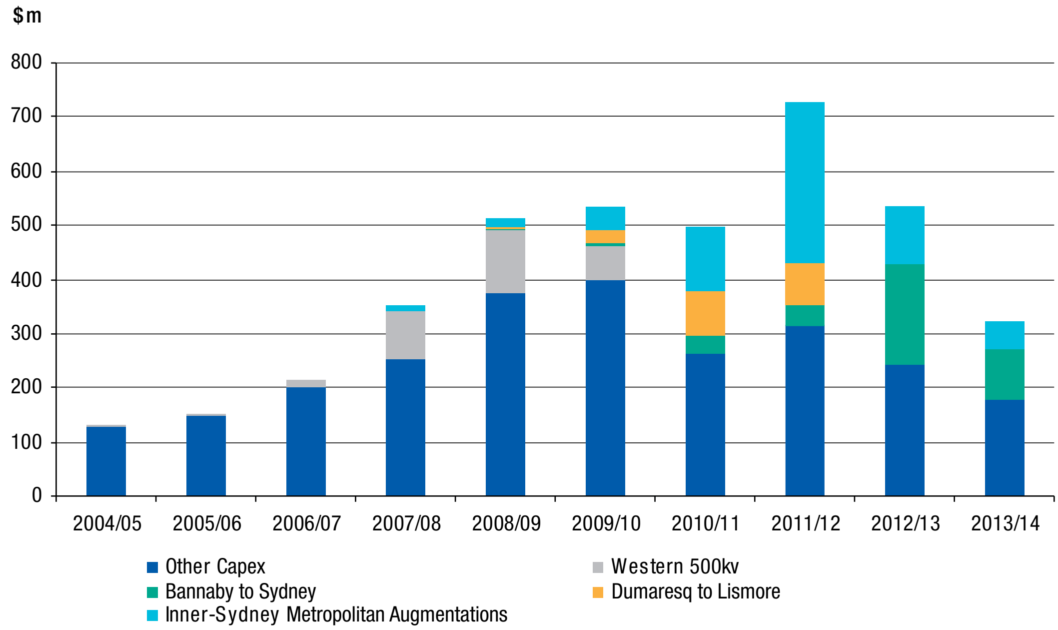
Category (2008 $m)	2009/10	2010/11	2011/12	2012/13	2013/14	TOTAL
Augmentation	328.6	279.1	573.0	343.4	139.4	1663.5
Easements	63.2	92.2	37.7	26.5	67.9	287.4
Connections	0.0	0.0	0.0	0.0	0.0	0.0
Replacement	96.3	82.7	104.5	129.2	80.7	493.4
Other Network	0.0	0.0	0.0	0.0	0.0	0.0
Security/Compliance	10.2	3.8	5.4	5.6	1.1	26.1
Information Technology	17.9	22.9	20.3	13.2	21.7	95.9
Facilities	10	4.7	0	0	0	14.7
Motor Vehicles and Mobile Plant	9.3	9.3	5.9	4.6	10.0	39.1
Other	1.4	1.3	1.2	1.3	1.4	6.6
Total	536.8	495.9	748.0	523.8	322.3	2626.8

The capital expenditure forecast is significantly higher than capital expenditure in the current regulatory period. The profile of the forecast capital expenditure is shown in Figure 7.22. From this graph the annual capital expenditure levels can be identified for the underlying capital expenditure program (shaded blue on the bar chart) and for the major transmission projects.

This figure shows that the underlying capital expenditure has remained reasonably consistent throughout the ten year period with a consistent level of expenditure on the replacement program and for smaller system augmentations to meet our customer's transmission requirements.

The expenditure and timing for the four largest projects that will be undertaken in the current and next regulatory periods are also shown in Figure 7.22. These projects account for the majority of the increase in capital expenditure that will occur next period, with the peak expenditure occurring in the third year. TransGrid is confident it can meet this expenditure requirement as the ramping up of the capital program from the current regulatory period provides sufficient time for TransGrid to prepare for, and to meet the delivery of the proposed capital program.

Figure 7.22: Ten year capital expenditure



Capital Expenditure Objectives

TransGrid has developed its capital expenditure forecast to meet the Capital Expenditure Objectives stated in Clause 6A.6.7 of the NER.

The Capital Expenditure Objectives are met by:

- identifying projects that meet the increased demand growth in the state. i.e. to ease congestion on transmission corridors, between loads and generation centres and across interconnectors in accordance with TransGrid's planning criteria.
- ensuring that all projects and programs detailed in this proposal have been assessed as efficient and prudent through public consultation with the Annual Planning Report, joint planning with DNSPs and through engagement processes with intending customers; and

- ensuring that the standards set out in Schedule 5.1 of the NER for quality, reliability and security of the prescribed transmission services and the reliability, safety and security of the transmission system are met.

As well as meeting the capital expenditure objectives, TransGrid considers that the forecast capital expenditure set out in this chapter reasonably reflects the most efficient network development options that would be undertaken by a prudent TNSP to meet the increased demand growth in NSW.

Comparison of Capital Expenditure 2004/09 to 2009/14

The comparison of the capital program from the 2004/09 regulatory period to the 2009/14 regulatory period in Figure 7.23 shows a large increase in the augmentation works.

Figure 7.23: Comparison of current period capex to next period

Category	2004-2009	2009-2014
Augmentation	748.0	1,632.3
Replacement	396.9	519.6
Land and Easements	151.4	333.4
Support the Business	98.1	141.6
Total (Real 2008 $m)	**1,394.4**	**2,626.8**

The increase in the augmentation works as discussed earlier in this section is largely as a result of the three large projects that dominate the 2009/14 program. These projects also drive the increase in property and easement expenditure.

The replacement capital program shows an increase due to a large program of replacement assets and in particular the replacement of some of TransGrid's oldest assets that are in poor condition.

The support the business increase is predominately as a result of the replacement of TransGrid's SCADA system.

7.12 Corporate governance framework for major works

In May 2005 the TransGrid Board adopted a new corporate governance framework for expenditure on major capital works projects contained in the TransGrid capital program for 2004/2009. The framework, which has been regularly reviewed and refined since its introduction, is applied to all capital works projects with expected expenditure greater than $1 million.

The framework sets out a sequence of Decision Gates, in particular for Project Commencement and Project Funding Approval, and subsequent status reporting for each major project.

The consistent governance required by the framework enables TransGrid to:

- Comply with its statutory and regulatory investment obligations;
- Invest efficiently, in accordance with good industry practice;
- Maintain efficient investment planning and delivery processes;
- Approve all material investment decisions and commitments at the appropriate level and based on all available information;
- Produce and retain timely documentation, consistent with statutory and regulatory disclosure requirements; and
- Review and reapprove if there are significant changes.

In detail, the four main initiatives of the Corporate Governance Framework are:

1. Project Decision Gates. For each proposed capital works project with an estimated expenditure of $1 million or greater, the project is required to pass through at least two formal decision gates requiring a formal organisational sign-off. These are Decision Gate 1 (Project Commencement) and Decision Gate 2 (Project Funding Approval). For a project with an estimated expenditure greater than $10 million the formal sign-off will be by TransGrid's Board.

   Passing Decision Gate 1 initiates the regulatory test required by the National Electricity Rules, the detailed design and specifications for the work, and any necessary community consultation or environmental impact assessments.

   Passing Decision Gate 2 commits full funding for the project and will normally occur with the letting of the major contract(s) associated with the project construction.

2. Post-project review. At the completion of each project controlled under the governance framework a post-project review is undertaken and documented. For each major capital works project with expenditure greater than $10 million the post project review is presented to the TransGrid Board by the relevant project manager or managers.

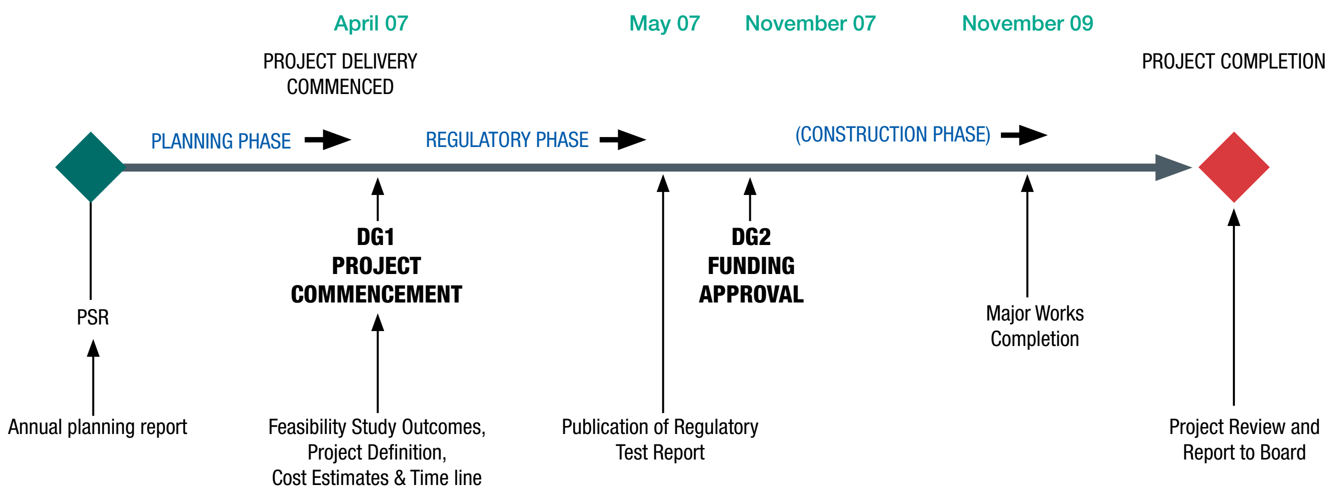
3. Capital Works Program Steering Committee. The Capital Works Program Steering Committee is an executive level committee that reviews, updates and monitors the progress of TransGrid's capital program and the individual projects in that program with an estimated cost greater than $1million.

   The committee meets monthly to monitor and co-ordinate the delivery of the projects and the program across the organisation to maximise the effectiveness and efficiency of this delivery. Where appropriate, the committee also reviews major capital works projects before they are submitted to the Board or Managing Director for project commencement (Decision gate 1) or funding approval (Decision gate 2).

4. Major capital works program reporting. Once the Board has approved the commencement of a major capital project with an estimated expenditure greater than $10 million (DG1), it will receive monthly status reports on the delivery of that project. Similarly all projects under the governance framework are formally reported monthly to the Capital Works Programs Steering Committee.

Figure 7.24 below illustrates a typical project timeline for a major capital project with estimated expenditure greater than $10 million with the decision gates requiring Board approval shown. This particular timeline accompanied the submission to the Board requesting project funding approval for the upgrade in capacity to Sydney South substation.

Figure 7.24: Project timeline with Decision Gates
Capacity Upgrade at Sydney South Substation – Timeline with Decision Gates



7.13 Deliverability of the Capital Program

TransGrid recognises that its capital expenditure forecast for the next regulatory period is a significant increase from the current regulatory period. During the current period there have been significant changes that have improved the organisation's capability to deliver capital projects and these are described in this section. Also an analysis of the next period's program indicates that a large part of the program is already underway and that three significant projects form a large part of the program.

7.13.1 Increased capability to deliver capital projects

The initiatives to improve the organisation's capability to deliver the capital program that have been implemented during the current regulatory period include:

- **Changes to organisational structures and increased capital works resources.** In addressing the challenges of the current capital program, TransGrid refocused those parts of the organisation involved with the delivery of the capital program.

  That refocusing involved the formation of the Capital Program Delivery business unit responsible for the effective and efficient delivery of the TransGrid major capital works program. To enhance the capacity to deliver the capital program, TransGrid significantly increased the internal resources available to this business unit during the current regulatory period.

In growing these resources, new project groups were also introduced. The project development group was established to deliver the more extensive feasibility studies required by the corporate governance framework. A specific project management group was established to deliver the design-and-construct projects and a specialist engineering design group was established to deal with the design load and critical timing associated with the secondary systems components of substation projects.

- **External and contracted resources.** In addition to growing the available internal resources, TransGrid has established long-term period contracts with major engineering companies for specialist engineering to provide such services as feasibility studies, project cost estimations, project and project component designs and environmental impact assessments associated with the suite of major capital projects. These contracts enable TransGrid to significantly augment its own growing internal resources and skills by linking with the wider pool of engineering resources in Australia and internationally.

  Services are put out to competitive tender and the agreements run for two to four years. Consideration is being given to extending these periods as retaining the strong long-term linkages with these engineering specialists are recognised as critical to the delivery of the capital program in the next regulatory period.

- **Delivery models.** TransGrid is committed to competitive tendering. Consistent with this commitment, TransGrid has pursued a number of innovative procurement/contracting strategies to deliver the current capital program and a number of specific projects in that program. Those delivery strategies include:

  > A design-and-construct model has been used to take advantage of contractor resources and the continued development of standard TransGrid designs. The model has been applied to $350 million worth of “greenfield” substation projects in this regulatory control period. It will be applied to a number of similar large projects in the next period and will also be extended to suitable “brownfield” substation projects within existing TransGrid substations for the next period. It should also be noted that TransGrid’s delivery model for transmission lines projects closely aligns to a design-and-construct model.

  > Works packaging has been used to deliver similar projects that are required in a period or sequence. Such packaging leads to efficiencies in design, project management and tendering. The model has been applied to capacitors banks at rural substations, and transformer replacement at Sydney South and Sydney West. It has also been used in combination with the design-and-construct model for the Western 500kV substation projects.

  > Relationship contracting is being used in a substantial telecommunications augmentation and replacement program being undertaken in this period. A single relationship agreement with a major engineering contractor with the required skills and resources covers a number of sub-projects over a period of time, with the aim of reaping efficiency gains (including skill development and shared expertise) from the TransGrid/contractor “team” approach.

- **Extended period agreements for plant procurement.** TransGrid traditionally uses period agreements of three to five years for the supply of major plant required in capital projects.

  In recent times, increased global investment in transmission infrastructure has resulted in greater demand for plant and subsequent longer lead times. The longer lead times has resulted in a re-assessment of the effectiveness of current agreements and changes in delivery strategies to ensure that critical plant is available on time and to budget for major projects. In particular, the lead-time for large power transformers is the critical path component for the timely delivery of major capital projects.

  To counter this threat, TransGrid now reserves production slots with major manufacturers before orders are placed within the period agreements. TransGrid has developed strong long term relationships with its major suppliers which allow these arrangements to work effectively for both the suppliers and TransGrid.

- **Alternative sourcing of critical major plant.** In addition to retaining long term relationships with its major plant suppliers, TransGrid continually tests the market and reassesses its sources of supply. This is especially relevant with the increasing demand for transmission plant putting strain on supply chains and component costs.

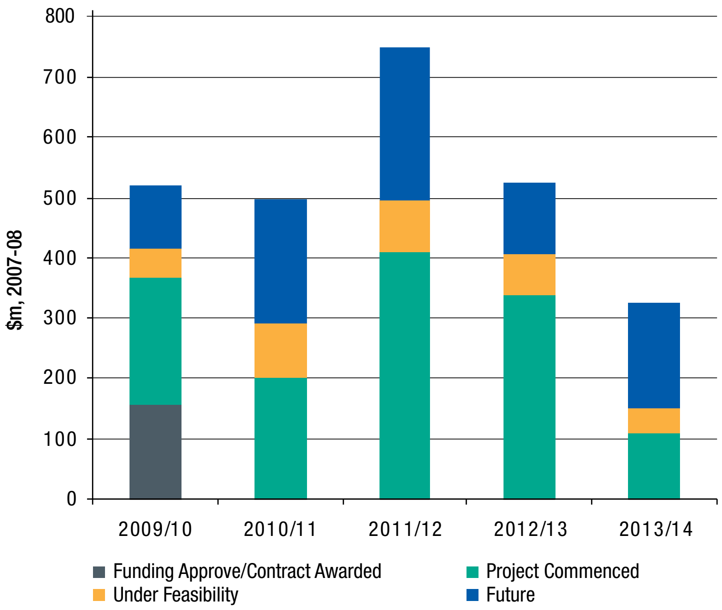
  With sourcing difficulties from some traditional suppliers, TransGrid has recently broadened its sourcing of major equipment to selected qualified suppliers in China and Thailand to ensure that the best value for money plant is available on time for its projects.

7.13.2 Deliverability analysis of next period's program

The capital program in the next period includes 14 projects (including the three largest) each worth more than $20 million that together account for three-quarters of the total capital expenditure.

TransGrid has a number of initiatives in place to ensure its current program is delivered, and it will continue to use and enhance these measures in order to deliver the 2009/14 capital works program. Figure 7.25 shows that a high proportion of works have been approved for commencement with projects in 2009/10 already under contract. A further quantum of work is well progressed through the completion of detailed feasibility studies.

Figure 7.25: Capex progress for 2009/10 - 2013/14



As noted earlier in this chapter three large projects account for over $1.1 billion expenditure in the 2009/14 regulatory period. Recognising this TransGrid has advanced the project preparation, planning and feasibility studies on these projects.

For each of these projects, project schedules, scoping and risk analyses have occurred and project commencement (DG1) has been approved by TransGrid's Board. The Regulatory Test for each of these projects will be undertaken in 2008. In some cases, strategic property purchases have been made ahead of the project to remove the risk of delays or loss of an available site in the project delivery.

Before finalising the ex-ante capital allowance submission TransGrid undertook a review of the deliverability of the program of works. The capability of key suppliers and outage implications were considered. As a result of that review some projects were deferred from their 'ideal' commissioning date and a small number of projects brought forward to smooth the work profile over the regulatory control period. This analysis did not materially affect the size of the ex-ante submission but did increase the organisation's confidence in its deliverability.

Where projects have been necessarily deferred risk mitigation actions will be investigated and implemented to manage any residual reliability risks.

This review of deliverability has helped ensure that the capital expenditure allowance is demonstrably reasonable.

7.14 Contingent projects

Some projects of significant scope and cost are not included in the ex ante forecasts. These projects are classed as contingent because they have uncertain timing, scope, or cost.

TransGrid does not anticipate that many, if any, of these contingent projects will be required to be undertaken in the 2009/14 regulatory control period. They are included, however, because if the events which trigger the requirement for the project do occur, TransGrid requires the ability to fund the project to meet the customer need.

Such projects would be triggered by specific events, such as:

- Individual load developments that are not presently included as components in the ongoing load growth in an area;
- A new load development that affects the quality of supply in an area and necessitates remedial measures for the system;
- A major power station development that may require transmission enhancement beyond the normal allowances for load growth;
- Retirement of a major power station, causing a significant increase in transmission from an external area;

- Interconnection development proceeding as part of a strategic plan for an enhanced national transmission system;
- A main system development proving its worth to the market by passing the "net markets benefit" limb of the regulatory test;
- A change to the reliability standard at a supply point; or
- Environmental or social constraints that require all or part of an overhead transmission line to be put underground.

The National Electricity Rules specify that the capital value of a contingent project must be greater than 5% of the maximum allowed revenue for the first year of the control period – at least $30 million in TransGrid's case.

In some cases, a contingent project may include a component of demand side response or contribution to the development of a generator as part of a network support arrangement. The cost for these services may not be known at this time.

The methodology TransGrid adopted for developing the expected capital expenditure for the contingent projects is similar to that used for the main forecast capital expenditure. If a contingent project is triggered and commissioned, operating expenditure for the maintenance of the equipments may also be required. This amount has been calculated in the same way as the main forecast operating expenditure.

Contingent projects are set out in Appendix I. None of these projects are included elsewhere in TransGrid's capital expenditure proposal. The indicative capital costs and the triggers are shown for each project.

8. Forecast operating expenditure

The methodology used to develop TransGrid's operating expenditure forecasts is described in this chapter of the revenue proposal. The key assumptions used to develop TransGrid's operating expenditure forecasts relate to:

- Asset management and maintenance performed as set out in TransGrid's Asset Strategies, Policies and Procedures;
- The level of costs in 2006/07 being an efficient base year for forecasting expenditure;
- The impact of capital expenditure on the base level of operating expenditure;
- Increases in costs based upon forecasts of wages growth and operating material and expenses;
- Forecast demand growth that results in network support; and
- Self insurance, debt and equity raising costs.

Based upon the methodology used and the key assumptions that underlie the operating forecasts TransGrid is of the view that the operating expenditure forecast contained in this chapter is necessary so as to:

- Efficiently meet the expected demand for prescribed transmission services over the 2009/10 to 2013/14 regulatory period;
- Comply with all applicable regulatory obligations associated with the provision of prescribed transmission services;
- Maintain the quality, reliability and security of supply of prescribed transmission services; and
- Maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

TransGrid considers that the operating expenditure forecast in this chapter meets the operating expenditure objectives set out in the NER.

8.1 Operating expenditure categories

In accordance with the AER submission guidelines, operating expenditure must be presented in well-accepted categories. TransGrid has used ten major groupings:

1. Maintenance: All field-based costs for routine maintenance, defect maintenance and major operating projects such as plant refurbishment;
2. Maintenance Support and Asset Management: Management of field-based maintenance teams, asset management and costs of running business systems that directly support the field maintenance activities, fleet costs, logistics and supply management;

3. Operations/control room: Around-the-clock state system control and regional control functions;

4. Grid planning: Operational costs associated with planning for the development of the transmission network;

5. Rates and Taxes: Operating costs paid to external authorities;

6. Insurance: Operating costs paid to insurance companies;

7. Property management: Ongoing management of property and issues related to easements and environmental compliance;

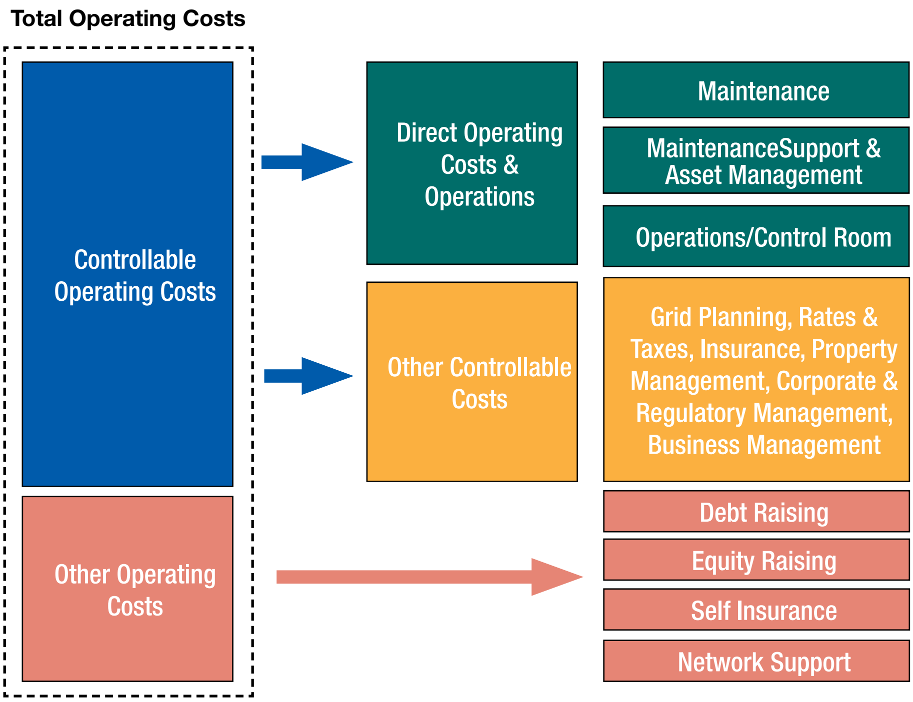
8. Corporate and Regulatory Management: Customer relations, stakeholder relations, providing assurance of effective corporate governance and regulatory support;

9. Business management: Business administration, including human resources, payroll functions, finance, accounting and IT; and

10. Other categories: debt-raising costs, equity-raising costs, self-insurance and network support.

The above categories can be grouped into controllable costs and other costs, as illustrated in Figure 8.1 below.

Figure 8.1: The elements of TransGrid's total operating costs



8.2 Forecasting methodology

TransGrid has based its forecast operating expenditure on a projection of the adjusted costs of an efficient base year.

In a recent TNSP review determination, the AER stated:

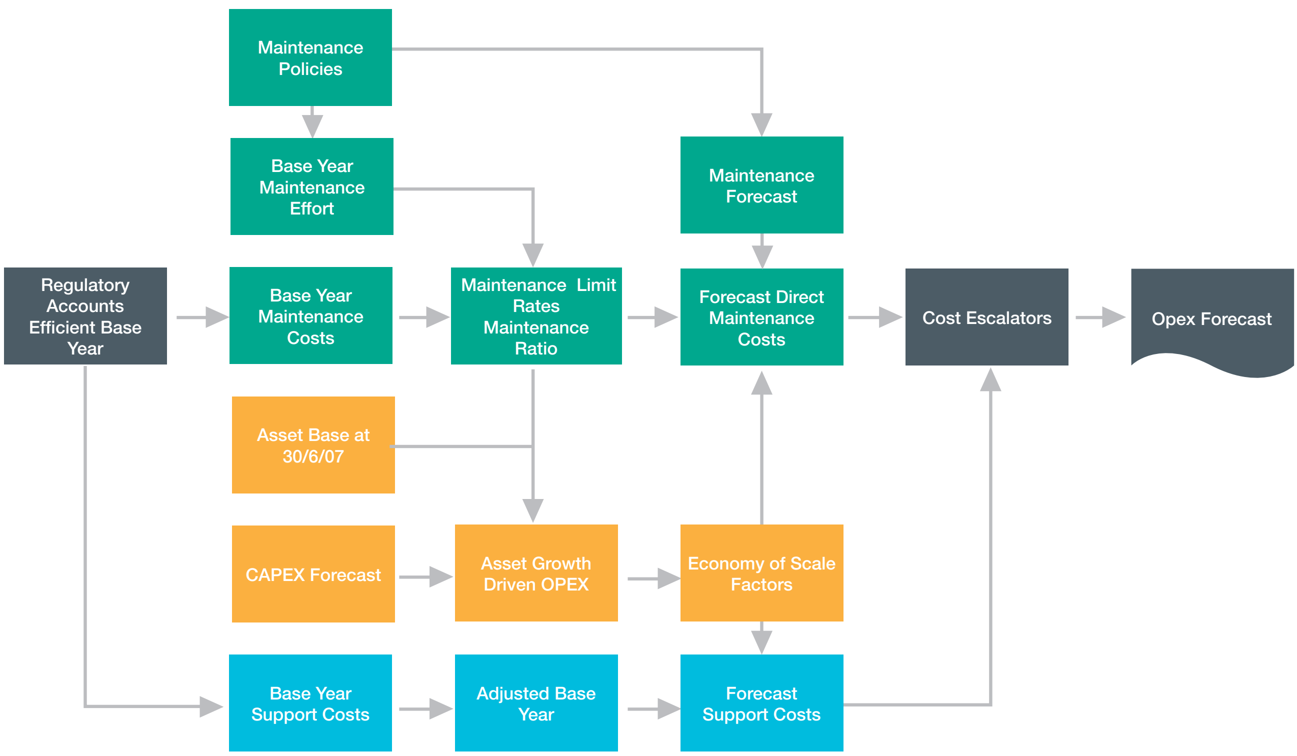
> *"The AER….. Accepts the use of zero-base forecasts for some opex components as well as extrapolation of base year opex for the remaining opex categories."*[29]

TransGrid's approach to building up its operating expenditure forecast has been to:

- Adopt 2006/07 as a base year for forecasting future costs;
- Preparing zero based maintenance costs for the current asset base;
- Escalate controllable costs for future years to account for new assets that need to be managed and for projected labour and input cost increases;
- Take into account economies of scale that are likely to be achieved, reduce the maintenance costs associated with replacement assets and the effect of once-off or cyclic costs; and
- Add in forecasts of other operating costs that do not escalate, or do not escalate linearly, with the growing asset base ("other operating costs").

TransGrid's forecasting technique for its controllable operating costs is summarised in Figure 8.2 below.

Figure 8.2: TransGrid's model for forecasting controllable operating expenditure



[29] AER, Draft Decision, Electranet transmission determination 2008/09 to 2012/13, 9 November 2007.

TransGrid has selected 2006/07 as the base year for forecasting operating expenditure as it is the most recent year for which audited financial accounts are available.

The key inputs to the controllable operating cost model are:

- Routine maintenance forecasts;
- Defect maintenance ratios;
- Major operating projects forecasts;
- Labour cost escalators;
- Asset growth factors;
- Economy of scale factors; and
- Base year costs and adjustments.

8.2.1 Efficient base year

The ACCC Determination for TransGrid for the present regulatory period included a compound 2% per annum reduction in the operating expenditure allowance as an efficiency adjustment. This set the organisation a challenging target for efficiency gains. For the first three years of the current regulatory control period TransGrid has been able to reduce operating expenditure to slightly below the ACCC target.

TransGrid has managed its business to deliver a real reduction in operating costs while absorbing additional maintenance workload.

This proposal contains evidence of this increase in efficiency, including benchmarking that confirms TransGrid has reached an efficient and prudent level of operating expenditure. TransGrid believes the base year estimation of 2006/07 is an appropriate point from which to project operating expenditure for the coming period.

While 2006/07 is considered to be an efficient base year, a number of adjustments have been made to the base year to cater for scope changes that will not be reflected in the forecast years. These scope changes have the impact of reducing the forecast controllable operating expenditure.

8.2.2 Forecasting maintenance costs

Maintenance costs are those costs directly associated with maintaining regulated transmission assets. Maintenance includes all field-based activities for routine maintenance, defect maintenance and major operating projects such as plant refurbishment.

The estimates of maintenance expenditure in this proposal are built up from TransGrid's maintenance polices and strategies. Sinclair Knight Merz (SKM) has recently carried out a review of these maintenance policies and found:

> *"SKM's review of TransGrid's substation, protection, metering and transmission line maintenance policies has found that the policies are well aligned with good practice of the electricity transmission and distribution industry within Australia. TransGrid appears to embrace a philosophy of continuous improvement in equipment reliability and availability as well as cost reduction in all maintenance activities. The policies cover a number of elements to achieve implementation of this philosophy and utilise comprehensive record keeping systems which are essential to efficient maintenance activities."*[30]

Based on TransGrid's maintenance policies, TransGrid's Works Management System provides routine maintenance forecasts to quantify the work required and the variance from year to year. The maintenance forecasts are an important factor in the expenditure forecast.

Routine maintenance forecasts for the existing asset base are built up from a "zero base". This approach allows the maintenance forecasts to reflect cyclical requirements and to be adjusted for changes in scope when assets are replaced with new equipment that requires less maintenance.

Defect maintenance forecast requirements are based on an expected ratio of defect maintenance hours to routine maintenance hours.

A forecast for major operating projects has been incorporated into the controllable opex forecast. These are significant maintenance or refurbishment projects not associated with normal routine or defect maintenance.

8.2.3 Impact of capital expenditure

With the significant increase to TransGrid's asset base that will occur due to the capital works program, a real increase in operating expenditure will be needed to ensure the network continues to be managed safely and prudently, and that reliable service continues to be provided to our customers.

TransGrid's technique for forecasting operating expenditure has taken into account the areas where capital expenditure has an impact. An asset growth ratio is used to estimate the additional operating costs resulting from changes to maintenance of new assets.

However, given that some capital spending will have only a secondary impact, if any, on the maintenance work load, the value of such projects needs to be discounted from the asset growth factor.

Capital expenditure can affect operating expenditure in the following ways:

- **Reduction in maintenance:** Some capital projects result in less ongoing maintenance (e.g. replacement of single-phase transformer banks with three-phase units, substation reconstructions and wood pole replacement with concrete poles). Capital spending for these projects is not included when determining asset growth. The reduction in operating costs is handled separately as an adjustment to the maintenance forecast from the Works Management System.

[30] Sinclair Knight Merz, Review of TransGrid's Maintenance Policies, February 2008

- **No maintenance impact:** Most asset replacements (e.g. like-for-like replacements of transformers or circuit breakers) and capital spending related to business support have no impact on the maintenance forecasts. Some augmentation projects (e.g. upgrading of line terminals, transformers and transmission lines) will also have little effect. The cost of these projects is not included in the "effective" capital expenditure figure for determining asset growth.
- **Secondary maintenance impact:** It is not appropriate to include the full capital cost of certain projects in the calculation of asset growth factors. For example, where it is proposed that a single-circuit line be converted to a double-circuit line, the rebuilding cost is not included as it will not result in additional operating costs. The capital cost, in this example, of providing two new line bays (for connecting the new feeder) is included, however.
- **Full maintenance impact:** The full capital cost of projects that result in a new set of assets (e.g. additional substations, transmission lines, transformers and line bays) is generally included in the "effective" capital expenditure for asset growth purposes.

8.2.4 Economy of Scale Factors

The impact of additional assets on operating costs varies depending on the incremental effort, across the business as a whole, needed to service the additional asset. To allow for this an economy-of-scale factor is allocated to each category of expenditure.

This recognises that the extra effort required to manage additional assets may only be marginal in some categories. For example, if the asset base doubled, grid planning expenditure is estimated to grow by only 25%.

The economies of scale factors are outlined in Figure 8.3 below.

Figure 8.3: Economies of scale applied to future expenditure

Economies of Scale		Rationale
Maintenance	95%	There is almost a one-to-one increase in maintenance effort but some minor efficiencies are achievable
Maintenance support and asset management	25%	Support of maintenance activities is linked to the size of the asset base but significant economies of scale are achievable
Operations	25%	Significant economies of scale are possible through efficient management of this process
Grid planning	25%	Operational support from grid planners is linked to the size of the asset base but significant economies of scale are achievable
Rates and taxes	100%	Rates and tax payments are direct charges which will be directly proportional to asset growth
Insurance	-	Not applicable as costs are based on a zero base forecast
Property management	10%	"There is an indirect relationship to the asset base and substantial economies of scale can be realised.
Environmental	25%	Environmental support of maintenance activities is linked to the size of the asset base but significant economies of scale are achievable
Corporate and regulatory management	10%	There is an indirect relationship to the asset base and substantial economies of scale can be realised
Business management	10%	There is an indirect relationship to the asset base and substantial economies of scale can be realised

8.2.5 Scope changes

Scope changes include adjustments to the base year and future estimated expenditure for one off costs, expenditure of a cyclic nature or changes in scope.

Adjustments have been made to the operating result of the 2006/07 base year for one-off and cyclic costs for the purpose of forecasting operating expenditure into future years. This has had the result of reducing the base year costs by $4 million.

Revenue Reset Costs

Due to the cyclic nature of the revenue determination process, revenue reset costs have been deducted from the base year and added as adjustments only in the years when TransGrid is required to undertake revenue reset activities.

Demand Side Management Program

A provision for the development of demand side management responses to emerging constraints in the transmission system has been included in the operating expenditure estimates. Chapter 5.1 describes some of the activities carried out by TransGrid in this area in the current period.

The marketplace for demand side management is still in its infancy and relatively immature. TransGrid believes that it is prudent to continue to investigate, identify and develop methods and opportunities that may be taken up by third parties. TransGrid will work with NSW DNSPs in this area.

The costs associated with specific demand management initiatives will continue to be treated as network support payments or included in the capital costs, where the investigation of non network solutions has ultimately resulted in a network solution.

8.2.6 Fixed versus variable costs

The operating expenditure forecasts in this proposal are for the provision of prescribed transmission services in 2009/14 regulatory control period. The categories and amounts of operating expenditure in each year of the period to provide these services are considered to be fixed other than network support payments or positive or negative change events, as defined in the NER, that may occur during the period.

8.2.7 Maintenance associated with STPIS

TransGrid's maintenance polices and procedures are based on industry good practice. In compliance with the reporting requirements of the AER Submission Guidelines, TransGrid confirms that it has no maintenance expenditure programs in this proposal specifically designed to improve the performance of the transmission system for the purpose of the Service Target Performance Incentive Scheme that will apply to TransGrid in the 2009/14 regulatory control period.

8.2.8 Efficiency Benefits

During the current regulatory period TransGrid has responded to the real reduction in the ACCC operating expenditure allowance and in the normal course of business has been able to reduce expenditure to slightly below this allowance. As described elsewhere in this proposal maintaining this level of expenditure is becoming extremely difficult in light of increasing input costs and a growing asset base.

The external benchmarking of TransGrid's costs indicates that TransGrid has reached an efficient and prudent level of expenditure for the selected base year of 2006/07.

The operating expenditure forecasting methodology also takes into account further efficiency improvements. These improvements are:

- Adjustments to reduce the 2006/07 base year even further, for one off costs, before using it to project costs forward;
- Economy of scale factors that provide reductions in cost increases relating to costs associated with the growth in the asset base; and
- Provision for reductions in maintenance associated with the replacement of assets with new technology.

The combination of these factors results in a reduction of the Opex/RAB ratio over the course of the coming regulatory control period, which is a measure of TransGrid's ongoing efficiency improvements.

8.3 Labour and other input costs

The utilities sector has experienced above-average wage growth in the past 20 years. This is expected to continue due to a tight labour market in the electricity sector.

These cost pressures have a direct impact on the revenue needs to prudently manage its operating activities.

Accordingly, TransGrid has used escalation factors for labour in calculating its forecast operating expenditure.

To derive appropriate labour escalation factors, TransGrid sought, in conjunction with the NSW DNSPs, independent expert advice from Competition Economists Group (CEG) on the industry wage growth forecast in NSW.

CEG's advice, using Macromonitor and Econtech forecasts, is that wage growth in the utilities sector will be above the national average across all industries. Figure 8.4 shows the growth in the annual average wage forecasts. This is consistent with historical experience, which shows that, on average, wages in the utilities sector grow faster than the national average.

Figure 8.4: Real average wage growth in the Electricity Gas & Water sector (year ended June)

	2007	2008	2009	2010	2011	2012	2013	2014
Econtech (Aust wide)		2.00%	2.80%	5.60%	5.00%	3.90%	3.40%	3.10%
Macromonitor (NSW)*	4.30%	4.20%	4.40%	2.30%	-1.20%	1.70%	3.70%	4.20%
Average	4.30%	3.10%	3.60%	3.95%	1.90%	2.80%	3.55%	3.65%

* Productivity adjusted
Source: CEG – Escalation factors affecting capital expenditure forecasts – Jan 2008

Non labour costs in the operating expenditure estimates include a wide range of materials and expenses. The cost of these items are expected to reflect general price increases and have been escalated at CPI in the revenue proposal.

8.4 Forecast operating costs

Operating costs are divided between controllable operating expenditure and other costs.

8.4.1 Controllable operating expenditure

TransGrid's controllable operating expenditure forecast is shown in Figure 8.5 below.

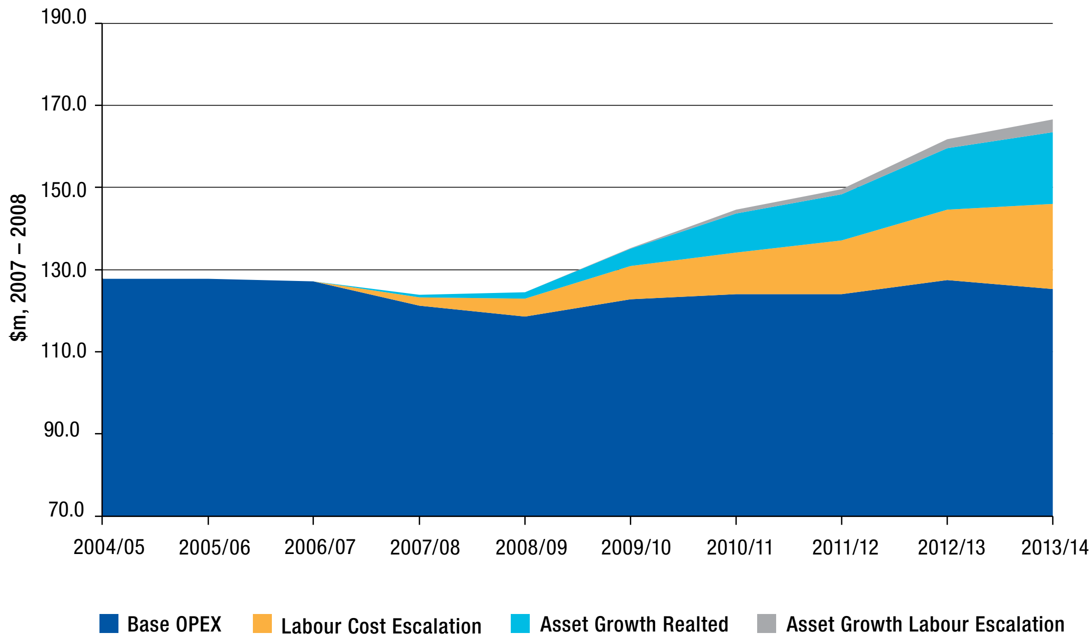
Figure 8.5: Controllable operating costs

Opex by Category (Real 2008 $m)	2009/10	2010/11	2011/12	2012/13	2013/14	Total
Maintenance	62.5	70.1	72.2	80.1	81.7	366.5
Maintenance Support & Asset Management	12.6	12.8	13.3	13.9	14.4	67.0
Operations	9.1	9.3	9.6	10.1	10.5	48.5
Grid Planning	4.2	4.3	4.5	4.7	4.9	22.4
Taxes and Insurance	9.4	9.9	10.5	11.1	11.4	52.2
Property Management	6.6	6.7	6.9	7.1	7.3	34.7
Corporate & Regulatory Management	11.5	11.7	12.5	13.9	14.8	64.4
Business Management	19.4	19.7	20.3	20.9	21.6	101.9
Total Controllable Opex	**135.2**	**144.4**	**149.7**	**161.8**	**166.5**	**757.6**

TransGrid has delivered real cost reductions in recent years despite having to perform maintenance on a growing asset base.

Increasing cost pressures mean it will not be able to continue to absorb these additional costs. Figure 8.6 below indicates that TransGrid intends to continue to deliver incremental efficiencies, however increases in the asset base being managed and in labour costs will lead to increase in total operational expenditure.

Figure 8.6: Controllable operating expenditure



8.4.2 Capital raising costs

It has been accepted by the AER that a legitimate cost of business includes the costs associated with the raising of debt and equity capital. The AER's past methodology has involved two steps:

Step 1: Estimate the amount of debt and/or equity that must be raised in order to maintain the benchmark gearing assumption of 60% debt and 40% equity; and

Step 2: Use market evidence to estimate the unit cost of raising debt and/or equity capital and then apply this to the amount of equity capital estimated in step 1.

TransGrid has sought the advice of both the Allen Consulting Group (ACG) and Competition Economists Group (CEG) in implementing each of these steps.

Step 1 – estimating the quantum of capital that must be raised

It is well accepted that the amount of debt that must be raised is proportional to the value of the debt component of the RAB. However, the appropriate methodology for estimation of the amount of equity that must be raised is more controversial with the main area of contention being the assumptions around how much equity should be assumed to be raised through retained earnings and how much externally.

ACG has provided a detailed report for TransGrid on this topic. ACG provides compelling theoretical and empirical evidence from listed Australian businesses to the effect that a benchmark regulated utility would optimally maintain a dividend yield of 8.6% even if it were raising significant equity capital. TransGrid has adopted ACG's advice in estimating the amount of equity capital to be raised. CEG has strongly argued that any assumed reduction in dividend yield will come at a cost to the regulated business.[31]

Step 2 – estimating the unit costs of capital

In the CEG advice, Professor Grundy and Dr Tom Hird strongly argue that the total cost of raising capital includes both direct (including under-writing costs) and indirect costs (including under-pricing costs). CEG demonstrate that both of these costs are economically identical and are treated as such in the finance literature[32]. Moreover, these costs are clearly inversely related – the lower the price set for a capital raising the lower the underwriting fee demanded on that capital raising. CEG note that average under-pricing has become significantly larger since the early 1990s and that this has been coincident with a fall in under-writing fees.

CEG find that it is simply wrong (illogical and inconsistent with finance theory and practice) to estimate capital raising costs based on direct costs (predominantly under-writing fees) without including an estimate for indirect costs. Moreover, they note that the magnitude of the resulting error has increased over time as under-pricing has become an increasingly popular substitute for under-writing in capital markets.

In particular, CEG notes that debt issued by private placement has at least 19bp higher interest rates (a form or under-pricing) than debt issued by public placement. CEG argues that it is a form of cherry-picking for the AER to set interest rates based on debt issued publicly and to simultaneously restrict debt raising cost estimates to evidence of direct costs in private placement markets (i.e. ignoring the 19bp higher indirect costs of raising debt in this manner).

TransGrid has adopted CEG's recommended correction for these errors, namely:

- the unit cost of raising equity be set at 7.6% of the amount of equity to be raised; and
- the cost of raising debt be set at least equal to 15.5bppa of the amount of debt to be raised.

[31] These costs include: a) an increase in the systemic risk associated with the business (as its dividend stream becomes back-ended increasing the sensitivity of the equity to changes in market discount rates); b) a reduction in the value of imputation credits as distribution of imputations credits are delayed; and c) negative signalling to the market about the financial strength of the firm. CEG notes, along with ACG, that these types of costs of internal capital raising likely explain the common market observation of simultaneously high dividend payout ratios and external equity raising. CEG also cites relevant finance literature examining why firms commonly choose not to raise equity internally.

[32] Specifically, firms pay underwriting fees to ensure that the underwriter will buy any under-subscribed issue and/or will undertake the costly process of informing the market about the quality of the capital being sold. However, firms achieve precisely the same goal by lowering the price at which they are prepared to issue new capital in order to ensure it is fully subscribed. Note that this is not the same as arguing that when new debt or equity is issued, the value of the business per share falls. Rather, it is that the new capital is sold at a price that is discounted relative to its market value – just as dividend reinvestment plans often are.

8.4.3 Network support payments

In developing its ex ante capital estimates TransGrid has considered demand side management response. Where current available information indicates a non network solution will be the most efficient option it has been included in this section as a network support payment. The projects included in the estimates for network support payments are:

- Western 500kV Conversion;
- Reactive power capability; and
- Import Capability from Snowy.

Western 500kV Conversion

The fourth stage of the development of a 500kV transmission ring encircling the Newcastle/Sydney/Wollongong load area involves the conversion of the Bayswater-Mount Piper-Marulan system to operate at its design voltage of 500kV. This project is known as the “Western 500kV Conversion” and is in construction now with a commissioning date in 2009/10.

The project includes reconnection of two Bayswater power station units 3 and 4 to 500kV, together with network support from embedded generation and load reduction in the Newcastle/Sydney/Wollongong area in summer 2008/09.

To this end, TransGrid and Macquarie Generation signed a network support agreement for the reconnection of their units to 500kV in 2009/10. This reconnection is achieved by the replacement of existing generator transformers and the reconnection of the transformers to the Bayswater 500kV switchyard.

An application for the pass-through of network support payments to Macquarie Generation and for TransGrid’s costs in implementing the arrangement for an amount of $30.51 million in the present regulatory period, was approved by the AER on 24 January 2008.

The pass-through application foreshadowed an additional network support payment in 2009/10 that has been contracted.

Reactive Power Capability of the NSW Thermal Power Stations

The planning of future reactive plant on the NSW system incorporates a significant level of reactive support from the NSW thermal power stations. The generators already provide reactive power support up to the level specified by their Performance Standards under the NER. NEMMCO also contracts a small additional reactive capability as part of its security obligations. TransGrid however relies on a significantly higher level of reactive support, approaching the rated capability of the generators, in meeting its reliability obligations.

TransGrid has the option of providing this reactive support at the power station sites by installing shunt switched capacitor banks or by arranging for reactive support from the generators. It is considered that a reactive support arrangement would be the least cost, most efficient option. It is aimed to have these network support arrangements in place in 2009/10.

As a fall back position, should TransGrid not be able to successfully arrange reactive support, it would be necessary to install shunt switched capacitor banks. These have been included as a contingent project.

Import Capability from Snowy

The NSW capability to import power from the south is dependent on many factors including the levels of generation at the Snowy power stations and the rating of the four 330 kV lines between the Snowy stations at Upper Tumut and Lower Tumut and the 330 kV substations at Yass and Canberra.

Following the commissioning of Uranquinty Power Station this year, the combined power transfer from the south and Uranquinty must effectively pass through the four lines to supply the NSW load. Planning studies have shown that the rating of the four lines will impose an increased constraint on import from the south following the commissioning of the Uranquinty Power Station. To help restore the power transfer capability, TransGrid intends to install a scheme that would involve an adequate amount of load to be tripped in NSW and generation to be tripped south of Yass / Canberra. The participants in the scheme and payments would be determined by an open tendering process. The generator or generators participating in the scheme could be within Snowy or could be further south at Uranquinty or in Victoria.

It is aimed to complete the network support arrangement in 2009/10.

The network alternative to this scheme is the development of a new transmission line, such as a Yass–Wagga 330kV or 500kV line and an appropriate project has been included amongst the contingent projects.

Expected network support costs in 2009/14, including other network support costs anticipated by TransGrid, are outlined in Figure 8.7 below.

Figure 8.7: Forecast network support costs

Real 2008 $m	2009/10	2010/11	2011/12	2012/13	2013/14
Network Support requirement	21.50	6.00	6.00	6.00	6.00

8.4.4 Self-insurance

TransGrid engaged SAHA International to provide an analysis on self insurance which involves the identification and quantification of asymmetric business risks faced by TransGrid.

The quantification of this risk generally represents the 'expected cost' to TransGrid associated with this risk. The expected cost is calculated as a function of the probability of that risk occurring multiplied by the financial consequences to TransGrid of that risk occurring. In calculating the total amount of the self insurance allowance consideration needs to be taken into account of:

- the level of external insurance taken out both in terms of value of the deductable and whether external insurance has been taken out for that risk at all;
- whether the capex and opex programs that have been implemented, or will be implemented over the regulatory period impact on the probability and/or the consequence associated with the occurrence of the risk; and
- whether the risk is best dealt with by other regulatory mechanisms, such as cost pass through mechanisms.

The amounts of self-insurance in this proposal are net of the external insurance and risks to be addressed as cost pass throughs.

TransGrid's board has resolved to self-insure or retain a deductable for the following risks:

- Towers and Wires;
- Industrial Special Risks – Property;
- Liability - General Liability, Completed Operations;
- Liability and Products Liability;
- Bushfire Liability;
- Professional Indemnity;
- Motor Vehicle;
- Fidelity / Crime;
- Excess Workers Compensation;
- Directors and Officers; and
- Employment Practices Liability.

TransGrid has been licensed by the NSW Work Cover Authority since 1976 to self-insure for Workers' Compensation and is required by legislation to have sufficient provision for the total liability of known claims, plus those incurred but not reported.

The SAHA International risk management assessment on the range of self-insured risks has calculated the appropriate revenue to manage these risks. This report is contained in Attachment L. The total self-insurance cost is shown in Figure 8.8 below. SAHA's report includes details of the amounts, values and other inputs used to calculate this proposed premium and the explanation of the calculations involved.

Figure 8.8: Self Insurance Allowance

Real 2008 $m	2009/10	2010/11	2011/12	2012/13	2013/14
Self-insurance requirement	1.91	1.91	1.91	1.91	1.91

8.5 Total operating expenditure

TransGrid's total forecast operating expenditure is presented in Figure 8.9 below.

Figure 8.9 Forecast operating expenditure

Opex by Category (2008 $m)	2009/10	2010/11	2011/12	2012/13	2013/14	Total
Maintenance	62.5	70.1	72.2	80.1	81.7	366.5
Maintenance Support & Asset Management	12.6	12.8	13.3	13.9	14.4	67.0
Operations	9.1	9.3	9.6	10.1	10.5	48.5
Grid Planning	4.2	4.3	4.5	4.7	4.9	22.4
Taxes and Insurance	9.4	9.9	10.5	11.1	11.4	52.2
Property Management	6.6	6.7	6.9	7.1	7.3	34.7
Corporate & Regulatory Management	11.5	11.7	12.5	13.9	14.8	64.4
Business Management	19.4	19.7	20.3	20.9	21.6	101.9
Total Controllable Opex	**135.2**	**144.4**	**149.7**	**161.8**	**166.5**	**757.6**
Debt Raising	3.7	4.0	4.3	4.8	5.1	22.0
Equity Raising	0.9	1.7	3.1	4.0	4.2	13.9
Self-insurance	1.9	1.9	1.9	1.9	1.9	9.6
Network Support	21.5	6.0	6.0	6.0	6.0	45.5
Total Other Opex	**28.0**	**13.6**	**15.4**	**16.8**	**17.2**	**90.9**
Total Regulatory Opex	**163.3**	**158.0**	**165.1**	**178.5**	**183.7**	**848.5**

Operating Expenditure Objectives

TransGrid has developed its operating expenditure forecast to meet the Operating Expenditure Objectives stated in Clause 6A.6.6 of the NER.

The four Operating Expenditure Objectives are met by:

- Identifying the operating expenditure required to meet the demand for prescribed transmission services; and
- Complying with the regulatory obligations associated with the NER and Federal and State legislation; and
- Ensuring that the standards set out in Schedule 5.1 of the NER for quality, reliability and security of the prescribed transmission services and the reliability, safety and security of the transmission system are met.

TransGrid has ensured that the forecast operating expenditure is both prudent and efficient and meets the expenditure objectives set out in the Rules. For this reason TransGrid believes the forecast operating expenditure is reasonable and realistic.

9. Forecast expenditure – compliance

This proposal has been prepared to comply with the National Electricity Rules (NER) and the AER's Guidelines. The compliance requirements not covered elsewhere are set out in this section.

Financial policies

TransGrid has a robust financial framework for supporting its business activities. Costs are charged to the specific categories of:

- Prescribed Services
- Negotiated Services
- Non-regulated Services

These procedures are regularly reviewed to ensure compliance to statutory, taxation and regulatory requirements while meeting TransGrid's reporting business needs.

This revenue proposal has been prepared in accordance with TransGrid's AER approved Cost Allocation Methodology. TransGrid applies the Cost Allocation Methodology to preparing:

- Forecasting operating expenditure;
- Forecasting capital expenditure;
- Prices for a Negotiated Transmission Service;
- A certified annual statement;
- Actual or estimated capital expenditure for increasing the value of the regulatory asset base;
- Prevent cross subsidisation between prescribed, negotiated and other services;
- Promote transparency in the cost information; and
- Promote consistency and comparability in the provision and reporting of financial information.

Directly attributable costs (labour, materials and expenses) are allocated both to :

- An appropriate Project or Task and;
- A structured cost methodology and account number.

Support costs are the costs incurred to enable the fulfilment of Prescribed Services, Negotiated Services, Non-regulated Services, Insurance Work or Property Services. These costs are appropriately segregated and are allocated to the respective business streams except to the extent the cost is immaterial or a causal-based method of allocation cannot be established without undue cost and effort.

TransGrid's capitalisation policies have not changed in the current regulatory control period. At this time, there are no planned changes to TransGrid's capitalisation policies for the next regulatory period.

Substance over form

The information in this proposal reports both the substance and detail of transactions and events. Where commercial substance differs from legal form, commercial substance is provided.

All aspects, implications and commercial effect groupings were considered in determining the substance of transactions and events.

Materiality

All material items have been disclosed. An item is material if its omission, mis-statement or nondisclosure has the potential to prejudice the understanding of the financial or operational position and nature of the prescribed transmission services.

Related party transactions

TransGrid confirms that there are no material related party transactions whose costs are attributed to, or allocated between, categories of transmission services provided by it.

10. Service Target Performance Incentive Scheme

TransGrid's performance will be measured against seven parameters related to network outages:

- Transmission line availability;
- Transformer availability;
- Reactive plant availability;
- Frequency of loss-of-supply events greater than 0.05 system minutes;
- Frequency of loss-of-supply events greater than 0.25 system minutes;
- Average unplanned outage restoration time; and
- Market impact performance component, which is new in 2009/14.

TransGrid's performance on all parameters was consistently good in the period 2003 to 2007. The vast majority of outages on TransGrid's network are planned outages to meet capital and operating regulatory obligations of the National Electricity Rules.

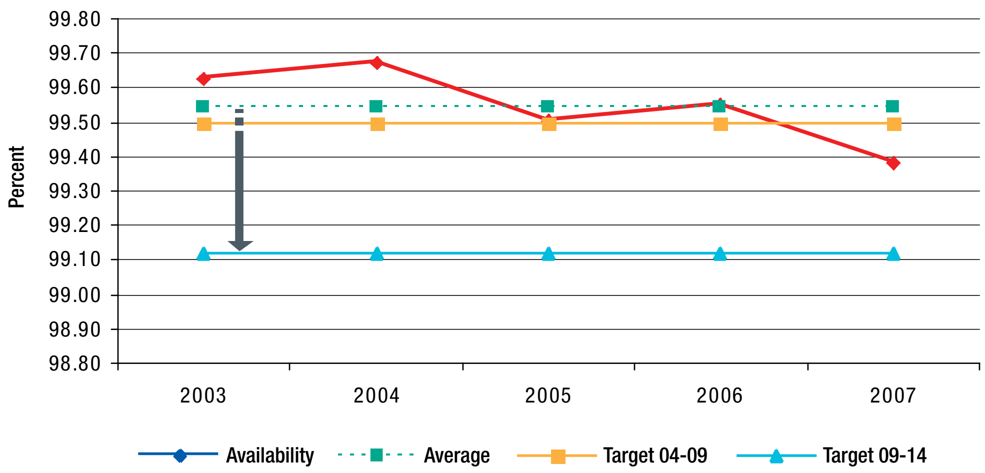
All capital works on network assets involve some outages. At the very least, outages are required to connect a new greenfield asset to the existing network. At the other end of the spectrum, projects involving replacement of an asset in the same physical location may require extended outages to ensure that the work can be carried out. Such projects include transformer replacements and transmission line replacements or upgrades.

The volume of capital works in the 2009/14 period will see an impact on the transformer and transmission line availability measures similar to the levels seen in the 2007 calendar year. Thus improvements in availability will become impossible during this period of significant capital works and future targets will need to be adjusted to reflect the capital works program in 2009/14.

10.1 Transmission line availability

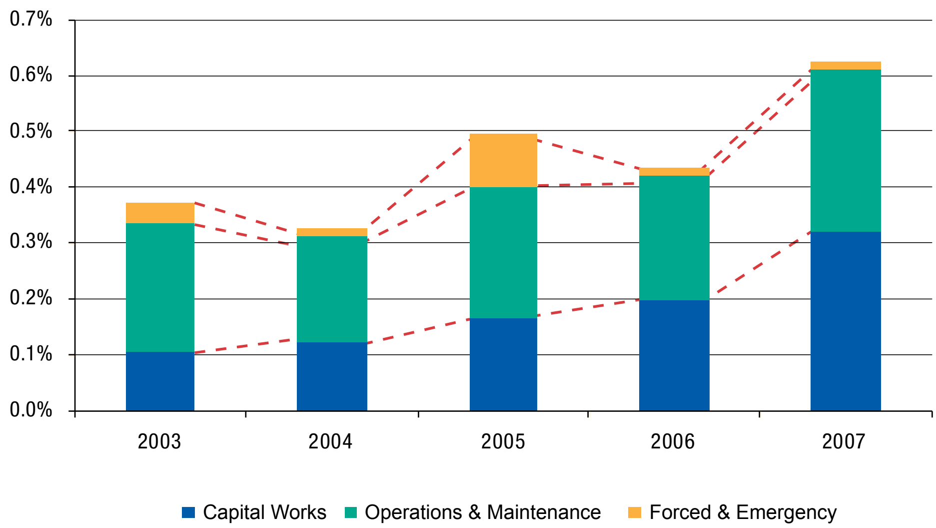
TransGrid's performance on transmission line availability has been very high in the past five years (with an average availability of 99.55% – see Figure 10.1).

Figure 10.1: Transmission line availability



The majority of outages are planned to meet regulatory obligations related to capital works, maintenance and major refurbishments. Less than 10% of all outages, by duration, have been unplanned, forced or emergency outages. This is shown in Figure 10.2. The trend of increasing capital outages is clearly seen and this will continue for the rest of the next regulatory control period.

Figure 10.2: Transmission line unavailability by outage type



As TransGrid has consistently high levels of performance, it will be difficult to increase availability in the coming regulatory control period without comprising the regulatory obligations outlined in the capital expenditure and operating expenditure objectives of the National Electricity Rules. Thus an asymmetric incentive is considered reasonable. This is consistent with recent determinations by the AER, in which "the AER accepts that asymmetric incentives may be appropriate where TNSPs are operating at a high level of performance and further improvements may be difficult to achieve".[33]

[33] AER Draft Decision, ElectraNet Transmission Determination 2008/09 to 2012/13, p199

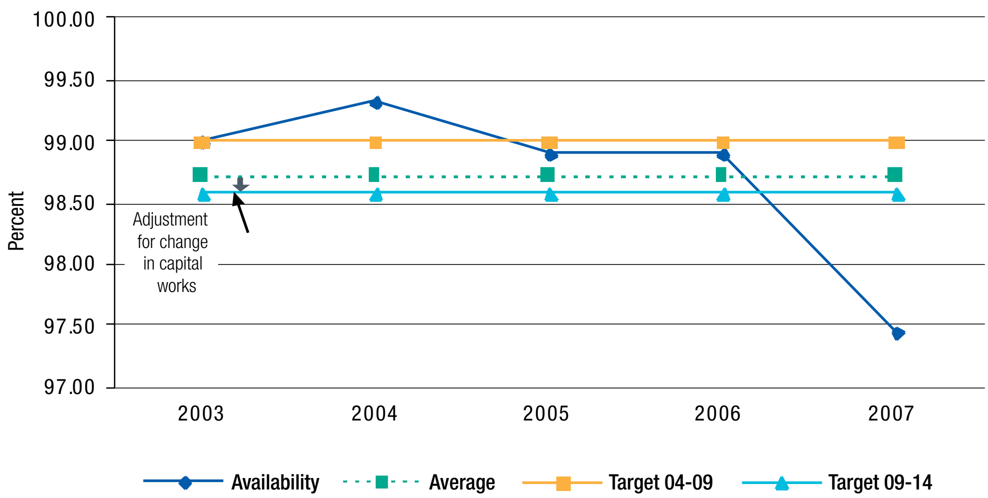
TransGrid proposes a target calculated by adjusting the average performance from 2003 to 2007 by the change in the level of capital works, which results in a target of 99.12% (shown in Figure 10.1).

It is proposed that the collar be set two standard deviations below the target, as common practice in recent determinations, resulting in a collar of 98.92%. TransGrid proposes that the cap be set at a level that allows best practice maintenance and capital works to be carried out without undue incentive opposing the regulatory obligations they are required to satisfy. This is determined by forecasting outages required to perform best practice maintenance and efficient capital works, adjusting the forecast to promote efficiency by a factor of 10%, and determining the corresponding availability. This results in a cap of 99.24%.

10.2 Transformer availability

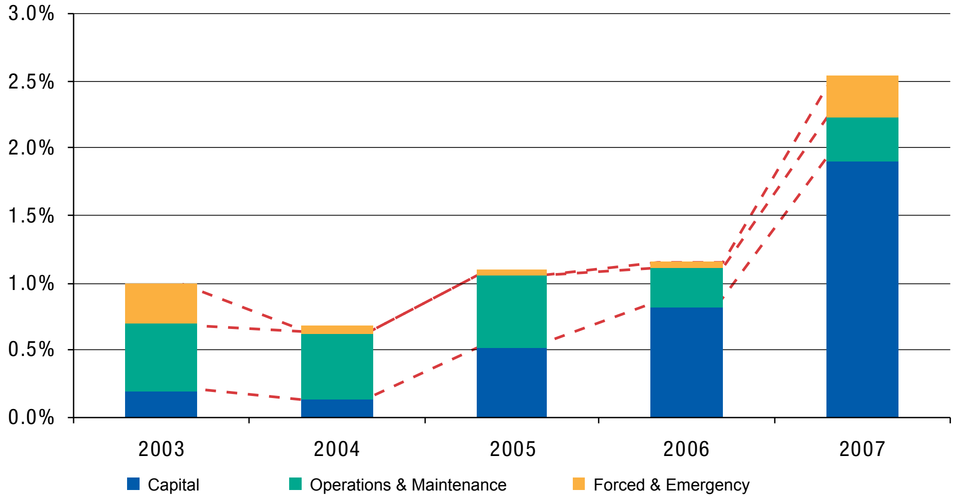
TransGrid achieved an average transformer availability of 98.72% from 2003 to 2007 (see Figure 10.3).

Figure 10.3: Transformer availability



Again, most outages were planned to meet regulatory obligations and the outages by type are shown in Figure 10.4. The trend of increasing capital outages is clearly seen and this will continue for the next regulatory control period.

Figure 10.4: Transformer unavailability by outage type



As with transmission line availability, attempts to achieve future increases in availability are likely to compromise these obligations and an asymmetric incentive is considered reasonable.

TransGrid proposes a target calculated by adjusting the average performance from 2003 to 2007 by the change in the level of capital works, which results in a target of 98.58% (shown in Figure 10.3).

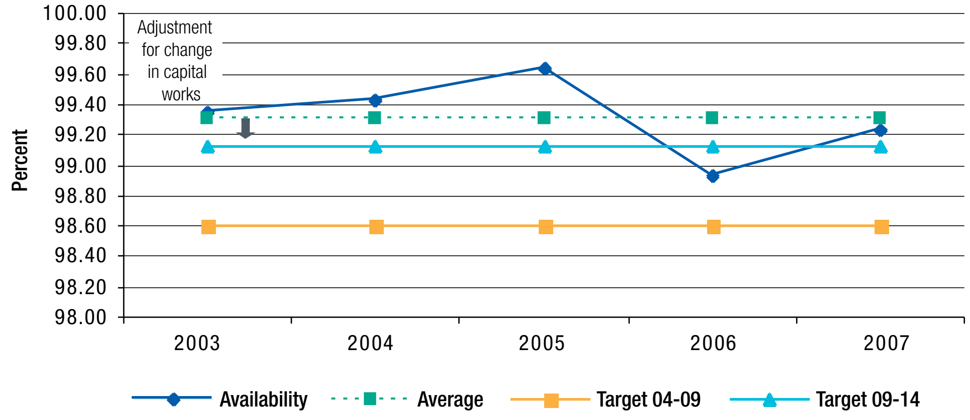
It is proposed that the collar be set two standard deviations below the target, as common practice in recent determinations, resulting in a collar of 97.29%.

It is proposed that the cap be set at a level that allows best practice maintenance and capital works to be carried out without undue incentive opposing the regulatory obligations they are required to satisfy. This is determined by forecasting outages required to perform best practice maintenance and efficient capital works, adjusting the forecast to promote efficiency by a factor of 10%, and determining the corresponding availability. This results in a cap of 98.85%.

10.3 Reactive plant availability

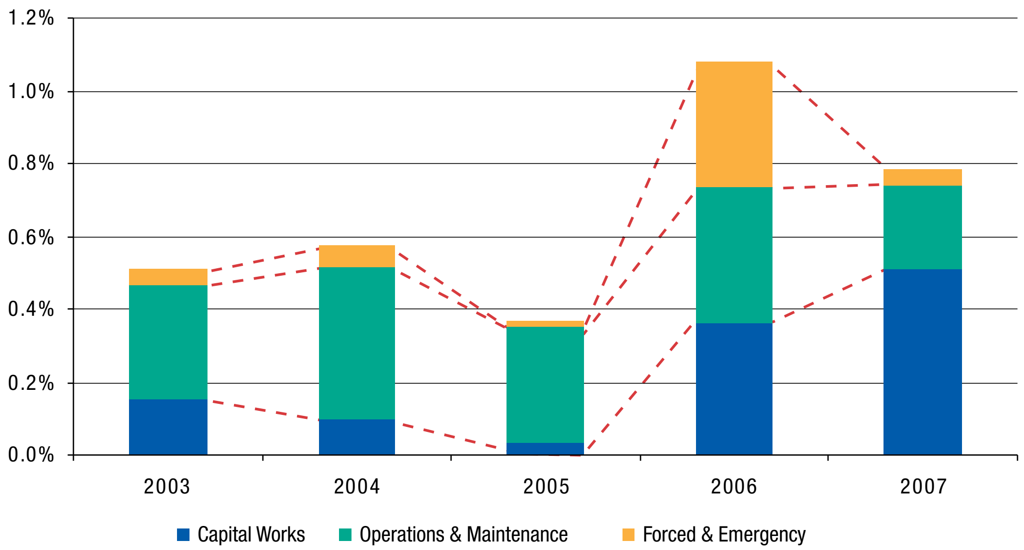
Average reactive plant availability in 2003-2007 was a very high 99.31% (see Figure 10.5).

Figure 10.5: Average reactive plant availability



Most outages were scheduled to meet regulatory obligations, as shown in the breakdown by type in Figure 10.6. Like transmission lines and transformers, the impact of increasing capital works outages is readily seen.

Figure 10.6: Reactive plant unavailability by outage type



Given TransGrid's consistently high levels of performance – and the fact improvements will be hard to find without compromising required levels of service relating to reliability – an asymmetric incentive is again proposed.

TransGrid proposes a target calculated by adjusting the average performance from 2003 to 2007 by the change in the level of capital works, which results in a target of 99.13% (shown in Figure 10.5).

It is proposed that the collar be set two standard deviations below the target, as has been common practice in recent determinations, resulting in a collar of 98.67%. TransGrid proposes that the cap be set at a level that allows best practice maintenance and capital works to be carried out without undue incentive opposing the regulatory obligations they are required to satisfy. This is determined by forecasting outages required to perform best practice maintenance and efficient capital works, adjusting the forecast to promote efficiency by a factor of 10%, and determining the corresponding availability. This results in a cap of 99.33%.

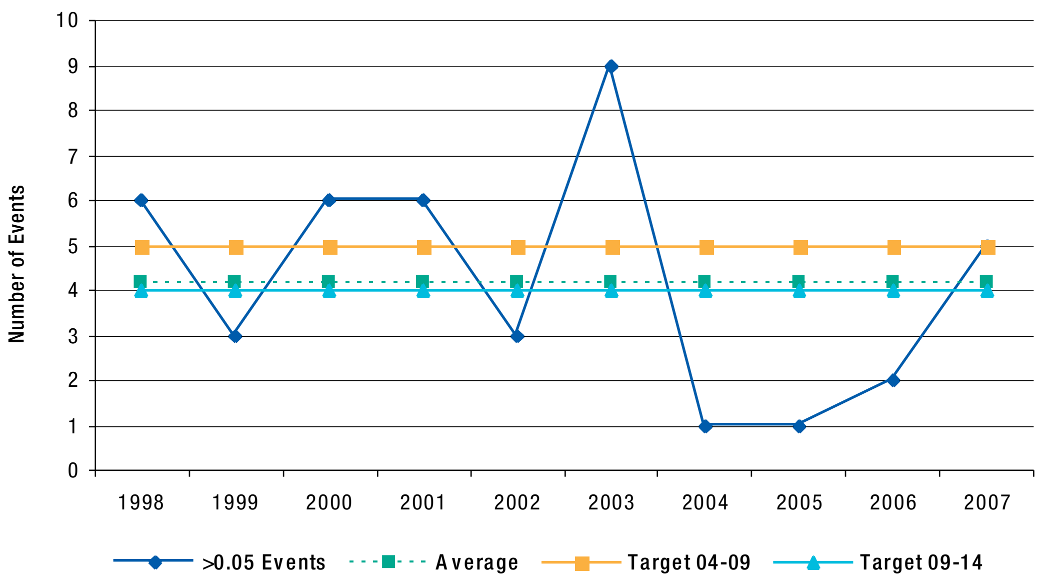
10.4 Loss-of-supply events

Greater than 0.05 system minutes

TransGrid's loss-of-supply results over the present regulatory period are shown in Figure 10.7. When expressed as a percentage these results correspond with a very high level of reliability, over 99.999%. The average frequency of loss-of-supply events greater than 0.05 system minutes in the past five years was 3.6. For setting a target this must be rounded to an integer, in this case four events.[34]

TransGrid engaged SAHA International to determine suitable values for this parameter. SAHA's analysis is attached (Appendix P). The cap and collar is determined using a statistical analysis of the past 10 years' results. This places the cap at two events and the collar at seven events.

Figure 10.7: Loss-of-supply events greater than 0.05 system minutes



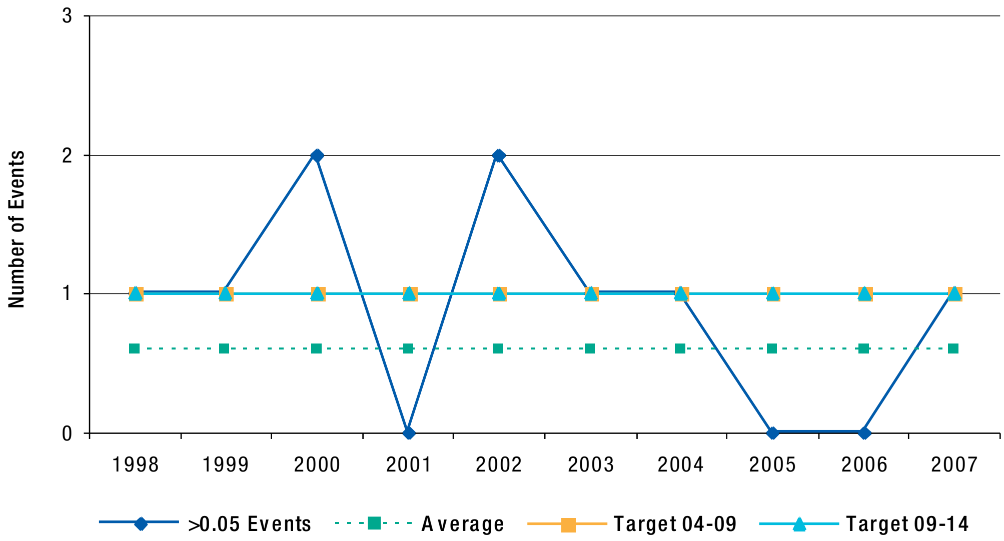
Greater than 0.25 system minutes

TransGrid has reduced the threshold for large loss-of-supply events from 0.4 system minutes to 0.25 system minutes. The average frequency of loss-of-supply events greater than 0.25 system minutes from 2003 to 2007 was 0.6 (see Figure 10.8). For setting a target this must be rounded to an integer, in this case to one event.[35]

[34] AER, Final Electricity Transmission Network Service Providers Service Target Performance Incentive Scheme, August 2007, clause 2.5(l))
[35] As for previous footnote

Based on the SAHA's analysis, the cap for this parameter has been set at nil events and the collar at two events.

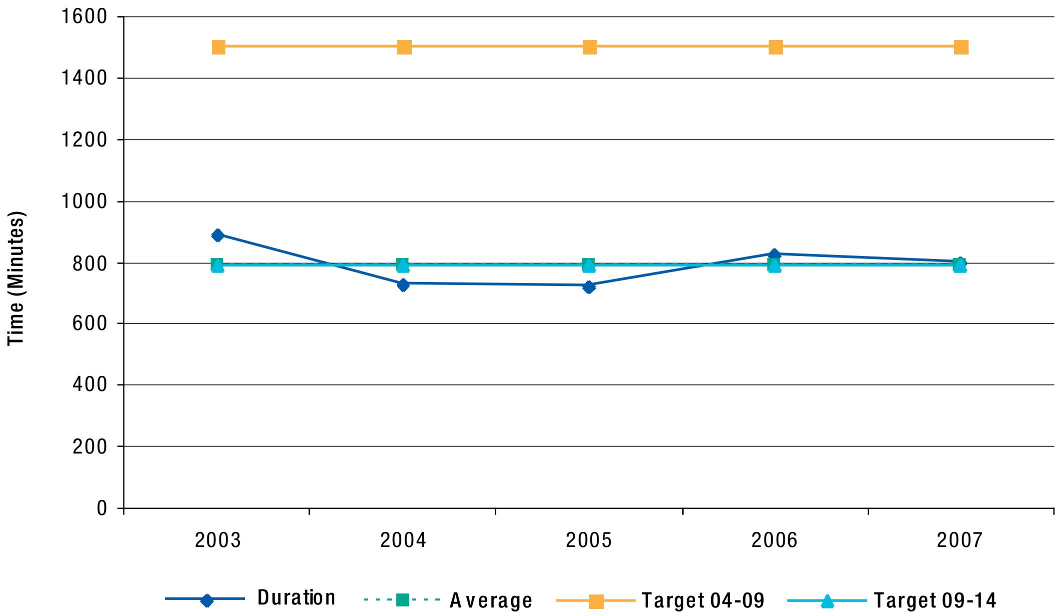
Figure 10.8: Loss-of-supply events greater than 0.25 system minutes



10.5 Average unplanned outage restoration time

The average outage duration from 2003 to 2007 was 790 minutes (see Figure 10.9).

Figure 10.9: Average outage duration



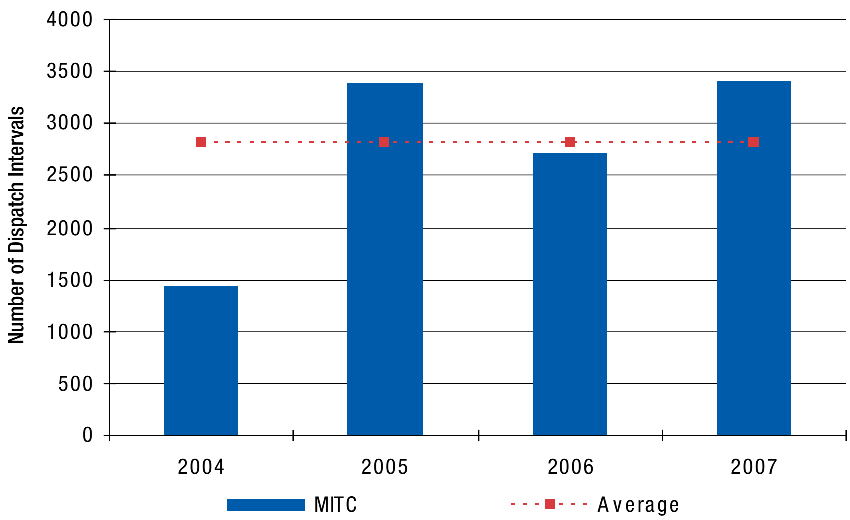
The average outage duration from 2003 to 2007 of 790 minutes forms TransGrid's target. Recent revenue determinations have set the collar and cap at two standard deviations either side of the target, which provides a 95% probability that a TNSP will attain a result on the slope of the curve between the cap and collar. TransGrid proposes to use this method, resulting in a collar of 917 minutes and cap of 663 minutes.

10.6 Market impact of transmission congestion

A parameter measuring Market Impact of Transmission Congestion (MITC) will apply to TransGrid. This is measured by a count of the number of five-minute dispatch intervals where an outage on TransGrid's network results in a network outage constraint with a marginal value greater than $10/MWh.

TransGrid's historical performance related to such network outage constraints is shown in Figure 10.10. The graph shows the period considered for MITC to date, which is the period over which TransGrid has reliable data.

Figure 10.10: Network outage constraints greater than $10/MWh



The average result over the period 2004 to 2007 is 2873 dispatch intervals. This forms TransGrid's target, and the cap is specified in the scheme as nil dispatch intervals. This corresponds to a total of 239 hours per year.

10.7 Proposed targets and weightings

The method for counting loss-of-supply events will change for TransGrid in the 2009/14 regulatory period. Large loss-of-supply events (greater than 0.4 system minutes) have traditionally not been double-counted as small loss-of-supply events (greater than 0.05 system minutes). The AER has requested that, to be consistent with other TNSPs, TransGrid commence double-counting large loss-of-supply events (now greater than 0.25 system minutes) as small loss-of-supply events greater than 0.05 system minutes.

Thus TransGrid proposes to reduce the revenue at risk for loss-of-supply events greater than 0.25 system minutes so that the total revenue at risk for one such event does not substantially increase. TransGrid proposes to reduce the weighting for events greater than 0.25 system minutes to 0.1%. This will also prevent an unreasonably large penalty for an event that is now subject to a tighter threshold.

The proposed change to weightings for loss-of-supply events means 0.1% of revenue at risk needs to be reallocated to other areas. Given TransGrid's excellent performance on availability, allocating additional revenue at risk to this area would not be a meaningful incentive.

TransGrid proposes that the weighting removed from the large loss-of-supply event be re-allocated to average outage restoration time, since this is the area in which it can most improve.

Figure 10.11 shows TransGrid's proposed weightings for the STPIS. Under the scheme, revenue is increased by up to 3% and decreased by as much as 1% of MAR according to performance within these parameters. The market impact performance component can provide an incentive of up to 2% and the service component can provide an incentive or penalty of up to 1%.

Figure 10.11: STPIS weightings

Measure	Weighting
Transmission Line Availability	0.20%
Transformer Availability	0.15%
Reactive Plant Availability	0.10%
Loss of Supply >0.05 System Minutes	0.25%
Loss of Supply >0.25 System Minutes	0.10%
Average Outage Restoration Time	0.20%
Market Impact Performance Component	2.00%

Figure 10.12 summarises TransGrid's proposed values and parameters for the Service Target Performance Incentive Scheme.

Figure 10.12: Proposed parameters for STPIS

Measure	Collar	Target	Cap	Weighting
Transmission Line Availability	98.92	99.12	99.24	0.20%
Transformer Availability	97.29	98.58	98.85	0.15%
Reactive Plant Availability	98.67	99.13	99.33	0.10%
Loss of Supply >0.05 System Minutes	7	4	2	0.25%
Loss of Supply >0.25 System Minutes	2	1	0	0.10%
Average Outage Restoration Time	917	790	663	0.20%
Market Impact Performance Component		2873	0	2.00%

11. Regulatory asset base

TransGrid's opening regulatory asset base (RAB) at 1 July 2009 needs to be established to allow the building-block calculation of the revenue requirement for the 2009-14 regulatory control period. The AER Roll Forward Model prescribes the process to be used to lock in the regulatory asset base when determining the opening asset valuation for the regulatory period.

11.1 Regulatory Asset Base value, 1 July 2004

The National Electricity Rules state that TransGrid's regulatory asset base value as at 30 June 2004 was $3012.76 million.

This value has been calculated as set out in Figure 11.1.

Figure 11.1: Regulatory Asset Base as at 30 June 2004

RAB@30/06/04 $m, nominal	2003/04
Opening base	2,427.1
Decision capex at actual CPI	377.2
CPI adjustment	48.1
Economic Depreciation	125.8
Closing asset base	2,726.6
Roll in un-forecast capex	286.1
RAB @ 30/06/04	**3,012.8**

11.2 Regulatory Asset Base value, 1 July 2009

TransGrid has calculated the value of its regulatory asset base for 1 July 2009 by rolling forward from the 1 July 2004 value.

Under the roll-forward methodology, the previous value of the regulatory asset base has been:

- Increased by the amount of all capital expenditure incurred during the current control period;
- Increased by the amount of the estimated capital expenditure for the remaining part of the current control period;
- Reduced by the amount of depreciation of the regulatory asset base using the rates and methodologies allowed in TransGrid's 2004 revenue cap decision;
- Reduced by the disposal value of any assets shed during the control period; and
- Reduced for the difference between the estimated capital expenditure during the last control period and the actual capital expenditure for that part of the period and the return on the difference.

Applying the AER the roll-forward methodology TransGrid's regulatory asset base as at 30 June 2009 is $4237.4 million, as set out in Figure 11.2.

Figure 11.2: Regulatory Asset Base as at 30 June 2009

Regulated asset base	2004/05	2005/06	2006/07	2007/08	2008/09
Opening regulatory asset base	3,012.8	3,103.9	3,227.7	3,394.4	3,757.1
WACC adjusted capital expenditure	134.0	154.1	221.2	360.7	557.7
Inflation adjustment	71.1	92.6	78.6	144.0	105.2
Straight-line depreciation	-113.9	-122.9	-133.1	-142.0	-161.2
Closing regulatory asset base	3,103.9	3,227.7	3,394.4	3,757.1	4,258.8
Adjustment for 03/04					-21.4
Final regulatory asset base					**4,237.4**

Disposal of Assets

The AER PTRM requires disposal of assets to be accounted for in calculating a TNSP's regulatory asset base. Disposals are referred to in two areas of the regulatory process, the Post Tax Revenue Model (PTRM) and the regulatory accounts:

- The PTRM requires asset disposal information but does not define the calculation process for ascertaining the value; and
- The regulatory accounts do not define the disposals value but request data such as 'Book value of Assets Disposed' (in the Income Statement) and 'Gross Book Value for Disposals and Accumulated Depreciation for Disposals'.

There are a number of alternative methods to valuing asset disposals and TransGrid has decided, consistent with the approval adopted for the regulatory accounts, to use the accounting book value for disposals within the Roll Forward Model.

To reflect the current levels of asset disposals, an average of the last three years of actuals have been used as the forecast asset disposals.

12. Depreciation

TransGrid complies with the Australian Accounting Standards Board requirements governing depreciation. The standards state that: *"Depreciation is the systematic allocation of the depreciable amount of an asset over its useful life."*[36]

The National Electricity Rules requires that the nominated depreciation schedules must use a profile that reflects the nature of the category of assets (which must be classified into well accepted categories) over the economic life of that category of assets.[37]

TransGrid has assigned a regulatory life to well-recognised categories of assets that equates to the assets' expected economic or technical life.

A straight-line depreciation method has been used to determine systematic allocations that are constant across reporting periods. No depreciation is applied to land and easement assets.

12.1 Asset lives

Asset lives have been reviewed in accordance with ASB 116 "Property, Plant and Equipment", and where required, adjustments have been made to the remaining useful lives of separately identifiable parts of assets having regard to factors such as asset usage and the rate of technical and commercial obsolescence.

TransGrid is required to depreciate new assets based on their standard lives. These lives are shown in Figure 12.1. Existing assets are required to be depreciated by their remaining lives.

In determining the asset classes to be used for the 2009/14 regulatory period TransGrid has decided to separate the asset classes by regulatory period while maintaining the asset class definitions used in those periods. TransGrid believes that this will more accurately represent the economic life of the assets and gives transparency across regulatory periods.

Due to the complexity of accounting for the individual economic life of every asset within the Post Tax Revenue Model, the PTRM Handbook issued in September 2007 states that the remaining economic life of the asset classes will generally be "assumed based to be the weighted average remaining life of all individual assets in the class". To determine the remaining lives of the assets at the beginning of 2009/10, TransGrid has used a weighted average calculation built up from the timing of actual capex expenditure incurred in the previous regulatory periods.

The weighted average in real terms is calculated separately for each asset class as follows:

1. The remaining life of the assets associated with expenditure incurred within the first year is calculated (R1).

2. The remaining value at the end of 2008/09 (taking account of depreciation within the 2004/09 regulatory period) of the actual capex expenditure incurred within the first year is calculated (V1).

[36] AASB 116 "Property, Plant and Equipment"
[37] NER: Clause 6A.6.3

3. This process is then repeated for each of the other four years and for the opening value of that asset class at the commencement of the regulatory period (V0).
4. The weighted remaining lives are added together (R0*V0 + R1*V1 + R2*V2 …).
5. The result is then divided by the total value of assets calculated in Step 2 and 3 to obtain the weighted average for that class at the end of 2008/09.

Generally replacement assets are added to or form part of a larger existing asset. TransGrid has calculated the standard economic and tax life for the 2009/14 replacement asset classes by using the remaining life of relevant asset classes in the methodology set out above.

The standard lives adopted by TransGrid for deprecation are set out in Figure 12.1.

Figure 12.1: 2009/10 to 2013/14 Asset Categories and Standard Asset Lives

Asset Category	Asset Life
Asset Lives Applicable to New Assets (Augmentation)	
Transmission Lines & Cables	50 years
Substations	40 years
Secondary Systems	35 years
Communications	35 years
Land & Easement	n/a
Business Information Technology	4 years
Support the Business - Minor Plant	8 years
Motor Vehicles & Mobile Plant	8 years
Asset Lives Applicable to Replacement Assets	
Transmission Lines & Cables	26 years
Substations	30 years
Secondary Systems	30 years
Communications	12 years
Land & Easement	n/a

12.2 Transition from Incurred to Commissioned Recognition of Capital Expenditure

The AER in its Post Tax Revenue Model (PTRM) issued in September 2007, decided to adopt the partly as-incurred ("hybrid") approach for recognising capital expenditure as the default position in the PTRM. This was because it considered this approach the most likely to be consistent with the requirements of the NER.

TransGrid's revenue decision for the current regulatory period is based upon recognition of capital expenditure on a fully incurred basis. TransGrid has decided that it will comply with the requirements in the new guidelines (the AER guideline decision indicated that TNSPs could request to remain on a fully incurred method) and transition to the hybrid method in the calculation of its depreciation for the 2009/14 period. This will bring TransGrid's treatment into line with other TNSPs in the NEM.

A transition arrangement is required to move from the as-incurred to as-commissioned treatment of capital expenditure to deal with projects that span the regulatory periods. For those projects that are committed and expenditure is incurred in the current period TransGrid proposes to continue to depreciate these projects on an as-incurred approach until the project is commissioned.

12.3 Forecast Depreciation

TransGrid's forecast depreciation has been calculated using the AER's post-tax revenue model and is set out in Figure 12.2 below.

Figure 12.2: Forecast depreciation ($m, nominal)

Economic Depreciation	2009/10	2010/11	2011/12	2012/13	2013/14
Straight-line depreciation	186.3	201.2	205.7	235.0	259.7
Inflation adjustment	-106.8	-119.3	-131.0	-150.5	-163.7
Economic Depreciation	**79.6**	**81.9**	**74.7**	**84.5**	**96.0**

13. Cost of capital and taxation

The National Electricity Rules prescribe the method and values for most of the parameters to be used in calculating the Weighted Average Cost of Capital (WACC) and taxation in a TNSP's revenue proposal.

The regulatory rate of return should be sufficient to ensure the continuing viability of TransGrid's business and to encourage necessary investment in new and replacement assets. If the rate of return is too low, discretionary investment will be constrained and the benefits to customers that such investments would deliver will not be realised.

Two of the major parameters in the WACC that are determined as part of a TNSP's revenue determination are the nominal risk free rate and the debt risk premium.

Due to unprecedented volatility in the market place in 2008, one of the significant issues facing TransGrid in preparing its revenue proposal is determining the appropriate values to be assumed for these factors in its proposal. This is because these factors will be set at a future time as agreed between TransGrid and the AER.

13.1 Weighted average cost of capital

The National Electricity Rules[38] state that the nominal post-tax weighted average cost of capital (WACC) is to be estimated using the following formula:

$$WACC = ke\frac{E}{V} + kd\frac{D}{V}$$

- **ke** is the return on equity (determined using the Capital Asset Pricing Model) and is calculated as **rf + ße x MRP**

  Where:

  > **rf** is the nominal risk-free rate for the regulatory control period determined in accordance with paragraph (c);

  > **ße** is the **equity beta**, which is deemed to be 1.0; and

  > **MRP** is the **market-risk premium**, deemed to be 6%).

- **kd** is the return on debt and is calculated as **rf + DRP**

  Where;

  DRP is the debt risk premium for the regulatory control period determined in accordance with paragraph (e)

- **E/V** is the market value of equity as a proportion of the market value of equity and debt, which is 1 - D/V; and

- **D/V** is the market value of debt as a proportion of the market value of equity and debt, deemed to be 0.6.

[38] National Electricity Rules: Clause 6A.6.2

13.1.1 Nominal risk-free rate and debt-risk premium

During the first half of 2008 there has been unprecedented volatility in the risk-free rate and debt-risk premium. The debt risk premium in the recent AER decision on ElectraNet was 1.68% in the draft decision based on the market rates in October last year and 3.42% in the final decision based on market rates in March, 2008. The AER was satisfied in this decision that the significant increase was being driven by the ongoing global credit crisis impacting on the financial market.

As required by the NER the risk-free rate and debt-risk premium to be used in the AER final decision will be calculated at a period to be nominated by TransGrid and agreed by the AER on a confidential basis. The values for these parameters in the revenue proposal are therefore indicative to be able to calculate an indicative MAR.

In view of the current volatility, TransGrid believes it is unhelpful and possibly misleading to use the current market rates in the cost of capital calculation in this revenue proposal. Between the lodgement of the proposal and the period over which the rates will be set there may be significant movement either up or down, particularly in the debt risk premium.

For the purposes of this proposal, TransGrid believes that that it is more appropriate to include values of the nominal risk-free rate and debt-risk premium in line with historical averages. These estimates provide a more neutral indicator of the possible revenue impacts when calculating the estimated MAR in the proposal and mitigates the recent volatility. Based upon external advice received by TransGrid the values being used in the proposal are:

- Nominal risk free rate - 5.7%
- Debt risk premium - 1.75%

13.1.2 Forecast Inflation

In recent AER revenue decisions, the setting of an appropriate rate of inflation for the Post Tax Revenue Model (PTRM) has attracted significant attention. TransGrid considers that a long term view of inflation is appropriate in determining inflation for use in the PTRM.

In this revenue proposal, TransGrid has adopted the methodology used by the AER in the recent SP AusNet and ElectraNet decisions. The methodology adopts a two part approach to setting the long term forecast inflation over a ten year period:

- Determining a short term forecast of inflation for the first two year period based on a reliable forecast; and
- Adoption of the mid point of the Reserve Bank of Australia (RBA) target inflation band of 2% to 3% beyond that period due to the inherent difficulties in forecasting inflation over the longer term.

In the recent AusNet and ElectraNet decisions the AER used the RBA's short term forecasts for the first two years of the calculation.

TransGrid considers that the RBA 'forecasts', adopted by the AER, are not the most appropriate short term forecast to be used. The RBA inflation projections are not true inflation forecasts. As the RBA has highlighted, its 'forecasts' are a policy signalling mechanism.

NSW network businesses engaged Competition Economists Group (CEG) to provide advice on escalation factors. This advice includes an estimate of inflation developed by CEG. Their report is included as Attachment F. The CEG inflation forecasts for 2009 and 2010 are 2.8% and 2.4% respectively.

Applying the AER's methodology leads to an average forecast inflation rate used in this revenue proposal for the 10 year period of 2.52%.

13.1.3 WACC parameters

TransGrid has calculated a nominal vanilla WACC of 9.15%, as set out in the National Electricity Rules.

The parameters used in calculating the cost of capital and TransGrid's proposed values are shown in Figure 13.1.

Figure 13.1: WACC parameters

Parameter	TransGrid Proposal
Nominal risk-free rate	5.70%
Inflation rate	2.52%
Cost of debt margin	1.75%
Market-risk premium	6.00%
Corporate tax rate	30.00%
Value of imputation credits	50.00%
Proportion of equity funding	40.00%
Proportion of debt funding	60.00%
Equity beta (uses Te)	1
Nominal vanilla WACC	9.15%

13.2 Tax allowance

The AER PTRM uses a benchmark business structure as one component in estimating tax payable. Another component is the estimated tax depreciation of the actual asset base.

The revenue model determines a notional "taxable income" and "tax payable", taking into account deductions for depreciation.

As part of the post-tax nominal approach, a separate allowance must be made in the revenue cap for corporate income tax, net of the value ascribed to dividend imputation credits.

The National Electricity Rules require that the allowance for corporate income tax be calculated using the following formula.[39]

ETCt = (ETIt x rt) (1 – y)

- ***ETIt*** *is an estimate of the taxable income a prudent and efficient TNSP would earn in a particular year (t) as a result of providing the same prescribed transmission services as the TNSP under review*
- **rt** *is the expected statutory income tax rate for that regulatory year as determined by the AER*
- **y** *is the assumed use of imputation credits, deemed to be 0.5*

TransGrid has used the AER's PTRM to calculate its proposed taxation allowance as set out in Figure 13.2.

Figure 13.2: Proposed taxation allowance ($m, nominal)

Tax Allowance	2009/10	2010/11	2011/12	2012/13	2013/14
Estimated tax payable	47.3	49.9	49.2	57.4	63.8
Less value of imputation credits	-23.6	-24.9	-24.6	-28.7	-31.9
Net tax allowance	**23.6**	**24.9**	**24.6**	**28.7**	**31.9**

[39] National Electricity Rules, clause 6A.6.4

14. Efficiency Benefit Sharing Scheme

During the current regulatory period TransGrid is subject to the efficiency carry-forward mechanism set out in the Statement of Regulatory Principles (SRP). For the next regulatory period from 2009/10 to 2013/14 the AER Efficiency Benefit Sharing Scheme (EBSS) released in September 2007 will apply.

14.1 Efficiency carry-forward

TransGrid commenced the current regulatory period operating under the ACCC's draft determination. The draft determination stated that there would be no efficiency carry forward mechanism. In December 2004 the ACCC released the Statement of Regulatory Principles. The ACCC's final determination issued in April 2005 indicated that the efficiency carry-forward mechanism in the SRP would apply to TransGrid.

As described elsewhere in this proposal the ACCC in its determination for the current regulatory period, set TransGrid a challenging target on the allowed amount of operating expenditure. During the first three years of the period TransGrid has implemented efficiencies to be able to spend less than the AER allowed opex by a small amount. Due to increasing costs and the maintenance of an increasing asset base TransGrid has been projecting that it will not be able remain under the ACCC allowance through to the end of this regulatory period.

As a result of the efficiency carry-forward mechanism being introduced in the ACCC's final decision at the end of the first year of the period, TransGrid did not have the opportunity to effectively manage its business and respond to the efficiency carry-forward incentives. As a result TransGrid has incurred a negative efficiency benefit from the first to second year of the current period.

The efficiency carry-forward for 2007/08 and 2008/09, the last two years of the current regulatory period, are now being impacted by unexpected but significant changes to TransGrid's liability for superannuation. The Electricity Industry Superannuation Scheme has advised that for 2007/08 and 2008/09 TransGrid's liability for superannuation contributions has been waived due to strong investment performance by the fund over preceding years. As a result of these changes which TransGrid had not planned for or anticipated, the efficiency carry-forward for these years is significantly increased.

Due to the unexpected increase in the efficiency carry-forward from superannuation contributions, TransGrid has chosen not to pursue correction of the negative carry-forward from the first to second year of the period which was due to the imposition of the efficiency carry-forward mechanism at the end of the first year of the current period.

The calculation of the efficiency carry-forward is set out in the AER's prescribed template submitted with the proposal. The total efficiency carry-forward is shown in Figure 14.1.

In calculating the efficiency carry-forward, the AER capital expenditure allowance has been adjusted by the same inflation as used in the Roll Forward Model.

Figure 14.1: Efficiency benefit carry-forward ($m, nominal)

	2009/10	2010/11	2011/12	2012/13	2013/14
Efficiency carry-forward	6.3	3.5	4.1	3.9	-0.8

14.2 Proposed efficiency benefit sharing scheme

The Efficiency Benefit Sharing Scheme that will apply to TransGrid in the 2009/10 to 2013/14 regulatory period is set out in the AER guideline of September 2007. TransGrid understands that this guideline requires TNSPs to do three things in its revenue proposal:

- Set out its forecast operating expenditure for each year of the regulatory period;
- Propose any operating expenditure cost categories that should be excluded from the calculation of the carryover amount into the 2014/15 regulatory period; and
- Set out its proposed approach to calculating an adjustment for expected growth in demand.

TransGrid has set out its forecast operating expenditure forecasts which are consistent with the operating expenditure objectives and criteria set out in the NER in chapter 8 of this proposal.

In its guideline, the AER has defined certain cost categories that will be excluded in calculating the carryover into the 2014/19 regulatory control period. These are changes in capitalisation policy, the growth adjustment and pass through events. TransGrid is prepared to work with the AER to determine other categories that may be appropriate to exclude.

The third area TransGrid is required to address in its proposal is the approach to calculating the impact of changes in expected growth in demand. This is the methodology that the AER will use in its determination for the 2014/19 regulatory period to adjust the operating expenditure forecasts established in the 2009/14 determination to remove the effect of growth on operating expenditure.

The operating expenditure methodology set out in chapter 8 of this proposal has established a linkage between growth and operating expenditure through the impact of maintenance of new assets. The need for these new assets is usually linked to a growth in demand.

The capital program that is the basis of the commissioning of these new assets and the resulting increasing maintenance effort has been generated from probabilistic analysis of possible load growth scenarios. The value of the capital program is the weighted average of these scenarios. As the capex program takes into account a range of load growth scenarios, the variation in opex for growth in assets is representative of an average of a range of growth options.

TransGrid considers that for the purpose of calculating the carryover into the 2014/19 regulatory control period a growth adjustment is only required if actual demand is outside the range of scenarios modelled in developing the proposal.

The details of these forecasts are set out in TransGrid's 2007 Annual Planning Report.

In the event this situation occurs, TransGrid is prepared to work with the AER to determine an appropriate growth adjustment.

15. Maximum allowed revenue

The building-block formula to be applied in each year of the regulatory control period is:

MAR = return on capital (WACC x RAB) + return of capital (economic depreciation)
+ opex + tax

- *MAR = maximum allowable revenue*
- *WACC = post-tax nominal weighted average cost of capital*
- *RAB = regulatory asset base*
- *economic depreciation = (nominal depreciation – indexation of the RAB)*
- *opex = operating and maintenance expenditure + efficiency glide path payments*
- *tax = regulated business corporate tax allowance*

This revenue is then smoothed through the use of an “X factor”, as required under the National Electricity Rules.

This chapter sets out TransGrid’s proposed Maximum Allowable Revenue for the next regulatory period and briefly summarises each of the building blocks used to make this up.

Presentation of financial estimates in the proposal

The financial estimates in this revenue proposal have been shown in 2007/08 dollars. This is so that the revenue proposal is consistent with TransGrid’s requirement to report its 2009/10 capital budget to the NSW Government in 2007/08 dollars and TransGrid’s 2008 Corporate Plan which is also prepared on the same basis.

To meet the requirement of the AER’s PTRM Guidelines all estimates have been escalated to 2008/09 dollars when inputted to the model. As the PTRM output is in nominal dollars most figures in this chapter are shown in nominal dollars.

15.1 Regulatory Asset Base

The calculation of the regulatory asset base for the 2009/10 to 2013/14 period is show in Figure 15.1.

Figure 15.1: Asset Base Roll Forward from 1 July 2009 to 30 June 2014 ($m, nominal)

Regulated Asset Base	2009/10	2010/11	2011/12	2012/13	2013/14
Opening regulatory asset base	4,237.4	4,734.9	5,199.0	5,972.3	6,494.3
WACC adjusted capital expenditure	577.0	546.0	847.9	606.5	379.7
Inflation adjustment	106.8	119.3	131.0	150.5	163.7
Straight-line depreciation	-186.3	-201.2	-205.7	-235.0	-259.7
Closing regulatory asset base	**4,734.9**	**5,199.0**	**5,972.3**	**6,494.3**	**6,778.0**

15.2 Return on Capital

The return on capital for the 2009/10 to 2013/14 period is show in Figure 15.2.

Figure 15.2: Return on Capital from 1 July 2009 to 30 June 2014 ($m, nominal)

Regulated Asset Base	2009/10	2010/11	2011/12	2012/13	2013/14
Opening regulatory asset base	4,237.4	4,734.9	5,199.0	5,972.3	6,494.3
Return on capital	**387.7**	**433.2**	**475.7**	**546.5**	**594.2**

15.3 Depreciation

The deprecation for the 2009/10 to 2013/14 period is show in Figure 15.3.

Figure 15.3: Depreciation from 1 July 2009 to 30 June 2014 ($m, nominal)

Depreciation	2009/10	2010/11	2011/12	2012/13	2013/14
Straight-line depreciation	186.3	201.2	205.7	235.0	259.7

Depreciation	2009/10	2010/11	2011/12	2012/13	2013/14
Tax depreciation	143.9	162.2	178.6	201.4	219.3

15.4 Operating Expenditure

The calculation of operating expenditure including efficiency benefit carry forward for the 2009/10 to 2013/14 period is show in Figure 15.4.

Figure 15.4: Operating expenditure from 1 July 2009 to 30 June 2014 ($m, nominal)

Operating Expenditure	2009/10	2010/11	2011/12	2012/13	2013/14
Controllable opex	144.3	157.9	167.9	185.9	196.2
Network support costs	21.8	6.6	6.7	6.9	7.1
Self insurance	2.0	2.1	2.1	2.2	2.2
Equity raising costs	1.0	1.8	3.5	4.6	4.9
Efficiency carryover	6.3	3.5	4.1	3.9	-0.8
Debt raising costs	3.9	4.4	4.8	5.6	6.0
Total opex	**179.3**	**176.3**	**189.2**	**209.1**	**215.6**

15.5 Tax Allowance

The calculation of the tax allowance for the 2009/10 to 2013/14 period is show in Figure 15.5.

The calculation of this tax allowance is discussed in Section 13.2

Figure 15.5: Tax allowance from 1 July 2009 to 30 June 2014 ($m, nominal)

Tax Allowance	2009/10	2010/11	2011/12	2012/13	2013/14
Estimated tax payable	47.3	49.9	49.2	57.4	63.8
Less value of imputation credits	-23.6	-24.9	-24.6	-28.7	-31.9
Net tax allowance	**23.6**	**24.9**	**24.6**	**28.7**	**31.9**

15.6 Proposed unsmoothed revenue

The unsmoothed revenue requirement for each year of the regulatory control period is calculated as the sum of the return on capital, return of capital, operating and maintenance expenditure (including efficiency carry-forward) and corporate tax allowance.

TransGrid's proposed unsmoothed revenue, calculated using the AER's post-tax revenue model, for each year of the 2009/10 to 2014/15 period is set out in Figure 15.6.

Figure 15.6: Unsmoothed revenue requirement from 1 July 2009 to 30 June 2014 ($m, nominal)

Unsmoothed Revenue	2009/10	2010/11	2011/12	2012/13	2013/14
Return on capital	387.7	433.2	475.7	546.5	594.2
Return of capital	79.6	81.9	74.7	84.5	96.0
Operating expenses	179.3	176.3	189.2	209.1	215.6
Estimated taxes payable	47.3	49.9	49.2	57.4	63.8
Less value of franking credits	-23.6	-24.9	-24.6	-28.7	-31.9
Unsmoothed revenue requirement	**670.2**	**716.3**	**764.2**	**868.7**	**937.8**

15.7 X factors

The X factors proposed to smooth the Maximum Allowable Revenue for 2009/10 to 2013/14 period are set out in Figure 15.7.

Figure 15.7: Smoothed revenue requirement from 1 July 2009 to 30 June 2014 ($m, nominal)

	2009/10	2010/11	2011/12	2012/13	2013/14
Unsmoothed revenue requirements	670.2	716.3	764.2	868.7	937.8
Smoothed revenue requirements	670.2	725.6	785.5	850.3	920.5
X factor		**-5.59%**	**-5.59%**	**-5.59%**	**-5.59%**

15.8 Average price path

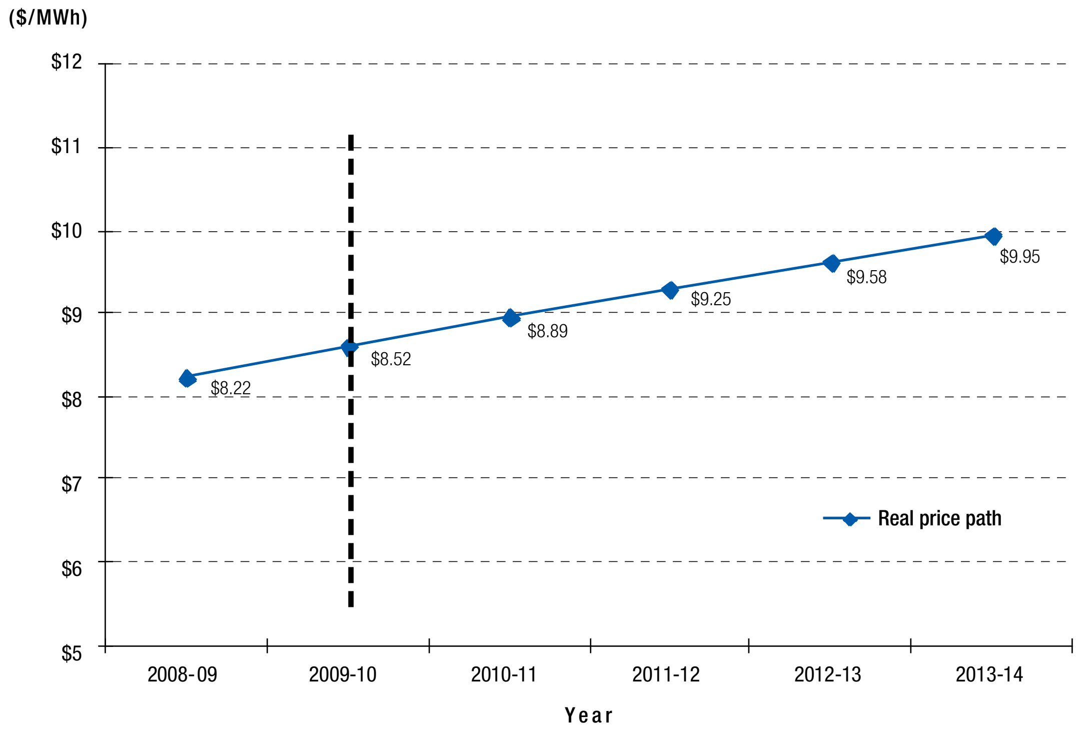
TransGrid's revenue proposal will result in an average real annual increase in TransGrid's charges of 3.9% a year. The average price path is shown in Figure 15.8.

Figure 15.8 Average Price Path ($2008, real)

	2009/10	2010/11	2011/12	2012/13	2013/14
Smoothed revenue requirements ($m)	636.0	671.5	709.1	748.8	790.7
Energy (MWh)	74,620,000	75,580,000	76,690,000	78,120,000	79,480,000
Average transmission price ($/MWh)	**8.52**	**8.89**	**9.25**	**9.58**	**9.95**

TransGrid's proposed average transmission prices are set out in Figure 15.9.

Figure 15.9 Average Price Path (real $2008)



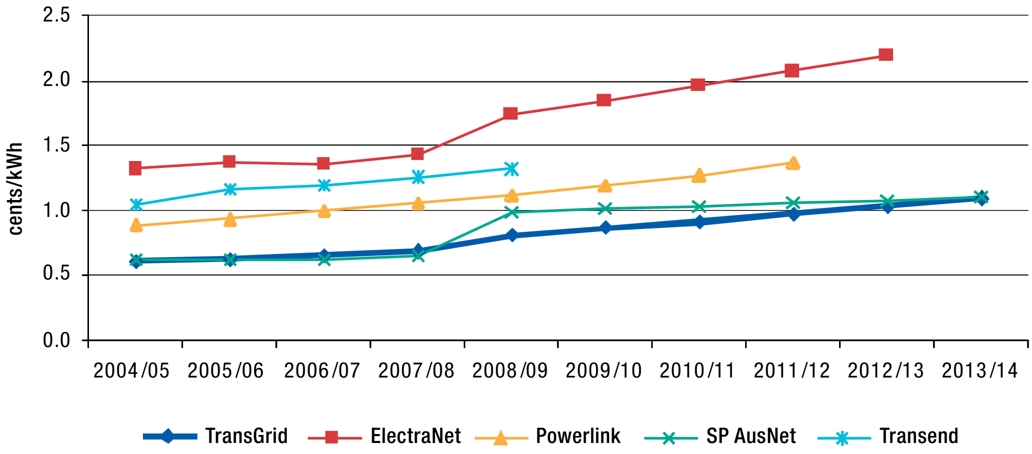
15.9 Cost to customers

As TransGrid's costs represent only about 6% of the total delivered price for the average energy user, the impact on the total delivered price is estimated to be about 0.25% a year.

This price rise is about $3.50 a year for a typical household in NSW.

With this modest increase TransGrid's customers, and end users in NSW and the ACT, will continue to benefit from the lowest cost transmission service in Australia as shown in Figure 15.10.

Figure 15.10: Cost to customers



Source: These figures are from AER regulatory report and decisions. TransGrid's figures are from its proposal.

15.10 Revenue cap adjustments

TransGrid's revenue cap for the 2009/14 period, as determined by the AER, is subject to adjustment for the following reasons:

- The cap is calculated using actual CPI figures;
- Network support events are treated as pass-through amounts;
- Events related to insurance, regulatory change, service standards, tax changes or terrorism can be referred to the AER for a determination on the appropriate pass-through costs; and
- If a trigger event for a proposed contingent project occurs, affecting forecast capital expenditure, TransGrid may apply to the AER for an amendment to its revenue determination.

16. Glossary of terms

ACCC	Australian Competition and Consumer Commission
AGC	Automatic Generator Control
AER	Australian Energy Regulator
ANTS	Australian National Transmission Statement
APR	Annual Planning Statement
AASB	Australian Accounting Standards Board
CAM	Capital Accumulation Model
Cap	The level of performance that results in a TNSP receiving the maximum financial reward attributed to a parameter
CAPEX	Capital Expenditure
CB	Circuit Breaker
Collar	The level of performance that results in a TNSP receiving the maximum financial penalty attributed to a parameter
CPI	Consumer Price Index
CT	Current Transformer
DG1	Decision Gate 1
DG2	Decision Gate 2
DMPP	Demand Management and Planning Project
DNSP	Distribution Network Service Provider
DRP	Debt Risk Premium
EBSS	Efficiency Benefit Sharing Scheme
EPA	Environmental Protection Authority
IT	Information technology
ITOMS	International Transmission Operation and Maintenance Study
JPB	Jurisdictional Planning Body
kV	Kilovolts
LFRG	Load Forecasting Reference Group
LOS	Loss of supply
MAR	Maximum Allowable Revenue
MITC	Market Impact of Transmission Congestion
MVA	Megavolt-amperes
NEM	National Electricity Market
NEMMCO	National Electricity Market Management Company
NER	National Electricity Rules
NSW	New South Wales
OPEX	Operating Expenditure
POE	Probability of Exceedance
PTRM	Post Tax Revenue Model
QNI	Queensland/ NSW Interconnector
RAB	Regulated Asset Base
RFM	Roll Forward Model
SCADA	IT system for 'Supervisory Control and Data Acquisition'
S Curves	A display of cumulative costs, labour hours or other qualities plotted against time.
SEO	Seasoned Equity Offer
SOO	Statement of Opportunities
STPIS	Service Target Performance Incentive Scheme
TNSP	Transmission Network Service Provider
TUOS	Transmission Use of System
WACC	Weight Average Cost of Capital
WMS	Works Management System
X Factor	The X smoothing factor is simply a price adjustment mechanism. It ensures that the NPV of the smoothed and unsmoothed revenue streams are equal. (AER Guidelines Post Tax Revenue Handbook)

Attachments

A. AER Submission Guidelines Compliance Table

B. Negotiating Framework Compliance Table

C. Directors' Responsibility Statement

D. Ernst & Young - Audit Assurance Report

E. ROAM Consulting - Generation and Load Scenario Analysis

F. Competition Economists Group - Escalation Factors affecting Expenditure Forecasts

G. Evans & Peck - Capital projects risk analysis

H. Forecast capital projects description

I. Proposed contingent projects

J. KEMA - Load Forecasting Process Review

K. UMS - TransGrid Efficiency Review Report

L. SAHA Self Insurance Risk Analysis

M. Board resolution to undertake self-insurance

N. Allen Consulting Group - Equity Raising Costs

O. Competition Economists Group - Debt and Equity Raising Costs

P. SAHA Service Target Performance Incentive Scheme analysis

Q. Future Network Map