Ausgrid

Historical Expenditure Review

Independent review of outcomes for the 1 July 2009 to 30 June 2014 regulatory period.

Final | 24 May 2014

Job number 233574-00
Final V10
Arup
Arup Pty Ltd ABN 18 000 966 165

Arup
Level 17
1 Nicholson Street
Melbourne VIC 3000
Australia
www.arup.com

ARUP

Contents

Tables

Figures

Appendices

Statement of independence

While relying on the documents and information provided by Ausgrid, interviews with Ausgrid staff, and public documents, and while under contract to Ausgrid to produce this report, the comments in this report are Arup's independent view of the matters it has reviewed.

Disclaimer

This report was prepared by Arup on behalf of Ausgrid for submission to the Australian Energy Regulator (AER) with its May 2014 regulatory submissions. It takes into account our client's particular instructions and requirements and addresses their priorities at the time. This report was not intended for, and should not be relied on by, any other party and no responsibility is undertaken to any other party in relation to it. In preparing this report we are relying on information provided by Ausgrid including internal reports, interviews with staff and primary data from internal databases. We have relied in particular on the accuracy and completeness of this information and accept no liability for any error or omission in relation to the information provided. This report should not be considered as an audit opinion or comment on the accuracy of the information from Ausgrid.

Executive summary

Arup has reviewed the outcomes of Ausgrid's actual capital and operating & maintenance expenditures against the regulatory allowances approved by the Australian Energy Regulator (AER) for the current regulatory period from 1 July 2009 to 30 June 2014[1]. Through examination of documents and from discussions with Ausgrid staff, Arup has sought to understand and document in a clear fashion the external and internal factors which have impacted on these actual expenditures.

To the extent supported by the data and information provided, Arup has expressed an independent view on whether or not the explanation of outcomes is plausible and supports the contention that Ausgrid's expenditures are in accordance with or are moving towards the objectives of the regulatory framework defined by the National Electricity Rules (NER). Specifically, we have considered whether the data supports a view that the expenditures in each category and sub-category is either prudent and/or efficient given the time of commitment to expenditure and the changing environment over time. The underlying view against each category and sub-category is provided in the Appendices (where a view is possible).

Overall, Ausgrid has considerably underspent (21%) on its allowed capital expenditure program (capex), and slightly underspent (1%) on its operating & maintenance expenditure program (opex) for the regulatory period as approved by the AER in 2010 following appeal. In some expenditure plans it has overspent, and in others it has underspent.

The focus for the Capex Plans has been implementation of an expenditure program which was approved at a level of nearly three times that of the prior regulatory level. The primary expenditures have been on the Area Plans with the next largest expenditures on the Replacement Plan. Neither plan proceeded to the full allowance but the impact of changes in the external environment has allowed Area Plan projects to be deferred and Replacement Plan projects to be at levels less than forecast, with the latter being supported by a strong focus on expenditures and operations under the Opex Plans.

In general, Arup is of the view Ausgrid's capex ramp-up through to FY2012 was prudent in the context of the environment at the time. We have also formed the general view that the reversion to a ramp-down, resulting in significant under expenditure in some capex categories, was prudent in light of the changed circumstances from and including FY2013.

Definitive comments on the efficiency of capex during the ramp-up period through to FY2012 cannot be derived from the data available to Arup at the time of this review, but it should be recognised that acceleration of capex programs generally comes at an increased project cost. It is clear that moving to limit capex from FY2013 has had the effect of moving Ausgrid towards increased long-term average efficiency levels.

The focus for the Opex Plan has been to support the project ramp-up in the Capex Plan initially through increased staff numbers. This was followed by a stronger focus on asset condition monitoring to support the impact of under expenditure

[1] Actual expenditure data provided by Ausgrid assumes budget numbers for FY2014, as regulatory submissions are submitted before the end of the current regulatory period.

within the Replacement Plan. Additional opex to support ICT infrastructure capex has been required to assist mid-term and long-term productivity improvements. Overall opex efficiency gains otherwise available have been offset by these higher expenditures. Achievement of further opex efficiency gains are unlikely to emerge until some way through the next regulatory period, because redundancy costs are being incurred as a result of the continuing efficiency programs, and from a lower forecast average capex for the next regulatory period diverting resources to opex programs.

In general, Arup is of the view Ausgrid's opex levels have been maintained at the levels approved by the AER but that this has required opex reductions in some areas being off-set against opex increases in other. We consider in general that these adjustments can be viewed as reflecting prudent behaviour and outcomes over the period.

Definitive comments on the efficiency of opex during the current regulatory period through to FY2014 cannot be derived from the data available to Arup at the time of this review. However, it will be difficult for Ausgrid to rapidly reduce its opex in the short-term below the levels approved in the current regulatory period because of the Transitional Services Agreement (TSA), the method in the Cost Allocation Manual (CAM), continuing restructuring costs[2] and new regulatory obligations[3].

The Report provides a high level description of expenditure across all plans and the Appendices provide a detailed description of the expenditures for individual plans.

[2] Continuing opex relating to efficiency initiatives and a lower average capital expenditure forecast.
[3] For example, obligation to undertake private line inspections.

1 Introduction

Over the last regulatory period from 1 July 2009 to 30 June 2014, Ausgrid has experienced unprecedented change in its external environment. At the same time it has been charged with providing a safe, reliable and secure supply of electricity within the six regions of its franchise area.

The result of changes to the external environment mean that Ausgrid will be underspent (21%) compared to its allowed capital expenditure program (capex), and slightly underspent (1%) on its operating and maintenance expenditure program (opex) for the regulatory period as approved by the Australian Energy Regulator (AER) in 2010.

Ausgrid contends that this under expenditure on capex is an acceptable outcome given the importance of balancing the impact of increased expenditure on customer energy prices, the need to deliver electricity in accordance with its licence conditions, the National Electricity Rules (NER) and related legislation, and the change in the external environment brought about by changes in economic circumstances discussed further below. It further contends that, in the context of the day its original proposed capex and opex plans were both prudent and efficient, as was confirmed by the AER's final decisions, and were a realistic identification of the infrastructure interventions that were needed to meet the various licence conditions and other external incentives and pressures to which it was subject.

Looking back, Ausgrid contends that in managing its expenditures to be within the regulatory allowance, it needed to find a balance between outcomes which had the effect of increasing costs and decisions which were needed to decrease costs, at the same time as delivering a substantial capex program, and providing good customer service.

The lessons learnt during this current regulatory period, were that its initial identification (or forecast) of unit costs in 2008 tended to under estimate actual outcomes, and its initial program of capex delivery was too optimistic and tended to under estimate the time frames within which the larger projects could be delivered. In addition, Ausgrid believes the deployment of a combination of internal and external human resources allowed it to deliver the substantial capex program. Further, changes in the external environment allowed Ausgrid to reduce capex through deferral of capital projects and support this deferral in the short term by a strong emphasis on a targeted opex programs to support continued good customer service delivery.

This Report provides an overview of the circumstances which have seen Ausgrid spend less than it anticipated for the current regulatory period. The Appendices provide further information and detail, and an evidence base detailing how individual capex and opex plans have contributed to Ausgrid's overall performance against its regulatory allowance for these areas and the lessons learnt from Ausgrid's experience in seeking to deliver a capex program significantly in excess of the historical average.

Arup expresses a view that the information and evidence available to it during its review supports the contention that Ausgrid's expenditure through the current regulatory period has been reasonable and focused on meeting the regulatory requirements of the National Electricity Objectives (NEO) which are the central

requirements of the National Electricity Rules (NER). In particular this view concerns the requirements in the NEO for prudency and efficiency in expenditures, and whether Ausgrid's expenditure outcomes demonstrate that it has worked towards fulfilling these objectives.

Arup's specific views are also provided as to whether the outcomes achieved this period for capex and opex were appropriate from both a regulatory and business perspective given the significant change in Ausgrid's external environment.

This Report is structured as follows:

- Description of capex and opex during the previous and current regulatory periods;
- Discussion of external factors;
- Discussion of internal factors;
- Summary of capex outcomes; and
- Summary of opex outcomes.

The supporting Appendices provide additional detail and are structured as follows:

- Standard Control Services:
  - Individual Capex plans in detail;
  - Individual Opex plans in detail; and
- Alternative Control Services:
  - Street Lighting in detail.

2 Summary of expenditure

2.1 Previous regulatory period

The expenditures during the prior regulatory period from FY2004 to FY2009 are higher than the regulatory allowance because of internal and external factors which are discussed briefly below.

2.1.1 Capex FY2004 to FY2009

In the prior regulatory period, Ausgrid's[4] submission in 2004 to the Independent Pricing and Regulatory Tribunal (IPART) and the Australian Competition and Consumer Commission (ACCC) stressed the need for increased expenditure on replacement. It also sought an expenditure allowance to meet augmentation and growth requirements resulting from the expectation that peak demand would continue to rise. At that time the regulators did not accept Ausgrid's expenditure proposals and provided a lower allowance which resulted in under investment in the network over a number of years.

External events increased concern over the condition of the Ausgrid network and its ability to operate reliably under the contingency conditions specified for the CBD and its urban city service areas. These included:

- A number of outages over prior years following damage to the network by third parties or isolation of spare capacity for maintenance or repair, and then a concurrent additional failure of other equipment which caused a major outage[5];
- The Somerville report released in August 2004, which investigated distribution network performance in Queensland during a series of storms and hot weather events in early 2004; and
- The 1998 Auckland power crisis where the CBD had limited power for a five week period, as a result of the successive failure of two 40 year old 110kV gas-insulated underground cables that were past their replacement date, and then failure of a further two oil-insulated cables, leaving only a 22kV feeder in place.

In 2005 the New South Wales government imposed a set of licence conditions on all state distributors (refer to Section 3.1 below).

The NSW distribution network service providers (DNSPs) sought a pass through of the costs to meet these revised licence conditions, which provided targets for customer service standards, from IPART in December 2005. IPART granted a pass-through in May 2006 and spread the cost recovery over the last three years of the prior regulatory period. Ausgrid was able to manage these additional licence

[4] While previously named EnergyAustralia, a combined network and retail company which sold its name and retail arm with effect from 1 March 2011, we have used the name Ausgrid for the electricity network business throughout this period.

[5] These failures included failures in a transformer in Mossman zone substation in FY2004, in switchgear in FY2004 leading to explosions and fires, gas-filled cables feeding Turramurra in FY2006, and gas-filled cable damage leading to protection equipment failure at Dalley Street substation in FY2009 which interrupted CBD supply. These N-1 failures led to a perceived need to invest in asset renewals and additional standby capacity.

conditions using its internal resources and processes, but continued to grow its internal staffing levels to match the need for capex and the growing size of its network.

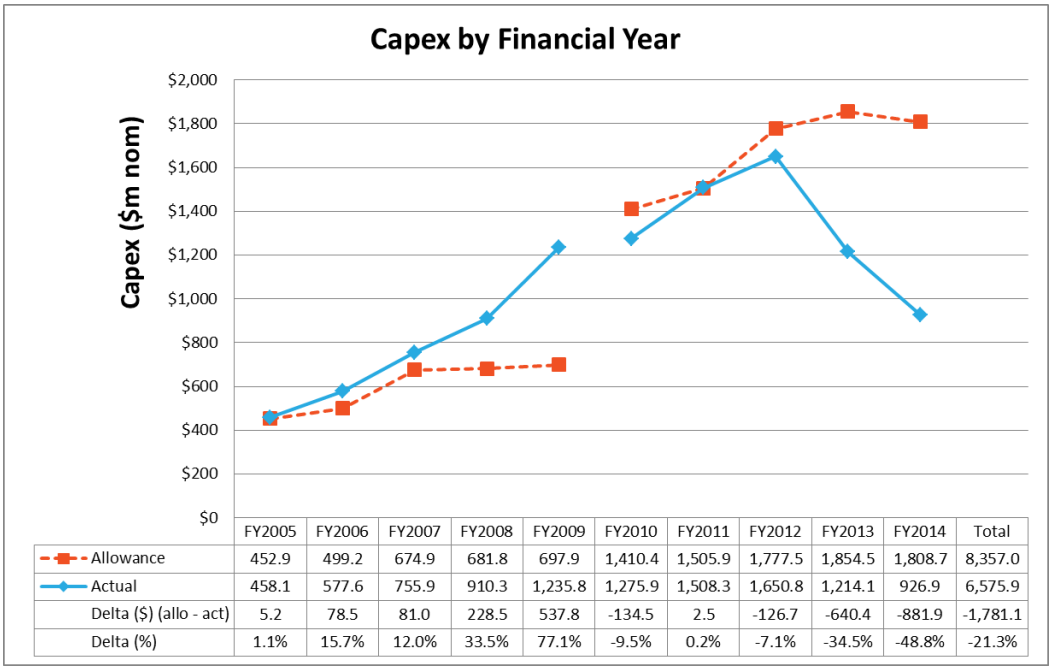
In 2007 the NSW government again changed Ausgrid's licence conditions which imposed further mandatory constraints on design and in general higher reliability standards (refer Section 3.1 below). These licence requirements were mandatory criteria to be delivered by 2019 at the latest, and as such are referred to as "deterministic" measures of network performance.

In response to the changes to its licence conditions, and with Ausgrid's concern that serious issues existed within its network because of prior underinvestment, Ausgrid began to gear up to undertake capex investment which IPART and the ACCC had not included in their regulatory decisions. However, Ausgrid believed this investment was necessary in order for it to meet the new 2007 design, reliability and performance requirements under its licence conditions.

Some of the issues of concern were a realisation that zone and sub-transmission substations were running at close to their thermal capacity, which had the effect of reducing the life of this equipment, and in the worst case being unable to supply load under N-1 conditions. The expected continued increase in peak load would require substation capacity augmentation. In addition both gas and oil filled high voltage underground feeders were nearing the end of their expected lives and the issue of reduced reliability or higher probability of a failure suggested there was a need for additional capex.

In addition Ausgrid felt that the transfer of regulatory responsibilities from IPART / ACCC to the AER would provide it a further opportunity of justifying the need for significant additional capex, with particular emphasis on bolstering zone and sub-transmission substation capacity to meet the new N-2 compliance requirement (requiring approximately $330 million of expenditure), and on replacement of gas and oil filled cables within the wider Sydney area.

The culmination of these factors on Ausgrid's level of capex over the last ten years is depicted in Figure 1.



	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	452.9	499.2	674.9	681.8	697.9	1,410.4	1,505.9	1,777.5	1,854.5	1,808.7	8,357.0
Actual	458.1	577.6	755.9	910.3	1,235.8	1,275.9	1,508.3	1,650.8	1,214.1	926.9	6,575.9
Delta ($) (allo - act)	5.2	78.5	81.0	228.5	537.8	-134.5	2.5	-126.7	-640.4	-881.9	-1,781.1
Delta (%)	1.1%	15.7%	12.0%	33.5%	77.1%	-9.5%	0.2%	-7.1%	-34.5%	-48.8%	-21.3%

Figure 1: Capex actual versus allowed

In particular capex was seen to grow above the IPART/ACCC allowance in FY2008 and FY2009 as can be seen in Figure 1. A particular example of this ramp-up in capex was the negotiation of two Alliance agreements during early 2009 where each had the form of a fixed annual cost to Ausgrid which underpinned the financial investment in skilled and experienced resources by the Alliance entity assuming outsourced capex project responsibilities. The Alliances were installed to help Ausgrid achieve an identified backlog and forecasted range of issues in its sub-transmission network.

Having increased its capex deployment capabilities from around $450 million per annum in FY2005 to around $1,200 million in FY2009, Ausgrid sought a further significant increase in its capability to deliver capex. In its application to the AER in 2009 it sought approval for a further increase in capex to around $1,700 million on average per annum.

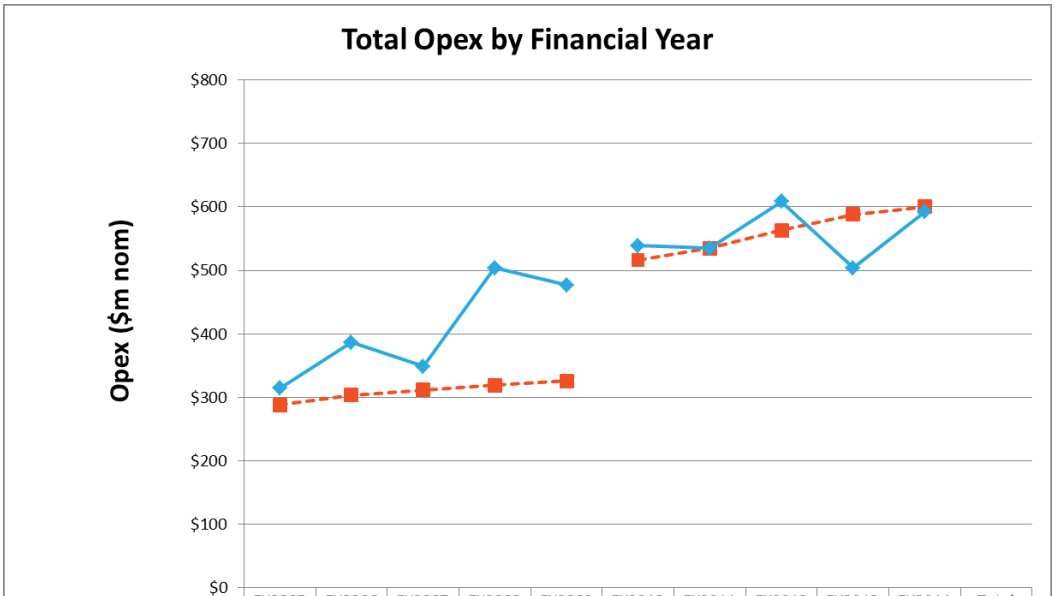
2.1.2 Opex FY2004 to FY2009

During the prior regulatory period, Ausgrid was not able to restrict its opex to the levels approved by IPART and the ACCC. This was particularly relevant in FY2008 and FY 2009. Figure 2 indicates that while there was a step change in the approved level of opex approved by the AER for the FY2010, Ausgrid had already ramped up its opex to meet the requirements of its accelerating capex program.

While the reasons for this are documented in prior regulatory reset consultations, there are a number of reasons for this which impact the current regulatory period. These are discussed further below, but include:

- An increased focus on the risks associated with asset failure and stronger emphasis on performing the required maintenance;

- The need to grow its workforce to allow a sustainable and responsive maintenance program over time (see Figure 20 below);
- A significant increase in the number of apprentices recruited over FY2005 to FY2011, whose costs are included in opex (see Figure 25below); and
- The recruitment of staff in back office functions to support previous capital investment made in previous periods, forecasted capital investment and an overall increased asset management need.



	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	288.00	303.37	311.93	319.36	325.60	516.57	535.22	563.32	588.24	600.45	2,803.80
Actual	314.10	386.74	348.50	504.20	477.14	538.78	534.76	608.42	503.58	592.00	2,777.55
Delta ($) (allo - actu)						22.21	-0.45	45.10	-84.66	-8.45	-26.25
Delta (%)						4.3%	-0.1%	8.0%	-14.4%	-1.4%	-0.9%

Figure 2: Opex by financial year

2.2 Current regulatory period – FY2010 to FY2012

The expenditures during the first three years of the current regulatory period saw the expenditures roughly equal to, or slightly below, the regulatory allowance, but the emergence of internal and external factors began to have an effect. These issues are discussed below.

2.2.1 Capex from FY2010 to FY2012

In its Final Determination (and subsequent amended Final Determination of 2009), the AER approved approximately 90% of Ausgrid's original proposed capex as shown in Figure 1. The allowed expenditure represents what was considered to be the prudent and efficient capex and opex programs for Ausgrid. It then became Ausgrid's responsibility to implement these ambitious programs.

From the commencement of the current regulatory period Ausgrid continued to ramp up its annual capex. For the first three years through to FY2012, Ausgrid spent close to or slightly below the approved capex.

However, it was clear that its forecasts of overall costs per project were low, and its projections of how quickly projects could be designed, approved, constructed and commissioned was optimistic. These issues emerged with larger turn-key style projects allocated to its Alliance partners and with the majority of replacement driven projects undertaken by its own teams. This overestimation of delivery capability by Ausgrid was the result of the 'learning curve' associated with moving on average from smaller-scale and smaller-volumes of projects undertaken in previous regulatory periods to larger-scale and higher-volumes of projects this period. While the capex was close to the approved amounts, it was clear the number of projects completed by Ausgrid was lower than that embedded in the original program approved by the AER. The end result suggests that while Ausgrid's identified capex program was prudent, given its licence conditions and the focus required by the National Electricity Objectives (NEO) of the regulatory framework, its delivery of the capex program was slower than forecast and thus likely not at the unit cost levels anticipated in the approved capex program by the AER.

Review of the Alliance program suggested that for turn-key projects the Alliances delivered the construction phases at or below the AER's approved costs levels and delivered these before time or around the time frames projected. However, the initial ramp-up of projects covering design and approval was much slower than projected, necessitating more liaison between the Ausgrid and Alliance design teams than anticipated. This diverted the focus of Ausgrid staff away from project delivery onto management of the Alliance and the sub-transmission portion of its network in general at the expense of its distribution network. The available expenditure data and disaggregated performance data tend to support this contention.

In addition, projects which were jointly delivered tended to be delivered in longer time frames than projected because of the need for more liaison and coordination than anticipated. This resulted in diversion of Ausgrid staff away from its focus on the replacement program and the end result was a slower delivery of replacement projects than forecast or programmed.

By FY2012, it was also evident that there were changes in the external environment which necessitated a change in the capex program. These external changes related to a softening in economic growth which led to softness in electricity consumption which further led to a plateau of the coincident peak demand (and in many instances a reduction in non-coincident peak demand at some substations). These changes in the external environment are discussed further below, following a discussion of opex for the first three years of the current regulatory period.

2.2.2 Opex from FY2010 to FY2012

The AER's 2009 Final Determination approved an increase in opex relative to the allowance of the final year of the prior regulatory period of over 70%, or approximately $240m per year. The level approved by the AER was consistent with Ausgrid's actual expenditure toward the end of the prior regulatory period. This level of expenditure was well above the prior regulatory period allowance due to the ramp-up that was occurring to meet the foreshadowed capital works program as well as an expanded system maintenance program.

During FY2010 and FY2011 Ausgrid's expenditure was relatively consistent with the regulatory allowance. While the total actual opex remained below the allowance in FY2012, there were spikes in opex relative to both the allowance and previous year expenditure in a number of Opex Plans, offset by falls in other opex. The opex above allowances appeared in moderate expenditure increases in the Information, Communications and Technology (ICT) Plan to support capital investment made over multiple regulatory periods, and a significant increase in the Other Operations Plan due to increased management expenditure as a result of the introduction of Networks NSW. There was also significant cost incurred for Employee Remuneration Entitlements (ERE).

Throughout this period, resources were also being redeployed from opex to capex to assist with the delivery of the expanded capital works program. However, Ausgrid also contends that during this period it strongly focused on its Systems Maintenance programs and improved its performance in identifying and rectifying maintenance issues. The data provided below in Sections 7.2.1 supports this position.

2.3 Current regulatory period – FY2013 to FY2014

The expenditures during the last two years of the current regulatory period saw major savings against the regulatory allowance because of internal and external factors which are discussed briefly below.

2.3.1 Capex from FY2013 to FY2014

The focus of Ausgrid's capex during the early years of the current regulatory period was delivery of the significant capital works program approved by the AER. This represented a prudent response to delivering the volume of works contained in the regulatory allowance, which by definition is assumed to be a prudent and efficient program of expenditure, both capex and opex.

During FY2013 and FY2014 there was a ramp-down in capex with a shift in focus to more efficient delivery of a reduced work program. The ramp-down was due to a combination of:

- Changes to external economic circumstances leading to reduced customer consumption, and the response to these by Ausgrid's internal budgeting and expenditure control mechanisms (discussed further in Section 4.3 below); and
- The impact of Network NSW changes to business strategy, including the restructure of Ausgrid (discussed further in Section 3.5 below).

The ramp-down was made possible by improvements in compliance and reliability metrics as a result of the increased investment in previous years, combined with a plateau of peak load arising from consumption changes within its customer base, which meant that reduced capex for the remainder of the current regulatory period would not markedly compromise Ausgrid's network performance against the more onerous licence standards required at the time.

There was also significant external stakeholder discussion on the impact of price increases on consumers and its cause, suggesting the mandated increase in licence conditions had required an expansion in the capex program which had fed through to price increases during the current regulatory period. Although there had been

significant consultation on this impact prior to the AER's regulatory decisions in 2009 and 2010, post decision emerging stakeholder discussion suggested a relaxation of the licence conditions was possible[6]. This has led to a significant capex reduction over the FY2013 and FY2014.

2.3.2 Opex from FY2013 to FY2014

Opex expenditure for the FY2013 to FY2014 period remained below the regulatory allowance compared to previous years in this regulatory period. This was despite a significant organisational restructure with associated redundancy costs, and new internal management initiatives introduced by Networks NSW since 2012. Significant opex savings from the organisation structure and new initiatives are forecasted to be realised from the middle of the next regulatory period, for reasons which are discussed later in Section 3.5 below.

From a high level expenditure perspective, there was a decrease in opex from FY2012 to FY2013 as a result of an organisation wide enforced hiring freeze and the removal of surplus staff not employed under the Award, in areas such as engineering planning, back office and ICT. Such reductions were in line with applicable reductions in capex. There was also an increased focus on reducing overheads and on costs through tightening up on over time and staff entitlement in areas such as travel. A slight increase in opex from FY2013 to FY2014 is expected as a result of costs associated with:

- Implementing staff reductions which will allow the required reduction in opex to be made in the next regulatory period (discussed further in Section 5.1);
- System maintenance which approached the allowed amounts, and facilitated the short-term deferral of a significant asset replacement need; and
- Transfer of staff costs from capex to opex due to staff no longer doing as much capex compared to the beginning of the period.

[6] The licence conditions have subsequently been relieved by the removal of government mandated design criteria in Schedule 1 of the DNSP licences in April 2014 to apply from 1 July 2014, however, this shifts the risk of deciding what design criteria should be employed to the NSW DNSPs, and hence they are now fully responsible for setting the reasonable balance between network performance and cost. In stakeholder terms, NSW DNSPs are now able to move towards a 'probabilistic' approach to designing their networks and capex programs away from the 'deterministic' approach previously mandated by government, should they so choose.

3 External factors

Ausgrid contends that there were a range of external factors during the current regulatory period which impacted on its level of capex and opex as discussed below.

3.1 Licence conditions and changes

Ausgrid has experienced in recent years two increases to the stringency of its licence conditions resulting in increased capex as shown in Table 1.

Table 1: Increased licence condition stringency Schedule 1

Network element		**Load type**		**2005 licence conditions**		**2007 licence conditions**	
		Demand	Security standard	Interruption	Demand	Security standard	Interruption
Sub Trans Line	CBD	Any	N-2	< 1 minute (1st outage); <1 hour (2nd outage)	Any	N-2	Nil for 1st credible contingency; <1hr for 2nd
	Urban; Non-Urban	≥ 5 MVA	N-1	< 1 minute	≥ 10 MVA	N-1	< 1 minute
	Urban; Non-Urban*	< 5 MVA	N	Best practice	< 10 MVA	N	Best practice
Sub Trans Sub	CBD	Any	N-2	< 1 minute (1st outage); <1 hour (2nd outage)	Any	N-2	Nil for 1st credible contingency; <1hr for 2nd
	Urban; Non-Urban	Any	N-1	< 1 minute	Any	N-1	< 1 minute
Zone Sub	CBD	Any	N-2	< 1 minute (1st outage); <1 hour (2nd outage)	Any	N-2	Nil for 1st credible contingency; <1hr for 2nd
	Urban; Non-Urban	≥ 5 MVA	N-1	< 1 minute	≥ 10 MVA	N-1	< 1 minute
	Urban; Non-Urban*	< 5 MVA	N	Best practice	< 10 MVA	N	Best practice
Dist Feeder	CBD	Any	N-1	< 1 minute	Any	N – 1	Nil
	Urban ≥ 15k	Any	N-1	< 4 hours	Any	N – 1	< 4 hr
	Urban < 15k	Any	N	Best practice	Any	N-1	< 4 hr
	Non-Urban	Any	N	Best practice	Any	N	Best practice
Dist Sub	CBD	Any	N-1	< 1 minute	Any	N-1	Nil
	Urban; Non-Urban	Any	N	Best practice	Any	N	Best practice

* 2005 licence conditions referred to non-urban only

The shaded cells in Table 1 are the primary changes to the Schedule 1 of the licence conditions, and relate to the design planning criteria used by the network planners to identify the assets which are non-compliant and which need additional investment to reach compliance.

In the changes required in 2007, the primary additional issue imposed on the design planning criteria imposed in Schedule 1, was that the licensee needed to be as *"compliant as reasonably practicable by 1 July 2014"* and *"Fully compliant by 1 July 2019"*. Ausgrid sought to implement a capex program so that it could be substantially compliant by 1 July 2014. This is one of the drivers for the very large increase in capex sought by Ausgrid from the AER. While Ausgrid has indicated it will be close to compliant in relation to sub-transmission asset design, it is unlikely this will be achieved in relation to distribution feeders.

The 2007 changes in mandating *"nil interruptions for the first credible contingency"* in the CBD, required considerable additional investment by Ausgrid in order to be compliant.

A new change to the Ausgrid licence conditions has been notified to Ausgrid requiring implementation from 1 July 2014. This latest change has eliminated Schedule 1 from the licence conditions entirely. It is now the responsibility of the DNSPs to determine, using existing Australian or international standards, to what level of design planning criteria they will design their network, and thus they will automatically need to:

- Assume more responsibility and risk in determining their design planning criteria;
- Be held accountable by their customers (and industry stakeholders) for major interruptions which may occur should the design planning criteria they choose be inappropriate ; and
- Have more control over what capex is required and by when, in their submissions to the AER, technical regulator and other stakeholders.

3.2 Global Financial Crisis

The first signs of the Global Financial Crisis (GFC) emerged during 2008 and 2009. While Australia was not affected to the same extent as other economies, there has been a noticeable reduction in electricity consumption over the last five years which is in part attributable to generally weaker economic conditions including weakness in building-sector confidence.

In particular, residential and non-residential dwelling connections have been below that forecast by Ausgrid for the current regulatory period. In addition, a relatively high Australian dollar – as a result of the view of Australia as a 'safe haven' and strong investment in the mining sector – has led to a reduction in manufacturing and agricultural exports and the closure of various export oriented businesses within Ausgrid's franchise area.

3.3 Australian and NSW Government policies

There have been a substantial number of government-endorsed polices which have had the effect of increasing electricity prices and this in turn has contributed to a reduction in electricity consumption. These include:

- Uncertainty relating to the Commonwealth Government's establishment and potential removal of a price on Carbon (including the Carbon Pollution Reduction Scheme (CPRS), Carbon Pricing Mechanism and potential removal of the Carbon Tax) which, among other things, have increased hedging costs for retailers;
- The Commonwealth Government's Mandatory Renewable Energy Target (Ret, including both large RET and small RET targets);
- Cost imposts from some of the NSW Government's energy efficiency programs;
- Cost imposts from NSW Government's Solar Bonus Scheme;
- Australian Government's GFC stimulus package which included subsidised housing insulation; and
- Australian Government Mandatory Energy Performance Standards (MEPS) and High Energy Performance Standards (HEPS).

3.4 Changes to peak demand and energy consumption

This section looks at changes to peak demand and energy consumption.

3.4.1 Reduction in peak demand

The information on system peak demand leading into the 2009 regulatory reset by the AER is represented in Figure 3, which shows the Ausgrid forecasts at that time.

During the development of its regulatory submission and its subsequent revised submission, Ausgrid continued to forecast growth in its system (or coincident) peak demand and its non-coincident peak demands. In its revised submission this forecast was at a slower rate which was influenced by the initial impacts on its customer base, resulting from a deteriorating economic environment as a result of the GFC.

Examination of a sample of the non-coincident peak demand forecast at the zone substation level underlying the Ausgrid's capex plan included in the information submitted to the AER in 2008, also indicates that Ausgrid expected additional non-coincident peak demand growth which underpinned its capex program application for the current regulatory period.

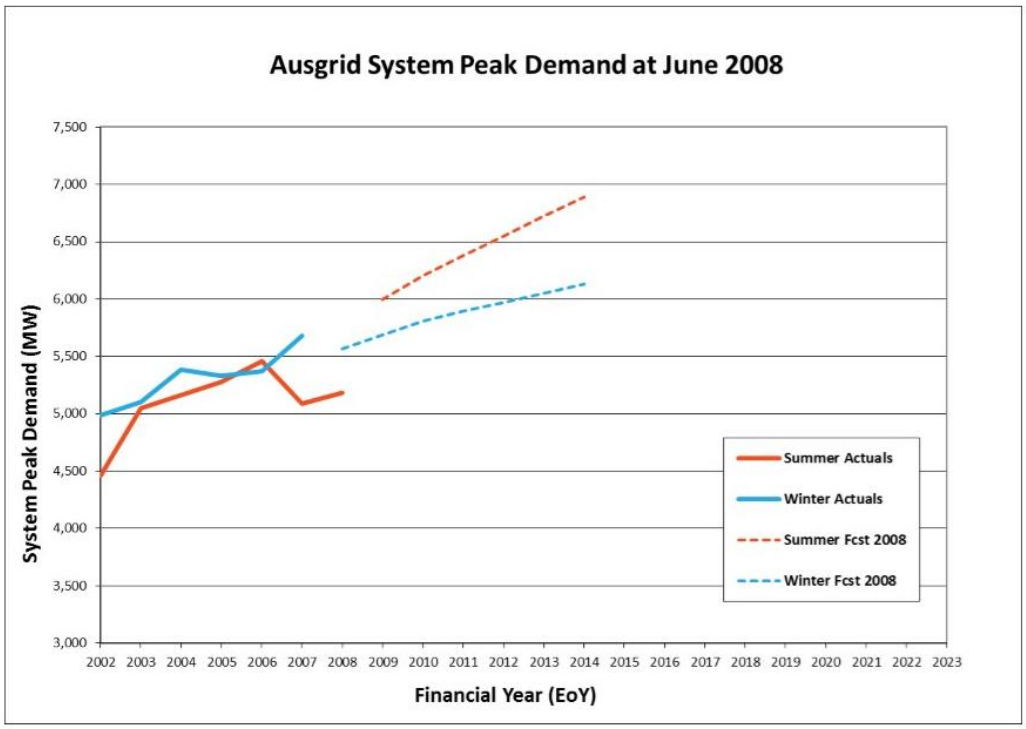


Figure 3: System Peak Demand for 2009 Reset

Note : Data not weather corrected.

The Ausgrid forecasts of system peak demand with an expectation of continued growth were mirrored by the AEMO forecasts for NSW in the similar time frame, as published in its 2009 Statement of Opportunities.

In addition, between its initial submission dated June 2008, and its revised submission dated January 2009, Ausgrid had already modified its coincident peak load forecasts for the current regulatory period to lower values (6,205MW to 6,022MW in June 2010[7]) and lower growth rates (2.7% pa to 2.6% pa) to reflect changes in actual outcomes in 2008. The AER eventually decided to adopt the capex program based on Ausgrid's revised coincident peak demand forecasts provided in its January 2009 submission.

In hindsight, these Ausgrid (and indeed the AEMO and other) forecasts proved to be optimistic. Figure 4 provides the update on the actual outcomes and the prior and current forecasts of system peak demands at June 2013.

[7] Ausgrid, Revised Energy and Global Peak Demand Forecasts to 2014, 12 January 2009, Attachment 13A, Figure 1.2, page 3.

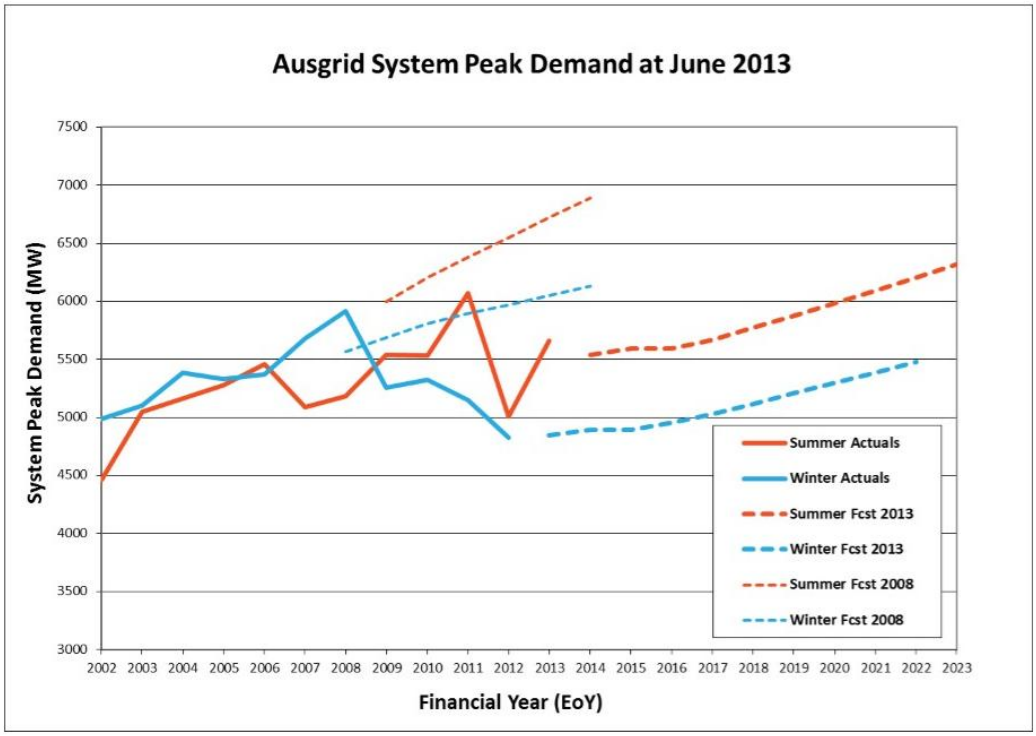


Figure 4: System Peak Demand for 2014 Reset

Note : Data not weather corrected.

The coincident peak demands had plateaued rather than grown over the period from June 2008 to June 2013.

By early 2012, Ausgrid's internal annual capex plan review processes had recognised the significant changes which were reflected in the non-coincident peak demand forecasts at the zone and sub-transmission levels and allowed the review and reassessment of capex projects which had not been already committed or had not commenced. As previously mentioned a major capital works plan review was undertaken in mid-2012 which looked at forecasted capital works that could be deferred as a result of the unexpected plateauing of peak demand.

The changes in energy consumption reflected the response by consumers to higher electricity prices, incentives for PV installation and the general downturn in the economic environment leading to a much stronger focus by consumers on efficient electricity usage. There has been broad industry acceptance that these drivers have also played a role in a nation-wide drop in peak demand. Because of the applicability of these factors in Ausgrid's network area they are likely to have significantly contributed to the large deviation between Ausgrid's peak demand forecast and the actual outcomes for this regulatory period. As there was no broad industry consensus around the potential impacts of these issues in 2008 when Ausgrid submitted its submission it would have been very difficult for Ausgrid to foresee these impacts and incorporate them into their capital expenditure forecast for this period.

The impact of the increased prices and reduced electricity consumption led to:

- A plateau in coincident peak demand and a reduction in overall energy consumption; and

- A mixed impact on non-coincident peak demand at zone and sub-transmission substation level, with some substations experiencing growth at or above the original forecast, and others experiencing a decline in non-coincident peak demand.

3.4.2 Changes in Energy Consumption

While energy consumption is not used by Ausgrid, and indeed by other DNSPs, to trigger growth driven capital investment, many of the underlying drivers of energy consumption also affect peak demand. As can be seen in Table 2 there has been a significant drop in energy consumption across this regulatory period and a significant acceleration in this drop from FY2012 onwards.

This drop in total energy consumption has occurred in conjunction with a plateau of coincident peak demand and for the same reasons. This effect is not uniformly spread throughout the geographic regions of Ausgrid's transmission and distribution network. Hot-spots exist where both energy consumption and non-coincident peak loads continue to grow, while in other locations, they have fallen. In addition, a drop in energy consumption has also been caused by the uptake of photo voltaic (PV) technology and other energy efficiency technology which has also flowed through to lower peak demand.

Table 2: Energy consumption for prior and current regulatory periods

Energy (MWh)	2009/10	2010/11	2011/12	2012/13	2013/14	Total
Forecast[8]	27,948	28,041	27,989	27,673	27,477	139,129
Actual[9]	27,527	27,510	26,689	26,062	25,508	133,296
Variation	-421	-531	-1,300	-1,611	-1,969	-5,833
% variation	-2%	-2%	-5%	-6%	-7%	-4%

Irrespective of the fall in energy consumption, it is growth in non-coincident peak demand which drives the need for growth driven network infrastructure investment. For these growth hot-spots, solutions including demand side management, load switching (or re-routing), and adoption of next generation monitoring and control technology are options which can be exploited to allow deferment of additional network infrastructure investment.

3.5 Networks NSW formation

The external factors identified above had the effect of lower peak demand and declining energy volumes. This coupled with the need for returns on the high level of capital investment placed further pressure for increases in electricity prices in order to compensate for falling energy volumes.

In June 2011, the NSW government announced its concern with rising electricity prices. In March 2012, the NSW government announced the restructure of the

[8] AER (2009), *Final Decision: New South Wales distribution determination 2009-10 to 2013-14*, pg 113

[9] Actual energy consumption figures provided by Ausgrid.

NSW electricity network sector, leading to the formation of Networks NSW as the primary governance structure overseeing the management of the three NSW DNSPs. The key elements of the NSW government's reforms include:

- Target cost and efficiency savings of more than $400 million over four years;
- A reduction in the workforce of the three DNSPs by 780 jobs over four years;
- Reducing administrative and corporate costs; and
- Standardising operations for procurement and IT.

Network NSW has developed a four pillar business strategy to tackle these and other concerns. The strategy pillars are:

- Network operating initiatives through removal of functional duplication and improving business practices;
- Capital expenditure efficiency initiatives through improved capital management on network expenditure and on fleet, property and IT;
- Strategy and policy initiatives through consistency in reliability planning, maintenance and renewal plans and property and fleet management; and
- Procurement and logistics initiatives through faster processing and volume savings across a number of product and service inputs.

This reform package led to a change in Ausgrid's business strategy with an increased focus on:

- Stronger and more responsive customer service delivery;
- Continuing focus on safe and reliable electricity service delivery;
- Cost reductions and more efficient delivery of the capex and opex programs, and through better management of overheads;
- A tightening of Enterprise Bargaining Agreement negotiations; and
- Financial performance and a reduction in the growth and eventually the level of debt.

The change in Ausgrid's corporate objective as a result of these initiatives led to the deferral of capex especially from FY2013 onwards. The drop off in capex was also supported by the significant structural and governance changes Ausgrid underwent which led to deferral of some projects in the last two years of the current period.

4 Internal factors – Capex Related

The discussion that follows identifies the internal factors which contributed to Ausgrid reducing its capex during the FY2013 and FY2014, and the impacts this has had on the financing arrangements.

4.1 Reliability compliance

Reliability metrics seek to measure the performance of electrical service delivery to the average customer. In modern developed economies the availability of electricity of the right voltage and frequency, 24/7 is assumed almost without question. Therefore measurements of outage frequency and duration are ways to determine whether customers are being properly serviced by electricity distribution companies.

All of the capex and opex which Ausgrid undertakes is to ultimately ensure the infrastructure exists to provide a safe, reliable and sustainable network for delivery of electricity supply to its customers. The Area Plans (for zone and sub-transmission infrastructure) and Replacement Plan are contributors to ensuring the electricity network has the necessary capacity and resilience to provide strong reliability and security of supply over the long-term, but ultimately all expenditure plans contribute to these outcomes.

The 2007 licence conditions set mandated network design planning criteria (licence Schedule 1), average performance target requirements for customers (licence Schedule 2), and individual performance target requirements for distribution feeders (licence Schedule 3). The targets are based on the normal duration (system average interruption duration index, SAIDI) and frequency (system average interruption frequency index, SAIFI) reliability standards for electricity networks, and set different targets by geographic area, including for the CBD, urban, short-rural and long-rural customers and feeders.

The following discussion of SAIDI and SAIFI indicates that the average network performance was adequately supported by the investments undertaken by Ausgrid, and that the average performance was maintained as it reduced its capital expenditure during FY2013 and FY2014. Improvements in reliability metrics such as SAIDI and SAIFI during the period influenced Ausgrid's decisions to defer growth driven capital expenditure in certain areas of its network.

4.1.1 SAIDI

Coming into the current regulatory period one of Ausgrid's primary concerns was the high loading of its aging CBD infrastructure combined with the tighter N-2 compliance requirement and the very real possibility of a major interruption event to the primary economic and business centre of NSW.

Figure 5 shows the SAIDI performance in the CBD area against the targets required in the 2005 then 2007 licence conditions.

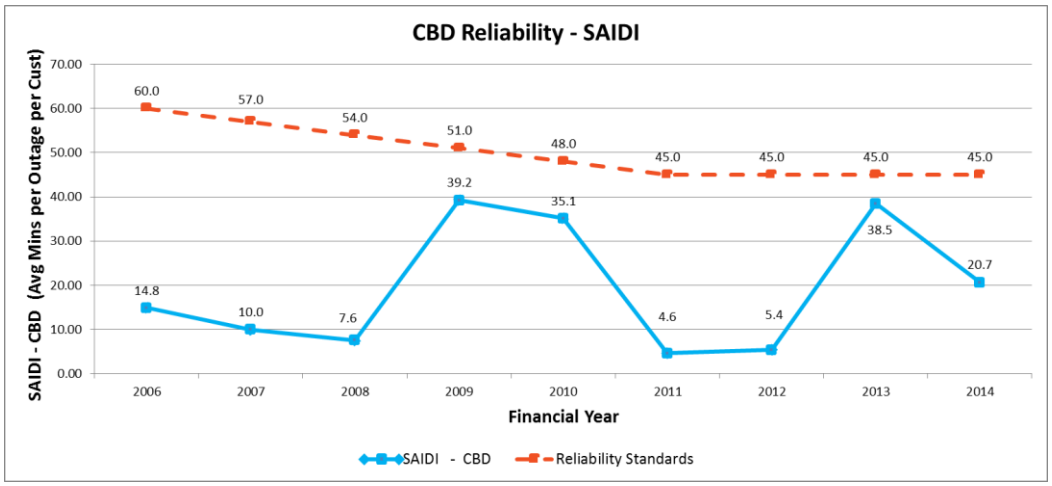


Figure 5: SAIDI (average minutes per outage per customer)

Over the period from FY2005 to FY2011 the targets were lowered and while Ausgrid's performance differed year-on-year, it has not breached this reliability measure for the prior or current regulatory period. The spikes relate to unusual and exceptional circumstances[10], which are reported in Ausgrid's annual Network Performance Reports.

4.1.2 SAIFI

Figure 6 shows the SAIFI performance in the CBD area against the targets required in the 2005 then 2007 licence conditions.

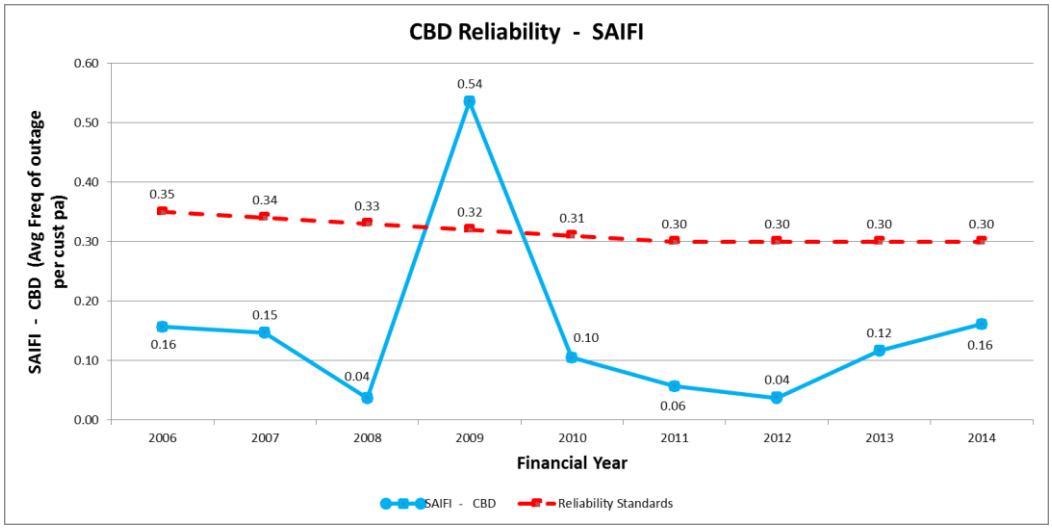


Figure 6: SAIFI (average frequency of outages per customer per year)

Over the period from FY2005 to FY2011 the targets were lowered and have been constant since then. While Ausgrid's performance was usually considerably lower

[10] These include the Dalley Street substation outage in FY2009 and its feeder cable issues in FY2010.

than the target for the prior or current regulatory period, it breached this reliability performance target in FY2009[11].

Given the considerable capex which has been deployed during the first three years of the current regulatory period, and which has had the effect of unloading the CBD zone and sub-transmission substations, the SAIFI performance measure has returned to levels more representative of the historical performance since FY2010.

4.2 Licence compliance

The NSW DNSP's licence conditions provide design criteria and reliability and performance targets which must be met. The design criteria have been strengthened and the reliability targets have been trended towards higher reliability, over time. Ausgrid measures and reports its compliance against these licence conditions annually.

It should also be noted that the strengthening of the design criteria required considerable additional capex to achieve compliance, and this in turn was the primary driver for increased network prices to consumers over the current regulatory period.

After the initiation of new and more stringent licence conditions at both the sub-transmission and distribution levels of its network in 2005 and 2007, Ausgrid used its surveying programs to identify which infrastructure was then deemed to be non-compliant and therefore in need of corrective action. Leading into the current regulatory period, it was found the number of non-compliant substations, feeders and distributors at the transmission, sub-transmission, 11kV and Low Voltage levels were higher than was acceptable.

These regular inspections also provided data for use in developing its Area Plans which focus in particular on capex for zone and sub-transmission infrastructure, and the individual 11kV Plan and the Low Voltage Plan which focus on capex in those asset categories respectively.

The following three sections look at how the capex plans and the expenditure deployed in the first three years of the current regulatory period began to have an impact on compliance with the licence conditions thereby underpinning the potential to support a reduction in capex in FY2013 and FY2014.

4.2.1 Zone & Sub-transmission Compliance

Figure 7 below shows the total of the non-compliant zone and sub-transmission substations recognised during each year of the current regulatory period. The total comprises the new non-compliances identified in the relevant year and any non-compliance identified in previous years, but not yet rectified.

[11] The spike in 2009 relates to the Dalley Street substation outage resulting from cable damage by a third party, and a further protection system event resulting in an N-1 outage.

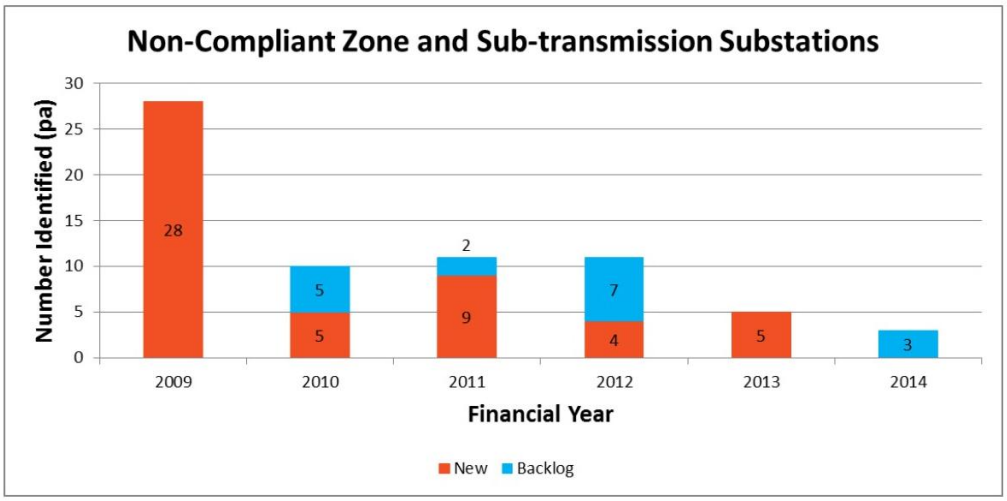


Figure 7: Non-compliant zone and sub-transmission substations

As can be seen, the number of substation non-compliances was high just prior to the current regulatory period, and then fell, but grew marginally to FY2012 and then began to fall again once the capex in the Area Plans begins to have an effect. By FY2014 all backlog non-compliances are anticipated to be addressed and only 3 new non-compliances have been identified for action.

It should be noted that although it is felt the capex in the Area Plans had the most impact on this outcome, other issues assisted the outcome and this is discussed further below.

Figure 8 shows the total of the non-compliant sub-transmission feeders recognised during each year of the current regulatory period.

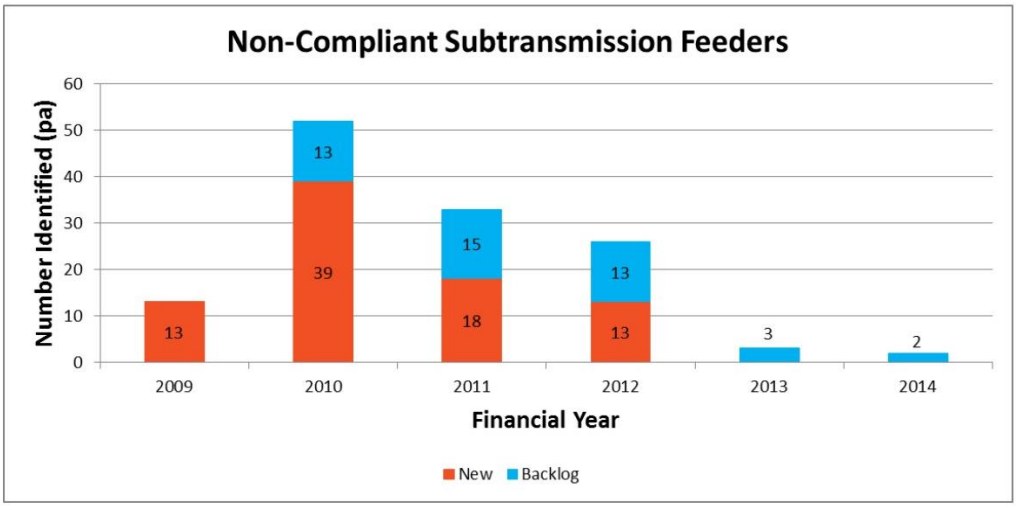


Figure 8: Non-Compliant sub-transmission feeders

It can be seen the number of non-compliances was highest early in the current regulatory period and fell steadily from FY2010 once the capex in the Area Plans began to have an effect. A significant number of non-compliant feeders were addressed by the end of FY2012. By FY2014 all backlog non-compliances are anticipated to be addressed and only two new non-compliances have been identified for action.

Again, it should be noted that while Ausgrid considers that the capex in the Area Plans had the most impact on this outcome other issues assisted the outcome as discussed in the following paragraphs.

Figure 9 and Figure 10 suggest that by the end of this regulatory period, Ausgrid will have addressed the majority of the zone and sub-transmission non-compliance issues. This has occurred for a number of reasons including:

- The significant expenditures on zone and sub-transmission substations and feeders through the capex allowance provided by the AER in the Area Plans;
- The use of the Alliance program to speed up delivery of zone and sub-transmission capex projects in the first half of the current regulatory period; and
- A plateau of the coincident peak load and reductions in the forecasts for some non-coincident peak loads, alleviating the immediate pressure of some of the non-compliances.

However while there has been considerable success at reducing zone and sub-transmission substation and feeder non-compliance by FY2014, additional difficulties remain with zone substations, particularly in the city area which has limited available space for new infrastructure and where Ausgrid has experienced considerable delays. Delays result from issues such as slow development approval, and difficulties related to design and implementation hurdles in some brownfield sites.

4.2.2 11kV Compliance

Ausgrid contends that the initial focus during the first two years of the current regulatory period was in the rectification of identified N non-compliance issues. These were more serious cases of non-compliance as a single failure could result in a customer service outage.

Once the backlog of N non-compliance issues had been addressed, resources were devoted to identifying new or N-1 non-compliances. Figure 9shows that the total number of identified non-compliant 11kV feeders grew substantially in the last three years of the regulatory period, but with a trend towards falling non-compliances by the end of the period. The initial increase was a result of a new surveying cycle and not due to increased load on the network.

Our understanding from Ausgrid planners at the time of this review is that work has commenced to rectify the majority of the remaining 11kV asset non-compliances and that there will be a small carry-over of capex for these non-compliances into next period.

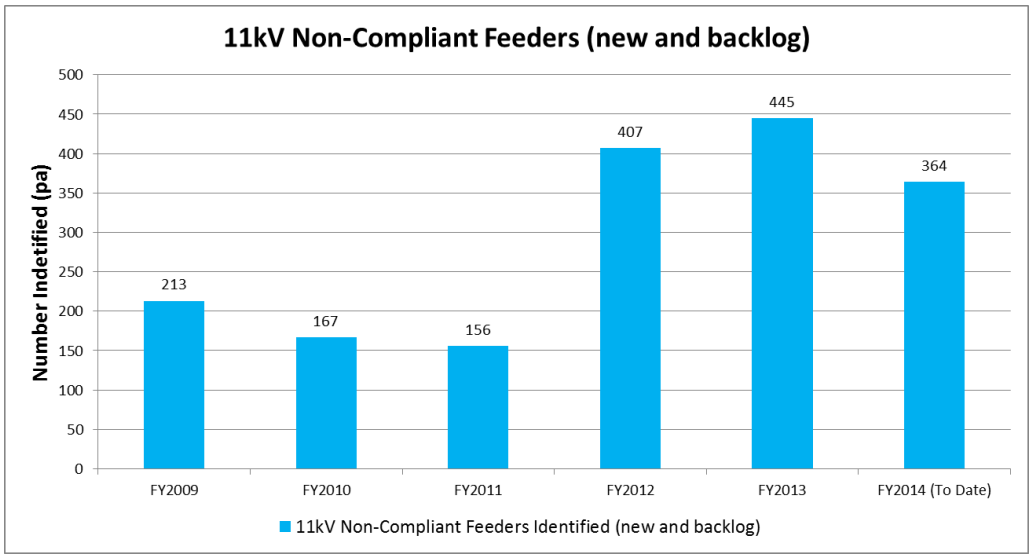


Figure 9: Non-Compliant 11kv Feeders

4.2.3 Low Voltage Compliance

Figure 10 shows the total of the non-compliant low voltage substations recognised during each year of the prior and current regulatory periods. While the backlog of identified non-compliant low voltage substations grew coming into the period, the number of non-compliances has been falling steadily over the current regulatory period, with only a small number of non-compliances to be addressed in FY2014.

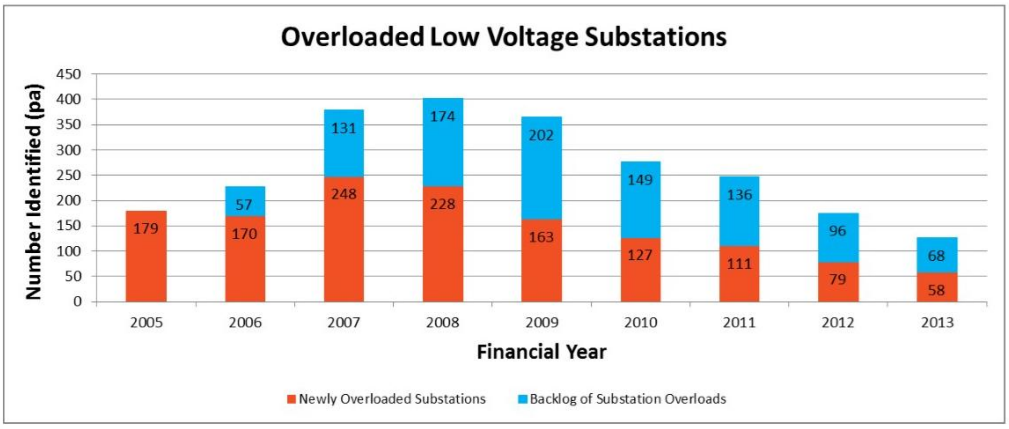


Figure 10: Non-Compliant Low-Voltage Substations

Figure 11 shows the total number of the non-compliant low voltage distributors recognised during each year of the prior and current regulatory period. While the backlog of non-compliant low voltage distributors coming into this period has significantly dropped over the period the rate of reduction has been slower than with low voltage substations in the back half of the period.

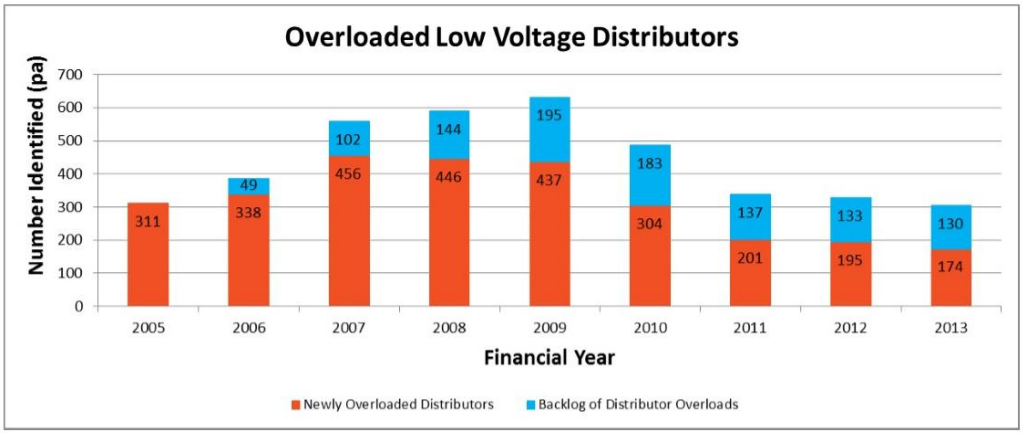


Figure 11: Non-Compliant Low-Voltage Distributors

Based on our discussions with Ausgrid planners, it is expected that the majority of non-compliances identified for both low voltage substations and distributors as of the end of FY2013 will be resolved by the end of the current regulatory period. As such, Ausgrid has forecasted no carryover expenditure into the next regulatory period for these identified compliance issues. The tracking down in the overall number of low voltage non-compliances across the period suggests that the investment it has made this period has improved the network compliance with the licence requirements.

Since the target licence conditions were more onerous in FY2013 than FY2005, the distribution network should and appears to be providing better service towards the end of the current regulatory period than at the beginning of the prior regulatory period.

4.3 Internal governance response

All utility businesses which are heavily reliant on infrastructure assets to provide services to customers, manage their capex and opex through the application of internal governance processes to assist with sound asset management. Ausgrid has internal governance processes of this nature shown in Figure 12.

Ausgrid has claimed that the decrease in capex from FY2012 is attributable to its use of governance mechanisms to deal with unanticipated internal and external factors, many of which have been described above. These mechanisms include the governance framework and investment procedures. There are three primary levels of capex governance within Ausgrid:

- The Investment Governance Framework (IGF);
- The Project Management Manual (PMM) Matrix; and
- The Statement of Corporate Intent (SCI).

The IGF is a process used to identify network capital projects which require attention, and provides a sequence of decision gates and allows subsequent status reporting for each project or program. The key stages in the IGF are:

- Identify needs;
- Develop options;

- Plan & justify the project / program;
- Execute the project / program; and
- Operate & evaluate the project / program.

The options analysis looks at different technical solutions, but also looks at demand side management and operational solutions which could defer or off-set technical solutions. Net present value estimates are used to evaluate the most efficient economic solution for larger projects.

The PMM process is a LAN based tool which assists the management of the detailed design, parts list development, local approvals, and a myriad of other activities required so that field crews have all the necessary equipment and approvals to implement the capex plans. Its various steps assist in the management of the capex deployment so that implementation occurs in an efficient manner and can respond to changing needs throughout the implementation process.

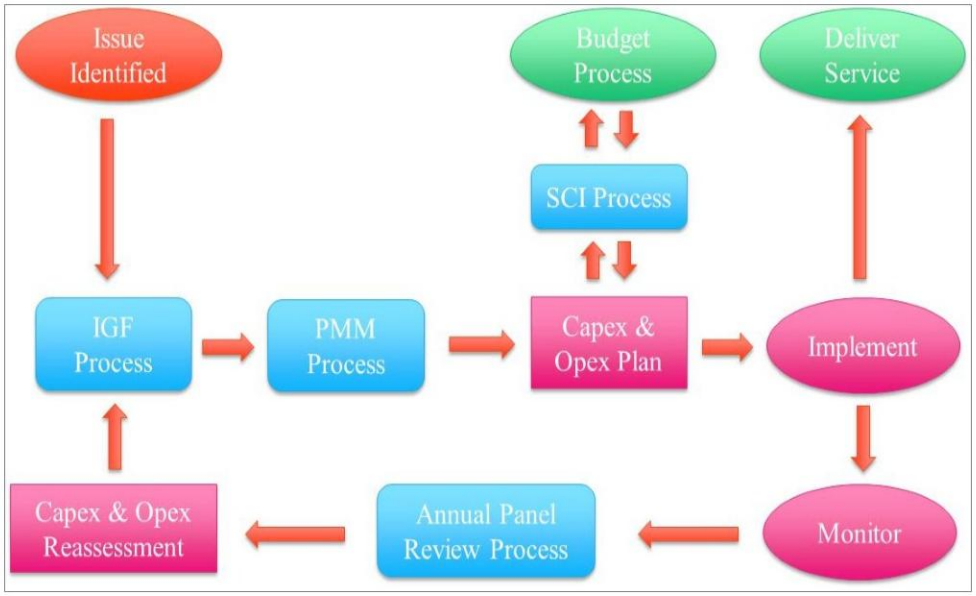


Figure 12: Internal Governance for Capex

Source: Arup observation & analysis

The SCI is a legally required statement (under the State Owned Corporations Act) of the projects and outcomes Ausgrid is seeking to achieve in the coming financial year and is delivered to the NSW government. The SCI, once ratified by government, therefore sets a limit on the expenditures that can be funded and within which Ausgrid must operate for the coming financial year.

Since the set-up of Network NSW, these internal governance processes have been bolstered by the Network NSW Governance Framework. This has assisted in aligning the internal governance processes for the NSW NSPs so that additional synergies in their asset management processes allow cost efficiencies to be exploited which would otherwise not have been possible where the businesses continued to run under fully separate business planning and procurement strategies.

While documentation on the IGF, PMM, SCI and Budget processes have been provided by Ausgrid, Arup has not been able to observe the physical application of these processes in the limited time it has had to undertake this review. Observations of the outcomes of the capex plans and the documentation itself suggest the governance mechanisms work in this manner and are followed by the wider organisation.

Of particular note, are the comparison on Area Plans provided to the AER under the 2009 regulatory reset arrangements, and the more recently updated Area Plans which have been prepared for the current regulatory reset review? The changes in forecast non-coincident demand and its impact on the available installed capacity, along with consideration of demand side initiatives, have allowed the deferral of a number of capex projects which were otherwise necessary, or moved priority to other less costly options identified within the plans. This combined with the SCI review process and the Network NSW additional guidance has allowed a reduction in the capex undertaken in the FY2013 and FY2014 period.

It should be noted that the reduction in capex during the latter years of the current regulatory period, has had the effect of tapering the rise in the regulatory asset base (RAB) which in turn has the effect of reducing the rate of increase in prices to consumers in future regulatory periods.

4.3.1 Change to medium term peak demand forecast

The combination of plateaued coincident and reduced non-coincident peak demand across many regions of the network and strong reliability and compliance performance provided an opportunity for Ausgrid to reduce its overall capex during FY2013 and FY2014.

The major mechanism through which this capex reduction occurred was via the annual Area Plan expenditure assessment process. The annual process is based on updated peak demand forecasts which flow through into the individual capital works required to ensure reliability and compliance performance is achieved. The reduction in medium term peak demand forecasts as shown in Table 3 translated directly into a deferral, and in some instances cancellation, of capital works project hence reducing capex.

Table 3: Medium term summer peak demand forecast

Year	Medium term summer peak demand growth forecast
2007/08	2.8%
2008/09	3.7%
2009/10	2.7%
2010/11	2.3%
2011/12	1.9%
2012/13	1.9%

This table presents the medium-term forecast (i.e. a ten year forward looking annual peak demand growth projection) from the relevant year's Business Plan. Clearly Ausgrid's expectations of growth in summer peak load continued to reduce from FY2009.

Despite the reduction in peak demand, there was continuing expenditure to address growth hot-spots through installation of new substations, feeders or protection equipment and replacement of aged infrastructure.

The change in peak demand led to changes in the capex implementation scheduling and eventually to the deferral and in some instances the cancellation of some capex projects, particularly those which had not received commencement approval.

4.3.2 Updated Plans

Arup reviewed documentation associated with a sample of the 2008 Area Plans which were provided to the AER for the regulatory reset in culminating with its decisions in 2009. These earlier documents were compared to the updated 2013 Area Plans being prepared for the current regulatory reset process, leading to submissions by Ausgrid to the AER in May 2014. The differences in the projects identified, including the timing for projects and the deferral or cancelling of planned projects not yet commenced, demonstrated the significant changes to capex implementation during the current regulatory period.

The impact of the changes in non-coincident peak demand is evident in the changes in the capex plans, and detailed schedules of identified projects. In some instances capex projects have been deferred, and in others cancelled because of the reduction in non-coincident peak load, or deployment of other capex or operational decisions which have ameliorated the need for the originally planned capex. In other instances, capex has been required because the hot-spot remains and capacity expansion has been required to meet the customer service delivery requirements.

In this way the governance and asset management frameworks need to support the business to be efficient in deployment of capex and in service delivery. While improvements are always possible, the outcomes during the current regulatory period, suggests the governance framework can reasonably support the efficient delivery of Ausgrid's capex plans.

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

- [redacted]
- [redacted]

[redacted]

- [redacted]
- [redacted]
- [redacted]
- [redacted]

[redacted]

[redacted]

[redacted]

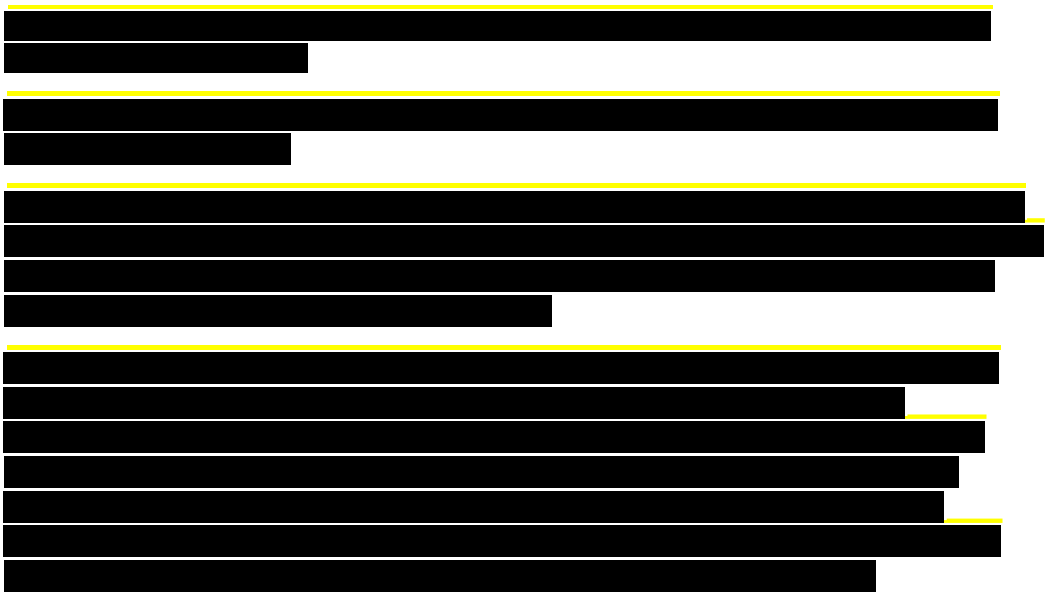
[redacted]

[redacted]

[redacted]

[redacted]

[redacted]



5 Internal factors – Opex Related

The discussion that follows identifies the internal factors which impacted on Ausgrid opex and the need to balance increases in some areas with reductions in other areas to maintain opex within the levels approved by the AER.

5.1 Workforce considerations

Ausgrid's workforce characteristics mean that it takes considerable time to adjust its staffing levels in response to varying workloads. This has both a short-term and a long-term impact on opex. These characteristics are discussed in more detail below.

5.1.1 Workforce Characteristics – Expenditure Issues

Ausgrid contends that historically the size of its workforce has been commensurate with the need to both manage and implement its capital program, and operate and maintain its network on a sustainable basis. Therefore workforce numbers and associated costs have an impact on both capex delivery and opex size going forward related to the size of the network and the need to maintain it.

In the lead up to the current regulatory period it was recognised internally that Ausgrid did not have enough internal resources to implement all of the operational, augmentation and replacement expenditure that it had requested in its regulatory submissions for the current regulatory period. It was also uncertain how many skilled and experienced personnel could be recruited in a situation where there was competing demand for skilled workers in the resource sector. This combined with an aging internal workforce raised concerns within Ausgrid over whether it would be able to deliver the capex and opex plans it felt were required.

5.1.2 Workforce size

In order to understand the relationship between network size and staffing requirements, and its relationship to opex, data on the number of zone substations commissioned per annum has been provided over the last three regulatory periods, along with the Ausgrid employee head count specific to the network business.

The assumption underlying the analysis is that the size and to an extent the complexity of the Ausgrid network is related to the number of zone substations built and managed by Ausgrid. Figure 17 shows these two metrics on the one plot.

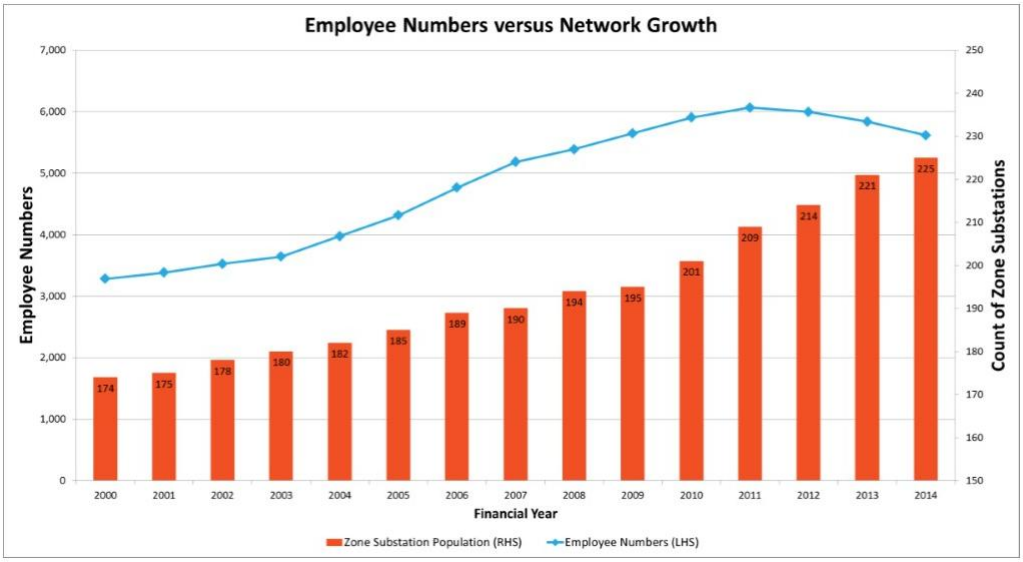


Figure 17: Employee versus Zone Substation Numbers

Note: The employee numbers exclude outsourced and labour hire arrangements

The data demonstrates a steady growth in employee numbers through to FY2011, and then a slow decline to the end of the current regulatory period.

The data suggests a steady growth in the number of zone substations and employees through to FY2003. But a stronger growth in workforce numbers appears to occur from then till around the end of FY2009. Then the growth in the zone substations increases from FY2010 as anticipated following the considerable expansion in allowed capex in the current regulatory period, before the workforce numbers plateaus and begins to fall. To better understand the drivers for these characteristics, the growth rates in each metric were reviewed.

Figure 18 suggests that to undertake the capex expansion in the prior regulatory period. Ausgrid felt the need to expand its workforce to accommodate the additional work on capex project design and building, and for expanded maintenance of the existing and new assets. This expansion in workforce, at 200 persons per year or more, occurred from FY2004 to around FY2011. Following that year the workforce began to reduce for the first time in over a decade.

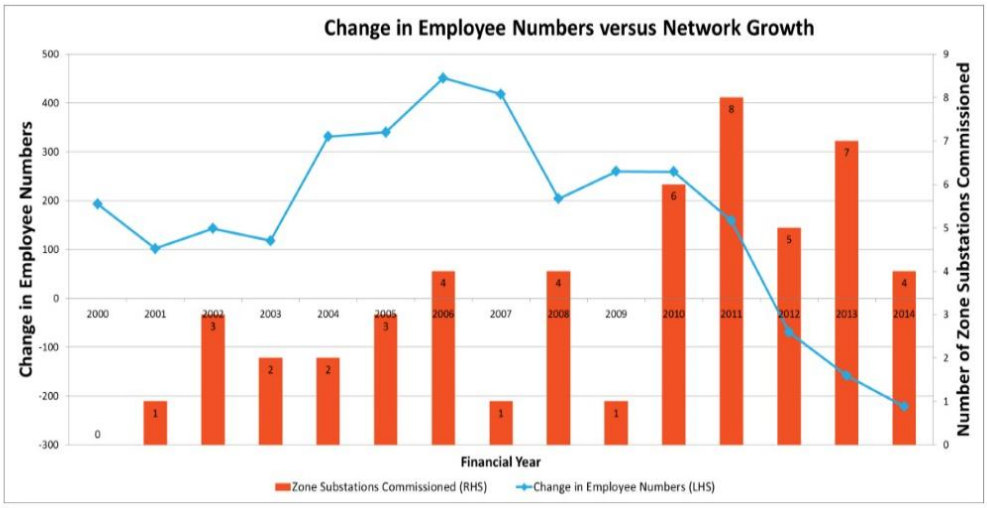


Figure 18: Change in Employee and Zones Substation Numbers

Note: The employee numbers exclude outsourced and labour hire arrangements.

As the number of zone substations installed and commissioned each year accelerated from FY2010, the number of employees maintained its growth for only two years, then it began to reduce for the last three years of the current regulatory period with a negative growth in workforce numbers over that period.

It is clear from the interview process undertaken by Arup that Ausgrid realised that it would have difficulty in implementing its capex program between FY2010 and FY2014, using internal resources alone. Even though Ausgrid seems to have anticipated the need for additional resources to undertake this program, and begun to expand its workforce in the prior regulatory period, it also sought other outsourcing arrangements to speed up the delivery of the capex program. This approach was called the Alliance program and this is explored in a separate Section 5.1.6 of this Report below. The Alliance had the effect of reducing Ausgrid's need to take on additional staff above its potential long-term sustainable level, to tackle the short-term phase of capex expansion. While this approach assisted in limiting increases in opex levels during the period, it does not eliminate Ausgrid's need to further reduce its opex in the short to medium term.

Nonetheless the impact of the combination of the increased internal resources and the outsourcing through the Alliance program can be clearly seen in Figure 18 as the number of zone substations commissioned over the current regulatory period averaged 6 per annum, while the historical average was around 2 per annum.

5.1.3 Attrition Rates

Ausgrid's workforce has a number of characteristics which impact on its ability to quickly ramp-up and ramp-down the total number of staff, and therefore, its level of opex.

One of these is that approximately 80% of its workforce is employed under an Enterprise Bargaining Agreement (the Award) which is re-negotiated on a regular basis, usually around every two years. The last Award called the Ausgrid Agreement 2012 was registered in June 2013 and is due to expire in December 2014.

The Award is a legally binding document which prohibits forced redundancies for employees covered by it. A large number of employees sit under the Award due to the nature of the industry being construction based and therefore, by tradition being very heavily unionised. Employment under the Award has been the default position for a long period of time with penetration into middle management ranks. Because of this Ausgrid faces legal limitations in significantly changing the makeup of its workforce overtime and is also constrained at the same time by its need for staff with specialist industry skill sets.

The level of staff outflow due to natural attrition this period has also been affected by state wide hiring freezes which have been put in place to curb costs. As many of Ausgrid's employees have specialist skill sets there is limited scope for them to readily move into other industry sectors. State wide hiring freezes amongst NSW DNSPs and limited employment opportunities elsewhere in the local electrical industry sector has contributed to Ausgrid's inability in recent years to have opex follow the step change wind down in its capex program.

As can be seen in Figure 19, there was high growth (and low attrition) in employee numbers between FY2004 and FY2007. This suggests Ausgrid was building its internal resources to implement anticipated additional capex and opex programs which it believed were necessary and it had applied for to the AER for the current regulatory period. In the last three years of this period there has been a higher than historical rate of attrition in Ausgrid's workforce. This is a result of a combination of the imposed hiring freeze, older employees retiring, non-renewing of contracts and targeted redundancies.

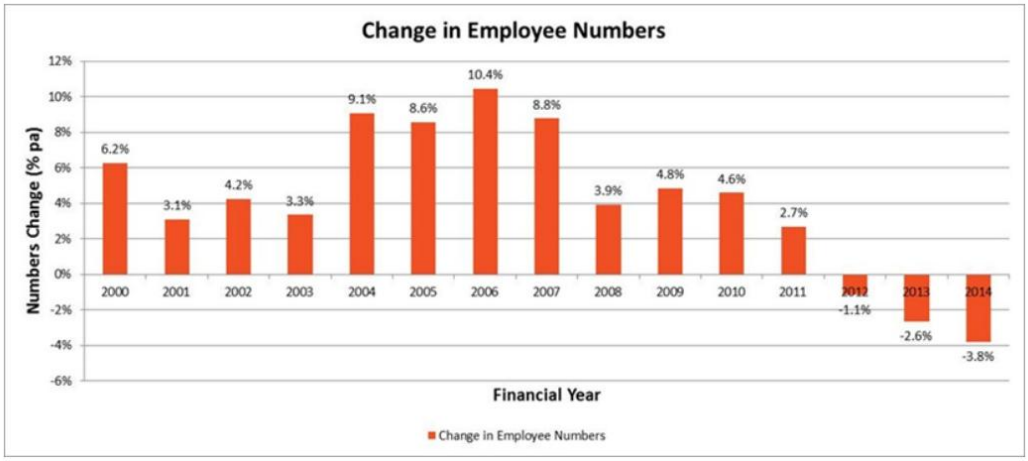


Figure 19: Change in Employee Numbers

Note: The employee numbers exclude outsources and labour hire agreements.

5.1.4 Workforce age profile

Figure 20 shows how the number of staff has grown from 3,282 in June 2000 to 5,908 in June 2010 and is expected to fall slightly to 5,619 by June 2014. It also shows the numbers of employees falling into primary ten year age profiles.

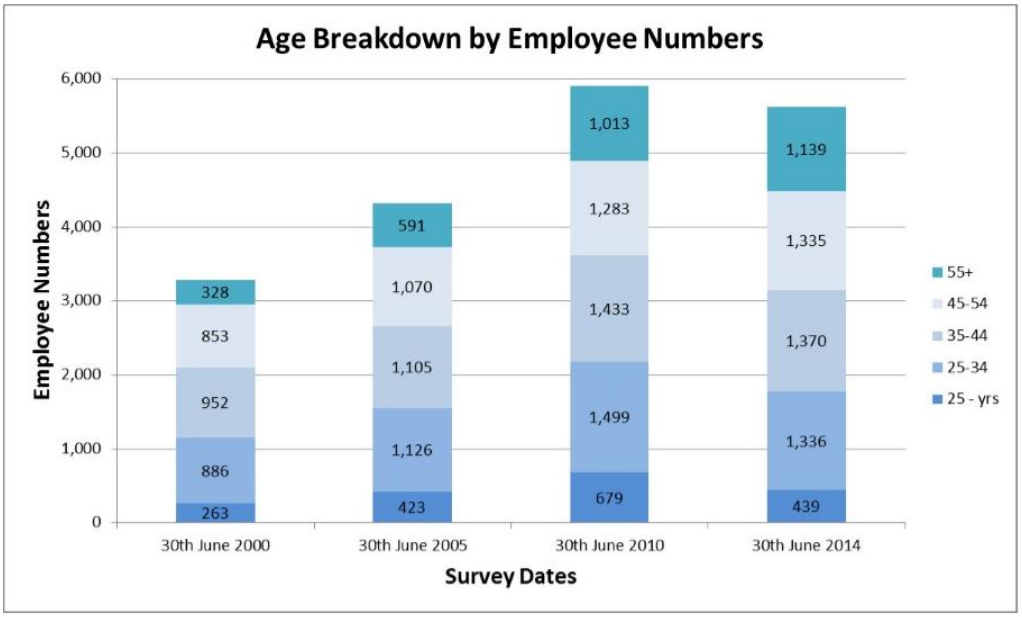


Figure 20: Workforce number and age profile

Note: The employee numbers exclude outsourced and labour hire arrangements. Different age brackets were recorded in different years and the above analysis pro-rates numbers across uniform age categories.

One of the characteristics of Ausgrid's workforce is that it evenly spread in age profile with around 24% of the workforce numbers as of June 2014 in each ten year age bracket from 25 to 34 years, 35 to 44 years and 45 to 55 years.

The other aspect of Ausgrid's workforce is that its staff retention rate is very high (refer to Section 5.1.1 above) and that this has the effect of increasing the average age of the workforce over time. This in turn increases the potential costs associated with any reduction of the workforce, as natural attrition usually occurs from the age cohort closer to retirement. In this instance, where redundancy costs are based in some part on length of service, the costs for reducing the staff head count are likely higher than other industry averages.

5.1.5 Apprentice build-up

One aspect of this ramp-up in employee numbers was the approach adopted by Ausgrid to mainly focus on appointing apprentices in the below 25 years age group. Ausgrid offers a comprehensive apprenticeship program as part of its workforce forward planning and aims to train apprentices so that they can be eventually redeployed into areas within Ausgrid where there are shortages in specialist skill sets. Many of these areas involve front line services to customers.

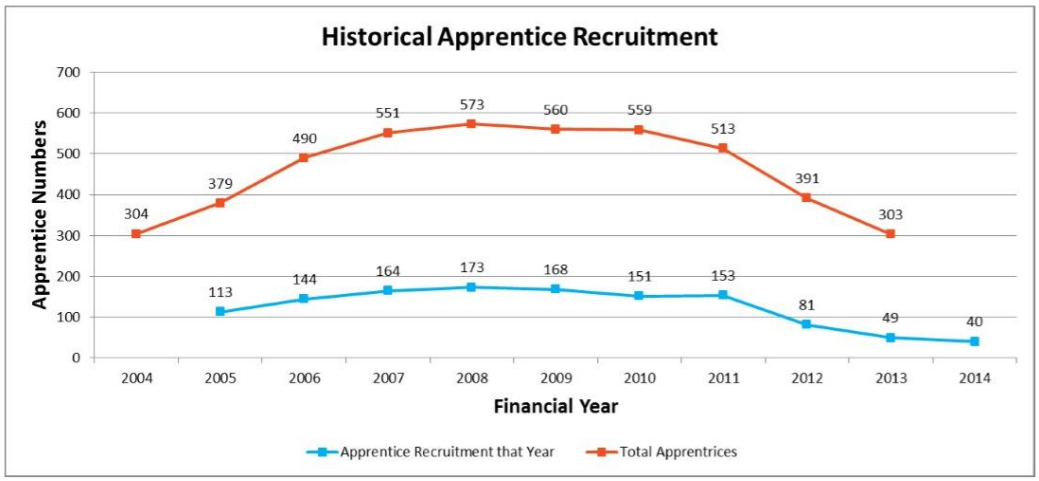


Figure 21: Apprentice Recruitment byYear

Figure 21shows this build-up of junior staff occurred between FY2005 and FY2011, with a clear change in policy reducing apprentice recruitment from FY2012.

One aspect of the apprentice build-up, is that a significant portion of these staff costs are treated as opex, until such time they are fully trained and enter the mainstream Ausgrid workforce. At that point their labour costs are allocated to capex plans or opex plans depending on their assignment, the type of work undertaken and geographic area of employment. This apprentice cost is not insignificant, and contributed considerably to the opex being above the regulatory allowance in the prior regulatory period and for the first half of this period (see Figure 21 above).

5.1.6 The Alliance Strategy

In the prior regulatory period, Ausgrid had identified that it needed considerable additional capex to develop its network to meet growth and condition driven requirements, and in particular to meet the new licence conditions imposed in 2005 and then further adjusted in 2007. While ramping up staff levels, it also recognised it needed external contracting support to deliver the programs which were necessary.

In October 2009 Ausgrid established two Alliance programs to focus on delivery of zone substations and associated reticulation equipment. Ausgrid entered into these two new alliance contracts with Energised Alliance (led by United Holdings) and Energy 2U Alliance (led by Leighton Contractors) to help deliver the capital program.

A third Alliance, the Transmission Cable (TraCa) Alliance, was established in December 2011, to focus on the 132kV cable capex program. This includes the need for external contract resources for overflow work in street lighting, routine pole replacements, aerial bundled cables (ABC), and fire -prevention.

The objective of the Alliance programs was to ensure the speed of delivery of zone substation and cable replacement in a safe manner. Ausgrid was clear in its strategy that project deliverability was the core driver for the introduction of the

Alliances, with cost efficiency measured against regulatory allowances and quality also being important.

Ausgrid has also indicated that the Energy2U Alliance and Energised Alliance have been successful in delivering an overflow of capital works, and have successfully delivered projects on schedule and have demonstrated strong financial discipline. They have acted as a pressure relief valve on Ausgrid internal resources, ensuring that the substation portion of the area plans was met through to FY2012. The TraCa was established to have a similar impact on the 132kV cable program.

The strategy behind the Alliance program is very clear. For the current regulatory period, the very strong incentive provided by the AER in allowing a significant increase in capex meant that the primary objective was to quickly deliver the capex program which was focused on zone substations and 132kV cables, recognising that even the expanded internal Ausgrid planning, design, engineering and deployment teams were insufficient to complete the quantum of tasks during the 5 year regulatory period.

In circumstances where speed of delivery is required in a compressed period of time, simple dollar efficiency cannot be the primary consideration in program implementation. The speed generally comes at a higher cost than if longer time frames were allowed. In this way, the current regulatory framework (prior to the implementation of the AER's new guidelines on efficiency sharing in late 2013), requires expenditures to occur within a regulatory period wherever possible.

By January 2014, 67 projects had been completed by the Alliances, and of the remaining projects, 21 had reverted to Ausgrid for completion and 7 had been cancelled from the program.

The work in progress details schedule as at mid February 2014, in relation to all of the capex projects which have been undertaken by the Alliance partners shows that the vast majority of the 95 capex projects allocated to the Alliance partners were allocated in FY2010 and FY2011, with 12 projects having scheduled practical completion dates after the end of FY2014, out of those originally allocated to the Alliances. It is assumed these projects shall be completed by Ausgrid.

Going forward and with a focus on improving cost efficiency now that the backlog in zone substation capex has been mostly addressed, Ausgrid's strategy appears to be the ramp down of the Alliance program by the end of the current regulatory period, which provides the opportunity for reduced costs.

The Alliance approach seeks to lock in skilled and experienced contracting teams to deliver programs over an extended period, working closely in parallel with the Ausgrid planning, engineering, technical delivery and management teams. This occurs through a negotiated fixed annual fee and a pain / gain performance arrangement which underpins the Alliances successful financial involvement, and where allocated projects are delivered at cost. Efficiency is encouraged through a 50%:50% sharing of cost savings below the value approved for the project by the AER, alongside a myriad of other contractual performance requirements. Costs above the approved amount are recovered at cost by the Alliance.

Arup interprets that while overall cost efficiency savings may not be maximised by the arrangement which has parallels to a take-or-pay arrangement, it

encourages expenditures to be at or below the regulatory allowance, and does encourage a speedy delivery of the allocated projects in a safe manner and with high quality. As previously mentioned, the Alliance had the effect of reducing Ausgrid's need to take on additional staff above its potential long-term sustainable level, to tackle the short-term phase of capex expansion. While this approach assisted in limiting increases in opex levels during the period, it does not eliminate Ausgrid's need to further reduce its opex in the short to medium term.

6 Capex outcomes

This section looks at the capex outcomes at a high level.

6.1 Summary of Capex Plan Outcomes

Table 5 identifies each standard control capex plan and how actual expenditure compared with the regulatory allowance. The figure shows that in total actual expenditure was 21% below the allowance. The Appendices show additional detail against each Capex Plan, including sub-categories of expenditure.

Table 5: Allowed and actual expenditure by standard control Capex Plan

Standard Control - Capex Plans ($m nominal)	FY2010	FY2011	FY2012	FY2013	FY2014	Total	% Spend
Area Plans	$527	$622	$755	$522	$342	$2,769	76%
Area Plans (Determination)	$638	$641	$805	$832	$707	$3,623	
Replacement Plan	$186	$209	$221	$213	$189	$1,018	56%
Replacement Plan (Determination)	$136	$270	$355	$453	$591	$1,805	
Duty of Care Plan	$25	$29	$41	$43	$33	$170	59%
Duty of Care Plan (Determination)	$57	$52	$57	$62	$61	$288	
11kV Plan	$57	$99	$107	$92	$80	$435	75%
11kV Plan (Determination)	$53	$103	$150	$147	$131	$584	
Low Voltage Plan	$71	$106	$132	$74	$43	$426	169%
Low Voltage Plan (Determination)	$39	$47	$50	$54	$61	$252	
Customer Connections Plan	$62	$82	$81	$82	$78	$386	75%
Customer Connections Plan (Determination)	$87	$101	$105	$108	$111	$512	
Reliability Plan	$12	$11	$14	$10	$9	$56	88%
Reliability Plan (Determination)	$24	$19	$10	$5	$5	$64	
System ICT	$54	$86	$79	$28	$3	$250	177%
System ICT (Determination)	$26	$28	$51	$26	$10	$141	
Non-System ICT	$51	$57	$37	$28	$28	$201	85%
Non-System ICT (Determination)	$79	$48	$37	$39	$33	$237	
System Property	$30	$27	$14	$9	$9	$88	50%
System Property (Determination)	$73	$78	$13	$7	$6	$177	
Non-System Property	$93	$54	$43	$20	$30	$240	96%
Non-System Property (Determination)	$108	$37	$50	$26	$28	$249	

Fleet	$29	$32	$34	$16	$11	$121	114%
Fleet Plan (Determination)	$26	$24	$20	$18	$19	$106	
Other	$8	$8	$9	$5	$6	$36	120%
Other (Determination)	$6	$6	$6	$6	$6	$30	
Metering Replace Plan	$29	$32	$21	$16	$17	$115	106%
Metering Replace Plan (Determination)	$24	$14	$23	$23	$24	$108	
Business Support	$42	$54	$63	$55	$51	$264	146%
Business Support (Determination)	$34	$39	$45	$47	$16	$181	
Total Capex Spend	$1,276	$1,508	$1,651	$1,214	$927	$6,576	79%
Total Capex Determination	$1,410	$1,506	$1,777	$1,854	$1,809	$8,357	

The figure shows the major drivers of the under expenditure were the Area Plans and the Replacement Plan while the Low Voltage Plan and System ICT Plan were the major areas over spent.

Table 6 identifies the alternate control capex plan and how actual expenditure compared with the regulatory allowance.

Table 6: Allowed and actual expenditure by alternative control Capex Plan

Alternate Control - Capex Plan ($m nominal)	FY2010	FY2011	FY2012	FY2013	FY2014	Total	% Spend
Street Lighting	$16	$16	$15	$19	$17	$82	68%
Street Lighting (Determination)	$15	$26	$26	$27	$27	$121	

The table shows the alternate control capex plan was significantly under spent

6.2 Major capex plans

The external factors identified above, combined with Ausgrid's internal budgeting and expenditure control mechanisms, led to a reduction in capex during FY2013 and FY2014. These factors included:

- The plateau of coincident peak demand (below levels initially forecast) allowing the deferral or cancellation of projects planned but not yet commenced;
- Many of the critical ongoing projects commenced under the Area Plans scheduled for completion by the end of FY2014; and
- Additional expenditure strategies implemented by Network NSW, including an increased focus on expenditure efficiency.

Figure 22 identifies the roll-off in capex broken down by the plans. The table shows that the two largest plans are Area Plans and the Replacement Plan. It also shows that the majority of the capex roll-off occurred in the Area Plans, Low Voltage Plan, System ICT Plan, Fleet Plan and Non-system Property Plan. A brief discussion of Area Plans and the Replacement Plan is provided below.

The Appendices provide further detail on all of the Capex Plans

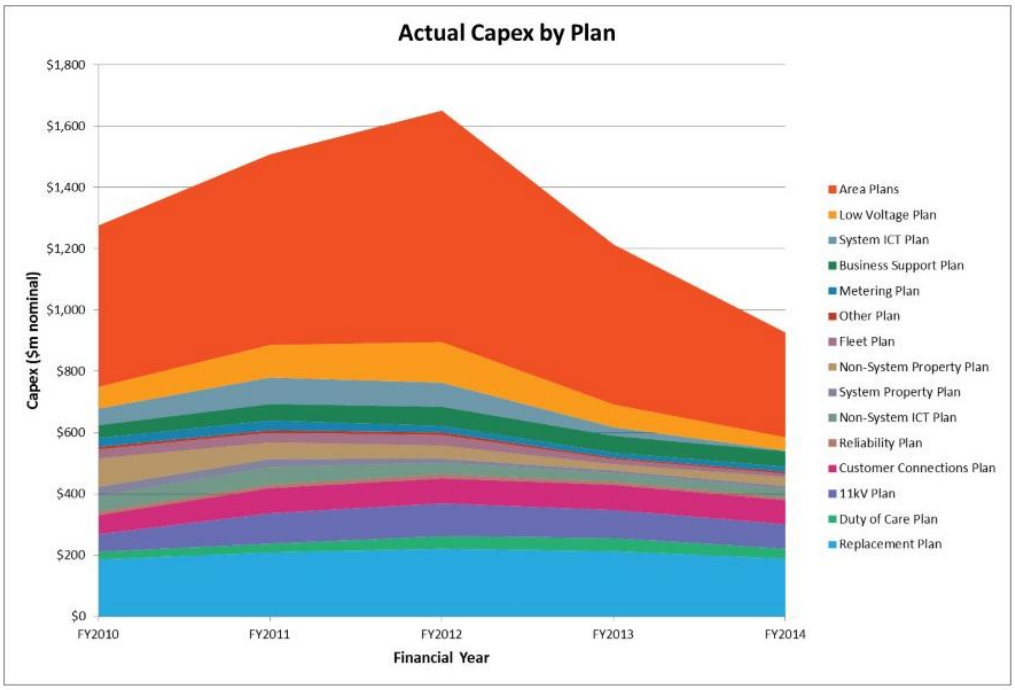


Figure 22: Actual Spend by Capex Plan

6.2.1 Area Plans

Area Plans are developed for growth and replacement driven capital expenditure on transmission and sub-transmission assets as well as associated 11kV infrastructure. There are 28 Area Plans, 3 of which involve transmission assets and 25 involving sub-transmission assets. The major area of expenditure for this period was the Sydney East and CBD region. Figure 23 shows that capex on Area Plans tracked the allowance in the initial years of the regulatory period before reducing significantly in FY2013 and FY2014. Additional information on each Area Plan is available in the Appendices.

	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	638.5	640.5	805.3	831.9	706.5	3,622.7
Actual	526.7	622.2	755.4	522.3	342.1	2,768.6
Delta ($) (allo - act)	-111.8	-18.3	-49.9	-309.7	-364.5	-854.1
Delta (%)	-17.5%	-2.9%	-6.2%	-37.2%	-51.6%	-23.6%

Figure 23: Area Plans Allowed and Actual Expenditure

The drop-off in Area Plans capex was in response to the external and internal factors identified previously. Of these factors, the following were the larger contributors:

- The realisation that coincident system peak demand was not growing as fast as forecast at the beginning of the current regulatory period meaning that investment could be deferred until future regulatory periods while still addressing network compliance;
- Unanticipated difficulties in delivering work in brown field areas which led to project delays;
- The establishment of Networks NSW and the bedding down of the new organisational structure;
- Concerns regarding the level of debt being taken on by Ausgrid;
- Mounting concern by customers on the continuing price increases, leading to the State government's position of *"placing downward pressure on the retail price for electricity by reducing network charges which will benefit all NSW energy customers"* through reducing network capex; and
- Restructuring of the NSPs to have Networks NSW guide the financial, management and network strategies of these network businesses.

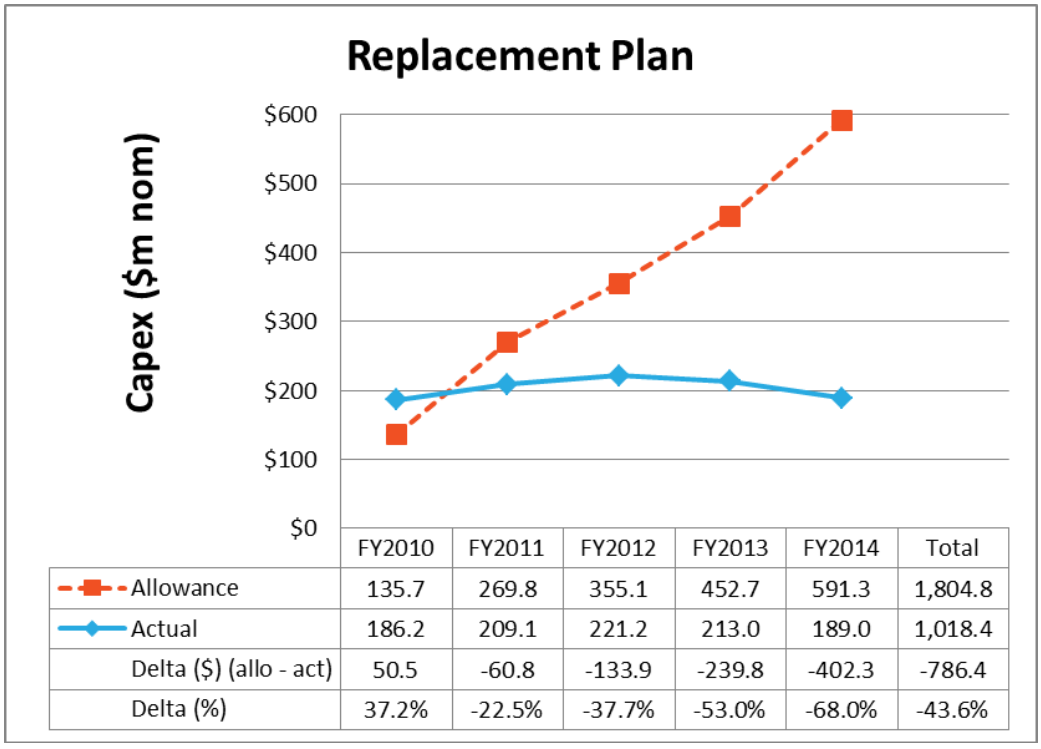
6.2.2 Replacement Plan

The Replacement Plan includes replacement driven capital expenditure on assets which are not included in Area Plans. This includes replacement of assets which are considered a risk to Ausgrid in not meeting its corporate objectives. The replacement plan therefore involves projects on the following assets: distribution

mains; distribution substations; zone substations; sub-transmission substations and transmission mains (including sub-transmission mains). Additional detailed information is provided in the Appendices.

The Replacement Plan seeks to replace older network equipment which does not meet its condition requirements. The aim of this is to provide a sustainable network for long-term service delivery and to allow a potential reduction in maintenance opex. Ausgrid measures success for the Replacement Plan by the condition of its assets which has an influence on reducing the number of assets which in operation may breakdown unexpectedly and lead to supply outages. The other side effects of managing the condition of its assets include movement in the monitored average age of the equipment to a long-term sustainable level, commensurate with customer service needs balanced by an efficient expenditure level.

Figure 24 shows that capex on the Replacement Plan failed to meet the allowance in all years except FY2010 with the variation increasing to around 70% or $400m in FY2014.



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	135.7	269.8	355.1	452.7	591.3	1,804.8
Actual	186.2	209.1	221.2	213.0	189.0	1,018.4
Delta ($) (allo - act)	50.5	-60.8	-133.9	-239.8	-402.3	-786.4
Delta (%)	37.2%	-22.5%	-37.7%	-53.0%	-68.0%	-43.6%

Figure 24: Replacement Plan Allowed and Actual Expenditure

The underspend relative to the allowance was the result of significantly fewer replacement activities being undertaken than anticipated with a major driver being resource constraints requiring a more steady approach to the delivery of the Replacement Plan program, rather than the ramp up in capex originally proposed.

It should be emphasised that while the primary driver for the Area Plans in the current regulatory period was related to meeting the ungraded design criteria in the licence conditions, many Area Plans also had parallel asset replacement drivers. Ausgrid believed the need to divert resources, including skilled staff resources, to successfully deliver the Area Plans meant that for FY2010 through FY2012 the Replacement Plan could not be reasonably delivered at the speed and

ramp-up expenditure originally forecast. However, this led to greater risk reduction through the parallel drivers for expenditure in many Area Plans, and a supporting focus on the System Maintenance Plan in the short-term to fill the gap left by the deferment of replacement as discussed below in Section 7.2.1.

The resource constraints resulted from a focus for the first three years of the current regulatory period on delivering growth-driven capex to address the significant changes in design planning criteria mandated in Schedule 1 of the revised licence conditions (refer Section 3.1 above), and the decision to be compliant with these licence conditions by 1 July 2014. More resources were required to deliver the Area Plans than forecast at the beginning of the current regulatory period due to unexpected difficulties in delivering major projects in brown field areas. Level expenditures (without an increase) in the last two years of the current regulatory period were influenced by internal factors discussed above in Section 4. The lack of ramp-up in the Replacement Plan had two effects which are discussed below.

Firstly, the average age[16] of network assets would continue to increase, particularly for distribution assets as they were not a major component of the early effort and expenditure focus of the Area Plans. This is evident in Figure 25 where the average age of the distribution assets increased over the regulatory period primarily driven by the large proportion of poles in the distribution asset base, even at the constant level of replacement capex deployed. Alternatively, the average age of transmission assets stabilised over the period largely as a result of the impact of large investment in Area Plans which deployed many new assets and applicable subprograms of the Replacement Plan from FY2010 to FY2012.

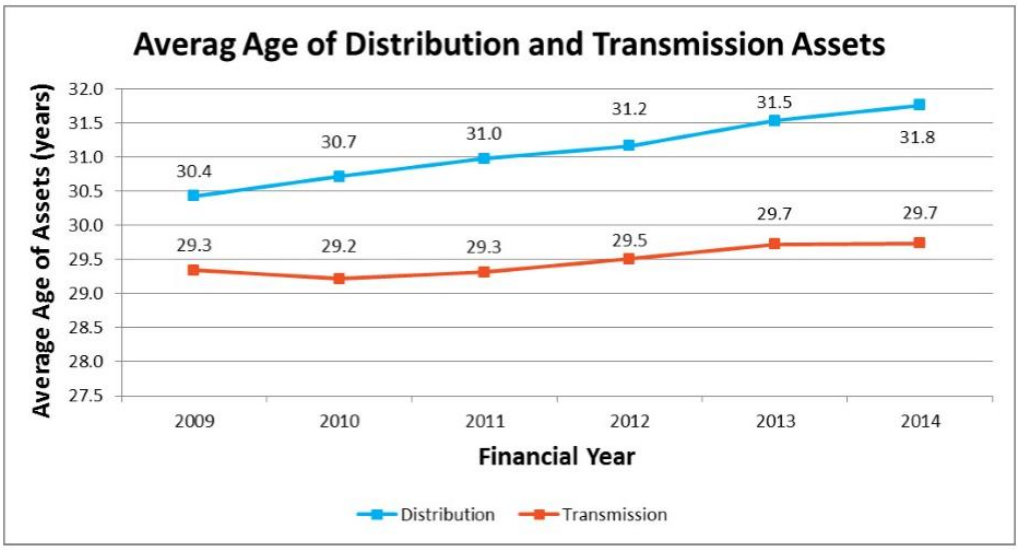


Figure 25: Average Asset Age for Current Regulatory Period

[16] It should be emphasised that the condition of assets and the management of failure risk is the strongest driver in the Replacement Plan. Replacement of a newer poorer-condition asset which may fail leading to a large customer outage is preferred to replacement of a pole where failure has more limited impact, and whose condition can be monitored through a regular inspection process.

Secondly, older assets begin to exhibit higher levels of faults which needed to be addressed where the risk of failure (ie. the impact on customers) is too high. The best way to address potential faults with high risks which may arise from aging infrastructure is to undertake expenditure on condition inspection programs and fix faulty assets when found where this is prudent to do so, or replace assets where the risks of potential faults are high. So repair (or refurbishment) or replacement depends on the specific circumstances of the asset. Even then failures may still occur for unforseen reasons and rapid response to fix these failures is required to maintain customer service.

Figure 24 and Figure 25 show that Ausgrid continued to find and fix a growing number of faults under its System Maintenance Plan. Even though opex in the System Maintenance Plan was maintained at the forecast level the annual number of breakdowns for distribution assets rose from 3,376 in FY2010 to 3,807 in FY2013 and for transmission assets they rose from 769 in FY2010 to 1,135 in FY2013 (refer to Section 7.2.1 for further discussion on opex).

From the high level data available, the need for substantial continuing Replacement Plan expenditure by Ausgrid appears warranted as the number of corrections and failures has not been suppressed this period by expenditure incurred.

6.3 Capex conclusion

The focus of Ausgrid's capex during the early years of the current regulatory period was delivery of the significant capital works program approved by the AER which had a particular focus on zone and sub-transmission assets. This represented a prudent response to delivering the volume of works contained in the regulatory allowance, which by definition is assumed to be a prudent and efficient program of expenditure, for both capex and opex.

Ausgrid began the current regulatory period by ramping up system capex[17] as well as investing heavily in supporting capex[18] such as fleet, property and IT to facilitate this investment and ongoing improved asset management. It then became clear that the volume of work forecasted and approved by the AER could not be delivered for the unit costs used in the original forecasts. This was due to a range of different factors including longer planning approval lead times for complex projects, higher levels of complexity in delivery than anticipated for some projects especially in brown field areas, and network specific characteristics such as population density and legacy design issues.

During FY2013 and FY2014 there was a ramp-down in capex with a shift in focus to more efficient delivery of a reduced work program. The ramp-down was possible because of a significant change in Ausgrid's corporate objective under Networks NSW and was further facilitated by favourable changes to external circumstances such as the continued lower levels of peak demand than forecast.

[17] System capex includes all of the capex on the nine primary plans associated with network infrastructure, including Area Plans, Replacement Plan, Duty of Care Plan, 11kV Plan, Low Voltage Plan, Customer Connections Plan, Reliability Plan, Metering Replacement Plan and Other Metering Plan.

[18] Supporting capex includes capex on five secondary plans associated with network support and non-network assets, including System Property Plan, Non-System Property Plan, System ICT Plan, Non-System ICT Plan and Fleet Plan.

The level of capex was also lower during these years as a result of the change in organisation structure and governance under Networks NSW which led to the delay of some works.

Notwithstanding the approved allowance by the AER, Ausgrid continually reassessed its capital requirements over the course of the regulatory period through multiple annual review processes. These processes exist explicitly to ensure ongoing investment is prudent and justified given the changing conditions within which Ausgrid (and all businesses) operate. It is our opinion that these frameworks are consistent with achieving the objectives of the NEO and working towards meeting licence criteria.

The ramp-down in the second half of the period was also made possible by improvements observed at that time in compliance and reliability metrics in a number of plan focus areas. These improvements were the result of investment in earlier years to resolve a significant compliance backlog combined with a plateau of coincident peak load, and in some instances a reduction in non-coincident peak load, arising from consumption changes within its customer base. This meant that reduced capex would not markedly compromise Ausgrid's network performance against the more onerous licence standards during this regulatory period.

All of these factors have led to a significant capex reduction over FY2013 and FY2014 to a level which is likely overshot on the down side. The current level of capex may not be sufficient for sustainable network performance in the future as potentially highlighted in the disaggregated non-compliance data for the 11kV Plan and the high level snapshot of key metrics relating to replacement.

Overall, it is expected that Ausgrid will underspend its capex allowance for the current regulatory period by 21% with the majority of this underspend attributable to the last two years of this regulatory period. Again, it should be noted that these last two years were when Ausgrid was undertaking a major organisational restructure in order to meet new corporate objectives.

Furthermore, the condition of Ausgrid's assets continues to be an ongoing focus to identify assets at risk and expenditure incurred to replace and maintain these has remained relatively constant over the period. Despite significant replacement investment incurred this period there appears to be an increasing trend of asset failures over the period which suggests that Ausgrid must continue to monitor and act on asset condition.

It is our view that the Ausgrid's actual capex during the current regulatory period has been prudent in response to:

- The initial need to invest heavily during FY2010, FY2011 and FY2012 based on the then condition of the network, the expectation of continued growth in peak demand, and the strong incentives in the regulatory determination consistent with the revised licence design planning criteria.
- The external factors which arose during the initial years of the regulatory period, including a drop-off in peak demand, improvements in various performance metrics, Ausgrid's response to these changes, and Network NSW's stronger focus on efficiency, which allowed it to reduce expenditure in FY2013 and FY2014.

It is our view that the efficiency of capex delivery by Ausgrid during FY2010 to FY2012 of the current regulatory period was likely affected by its focus on the

speed of project delivery, but for FY2013 and FY2014 the efficiency of delivery has improved markedly under the new business strategies.

It is also our view that given the current condition of the network and expectations of future peak demand growth (albeit likely at a slower rate than historical averages), there is an ongoing need for investment in the network to address asset condition deterioration, to stabilise increasing average asset age, and to meet additional hot-spot growth as it emerges.

7 Opex outcomes

This section looks at the opex outcomes at a high level.

7.1 Summary of Opex Plan Outcomes

Table 7 identifies each standard control opex plan and how actual expenditure compared with the regulatory allowance. The table shows that in total actual expenditure matched (99%) the allowance. Within this, some plans were underspent – such as Network Operations, Finance and Training and Development – while others were overspent – such as ICT and Property. The Appendices show additional detail against each Opex Plan, including sub-categories of expenditure.

Table 7: Allowed and actual expenditure by standard control Opex Plans

Standard Control - Opex Plans ($m nominal)	FY2010	FY2011	FY2012	FY2013	FY2014	Total	% Spend
System Maintenance	$227	$225	$221	$225	$240	$1,138	99%
System Maintenance (Determination)	$208	$217	$230	$241	$249	$1,145	
Network Operations	$59	$66	$72	$61	$66	$324	87%
Network Operations (Determination)	$68	$71	$76	$79	$80	$373	
ICT	$65	$64	$68	$62	$62	$321	125%
ICT (Determination)	$49	$49	$51	$53	$54	$257	
Property	$47	$50	$50	$53	$55	$254	104%
Property (Determination)	$48	$49	$49	$50	$48	$244	
Finance	$16	$12	$16	$15	$15	$74	84%
Finance (Determination)	$16	$17	$18	$19	$19	$89	
Training & Develop.	$32	$35	$32	$30	$31	$160	71%
Training & Develop. (Determination)	$41	$43	$46	$48	$49	$227	
Other Operations	$84	$85	$91	$99	$104	$463	99%
Other Operations (Determination)	$86	$89	$94	$99	$102	$470	
Total Adjustments	$5	-$1	$58	-$41	$19	$39	
Total Opex Spend	$535	$535	$608	$504	$592	$2,774	99%
Total Opex Determination	$517	$535	$563	$588	$600	$2,804	

The table shows the major drivers of the under expenditure were the Network Operations Plan and the Training & Development Plan while the Property Plan and ICT Plan were the major areas over spent.

Table 8 identifies the alternate control capex plan and how actual expenditure compared with the regulatory allowance.

Table 8: Allowed and actual expenditure by alternative control Opex Plan

Alternate Control - Opex Plan	FY2010	FY2011	FY2012	FY2013	FY2014	Total	% Spend
Street Lighting	$19	$20	$20	$20	$20	$97	141%
Street Lighting (Determination)	$12	$14	$14	$15	$15	$69	

The table shows the alternate control opex plan was somewhat over spent.

7.2 Major opex plans

Figure 26 identifies opex broken down by the plans being used by Ausgrid in its upcoming Substantive Proposal regulatory submission. The graph shows that system maintenance is the single largest opex item, and that it remained fairly constant over the current regulatory period.

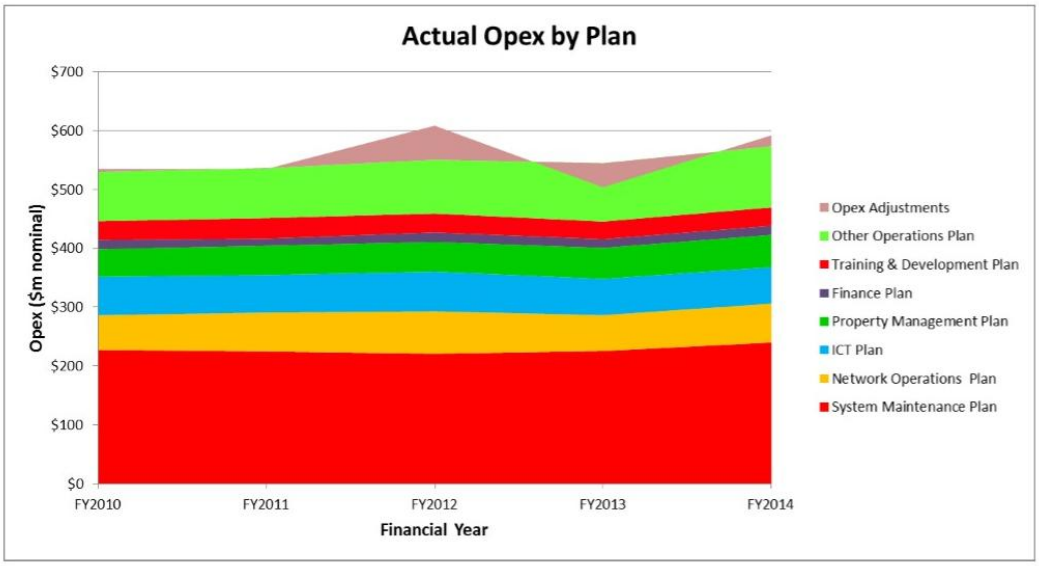
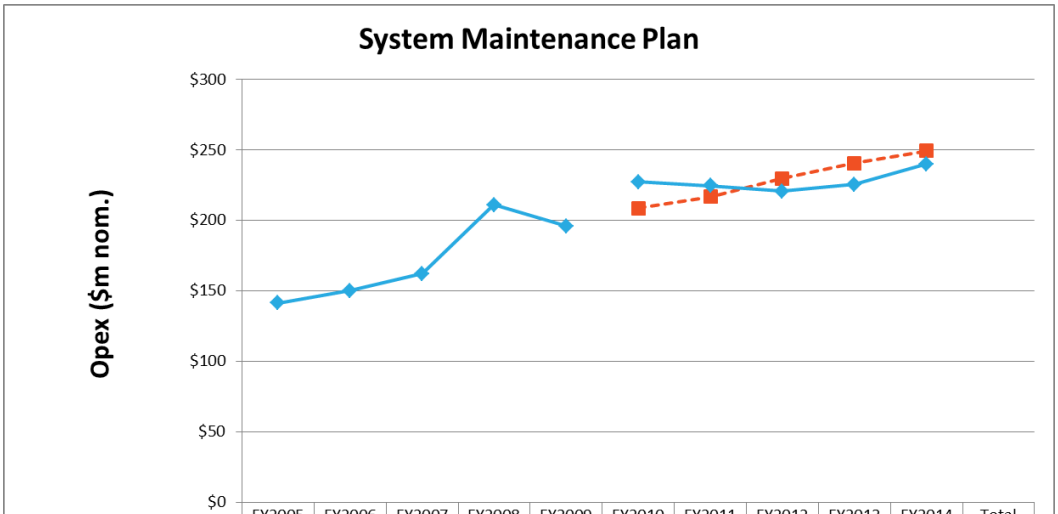


Figure 26: Ausgrid Open Plans and Expenditure

7.2.1 System Maintenance Plan

System maintenance activity is split by planned and reactive. Planned maintenance includes condition monitoring tasks and real time maintenance. Reactive maintenance includes corrective work to address conditional and functional failures which have been identified. The expenditures which occur against the System Maintenance Plan include expenditures on asset inspection, corrective maintenance, breakdown maintenance, nature induced breakdown repair, engineering support, 3rd party damage repair and other minor categories. Figure 27 shows the expenditure profile compared with the regulatory allowance and illustrates the significant increase in maintenance expenditure from the previous regulatory period in order to service what has been a network continually growing over time. Additional information on this plan is available in the Appendices.

The need for continuous maintenance and the need for inspection information to improve its asset management performance appear to have been a strong focus for Ausgrid this period. While the system maintenance expenditures are in total underspent by less than 1%, there is close correlation between forecast and actual expenditures during a period in which there were unexpected and significant other demands on staff to assist with the Capex Plans.



	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance						208.5	216.6	229.7	240.6	249.2	1,144.6
Actual	141.2	150.0	162.0	210.9	196.0	227.2	224.6	220.7	225.4	239.9	1,137.7
Delta ($) (allo - actu)						18.7	7.9	-8.9	-15.3	-9.3	-6.8
Delta (%)						9.0%	3.7%	-3.9%	-6.3%	-3.7%	-0.6%

Figure 27: Allowed and Actual Systems Maintenance Plan Opex

The need for higher system maintenance opex is linked to both the growth in size, the complexity of the network and the condition of network assets. As discussed above in Section 6.2.2, the condition of the assets has an impact on the maintenance requirements. Assets operating closer to their prescribed capacity or which are older generally have a higher need for inspections and maintenance. This appears to underlie the growth in the fault statistics found under the System Maintenance Plan, shown in Figure 28 and Figure 29 below for distribution and transmission respectively.[19]

[19] It should be noted that investment in ICT and high rates of routine field inspections this period has allowed better asset record keeping and may contribute somewhat to the increase depicted.

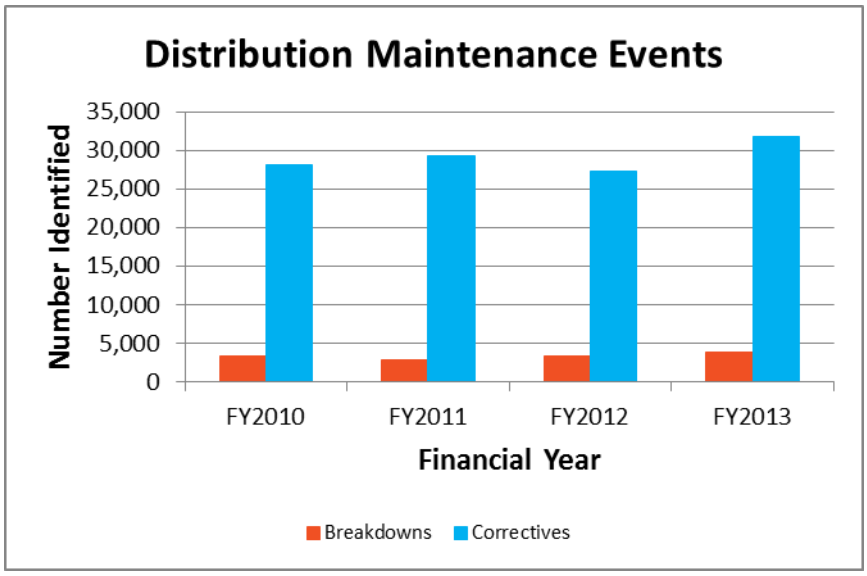


Figure 28: Distribution Conditional & Breakdown Maintenance Events

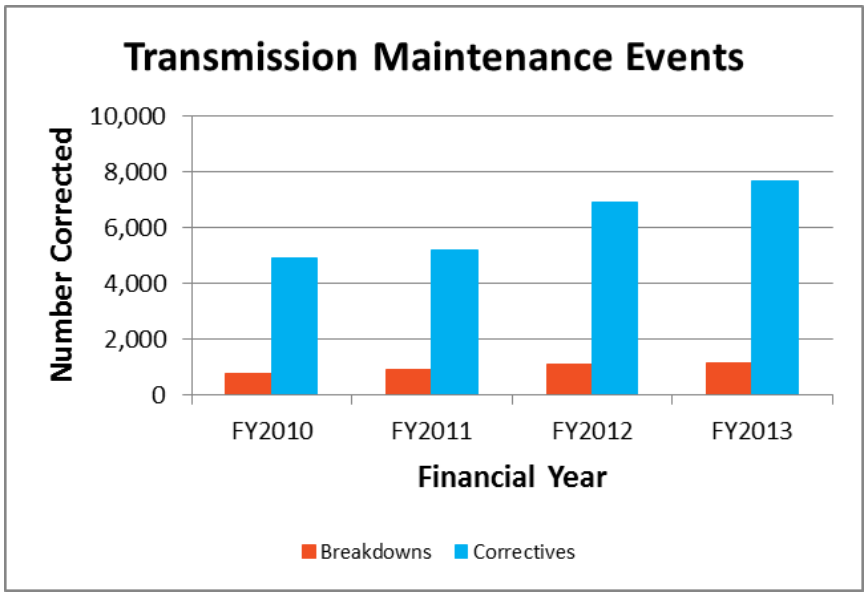


Figure 29: Transmission Conditional & Breakdown Maintenance Events

The corrective events show the number of conditional issues identified during maintenance and addressed prior to failure, thus preventing a breakdown. The breakdown events show the number of issues that, despite a well developed and implemented maintenance program, went through to full failure. These breakdown events may not have resulted in outages and/or service impacts on consumers, as many other operational and maintenance activities are in place to avoid or minimise these impacts.

The large number of corrective events relative to breakdown events highlights reasonable success in Ausgrid's planned maintenance and condition monitoring to address issues before they lead to breakdowns. The upward trend in both breakdowns and correctives reflects an increased asset deterioration rate as might be expected with an ageing asset base, and suggests a need for ongoing investment. However, there is also the possibility that the growth in both

corrective and breakdown events partly reflects acceptance of failure in assets where there is low risk on service delivery interruptions.

Ausgrid has indicated that the increase in Corrective Events saw an overspend of $23m for this maintenance category while the increase in Breakdown Events saw an overspend of $15m for this maintenance category relative to the allowance for the current regulatory period (see Appendices for more detail). Further the majority of corrective maintenance overspend occurred in the first three years of the period while the breakdown maintenance overspend was incurred across the entire period. This suggests that the condition of assets has likely worsened as a whole by the end of the period.

Despite this, Ausgrid's focus on systems maintenance has had some positive outcomes. Figure 30 shows that the number of inspections undertaken by Ausgrid has been consistent with those forecast at the beginning of the regulatory period, at close to or above 100% of the target.

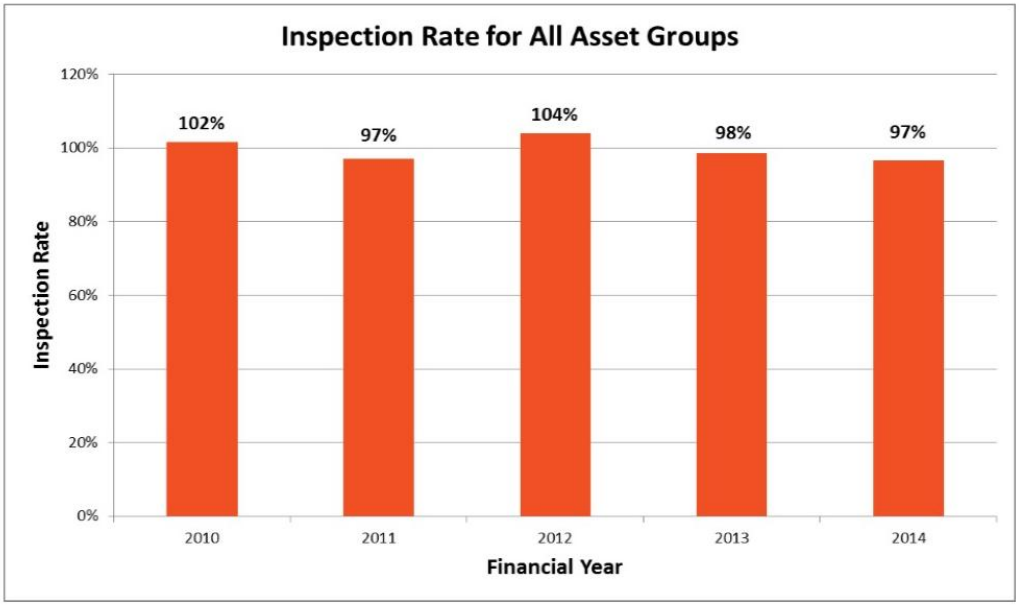


Figure 30: Asset Inspection Rate Actual / Planned

Available unit cost data in Figure 31 also shows that while initially rising, the average cost of distribution and zone substation inspections has decreased from $717 and $423 in FY2012 to $500 and $315 respectively over this period. For distribution mains inspection the average cost has decreased from $125 in FY2010 to stabilise around $103 by the end of the period. This suggests a general improvement in inspection productivity over this period.

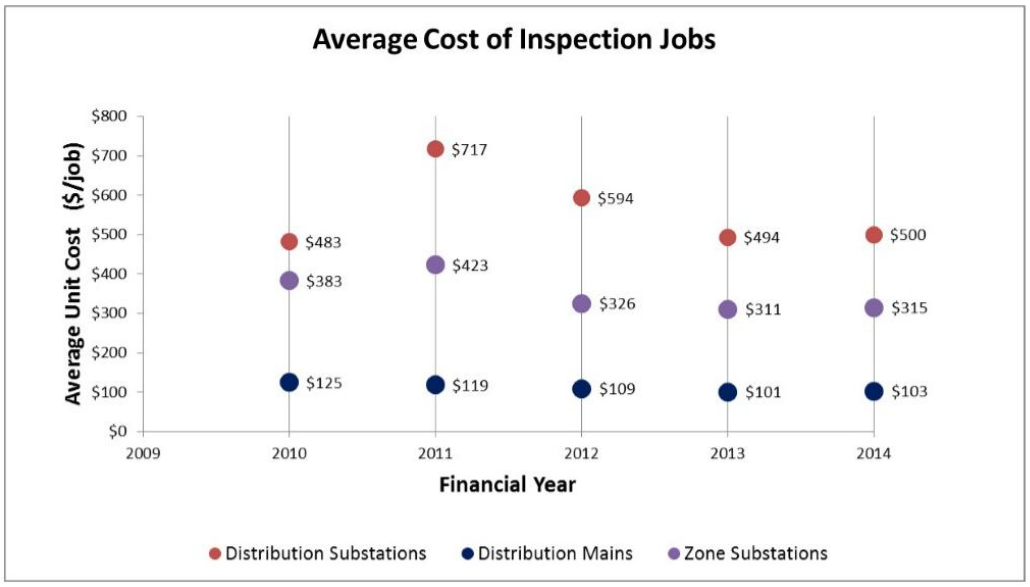


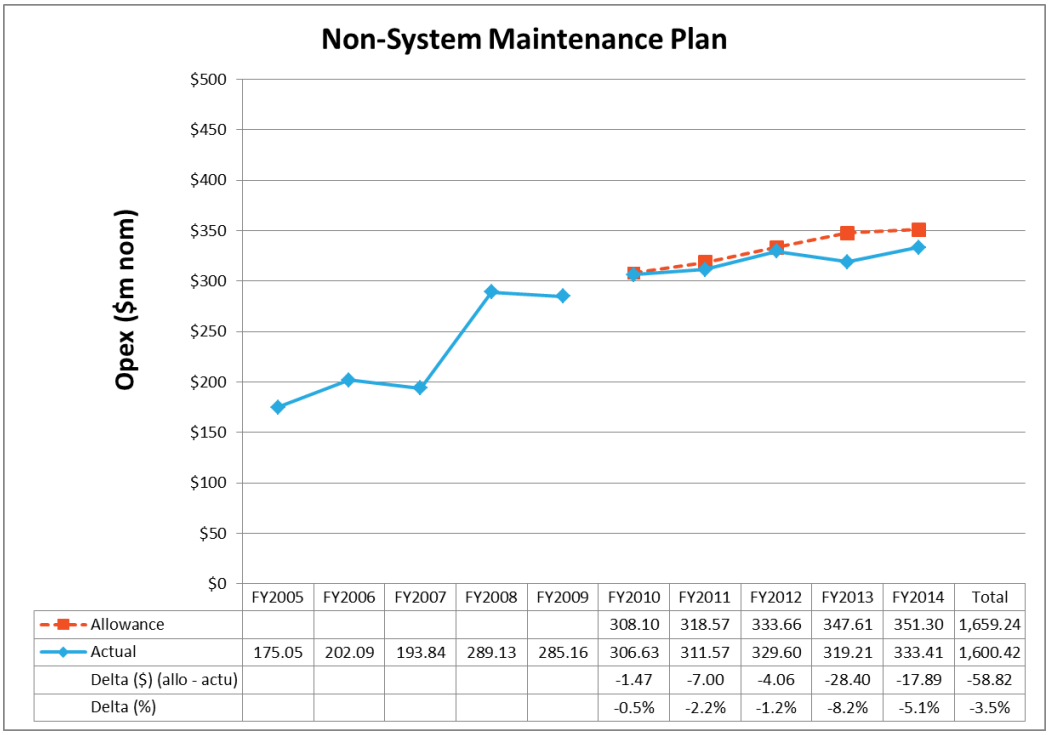
Figure 31: Asset Inspection Average Costs

It is important to highlight this outcome as the need to efficiently identify potential network issues and to get these fixed becomes important when the other approach of replacing tired or old assets is not available.

While significant maintenance expenditure has bought Ausgrid some time, and allowed it to defer a large amount of replacement expenditure under the Replacement Plan, it is unrealistic to expect that asset failures can continue to be managed without a return to a focus on the Replacement Plan, and a reasonable forward allowance for expenditure in this area.

7.2.2 Non-system maintenance opex plans

Non-system maintenance opex includes opex related to Network Operations, ICT, Property, Finance, Training and Development and Other Operations Plans. In effect it is opex incurred on engineering support which is not capitalised, corporate back office functions and legal requirements such as land tax. Figure 32 shows that non maintenance opex has remained relatively constant over the period and at a level slightly below the regulatory allowance. Additional information on these plans is available in the Appendices.



	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance						308.10	318.57	333.66	347.61	351.30	1,659.24
Actual	175.05	202.09	193.84	289.13	285.16	306.63	311.57	329.60	319.21	333.41	1,600.42
Delta ($) (allo - actu)						-1.47	-7.00	-4.06	-28.40	-17.89	-58.82
Delta (%)						-0.5%	-2.2%	-1.2%	-8.2%	-5.1%	-3.5%

Figure 32: Allowed and Actual Non-System Maintenance Plan Opex

Note: Includes Network Operations, ICT, Property Management, Finance, Training & Development and Other Operations Plans.

While the overall level of non-maintenance opex closely tracked the regulatory allowance, some expenditure areas were above the allowance and others below. The major area of over expenditure was in relation to ICT where the allowance was exceeded by approximately 25%. This corresponded with ICT capex made over multiple previous regulatory periods. The opex overspend on ICT was counteracted by lower than forecast expenditure on areas such as finance functions and training and development. The outcomes show that Ausgrid has been able to offset overspends against underspends in certain areas to remain within its overall opex allowance.

7.3 Opex conclusion

The level of opex that Ausgrid incurred for the current regulatory period has been heavily influenced by the level of system maintenance required and approved, the size of its workforce (which has been geared up to deliver the large increase in capex approved by the AER), an ageing and specialist workforce with an historically low natural attrition rate, and the Award structure under which most employees are employed and which does not allow mandatory redundancy programs.

As a result it is likely that the current level of opex will be difficult to reduce quickly, although restructuring of the business which is currently being undertaken by Ausgrid may allow further productivity improvements over time. Ausgrid has indicated that opex for the 2014-19 Regulatory Period does not include stranded labour costs as a result of the lower capex program.

It is evident that from FY2012 Ausgrid began to focus on improvements to allow it to more efficiently deliver its ongoing maintenance activities. Such initiatives include the reduction in staff numbers through natural attrition from an aging workforce. This saw the first reduction in the staff numbers in over a decade and indicates a growing awareness by Ausgrid that it needs to balance its workforce numbers and experience levels to meet its current investment levels, general asset management and long-term planning needs. The early rise in apprentice intakes from the beginning of the prior regulatory period has allowed Ausgrid's experience base to be refreshed and provided additional staff for the increase in the capex program. The shift to a lower and more sustainable level of apprentice intake in the last two years of the current regulatory period is an example where Ausgrid has made significant step changes in opex in the short-term, while longer term opex initiatives are implemented and begin to take effect.

These longer term opex initiatives include a combination of voluntary redundancies, natural attrition and technological development, and are forecasted to deliver net opex savings over future years. Ausgrid has indicated that net savings in opex can be achieved in the next regulatory period, and these net savings will grow in future years.

Where Ausgrid has encountered unexpected business needs or asset issues this period, it has demonstrated an ability to adapt and limit its opex to the allowed level overall, and position itself for future improvement. This shows a strong level of management by Ausgrid of its overall opex allowance and its ability to prudently reprioritise expenditure as needs arise. An example of this was the case of system maintenance where Ausgrid looked at ways to reduce core maintenance operations by reducing overheads and reviewing the strategic deployment of its maintenance resources. Another example is the continued investment in non-network opex such as ICT where savings were able to be made in other capex and opex areas through better access to more up-to-date asset location and condition information. This can be viewed as the building block for better asset management in the future. A continuation of focus on asset management improvement should ensure that the significant capex incurred to upgrade Ausgrid's IT systems over the prior and current regulatory periods can support a continued reduction in capex and opex requirements, through better knowledge of its network infrastructure.

Overall, Ausgrid has indicated it is seeking to establish a sustainable level of opex commensurate with the size, complexity and ongoing requirements of its network. It is likely that efficiency initiatives put in place during the last two years of the current regulatory period and continuing in the next regulatory period will not yield net opex savings until sometime into the next regulatory period. This is as a result of additional restructuring costs.

Appendix A

Ausgrid Expenditure Structure.

A1 Ausgrid's expenditure categorisation

Ausgrid supplied standard control services and alternative control services during the 2009-14 Regulatory Period. It undertakes expenditures to support the provision of these standard control services and alternative control services.

Ausgrid splits it expenditure into capex and opex. Capex is then split between 'system' (i.e. capital expenditure on the electricity network its self) and 'supporting' (i.e. supporting or non-system capital expenditure such as depots). Opex accounts for all expenditure not directly booked to particular capital activities. Figure 33 is a diagrammatic representation of the expenditure sub-categories which are examined in the following Appendices.

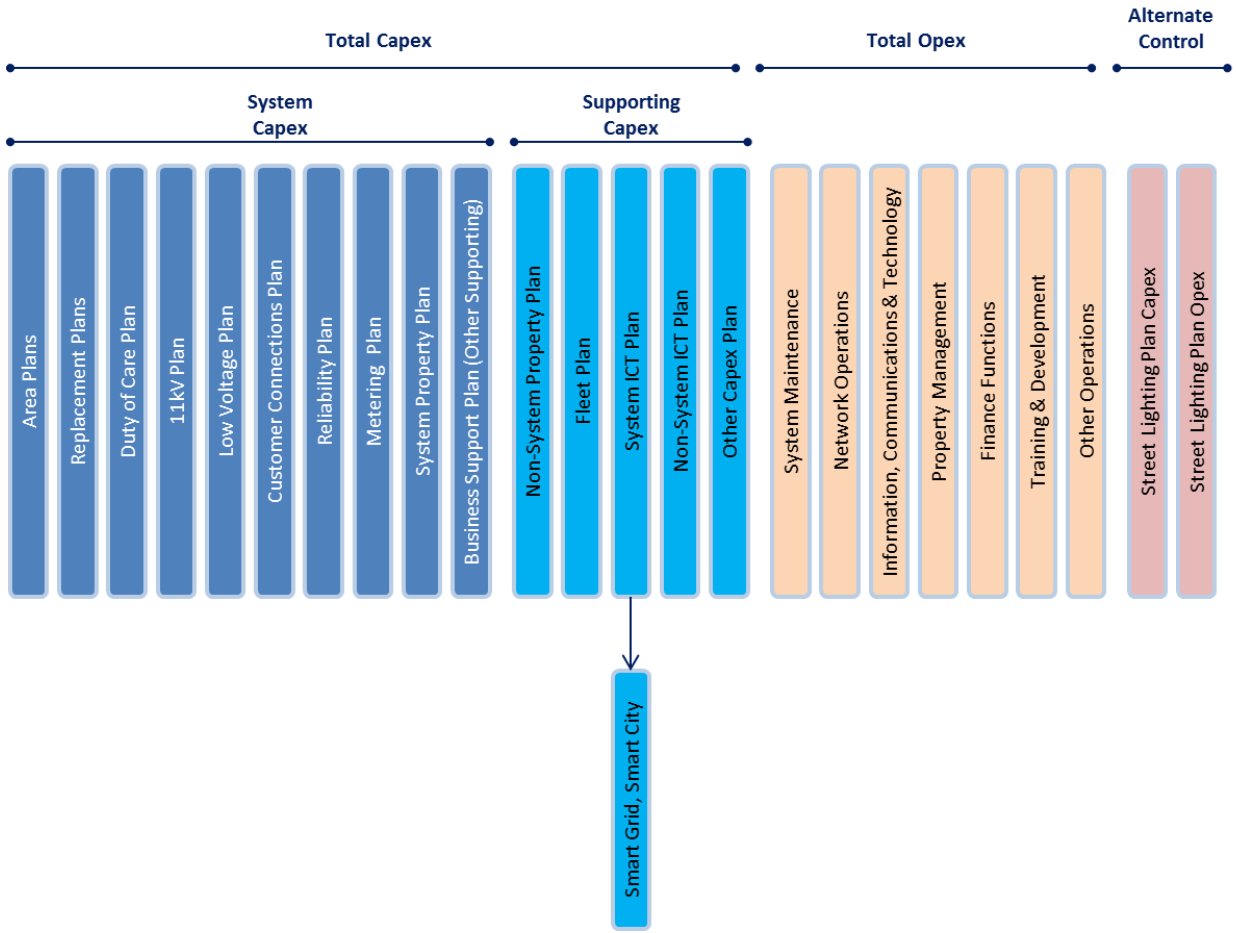


Figure 33: Ausgrid's approach to expenditure categorisation

Appendix B

Capex Plans

B1 Capex Plans

This section analyses each of the following capital expenditure plans related to delivery of standard control services:

- Area Plans
- Replacement Plans
- Duty of Care Plan
- 11kV plan
- Low Voltage Plan
- Customer Connections Plan
- Reliability Plan
- Metering Plan (combining Replacement and Other Metering)
- System Property Plan
- Non-system Property Plan
- Non-system ICT Plan
- System ICT Plan
- Smart Grid Smart City
- Other Capex Plan
- Fleet Plan
- Business Support Plan

B2 Area Plans

B2.1 Description

The Area Plans are developed for growth and major replacement driven capital expenditure on the transmission and sub-transmission assets. This includes substations, switchgear and protection equipment operating between 132kV, 66kV, 33kV, 22kV and 11kV, and feeders at all these voltages except 11kV (which are the focus of the 11kV Plan). There are 28 Area Plans, 3 of which relate to transmission assets and 25 relate to sub-transmission assets. These 28 Area Plans are grouped into 6 regions throughout the Ausgrid franchise area.

The development of the Area Plans follows a defined process, and this approach has not substantially changed from the last to the current regulatory period.

The aim of the Area Plans is to have these updated approximately every two years and amended to accommodate the changes in the internal and external environment which impact on the need for increased or reduced investment in each area.

At the beginning of the current regulatory period there were a significant number of sub-transmission assets which were aging and due for replacement and continued forecast load growth where many assets were actually or likely to be operating beyond their firm capacity. Assets operating beyond capacity are at significantly increased risk of premature ageing which could lead to early failure and reduced reliability of energy supply, with a resultant increase in required investment over the long term. The key drivers of expenditure in Ausgrid's Area Plan 2008 submissions for this period were that:

- System load growth was expected to increase at around 2% to 3% per annum over the regulatory period, placing more equipment beyond their firm capacity and further stretching many already heavily loaded assets.
- There were significant concerns with the reliability of specific assets groups such as 11kV switchgear which were at or would be beyond their assessed condition for replacement during the current regulatory period.
- Changes to licence conditions relating to design criteria and reliability meant many sub-transmission and 11kV assets were no longer compliant or were predicted to become non-complaint within the regulatory period.
- Ausgrid had concerns that many of its oil filled underground (and submarine) cables were nearing the end of their useful life and represented a pollution risk where there was a higher probability of a leak in breach of the 5 litres per day limit agreed with the EPA.
- There were concerns that many of Ausgrid's gas filled underground cables where also reaching the end of their useful lives, and had an increased likelihood of failure leading to increased outage risk to supply for some customers.

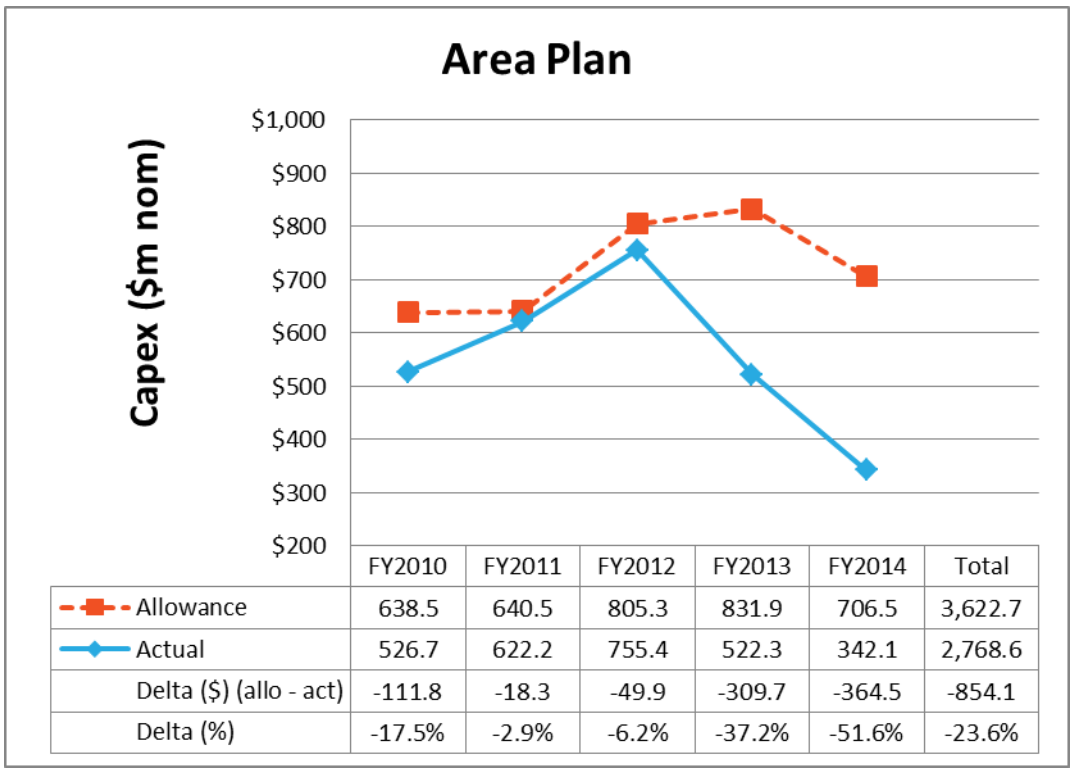
For these and other reasons, Ausgrid sought a significant increase in capex for the current five year regulatory period by greater than a factor of 3 above the prior period. This review capex for Area Plans for this period involves an analysis of:

- Expenditure;

- Project delivery, including issues and reconciliation;
- Performance against licence conditions; and
- Key findings, including lessons learnt and Arup's Conclusions.

B2.2 Expenditure

Overall, Ausgrid did not overspend the capital expenditure allowance provided by the AER for the current regulatory period. Indeed at $2,768.6 million the actual expenditures for the current period are forecast to be 23.6% below the expenditure approved by the AER at $3,622.7 million. Figure 34 summarises Ausgrid's expenditure on Area Plans for the 2009-14 Regulatory Period.



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	638.5	640.5	805.3	831.9	706.5	3,622.7
Actual	526.7	622.2	755.4	522.3	342.1	2,768.6
Delta ($) (allo - act)	-111.8	-18.3	-49.9	-309.7	-364.5	-854.1
Delta (%)	-17.5%	-2.9%	-6.2%	-37.2%	-51.6%	-23.6%

Figure 34: Allowed and actual Area Plan total capital expenditure

The reasons for the changes to the Area Plans expenditure profile are described in the following paragraphs by the period in which internal and external factors affected the capex outcomes.

B2.2.1 Financial Year 2009/10

Ausgrid was unable to ramp up its capital expenditure to the AER's approved level in FY2010, and underspent by 17.5%. The reasons for underspend included:

- The time required to mobilise more staff to the project management and implementation functions, and for liaison with the Alliance partners (a new outsourcing arrangement for Ausgrid refer to Section 5.1.6 for further information), as they ramped up their allocated projects;
- The time required to hire more staff to assist the planning, design and project management functions;

- Procurement lead times delayed project starts as many projects were not given internal approval until after the AER's regulatory determination had become clear; and
- Unexpected complexities associated with brownfield investment which slowed project progress when compared to forecast timeframes. This was largely driven by the change in design standards under AS2067and Ausgrid's need to review more project options for large scale capital investment projects at zone and sub-transmission levels, in brownfield environments.

B2.2.2 Financial Year 2010/11

During FY2011 Ausgrid was closer to the approved capital expenditure and only under spent by 2.9%. This result was affected by:

- Overspend on a project-by-project basis against the original forecasts, primarily because Ausgrid had not in recent history simultaneously undertaken the large number or variety of transmission and sub-transmission projects it was proposing which meant that its unit cost base knowledge for the proposed scope of work was poor;
- Under delivered on the number of projects which it initially planned to deliver in the earlier years of the regulatory period, through either:
  - More time spent rectifying and approving designs provided by the Alliances than planned; and
  - Lack of availability of field crews to undertake the required number of projects; and

B2.2.3 Financial Year 2011/12

During FY2012 Ausgrid's capital expenditure program again underspent, but by a larger amount at 6.2%. During this year and particularly from late 2011, a number of changes to the external economic environment began to be recognised and through network investment governance processes some projects began to be deferred or cancelled. The main driver of this change was reduced growth or falling non-coincident peak demand in different zones of the network.

Scrutiny from the government processes related to the NSW electricity reform program (NERP) which in December 2011 began to explore approaches to relieving pressure for continuing electricity price increases, and which eventually resulted in the appointment of a common chairman, board and CEO in May 2012 with the setup of Networks NSW.

B2.2.4 Financial Years 2012/13 and 2013/14

During FY2013 and FY 2014, there were significant reductions in the capex program with falls of 37.2% and 51.6% respectively from the allowance provided by the AER. There are a number of reasons for this reduction and these included:

- Finalisation of new Investment Governance Framework which required the organisation to come up to speed with the new processes and meant that projects with large investment commitments took longer to bring forward for CEO and Board approval;

- Delays resulting from the restructure of the Ausgrid senior management positions within Ausgrid and the continuing flow down of such restructuring to lower levels within the organisation;
- Coincident system peak demand was not growing as fast as forecast at the beginning of the current regulatory period or had flattened. This meant that significant amounts of investment could be deferred until future regulatory periods.
- The number of non-compliant substations and feeders were beginning to be reduced because of:
    - The earlier capital expenditure projects beginning to off-load critical older infrastructure;
    - A slowing of the number non-compliant installations being identified following the initial acceleration leading from the changes to licence conditions in 2007;
    - Entering the current regulatory period Ausgrid had a strong focus on catching up on identified and backlog of non-compliant infrastructure which required correction (albeit recent further changes to Ausgrid's licence conditions have relieved the hurdle for non-compliance, but shifted the risk of determining the standard levels of performance to Ausgrid);
    - A fall in non-coincident peak demand at a large number of zone and sub-transmission substations relieved pressure on the possibility of negative reliability events (albeit hot spots continue to be addressed with the aim to address all non-compliances by the end of the current regulatory period) ;
    - Relieving pressure on non-compliant and reliability concerns in many of the Area Plans through installation of new zone substations which unloaded older substations and equipment reducing the chance of failure;
- The internal Management Planning process requiring deferral of projects and this has been reflected in the updated Area Plans.

Figure 35 indicates the breakdown of the actual capital expenditures into the 6 regions of Ausgrid's franchise area. It is clear that most of the capital expenditures in the Area Plans occurred in the Sydney East / CBD region and CBD transmission, with a peak in expenditure in the FY2012.

The 6 regions in decreasing order of capital expenditure in the current regulatory period are:

- Sydney East and CBD;
- Lower Hunter;
- South;
- Sydney North;
- Central Coast; and
- Upper Hunter.

The CBD transmission work has been separated as it relates to CBD plus other regions.

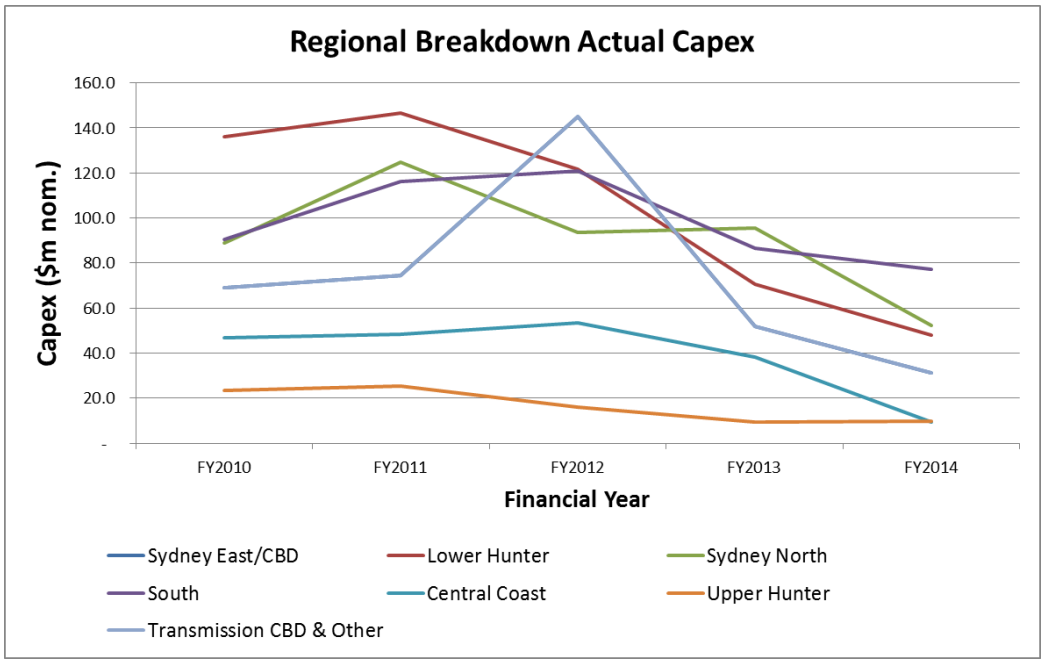


Figure 35: Regional breakdown of actual capital expenditure

Each of the 6 regions has specific Area Plans associated with management of the investment in infrastructure in those regions. Table 9 to Table 15 indicate the actual capex versus the AER's regulatory allowance for each of the 3 transmission (highlighted) and 25 sub-transmission Area Plans, and the level of under or over spend in each.

Area	Total Actual ($m)	Allowance ($m)	Difference ($m)	Difference (%)
Sydney CBD Area Strategy (SCAS)	$398.50	$599.42	-$200.92	-33.5%
Eastern Suburbs Area Strategy (ESAS)	$198.81	$256.87	-$58.07	-22.6%
Camperdown Blackwattle Bay Area Strategy (CBBAS)	$49.06	$84.48	-$35.42	-41.9%

Table 9: Sydney East / CBD actual capex versus regulatory allowance

Area	Total Actual($m)	Allowance ($m)	Difference ($m)	Difference (%)
Lower North Shore Area Strategy (LNAS)	$205.30	$252.18	-$46.88	-18.6%
Upper North Shore Area Strategy (UNAS)	$70.85	$57.33	$13.51	23.6%
Carlingford Area Strategy (CAS)	$60.91	$76.45	-$15.54	-20.3%
Manly Warringah Area Strategy (MWAS)	$82.67	$116.78	-$34.11	-29.2%
Pittwater Area Strategy (PAS)	$11.18	$12.40	-$1.22	-9.8%
North West Sydney Area Strategy (NWSAS)	$24.12	$9.59	$14.53	151.5%

Table 10: Sydney North actual capex versus regulatory allowance

Area	Total Actual ($m)	Allowance ($m)	Difference ($m)	Difference (%)
St George Area Strategy (StGAS)	$79.00	$109.08	-$30.09	-27.6%
Sutherland Area Strategy (SAS)	$135.22	$167.54	-$32.32	-19.3%
Canterbury Bankstown Area Strategy (CBAS)	$154.74	$178.04	-$23.30	-13.1%
Inner West Area Strategy (IWAS)	$122.74	$211.58	-$88.85	-42.0%

Table 11: South actual capex versus regulatory allowance

Area	Total Actual ($m)	Allowance ($m)	Difference ($m)	Difference (%)
Central Coast Transmission Strategy (CCTS)	$4.13	$38.40	-$34.27	-89.2%
Lower Central Coast Area Strategy (LCCAS)	$141.43	$117.89	$23.54	20.0%
Upper Central Coast Area Strategy (UCCAS)	$51.01	$94.10	-$43.09	-45.8%

Table 12: Central Coast actual capex versus regulatory allowance

Area	Total Actual ($m)	Allowance ($m)	Difference ($m)	Difference (%)
Lower Hunter Transmission Strategy (LHTS)	$61.39	$73.45	-$12.06	-16.4%
Newcastle Inner City Area Strategy (NICAS)	$96.64	$94.49	$2.15	2.3%
Newcastle Ports Area Strategy (NPAS)	$57.03	$90.21	-$33.18	-36.8%
Newcastle Western Corridor Area Strategy (NWCAS)	$1.38	$23.72	-$22.35	-94.2%
West Lake Macquarie Area Strategy (WLMAS)	$33.85	$67.81	-$33.96	-50.1%
North East Lake Macquarie Area Strategy (NELMAS)	$45.97	$59.63	-$13.66	-22.9%
Maitland Area Strategy (MAS)	$75.86	$76.44	-$0.58	-0.8%
Greater Cessnock Area Strategy (GCAS)	$30.58	$85.89	-$55.31	-64.4%
Port Stephens Area Strategy (PSAS)	$119.85	$100.63	$19.22	19.1%

Table 13: Lower Hunter actual capex versus regulatory allowance

Area	Total Actual ($m)	Allowance ($m)	Difference ($m)	Difference (%)
Singleton Area Strategy (SAS)	$15.03	$18.38	-$3.35	-18.2%
Upper Hunter Area Strategy (UHAS)	$69.16	$143.83	-$74.67	-51.9%

Table 14: Upper Hunter actual capex versus regulatory allowance

Area	Total Actual ($m)	Allowance ($m)	Difference ($m)	Difference (%)
Sydney Inner Metro Transmission Strategy (SIMTS)	$372.20	$338.20	$33.99	10.1%

Table 15: Transmission projects CBD and Other

The decision processes embedded in the development of Area Plans are complex and as decisions are made in each region, and at the zone sub-transmission substation level, the reasons and justification for particular capex outcomes are summarised within the detailed reports for each individual Area Plan. A broad summary of key reasons is provided in this report.

The following sections look first at the general performance position at the beginning of the regulatory period, and then the outcomes based on knowledge towards the end of the regulatory period.

B2.3 Project Delivery

B2.3.1 Summary of Issues with Project Delivery

Ausgrid had a lower than forecast capex on its Area Plans because external and internal factors beyond its control meant it under delivered the number of projects it forecast and requested for funding from the AER. Based on our conversations with Ausgrid staff and documentation obtained, the main reasons for this under delivery were:

- Ausgrid encountered significant challenges in brownfield areas which it had not factored into its forecast. This ultimately resulted in greater commitment of internal resources to individual projects, increased costs for certain works and required a longer delivery time. Upon review Ausgrid feels that it faced a severe learning curve this period in terms of delivering a large number of large scale investment projects compared to prior regulatory periods.
- Change in conditions in the external environment such as falling peak demand led Ausgrid to undertake significant reviews of its Area Plans during the period and this resulted in a prudent deferral of some of the approved capex. This prudent deferral of capex also coincided with changing corporate objectives regarding the need to curtail optional short-term investment because of the risks associated with rising debt levels and the increase in price for customers.
- The use of Alliance agreements successfully delivered a large volume of identified and/or forecasted sub-transmission work but in the initial phase of work utilised more input from Ausgrid engineering resources than was expected. This resulted in a shortage of engineering staff that could be used on other Ausgrid run projects especially in the first half of the current regulatory period.
- Significant changes to Ausgrid's organisation restructure and governance procedures in the second half of the regulatory period further delayed major projects.

B2.3.2 Reconciliation of Projects Delivered

As part of the review process, the delivery of major works relative to forecast was examined. The focus of this section is on the large assets of major substations (zone and sub-transmission), sub-transmission feeders and 11kV switchgear which accounted for the majority of forecasted Area Plan expenditure in Ausgrid's last submission.

Table 16 below shows the actual outcomes of the major project work undertaken during the current regulatory period. Ausgrid commissioned 30 major substations and decommissioned 16 major substations during the period. This was significantly less than the 42 major substations forecast to be commissioned and 32 major substations forecast to be decommissioned in Ausgrid's prior Regulatory Proposal[20]. Ausgrid has attributed this under delivery of major substation work to a combination of either:

[20] Ausgrid FY10-14 Regulatory Proposal, p.78.

- the unexpected fall in peak demand across most regions which allowed Ausgrid to defer investment on certain major substations; or
- longer lead times in transferring 11kV customer supply which delayed de-energising (and decommissioning) major substations.

Substation Outcome	FY2010	FY2011	FY2012	FY2013	Jan 2014	Total
Commissioned	9	7	4	7	3	30
Decommissioned	1	5	4	5	1	16

Table 16: Zone and Sub-transmission Substation Outcomes

Furthermore another large component of Ausgrid's Area Plans forecast for the previous Regulatory Proposal was centred on the replacement of sub-transmission cables. The results of this sub-transmission cable replacement are summarised in Table 17. In its Regulatory Proposal Ausgrid proposed that it would replace 155km of 33kV pressure and solid cable[21]. Ausgrid achieved this target by replacing 156.2km of this cable with 83km of replacement XLPE cable. In addition, Ausgrid had forecasted that it would replace 141km of 132kV pressure cable. Ausgrid was unable to deliver this target and has replaced to date, 27.5km of cable with 117.6km of predominantly XLPE cable.

Ausgrid expects to replace another 50km of 132kV pressure cable in FY2014 which would increase its delivery to half of what was forecast. Ausgrid has attributed this under delivery of 132kV cables to unexpected delays in delivery in brownfield zones. These delays led to a strategic reassessment of how to replace these 132kV sub-transmission cables in a more cost effective way. This strategic reassessment has meant that the replacement of 132kV cables has been pushed out over a longer period of time.

Cable Outcome	Km Retired	Km Installed	Additional Km of Cables
Underground 33kV Cables	-156.2	83.0	0.0
Underground 132kV Cables	-27.5	117.6	90.2
Total Underground Cable	-183.7	200.6	90.2

Table 17: Sub-transmission Feeder Outcomes (completed and committed)

Finally a significant proportion of Ausgrid's forecasted expenditure on Area Plans was attributed to 11kV switchgear replacement. We have reviewed this asset category as it was an example of where Ausgrid faced significant challenges in delivering projects in a brownfield environment and where the costs of actual delivery far exceeded the forecast cost. The results of 11kV switchgear replacement are provided in Table 18. In its Regulatory Proposal, Ausgrid forecasted that it would replace 1,263 panels of 11kV switchgear[22]. By the end of FY2014, Ausgrid is expected to have replaced 446 panels. The unanticipated difficulties that Ausgrid encountered in its 11kV switchgear replacement program primarily related to:

- Poor existing design documentation on many brownfield sites;

[21] Ausgrid FY10-14 Regulatory Proposal, p.78.
[22] Ausgrid FY10-14 Regulatory Proposal, p.78.

- Ensuring continuing supply at sites which proved to be expensive, complicated and time consuming;
- Changes in Australian Standards for building codes which meant that existing housing could not be reused which resulted in unexpected major civil construction;
- Difficulties in navigating around other infrastructure built below or around some major substations;
- Safety issues (primarily proximity to live wires) which were unforeseen during planning but encountered at implementation and exacerbated by the above two points; and
- Changes to switchgear and other equipment contracts during the regulatory period.

Ausgrid contends that as a result of minimal 11kV switchgear replacement undertaken in prior regulatory periods it had limited experience of the implementation issues it encountered and these were not factored into its forecasts for 11kV switchgear replacement. This increased delivery times, increased costs and resulted in Ausgrid taking on a substantial amount of operational risk. These risks included the potential for fire damage to the substation and a loss of energy supply as a result of faulty 11kV switchgear. Because of this high risk there has been a significant carryover of these works into the next regulatory period.

Switchgear Outcome	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Retirement via Zone Substation Decommissioning	6	67	108	95	2	278
Retirement via 'Like for Like'	22	0	25	72	49	168
Total Retired	28	67	133	167	51	446

Table 18: Switchgear Panel Retirement Outcomes

B2.4 Licence Compliance

Following the changes to the licence conditions in 2005 and again in 2007, the number of non-compliant substations at the zone and sub-transmission levels and non-compliant feeders at the sub-transmission level were, at the beginning of the current regulatory period, were higher than was acceptable.

During the current regulatory period Ausgrid has performed strongly in rectifying instances of non-compliance against its licence conditions. Based on the evidence it has obtained, Arup has identified three key reasons for Ausgrid's strong performance to improve licence compliance for its transmission and sub-transmission network during the current regulatory period. These are:

- the significant investment that Ausgrid made in Area Plans this period relative to previous periods which resolved backlogged issues coming into this period as well as newly identified compliance issues;
- the unexpected plateau in coincident peak demand which reduced forecasted non-compliances; and

- The establishment of the Alliance agreements whose focus was to assist Ausgrid to execute a large volume of projects in its sub-transmission network (refer to 5.1.6 of the main Report) within the current regulatory period.

The figures below show the number of non-compliant zone and sub-transmission substations, and sub-transmission feeders recognised each year of the current regulatory period. The total for each year comprises the new non-compliances identified in the relevant year and any non-compliance identified in previous years, but not yet rectified.

For the early part of the current regulatory period, the count of non-compliances was either high or growing, suggesting an overall problem with the general network condition.

Figure 36 indicates zone substation non-compliance for the current regulatory period.

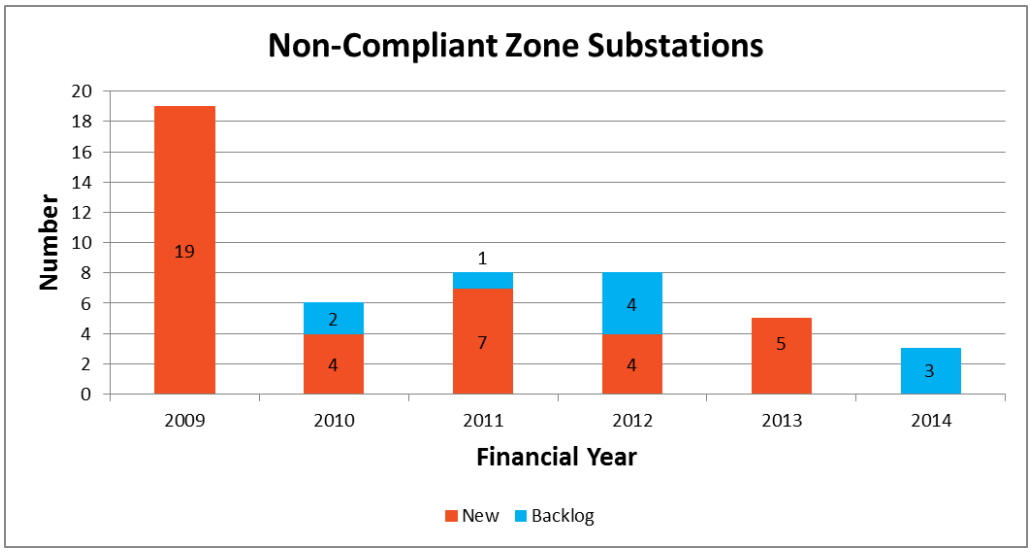


Figure 36: Zone Substation Non-Compliance

The highest number of non-compliances in this regulatory period occurred in FY2011 and FY2012, with gradual improvement thereafter. By the end of this period there are forecast to be only three zone substations which will be non-compliant and would require rectification in the following regulatory period under current licence conditions. These are:

- Leichhardt (Inner West);
- City Central (Sydney CBD); and
- City South (Sydney CBD).

Depending on the approach taken by Ausgrid to implement the new licence conditions, these zone substations may form part of the carry-over expenditure into the next regulatory period.

Figure 37 shows that at the beginning of the current regulatory period there were significant concerns regarding the lack of compliance in sub-transmission substations. Ausgrid has indicated these concerns are forecast to be mitigated by the end of the period.

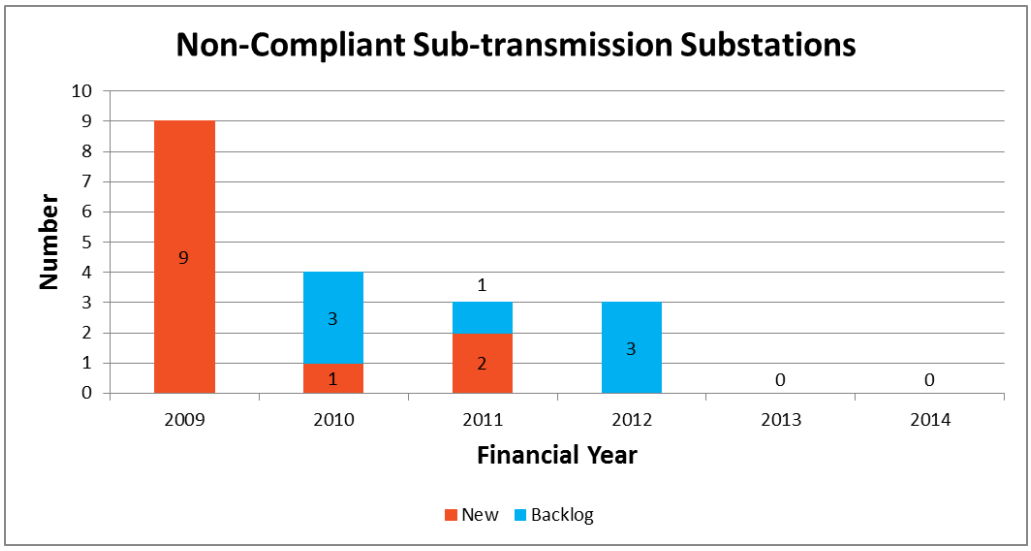


Figure 37: Sub-Transmission Substation Non-Compliance

These non-compliances were completely addressed by the end of FY2012.

Figure 38 shows the non-compliance of sub-transmission feeders. Entering the current regulatory period, there seemed to be less immediate concerns with sub-transmission feeders, but a refocus on monitoring of the feeders identified a large number of non-compliances early in the current regulatory period which needed to be addressed. Some increase may have been provided by the de-rating of feeders during the period.

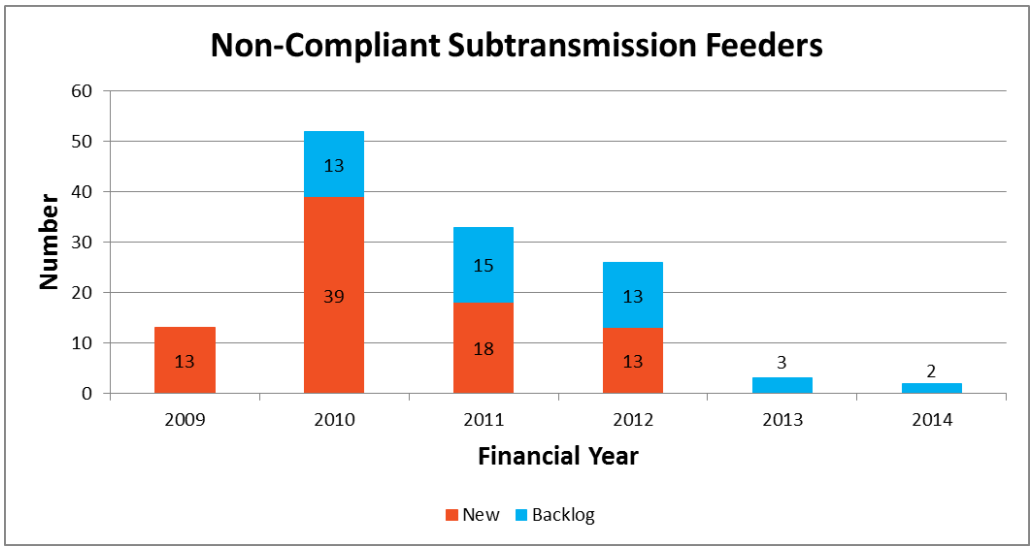


Figure 38: Sub-transmission Feeder Non-compliance

The data shows that in line with major substations, the number of non-compliant sub-transmission feeders has significantly decreased from the beginning of the period to the end of the period. By the end of the current regulatory period there are forecasted to be only two sub-transmission feeders which remain non-complaint and will need to be addressed in the following regulatory period. As with major substations the majority of issues were resolved in the first half of the period. No new non-compliances were identified in the second half of the period as a result of falling peak demand for most regions.

These outcomes are the result of the impact of the ramp-up in capital expenditure for the first three years of the current regulatory period, the use of Alliance agreements, and the fortuitous reduced growth or reduction in non-coincident peak demand. However, some problem areas remain non-compliant and these will need to be addressed in future regulatory periods.

B2.4.1 Sydney CBD Area Strategy

A significant focus of Ausgrid's Area Plan Regulatory Proposal was focused on addressing forecast non-compliance in the Sydney CBD. The forecast was for 16.9% of the Area Plan capex to be used in this area[23]. This was in response to the NSW Government's 2007 changes to licence conditions that imposed especially high N-2 design standards on sub-transmission assets supplying Sydney CBD. As discussed in the Section 2.2.1 this was a response to the Queensland supply incidents in August 2004 reported by Somerville and the Auckland outages in 1998 which were found to have been caused by underinvestment in key supply areas of the sub-transmission networks. In light of this, the NSW Government mandated N-2 design criteria in the licence conditions on all CBD sub-transmission assets which in effect set a lower threshold for assets being deemed as non-compliant.

When preparing its last regulatory submission Ausgrid had significant concerns based on peak demand forecasts at the time (mirrored by AEMO) that assets in place would be loaded to a level during the current regulatory period that would result in a breach of licence conditions. Because of this Ausgrid proposed a significant amount of capex for the Sydney CBD Area Plan which focused on constructing two new zone substations, one at Bligh Street and the other at Belmore Park. These new zone substations would assist Ausgrid in offloading demand from City North and City South zone substations which were already heavily loaded and forecast to be in breach of licence conditions should the peak-demand growth forecasts eventuate. In order to facilitate load transferring to the two new zone substations as well as future load transferring needs, Ausgrid also committed itself to spend several hundred million dollars on 11kV cabling in the CBD.

As can be seen in Table 9, Ausgrid spent approximately $200.9m less than the $599.4m approved by the AER in its last determination for this Sydney CBD Area Strategy (excluding CBD transmission assets). Because of a drop in peak demand, Ausgrid made the decision in FY2012 that continuation of some of the planned investment especially the 11kV underground cabling was not justified at that time. In addition, the Bligh Street zone substation construction had been delayed as a result of unanticipated difficulties in garnering approval for the project. Falling peak demand reduced the risk of non-compliance in the interim.

Despite, this Ausgrid is still not fully-compliant in this area of its network and the risk it identified at the time of its last submission has largely been deferred by falling coincident peak demand, but not resolved. Continued investment in this area is likely to be required in order to address the original risks identified especially in light of the recent volatility in peak demand.

[23] Excluding expenditures on CBD transmission assets in the Sydney Inner Metro Transmission Strategy Plan.

Arup's Independent finding and assessment

The approach Ausgrid uses to develop its Area Plans is defined by its Investment Governance Framework and this annual review process allows it to develop robust and flexible capex plans in the following ways:

- early identification of issues with the infrastructure within the regions and zones covered by the area plans;
- isolation of options for capex, operational change or demand side management (DSM) initiatives which could be used to ameliorate the issue identified (including looking at solutions at higher voltages into the TransGrid network, and down into the 11kV plan for alternative and cheaper solutions);
- annual update on non-coincident peak demand forecast and licensed capacity ratings to allow Ausgrid to adapt its capex programs to changes in the external economic and customer environment; and
- flexibility in when and how particular projects are commenced, delayed or cancelled, allowing savings in the capex where possible.

Arup considers that the wind back of capex for the Area Plans in response to the changes seen in the non-coincident peak demand and in the external economic and consumer environment was a prudent approach to management of regulated network assets. To the extent these reduced expenditures are not included into the regulatory asset base in the short term, or are delayed in time, the result should be less upwards pressure on consumer prices in subsequent regulatory periods.

B2.5 Lessons learnt

Ausgrid along with a number of other DNSPs and industry stakeholders were surprised by the rapid impact of external issues on the plateau of coincident peak demand and in some instances the reduction in non-coincident peak demand. It has since identified the need to refine its peak demand forecasting methodology, particularly in relation to its submissions for the next regulatory period.

Arup has been informed that SKM was brought in during 2013 as part of the 2014-19 Regulatory Submission forecasting process to do a full review of the peak demand methodology used by Ausgrid. Ausgrid has indicated that the majority of recommendations from this review have been adopted. This review has led Ausgrid to adopt:

- A modified process for determining the weather correction, resulting in a more conservative forecast going forward.
- A less conservative Probability of Event (POE) compared to the POE used in the last submission. The POE has gone from 10% to 50%. The less conservative POE has had the impact of decreasing the peak demand forecast which must be accommodated in the network planning criteria.
- Additional factors impacting the peak demand forecast including an estimate of the impact of embedded generators and energy efficiency initiatives as a result of government schemes.
- Econometric factors (independent forecasted economic metrics) which are applied from years 4 to 10 of the peak demand forecast. This avoids relying on

trend analysis beyond year 1 to 3. Trend analysis may not take into account significant swings in peak demand, and this was recognised as a weakness in the prior methodology. The impact of these economic metrics on the forecast is stronger in later years where there is greater uncertainty.

In relation to its under estimate of unit costs in the current regulatory period, Ausgrid has undertaken a significant revision of its unit costs for the upcoming 2014-19 Regulatory Submission so that, in its view, they more accurately reflect the costs that have been recently incurred especially for recent brownfield projects.

B3 Replacement Plan

B3.1 Description

The Replacement Plan seeks to address assets which have exceeded a certain condition and may consequently pose a risk to reliability or safety. The Replacement Plan includes all replacement driven capital expenditure on assets that are not included in the Area Plans. The Replacement Plan therefore involves projects on all parts of the network. The five Replacement Plans are:[24]

- Distribution mains;
- Distribution substations;
- Zone substations;
- Sub-transmission substations; and
- Transmission mains (including sub-transmission mains).

The latter three elements are also the subject of the Area Plans, and the Replacement Plan in these areas represents the remainder of the capital expenditure which is triggered primarily by asset condition[25]. When Ausgrid forecasts its Replacement Plan needs it categorises this work and related expenditure into one of the following categories:

- Reactive programs – programs designed to replace assets that fail whilst in service;
- Proposed programs – programs of work that have been identified but are yet to commence; and
- Planned programs – programs of proactive replacement work.

The expenditure within each of these elements is calculated using a bottom-up approach based on the forecast number of projects and estimated cost per project except in the case of large individual projects. The three forms of program are also linked. For example, work originally earmarked as reactive replacement may move through proposed programs and become planned replacement based on new or additional information gained during the period. Such changes may be suggested where a systematic failure mode is identified.

This review on Replacement Plan capex for this period involves an analysis of:

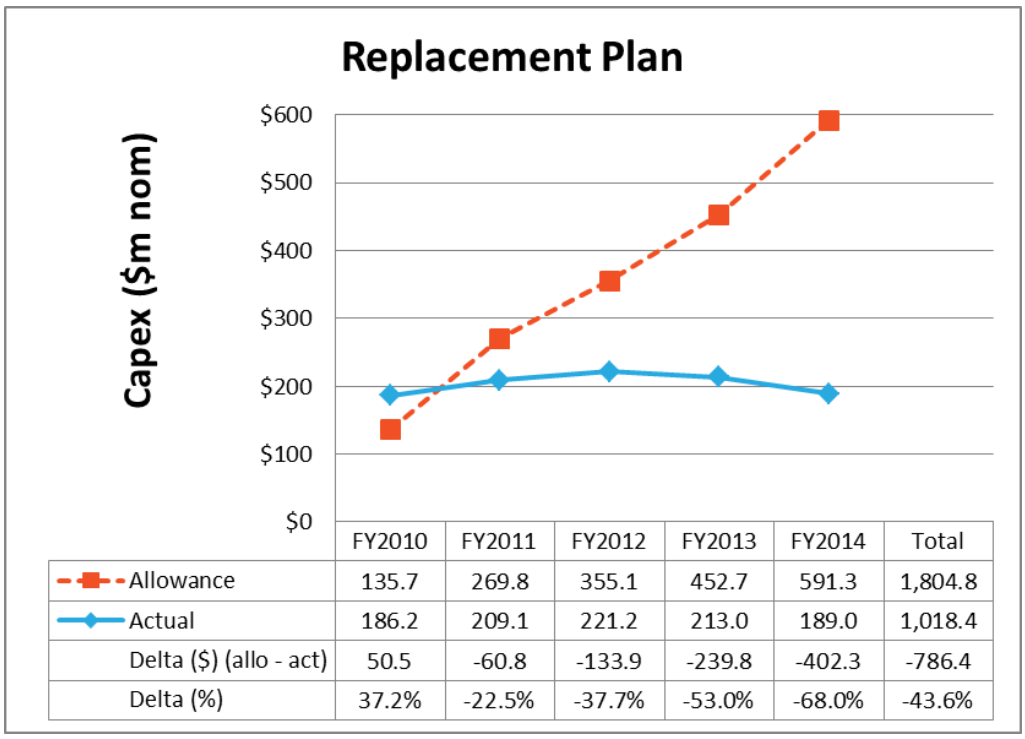
- Expenditure.
- Delivery of works.
- Impacts of replacement plan investment.
- Key findings, including Arup's conclusions and lessons learnt.

[24] Metering and SCADA replacement were included in the 2008 replacement plan but are now considered separately. For consistency going forward we have adopted the 2014-19 approach.
[25] Ausgrid has indicated that their accounting systems ensure there is no double counting of capital expenditure between the Area Plans and the Replacement Plan.

B3.2 Expenditure

Over the 2009-14 Regulatory Period Ausgrid significantly underspent the Replacement Plan allowance approved by the AER. By the end of the current regulatory period Ausgrid forecasts that it will have spent $1,018.4m of the $1,804.8m approved which is 43.6% less than the allowance. Figure 39 summarises Ausgrid's expenditure on the Replacement Plan for the 2009-14 Regulatory Period. Ausgrid underspent its Replacement Plan expenditure in all years of the current regulatory period except for FY2012 where it recorded a slight overspend. The dropping off of expenditure after the ramping up of expenditure from FY2012 was largely driven by Ausgrid's:

- redirection of staff towards growth driven works (especially Area Plans) which had a direct impact on Ausgrid's performance against licence conditions;
- reassessment of its risk tolerance for some programs as a result of its inability to deliver the required volumes of work at reasonable costs;
- reliance on maintenance to support the deferral of replacement needs in the short term; and
- Reassessment of asset replacement needs based on better quality asset condition information and improved system management based on this information.



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	135.7	269.8	355.1	452.7	591.3	1,804.8
Actual	186.2	209.1	221.2	213.0	189.0	1,018.4
Delta ($) (allo - act)	50.5	-60.8	-133.9	-239.8	-402.3	-786.4
Delta (%)	37.2%	-22.5%	-37.7%	-53.0%	-68.0%	-43.6%

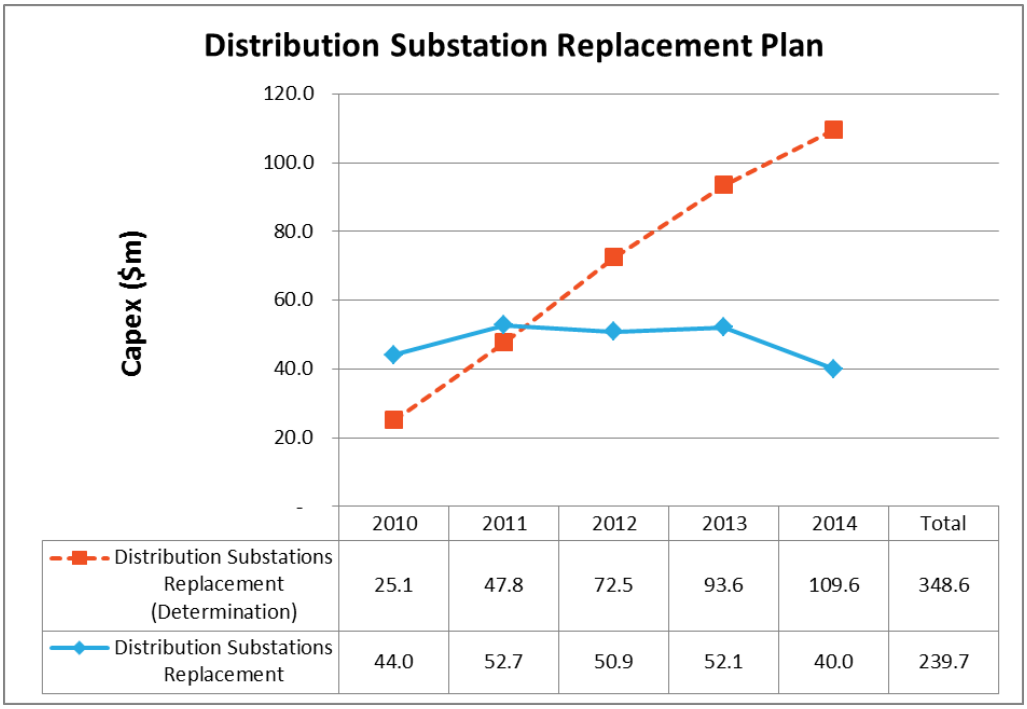
Figure 39: Allowed and actual replacement plan expenditure

When breaking down the total underspend the majority of this underspend can be attributed to sub-component Replacement Plans for distribution assets.[26] Distribution Replacement Plans expenditure accounted for 74.1% of the total

[26] As the majority of large sub-transmission replacement works are covered under Area Plans, the Replacement Plan therefore is skewed towards distribution assets and distribution capex.

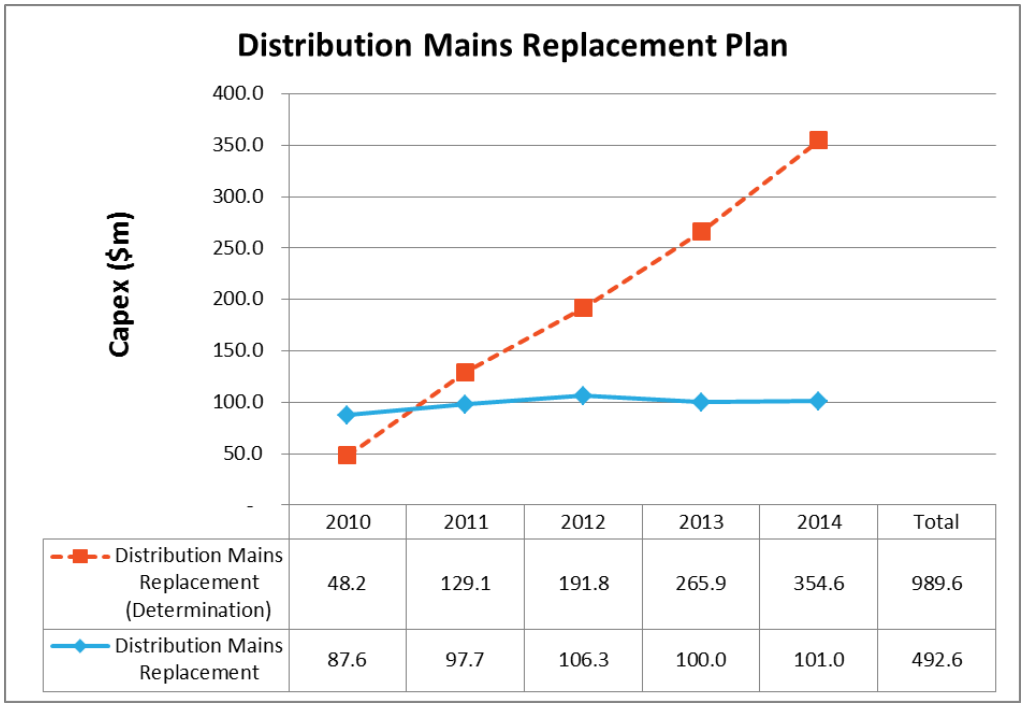
Replacement Plan allowance and 71.9% of total Replacement Plan actual expenditure. In total Ausgrid spent 54.7% of the allowance for Distribution Replacement Plans. As can be seen in Figure 40 and Figure 41 the majority of this underspend in dollar terms is attributed to the Distribution Mains Replacement Plan which was underspent by approximately $496.9m. This equates to 49.8% of the allowance for this individual Replacement Plan. Moreover, the Distribution Substation Replacement Plan was underspent by $108.9m which is equal to a 31.2% underspend of the allowance for this sub-plan. It should be noted that some distribution replacement expenditure has been booked to the Low Voltage Plan which has exacerbated the overspend for this plan and contributed to the underspend for the Replacement Plan.

The expenditure for the Sub-transmission and Zone Replacement Plans was also well under the allowance. Sub-transmission and Zone Replacement Plans expenditure accounted for 25.9% of the total Replacement Plan allowance and 28.1% of total Replacement Plan actual expenditure. The expenditure relative to the allowance for the three sub-component plans was 61.3% of the allowance. The breakdown of this expenditure into the two Sub-transmission and Zone Replacement Plans is provided in Figure 42, Figure 43 and Figure 44. The majority of this underspends for the Sub-transmission and Zone Replacement Plans is related to the Zone Substation Replacement Plan which was underspent by $112.4m or 44.2% of its allowance.



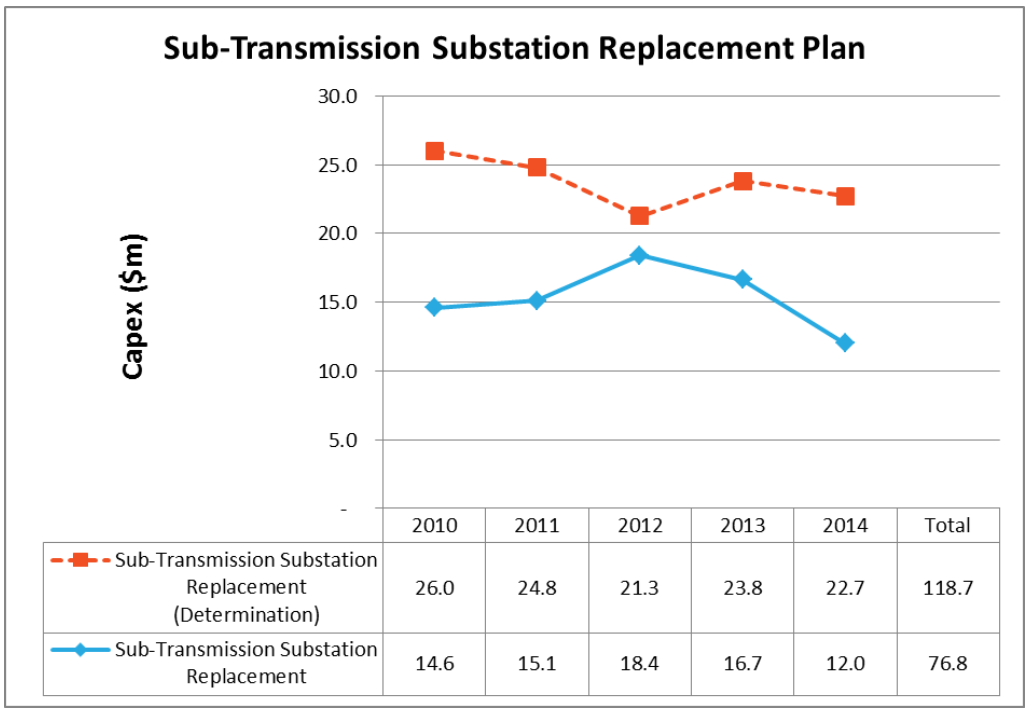
	2010	2011	2012	2013	2014	Total
Distribution Substations Replacement (Determination)	25.1	47.8	72.5	93.6	109.6	348.6
Distribution Substations Replacement	44.0	52.7	50.9	52.1	40.0	239.7

Figure 40: Allowed and actual exp. for Distribution Substation Replacement Plan



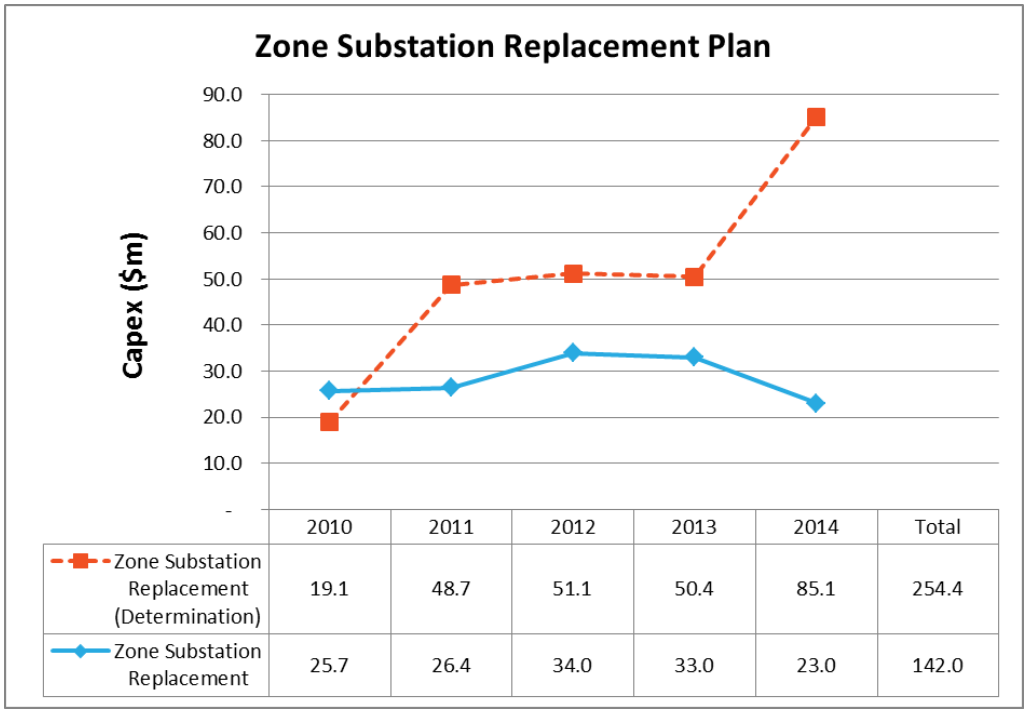
	2010	2011	2012	2013	2014	Total
Distribution Mains Replacement (Determination)	48.2	129.1	191.8	265.9	354.6	989.6
Distribution Mains Replacement	87.6	97.7	106.3	100.0	101.0	492.6

Figure 41: Allowed and actual exp. for Distribution Mains Replacement Plan



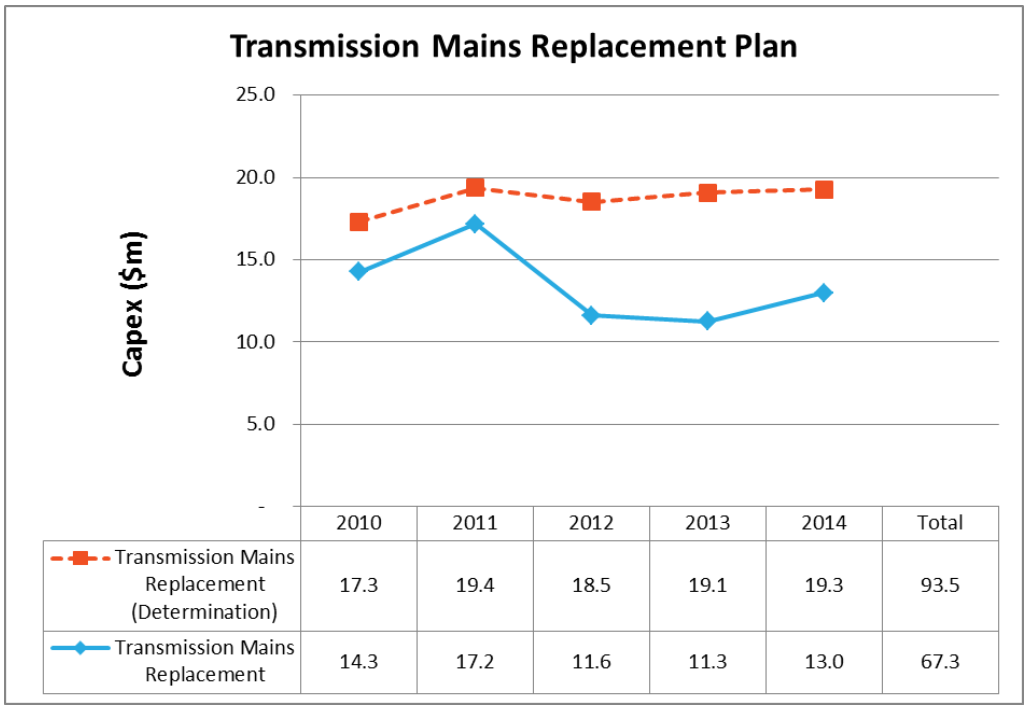
	2010	2011	2012	2013	2014	Total
Sub-Transmission Substation Replacement (Determination)	26.0	24.8	21.3	23.8	22.7	118.7
Sub-Transmission Substation Replacement	14.6	15.1	18.4	16.7	12.0	76.8

Figure 42: Allowed and actual exp. for Sub-trans. Substation Replacement Plan



	2010	2011	2012	2013	2014	Total
Zone Substation Replacement (Determination)	19.1	48.7	51.1	50.4	85.1	254.4
Zone Substation Replacement	25.7	26.4	34.0	33.0	23.0	142.0

Figure 43: Allowed and actual exp. for Zone Substation Replacement Plan



	2010	2011	2012	2013	2014	Total
Transmission Mains Replacement (Determination)	17.3	19.4	18.5	19.1	19.3	93.5
Transmission Mains Replacement	14.3	17.2	11.6	11.3	13.0	67.3

Figure 44: Allowed and actual exp. for Transmission Mains Replacement Plan

B3.3 Project Delivery

While Ausgrid was not able to deliver the number of replacement projects it forecast in its submission for the current regulatory period, considerable progress was made in its replacement program. The main reasons for the under delivery of

projects are those mentioned for above in Section B2.1. While some of this under delivery can attributed to a lack of Ausgrid internal resources and replacement needs reassessment there were also unanticipated challenges which increased the project delivery times, and increased average replacement costs relative to forecast. Below is a high level summary of works delivered for each of the five Replacement Plans.

B3.3.1 Distribution Mains Replacement Plan

The Distribution Mains Replacement Plan represented 48.4% of the expenditure of the Replacement Plan. It historically is the largest of Ausgrid's Replacement Plans as it comprises the majority of replacement jobs in relation to Ausgrid's pole population. The Distribution Mains Replacement Plan includes distribution mains, poles and associated equipment across Ausgrid's approximately 54,500 km of overhead mains and underground distribution cables including:

- approximately 500, 000 poles;
- approximately 40,000 pillars; and
- Approximately 11,000 pits.

In analysing the delivery of work for the Distribution Mains Replacement Plan, Arup has separated replacement jobs from the kilometres of mains replaced to ensure its findings are consistent with the data. The following paragraphs discuss these different aspects of the Distribution Mains Replacement Plan.

In relation to the distribution mains replacement jobs, Ausgrid forecast that it would undertake 28,771 mains replacement jobs this period. As seen in Figure 45, the total actual jobs completed during the regulatory period were 17,011 which is equal to 59.1% of forecast jobs. The annual breakdown of this under delivery of works is depicted in Figure 45. By a magnitude of four times, the largest category of expenditure was in relation to pole replacement. Ausgrid forecast the replacement of 24,000 poles at a total cost of $311m (average cost per pole of $13,000) compared with the actual replacement of 16,000 poles at a total cost of $184m (average cost per pole of $11,500). This is consistent with the broader trend across the replacement program of reasonably based average cost estimates but fewer projects delivered than forecast.

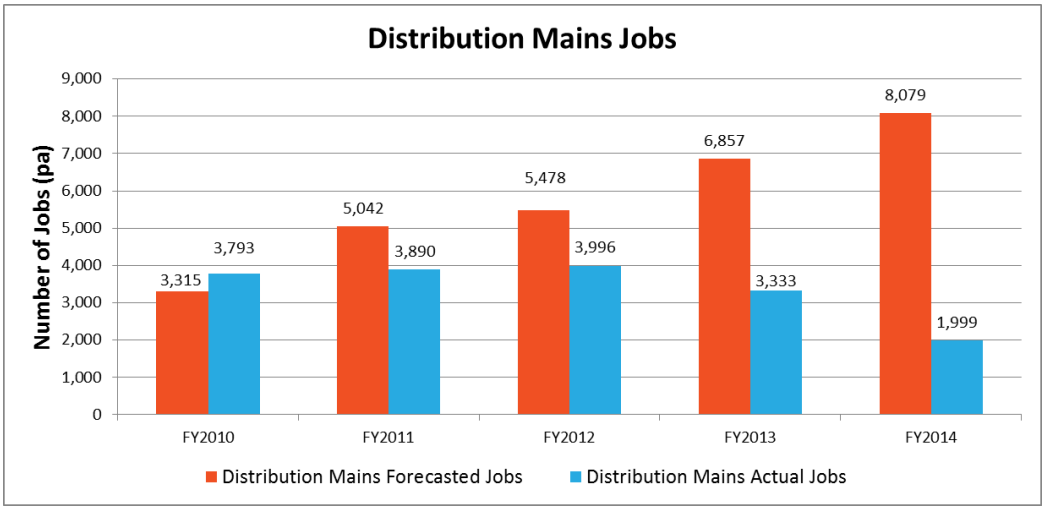


Figure 45: Forecast and actual distribution mains jobs

Despite the under delivering its Distribution Mains Replacement Plan, Figure 46 shows that Ausgrid has continued to improve its pole failure rates as a whole, due to the expenditure incurred this period, albeit at a slower rate. This represents a significant achievement and reflects the effectiveness of Ausgrid's replacement assessment methods.

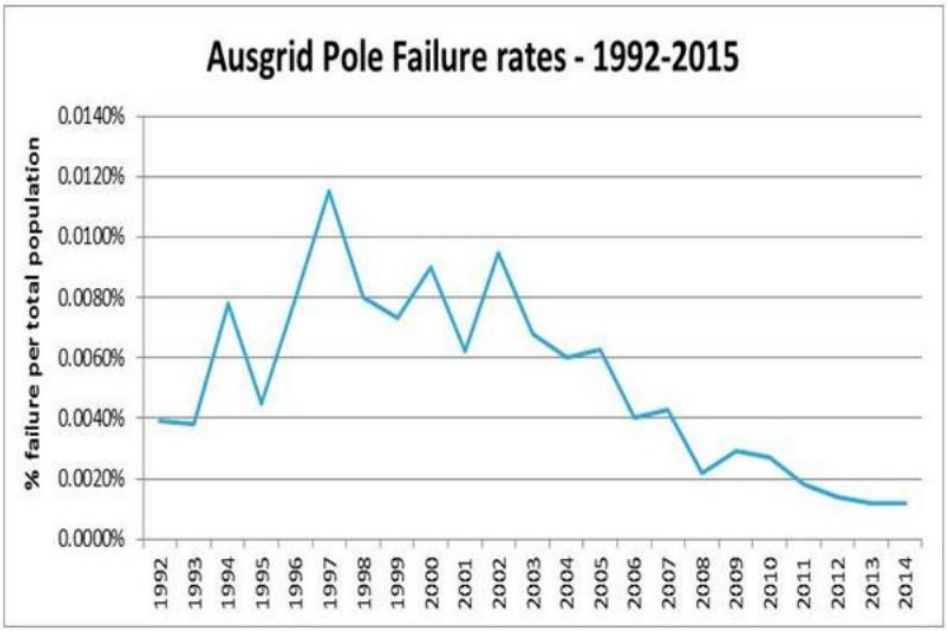


Figure 46: Ausgrid pole failure rates

Ausgrid also was not able to deliver the kilometres of distribution mains it forecast it would replace across this regulatory period. Figure 47 illustrates that the total km of mains forecasted to be replaced was 1,423 km and the actual km of mains replaced was 814 km. As such, 57.2% of forecast mains kilometres were replaced.

Part of the reason for the drop-off in replacement of poles in Figure 45 and kilometres of cables in Figure 47 for the FY2013 and FY2014 related to the internal structural changes resulting from Network NSW new strategies, and in addition cost pressures which needed to be addressed.

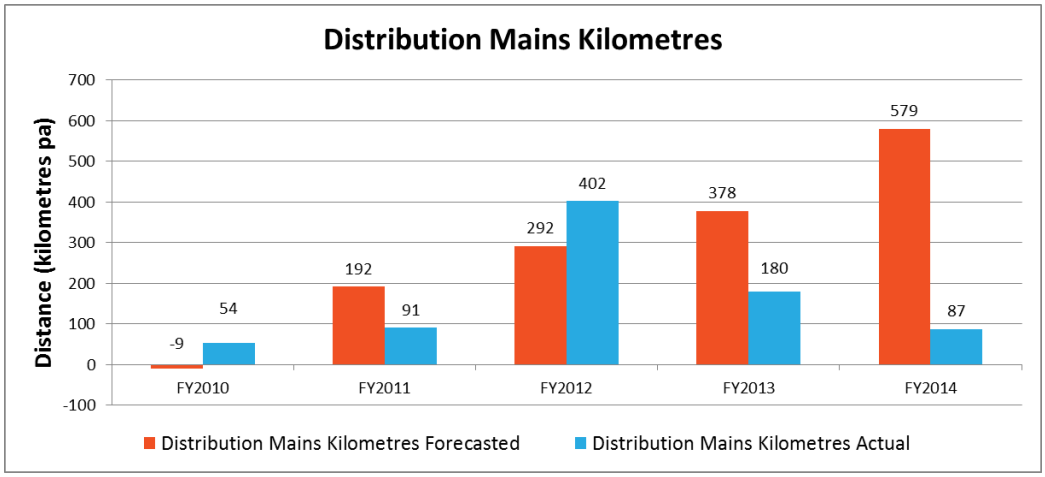


Figure 47: Forecast and actual distribution mains kms

While Ausgrid on average exceeded its forecasts in the first half of the period in relation to kilometres of distribution main replaced it struggled to deliver the larger forecasted quantities in the second half of the period. A significant driver of this under delivery in the second half of the period resulted from concerns over the costs incurred on mains replacement coupled with concerns in delivering an increasing volume of replacement kilometres. For example, the largest actual expenditure category by an order of four times was the replacement of LV Consac cables (underground cables).

Based on international recognition of increasing Consac failure rates Ausgrid had forecast that it needed to replace a significant proportion of its Consac cable this period, where the majority was installed in the 1970s. The forecast expenditure was $137m with an estimated replacement of 405km which compared with an actual expenditure of $78m for only 62 km replaced. The average cost per km was therefore $1.25m compared with a forecast of $0.39m. Ausgrid has attributed this increased cost and under delivered volumes of work to brownfield issues it did not anticipate with Consac cables. These issues included:

- The majority of Consac cables were laid under footpaths which meant that Ausgrid had to navigate other more recently installed utility infrastructure under these pavements to perform replacement.
- Due to other utility infrastructure being laid against or in close proximity to Consac cable, Ausgrid was unable to do a like for like replacement in many instances, which meant that it had to relocate the replacement cable. This led to increased costs such as undergrounding replacement cables in alternate locations, including under roads increased project complexity and delayed delivery times.

By mid period Ausgrid realised that it could not cost effectively deliver the proposed Consac cable subprogram of the Distribution Mains Replacement Plan. This was based on the increased cost per kilometre and the large volume of labour

that was being devoted to this program at the expense of other Replacement Plans and growth driven capex.

Discussions with key Ausgrid staff indicated that when Ausgrid prepared its original forecast for Consac cable replacement it was aware of the complexity involved in its replacement, but underestimated the time for practical replacement and the associated costs due to limited Consac replacement experience in previous regulatory periods. This realisation resulted in Ausgrid reverting back to a reactive replacement strategy (replacement as a result of failure) for the Consac cable sub-program in order to spread the significant costs and volume of labour required to undertake Consac replacement over multiple regulatory periods.

B3.3.2 Distribution Substations Replacement Plan

The Distribution Substation Replacement Plan accounted for 23.5% of the expenditure for the Replacement Plan. The main assets covered by this Replacement Plan include pole substations, kiosks, outdoor enclosures, chambers and underground substations. There are approximately 30,000 distribution substations in the Ausgrid network.

Figure 48 shows that the total forecast number of individual distribution substation jobs was 8,249 and the total actual jobs completed during the regulatory period was 5,492. This means that 66.6% of forecast jobs were undertaken which compares with 68.8% of the expenditure allowance spent. This indicates that on average the project cost estimates were reasonably based, reflecting Ausgrid's continuing experience with this type of sub-program. In relation to sub-programs to this plan some were over delivered such as the replacement of limited life poles while others were under delivered such as the refurbishment of pole substations.

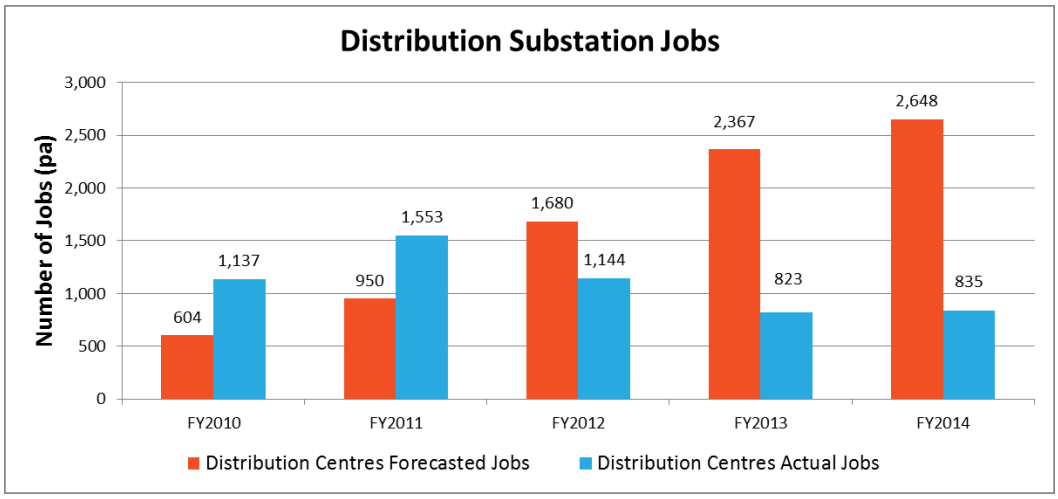


Figure 48: Forecast and actual distribution substation jobs

Again, part of the reason for the drop-off in replacement of poles in Figure 48 for the FY2013 and FY2014 related to the internal structural changes resulting from Network NSW new strategies, and in addition cost pressures which needed to be addressed.

B3.3.3 Sub-transmission Replacement Plans

There are three Replacement Plans directly related to sub-transmission assets. These are the:

- Zone Substation Replacement Plan;
- Sub-transmission Substation Replacement Plan; and
- Sub-transmission Main Replacement Plan.

They encompass all replacement works for these assets which are not factored into Area Plans. These three Replacement Plans are discussed in the following paragraphs.

B3.3.4 Zone Substation Replacement Plan

The Zone Substation Replacement Plan represented 13.9% of the actual expenditure of the Replacement Plan. There are approximately 200 zone substations in the Ausgrid network with expenditure incurred in relation to buildings, transformers, high voltage switchgear and earthing systems. Figure 49 shows a comparison of the forecast and actual zone substation jobs.

The total forecast number of individual jobs was 3,156 and the total actual jobs completed during the regulatory period were 1,723. As such, 54.6% of forecast jobs were undertaken which compares with 55.8% of the expenditure allowance spent. This indicates that the project cost estimates were reasonably based, reflecting Ausgrid's continuing experience with this type of program. While there was reasonable alignment between quantities and expenditure, there were variations between different sub-programs, including under delivery of protection relays and control load devices, and over delivery of circuit breakers.

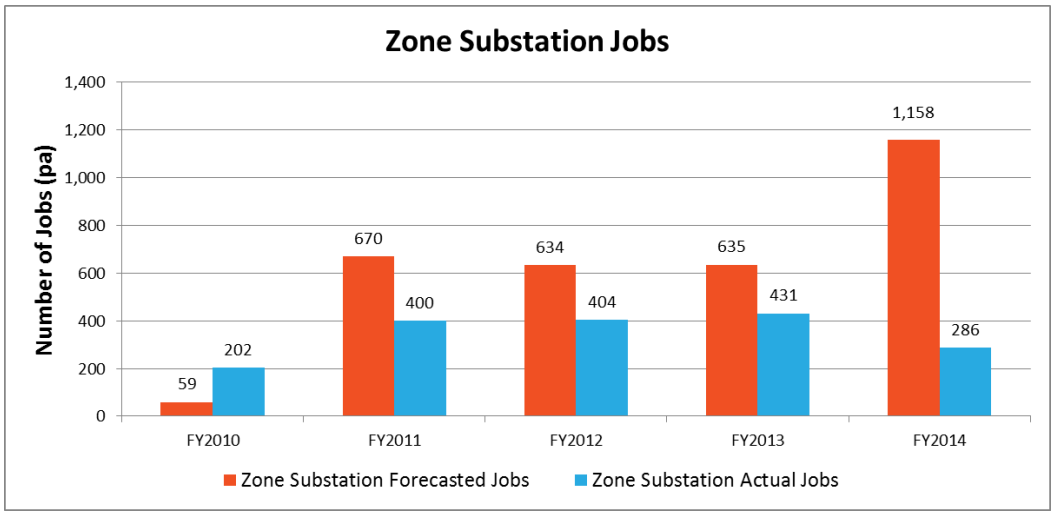


Figure 49: Forecast and actual zone substation jobs

Again, part of the reason for the drop-off in replacement jobs in zone substations in Figure 49 for the FY2013 and FY2014 related to the internal structural changes resulting from Network NSW new strategies, and in addition cost pressures which needed to be addressed.

B3.3.5 Sub-transmission Substation Replacement Plan

The Sub-transmission Substation Replacement Plan represented 7.5% of the actual expenditure of the Replacement Plan. There are approximately 50 sub-transmission substations in the Ausgrid network. Figure 50 compares forecast and actual sub-transmission substation jobs.

The total forecast number of individual jobs was 1,243 and the total actual jobs completed during the regulatory period were 993. As such, 79.9% of forecast jobs were undertaken which compares with 64.7% of the expenditure allowance spent. This indicates that the jobs were delivered at a lower unit cost than forecast.

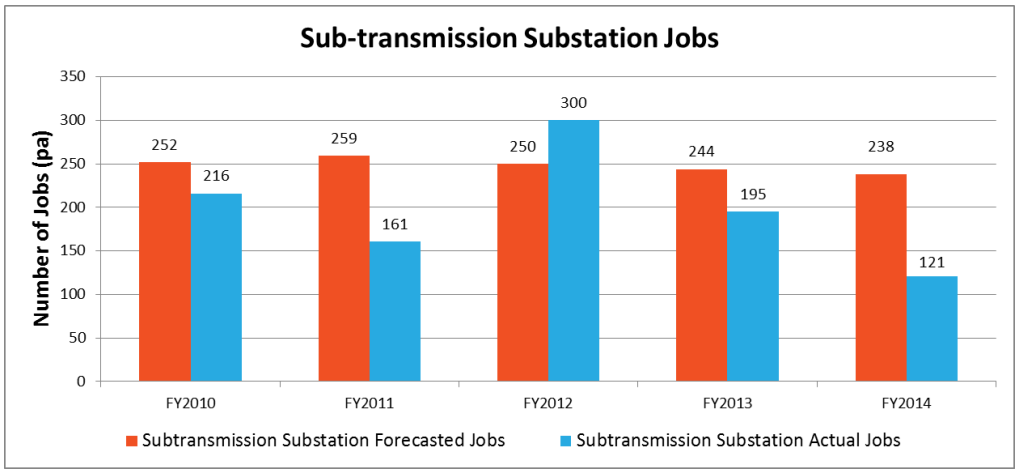


Figure 50: Forecast and actual sub-transmission substation jobs

Again, part of the reason for the drop-off in replacement jobs in zone substations in Figure 50 for the FY2013 and FY2014 related to the internal structural changes resulting from Network NSW new strategies, and in addition cost pressures which needed to be addressed.

B3.3.6 Sub-transmission Mains Replacement Plan

The Sub-transmission Mains Replacement Plan represented 6.6% of the expenditure of the Replacement Plan. There are around 4,000km of overhead and underground sub-transmission mains in the Ausgrid network. Figure 51 compares forecast and actual sub-transmission main replacement jobs.

The total forecast number of individual jobs was 1,116 and the total actual jobs completed during the regulatory period were 1, 258. As such, an additional 12.7% of jobs were delivered compared with only 72.0% of the expenditure allowance being incurred. This indicates that the jobs were on average delivered at a lower unit cost than forecast. However, there were major variances in work delivered for large projects probably as a result of increased costs relative to forecast for these works. There were also new issues that arose during the period including a greater than expected need for the replacement of condemned sub-transmission poles.

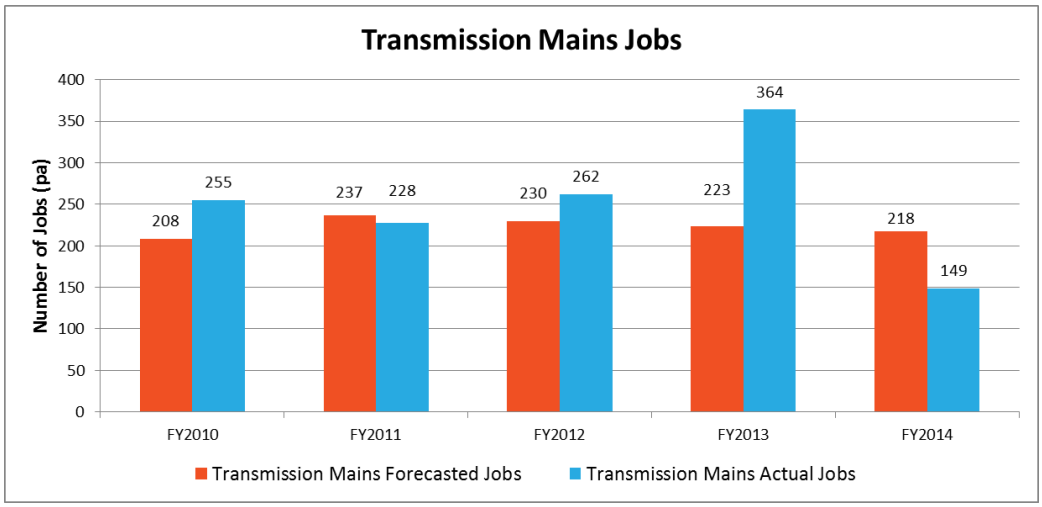


Figure 51: Forecast and actual sub-transmission mains jobs

B3.4 Impacts of Replacement Plan Investment

Despite significant replacement driven investment this period ($1,108.4 Million) relative to the prior regulatory period ($658.1 million), the Ausgrid network as a whole has continued to age. The weighted average age of distribution assets has continued to increase and for sub-transmission has roughly stabilised likely due to the focus of both the Area Plans and Replacement Plan capex on sub-transmission assets.

It should be noted that while age is not used by Ausgrid as the criteria for replacement it does provide a high level indication of the state of the network and the benefits of investment. This is highlighted in Figure 52 which shows that while the average sub-transmission asset age has stabilised during the current regulatory period as a result of both Area Plans and Replacement Plan investment, the distribution asset age on average has increased from the beginning to the end of the period. What the graph also shows is that the acceleration in ageing of both distribution and sub-transmission assets has occurred fastest from FY2012 as capital expenditure begun to roll-off and where 41.6% of the allowance for the period was allocated but under spent.

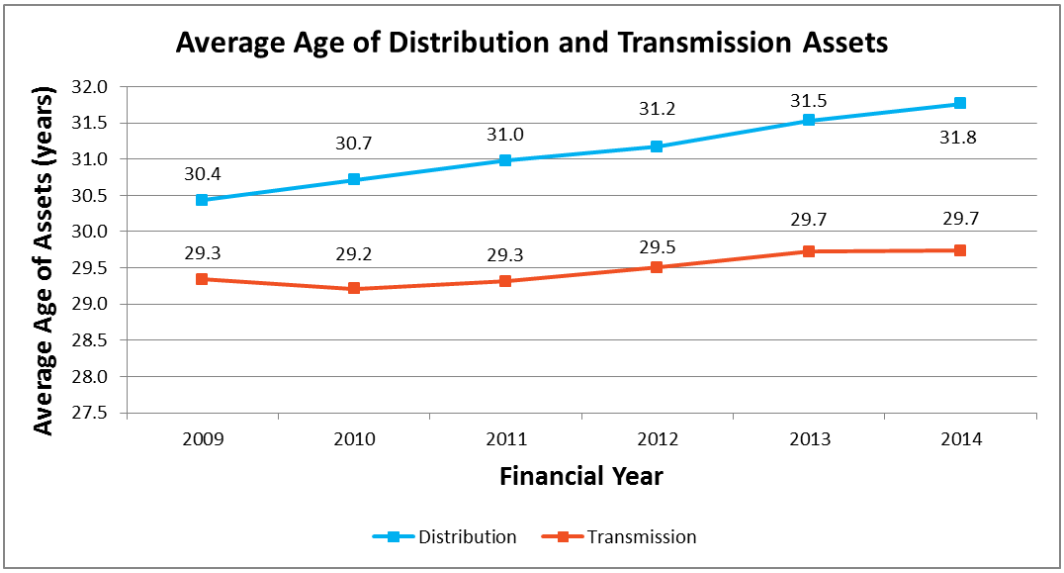


Figure 52: Average asset age of distribution and sub-transmission assets

A lower level view can be found in the number of corrective and breakdown events recorded in the first four years of this regulatory period. Figure 53 and Figure 54 show that the number of corrective and breakdown events recorded over the period for transmission and distribution respectively.

The corrective events show the number of conditional issues identified during maintenance and addressed prior to failure, thus preventing a breakdown. The breakdown events show the number of issues that, despite a well developed and implemented maintenance program, went through to full failure. These breakdown events may not have resulted in outages and/or service impacts on consumers, as many other operational and maintenance activities are in place to avoid or minimise these impacts.

The large number of corrective events relative to breakdown events highlights reasonable success in Ausgrid's planned maintenance and condition monitoring to address issues before they lead to breakdowns. However, the upward trend in both breakdowns and correctives reflects an increased asset deterioration rate as might be expected with an ageing asset base. There is also the possibility that the growth in both corrective and breakdown events partly reflects acceptance of failure in assets where there is low risk on service delivery interruptions as well as improved asset record keeping.

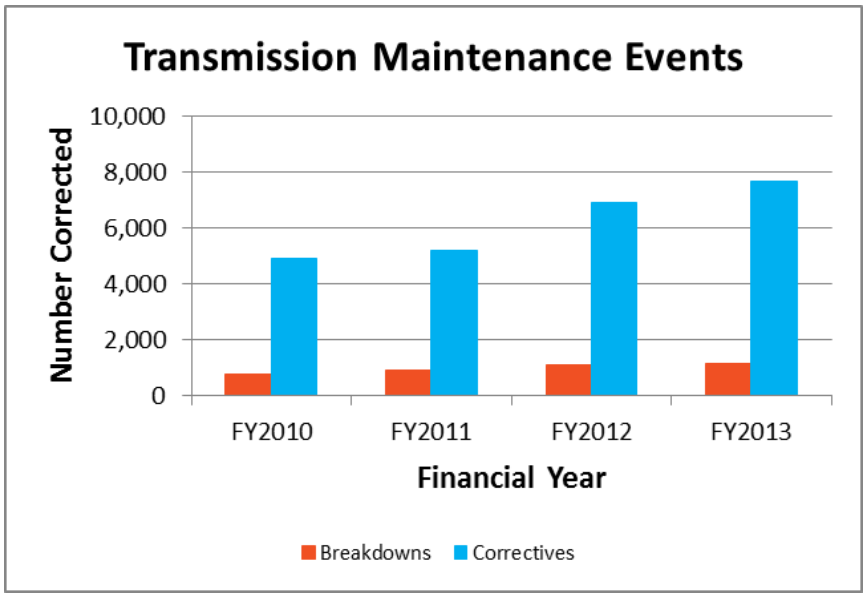


Figure 53: Number of Transmission Corrective & Breakdown Events FY2010-13

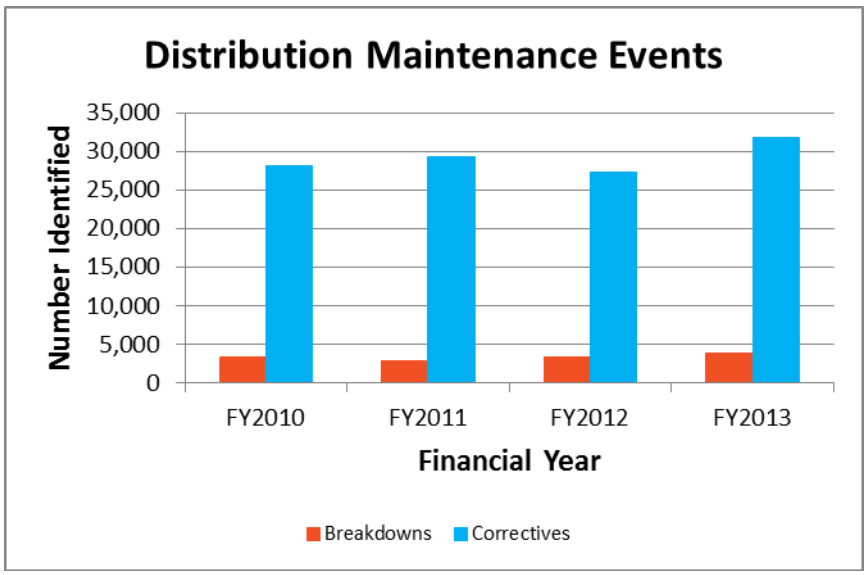


Figure 54: Number of Distribution Corrective & Breakdown Events FY2010-13

Ausgrid underspent relative to its allowance by between 30% and 50% on each element of the replacement plan. This generally translated to a similar reduction in the volume of works completed.

The two notable variations from this trend were sub-transmission substations where 79.9% of the works were delivered for 64.7% of the expenditure and sub-transmission mains where the number of projects exceeded that forecast by 12.7% for only 72.0% of the initial allowance.

There are a range of reasons for the general underspend including:

- Insufficient internal resource capacity to deliver the increased program particularly in relation to engineering input in the initial years of the regulatory period. This was exacerbated initially by the education of the Alliance partners on Ausgrid's internal approvals processes which meant it took more time than expected to start delivering significant volumes of work,

a focus by field crews to deliver growth driven projects because of stringent licence conditions, and design and engineering approvals required more input from internal resources than initially anticipated. It should be noted that once settled in the Alliance program delivered a significant volume of projects in excess of what Ausgrid could have delivered alone, and in later years freed up internal resources to focus on other programs.

- More detailed information regarding asset condition – the introduction of the integrated asset management system (iAMS) seems to have provided more detailed information on the condition and failures of Ausgrid's assets. As a result of the increased accuracy of the data, risk assessments were able to be undertaken with greater accuracy allowing work to be re-prioritised with minimal impact on total risk and hence performance of the network.
- Following the restructure, Networks NSW asked the business to assess the risk attached to failure of asset replacement, and to use this as another input when prioritising replacement based on the failure impact risk level. This was done in order to move towards an internal budget level that would suppress price increases and mitigate the risks attached to increased debt.
- Ausgrid placed a higher priority on meeting the more onerous licence conditions especially in relation to the transmission and sub-transmission elements of the network. This resulted in a lower focus on replacement works in relation to distribution assets.

Despite the overall under delivery of the Replacement Plan due to the reasons listed above, there have also been significant achievements this period which demonstrate the strength of Ausgrid's workforce and logistical capabilities. These are listed in Table 19 below.

Replacement Plan	Type of replacement work	Number of Assets Replaced
Distribution Mains	Replace low voltage overhead services - planned	78,711
Distribution Mains	Replace condemned poles	16,013
Distribution Mains	Replace low voltage overhead services - reactive	7,027
Distribution Centres	Replace substation equipment - reactive	2,170
Transmission Mains	Replace condemned poles	964
Distribution Centres	Replace single pole - pole transformers - reactive	374
Distribution Centres	Replace two-pole pole transformers	222
Distribution Mains	Replace steel mains	173
Zone Substations	Replace 33kV bulk oil cables	151
Zone Substations	Replace substation batteries	145

Table 19: Number of assets replaced

Arup's independent findings and assessment

Overall Ausgrid has underperformed by a significant margin on its Replacement Plan for the 2009-14 Regulatory Period. At the time of preparing its last submission, Ausgrid argued that it was prudent in identifying a large replacement need based on the available asset information and limited experience in some types of replacement works. This under delivery of the allowance and work has been driven by a number of key factors including:

- Ausgrid's overestimating of its ability to deliver a large volume of identified replacement projects and its underestimation of the complexity associated with brownfield replacement;
- The prioritisation of growth driven sub-transmission projects, given the more onerous licence conditions, limited Ausgrid's ability to also deliver higher volumes of replacement projects;
- While increasing staff numbers over the first three years of the regulatory period, the need to focus internal resources on growth driven investment in the Area Plans (usually in brownfield environments) limited a ramp up in regular replacement projects;
- The initial focus to assist the Alliance start-up meant that staff were not available for a ramp up in regular replacement projects (again it should be noted that once underway the Alliance program delivered significant volumes of greenfield work which would have otherwise diverted internal resources from the regular replacement projects);
- The implementation of Networks NSW which led to a change in Ausgrid's objectives and allowed increased risk tolerance which has supported deferral of replacement projects in the current regulatory period;
- The implementation by Networks NSW of a new organisational restructure which led to delays in work especially in the last two years of the current regulatory period; and
- A reassessment of replacement needs based on better available data as the period has progressed.

Both the asset age profile and failure events data provide an indicative snapshot of Ausgrid's replacement situation during and at the end of the regulatory period. They indicate that many of Ausgrid's replacement issues coming into the current regulatory period are still yet to be resolved by the end of the period..

B3.5 Lessons learnt

Based on our conversations with Ausgrid staff, it is clear that while they took measures to address the perceived resource shortage this period, including via the Alliance program, Ausgrid delivered a stable Replacement Plan expenditure, but was not able to increase its replacement expenditures to the levels initially forecast. Ausgrid has indicated that it believes it can adequately deliver the Replacement Plan it has forecast for next period due to a significant drop in the proposed number of projects (especially growth driven projects).

Ausgrid has indicated it has now moved to a long-term replacement strategy going forward and is utilising more reactive replacement in cases such as Consac cable replacement where the cost and internal resource commitments of mass replacement would have a detrimental impact on prices paid by customers and other system capex works as experienced this period. Ausgrid contends the movement to reactive replacement represents a prudent approach to investment.

In many different types of replacement works this period Ausgrid has delivered specific replacement works at a significantly lower or higher average cost than what was forecasted. Ausgrid contends that improved asset management systems implemented this period which better link financial and technical data and recent experiences in replacement will improve the accuracy of replacement expenditure forecasts. It should also improve capex delivery in the next regulatory period and allow further efficiency improvements.

The 2007 licence conditions have been largely met at all levels in the sub-transmission and distribution networks, although the increasing age of many elements of the network will require ongoing attention.

A rapid ramp up of internal resource numbers and capability, comes with the long term cost associated with these additional resources, who are typically employed on award arrangements. Reduction in resource requirements may take a number of years to implement, and will come at an additional cost, meaning any cost saving from this process will likely appear in later regulatory periods.

The conditions based risk profiling has increased in accuracy but should be able to be expanded further as additional data becomes available, and as better usage of the iAMS systems occurs.

There is an opportunity to reforecast unit cost information as additional project cost information comes to hand – see for example the Consac cable expenditure.

B4 Duty of Care Plan

B4.1 Description

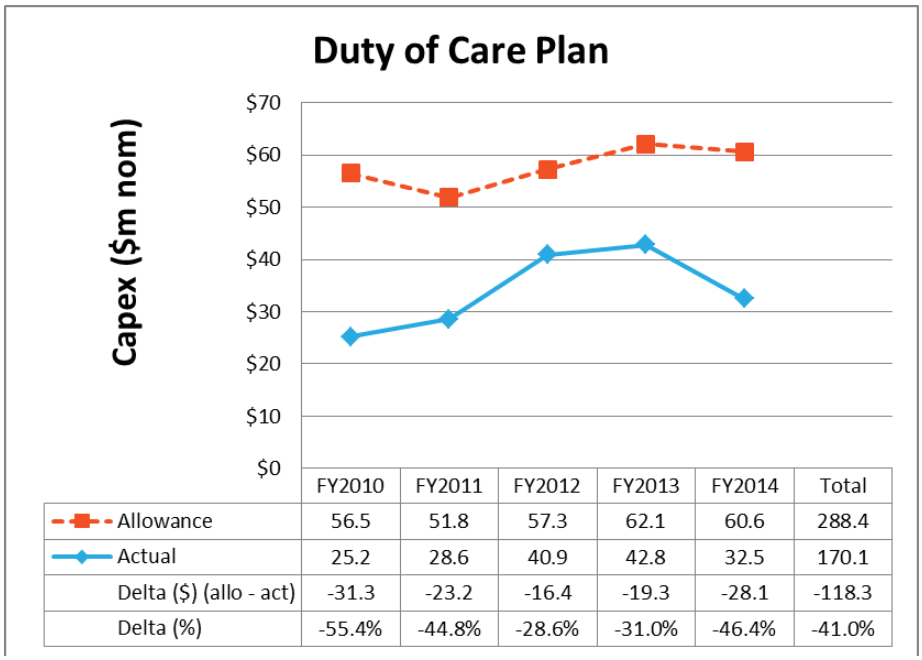
The Duty of Care Plan is dedicated to mitigating or resolving risks and meeting legal obligations associated with Ausgrid's network. The plan comprises three areas of focus:

- Safety – investment incurred to ensure public and workplace safety. Prime examples of this include fire prevention, asbestos management and removal strategies for existing assets.
- Environmental – investment incurred to meet environmental compliance requirements. This includes expenditure on waste disposal, pollution, land contamination, land remediation and the containment of hazardous chemicals.
- Infrastructure risk – covering security and compliance risks relevant to assets.

The Duty of Care Plan is reactive in nature and responds to changes in requirements over the course of the regulatory period as risk is reassessed. These changes can be as a result of, for example, increased asset information or changes in regulatory requirements. In addition, while all infrastructure is built to the requirements of the day, as standards change there can be a need to bring older infrastructure up to modern day standards.

B4.2 Expenditure

The Duty of Care Plan expenditure for the current regulatory period was forecast using a bottom-up approach. This involved identifying risks and developing individual unit costs which reflect the cost of mitigating or resolving these risks. Figure 55 compares allowed and actual expenditure on the Duty of Care Plan during the current regulatory period.



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	56.5	51.8	57.3	62.1	60.6	288.4
Actual	25.2	28.6	40.9	42.8	32.5	170.1
Delta ($) (allo - act)	-31.3	-23.2	-16.4	-19.3	-28.1	-118.3
Delta (%)	-55.4%	-44.8%	-28.6%	-31.0%	-46.4%	-41.0%

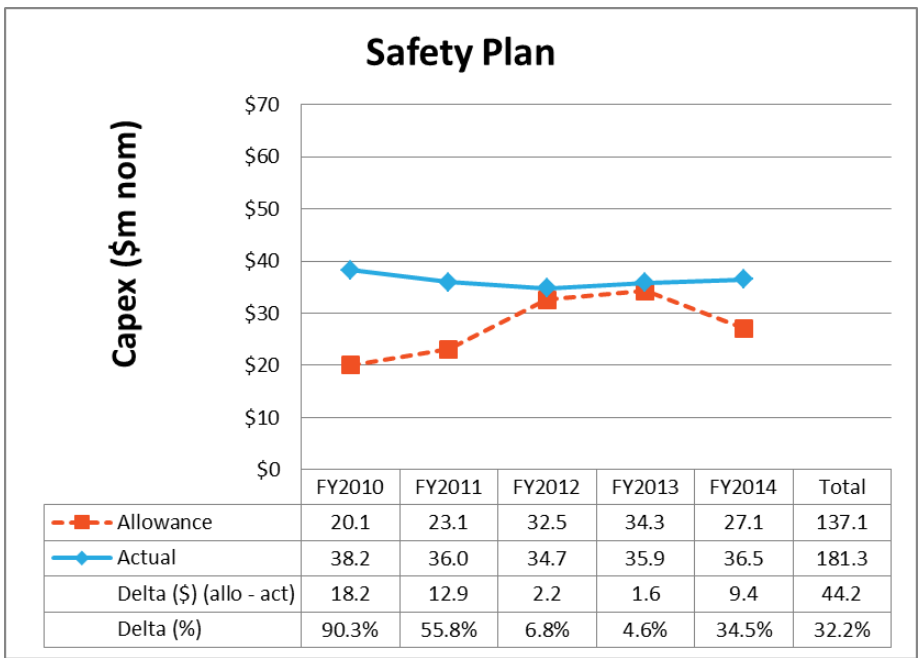
Figure 55: Duty of care plan comparison of allowance and actual

B4.3 Discussion

Ausgrid underspent its allowance on the Duty of Care Plan by 41.0% during the regulatory period. The underspend occurred across all three categories of the Duty of Care Plan as explained below.

B4.3.1 Safety Plan

Safety expenditure was underspent by 32.2% or $44.2m. Figure 56 compares allowed and actual expenditure on the safety component of the Duty of Care Plan.



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	20.1	23.1	32.5	34.3	27.1	137.1
Actual	38.2	36.0	34.7	35.9	36.5	181.3
Delta ($) (allo - act)	18.2	12.9	2.2	1.6	9.4	44.2
Delta (%)	90.3%	55.8%	6.8%	4.6%	34.5%	32.2%

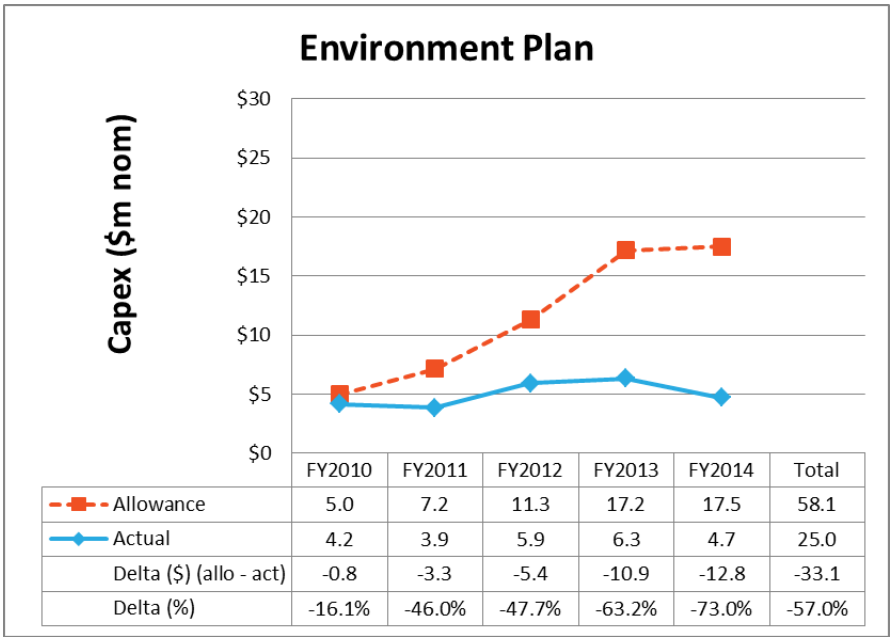
Figure 56: Safety comparison of allowance and actual

Key areas of the safety expenditure forecast this period brick wall replacement, substation modernisation and asbestos removal. Ausgrid provided the following details on these areas of expenditure:

- The replacing of brick walls of outdoor substations enclosures – this underspend is primarily due to an innovation which allowed the public safety risk to be effectively mitigated without replacing all brick walls..
- Underground substation modernisation – Ausgrid has 65 underground substations in the Sydney CBD many of which are 65 to 70 years old. Due to ongoing replacement needs of these assets and Work Health and Safety Obligations regarding working in confined spaces, Ausgrid sought to relocate and redesign these chamber substations. Ausgrid state that it has deferred this investment until the 2014-19 regulatory period due to unanticipated complexities surrounding approval for the relocation of these assets and design issues. It has stated that the majority of preliminary planning work will be done for these projects as at the end of the current period.
- Asbestos removal and management – a significant delay in spend on asbestos removal projects was incurred due to concerns raised by the union and Ausgrid undertaking measures to resolve these concerns.

B4.3.2 Environment Plan

Environment expenditure was underspent by 57.0% or $33.1m. Figure 57 compares allowed and actual expenditure on the environment component of the duty of care plan.



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	5.0	7.2	11.3	17.2	17.5	58.1
Actual	4.2	3.9	5.9	6.3	4.7	25.0
Delta ($) (allo - act)	-0.8	-3.3	-5.4	-10.9	-12.8	-33.1
Delta (%)	-16.1%	-46.0%	-47.7%	-63.2%	-73.0%	-57.0%

Figure 57: Environment comparison of allowance and actual

Forecasted expenditure for environmental issues this period focussed on oil containment (including oil waste disposal) and noisy transformer replacement. Ausgrid provided the following details on these areas of expenditure:

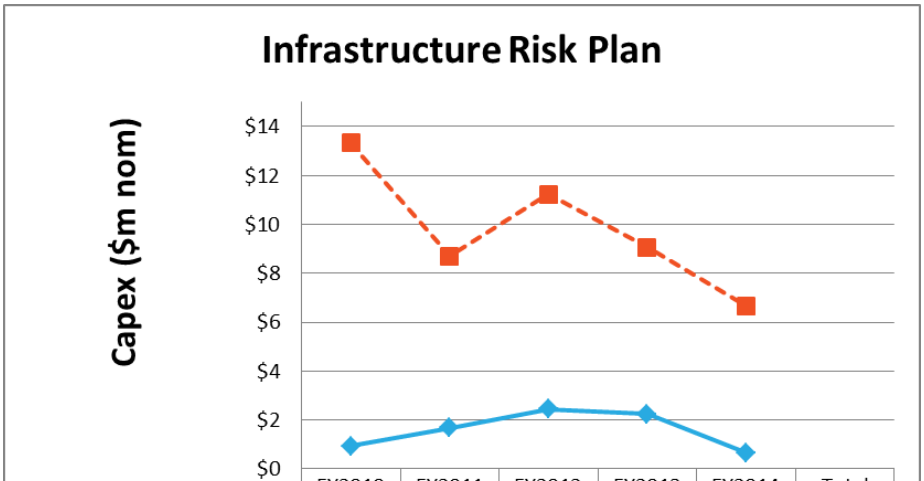
- Oil containment compliance is forecast to be mostly achieved during the current regulatory period. Ausgrid has spent significantly less than it set aside

to rectify oil leakage risks. Ausgrid contend that this highlights a significant achieved efficiency in delivering oil containment works.

- Noisy transformer replacement was less than expected as a result of a reassessment of risks and the allocation of resources to other capex plans.

B4.3.3 Infrastructure Risk Plan

Infrastructure expenditure was underspent by 83.8% or $41.0m. Figure 58 compares allowed and actual expenditure on the infrastructure component of the Duty of Care Plan.



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	13.3	8.7	11.2	9.1	6.7	49.0
Actual	0.9	1.7	2.4	2.2	0.7	7.9
Delta ($) (allo - act)	-12.4	-7.0	-8.8	-6.8	-6.0	-41.0
Delta (%)	-93.0%	-80.7%	-78.2%	-75.4%	-90.2%	-83.8%

Figure 58: Infrastructure risk comparison of allowance and actual

Intended expenditure on infrastructure this period focused on electronic security, battery duplication and the creating a 'mirror image' of the Sydney control room. Ausgrid provided the following details on these areas of expenditure:

- Electronic security expenditure was significantly less than forecast driven by a reassessment of risk during the period and reprioritisation of expenditure in line with changing corporate objectives.
- Battery duplication expenditure was significantly less based on a revision to the initial estimate of 20 sites to now only 8.
- The creation of a 'mirror image' Sydney control room was cancelled due to Ausgrid's reassessment of its immediate need and increased focus on cost reductions.

B4.4 Summary

The following general reasons were identified by Ausgrid as factors which contributed to the underspend on the Duty of Care Plan:

- There was a focus on delivering a substantial volume of capital works included in the Area and Replacement Plans which drew limited internal staff resources away from the Duty of Care Plan.
- As a significant number of Duty of Care works are undertaken by external providers, Ausgrid is required to provide trained supervisors on site to meet workplace safety obligations. As Ausgrid had a significant number of external providers working on Area Plan and Replacement Plan related work, this meant that there were insufficient supervisors available for Duty of Care driven works. It is claimed that additional supervisors were not employed due to the cost imposition.
- A major risk reassessment exercise as instructed by Network NSW identified a reduced need compared with that used in developing the forecasts. There was also a focus by Networks NSW on deferring some works in order to control costs and reduce price pressures on customers which contributed to the underspend in the second half of the period.
- Due to the nature of activities there was often a need to negotiate with local councils regarding new locations for asset replacements which delayed some projects. Ausgrid argues that that in some locations it has been near impossible to negotiate acceptable new locations for asset replacements.
- A significant portion of Ausgrid's Duty of Care Plan is based on observed risk which is noted while undertaking jobs or as part of asset inspections. Ausgrid states that this means that its Duty of Care Plan forecast is based on identified risks at a point in time and often on a subset of assets. It therefore claims that there will always be an inherent margin of error in the Duty of Care Plan forecasts as risks identified as widespread and or immediate may turn out to be otherwise. Ausgrid has argued that it has prudently deferred or decided not to spend some of its Duty of Care Plan allowance in light of more information that has come to hand during the period. It has also contended that the costs required outsourcing inspectors for its entire asset base as part of it regulatory submissions are prohibitive.

Despite Ausgrid's significant under delivery relative to forecast there were a number of notable achievements under the Duty of Care Plan. These are provided in Table 20 below.

Type of duty of care work	Number of Jobs
Oil containment program - zone substations	41 zone substations have undergone modifications and nearly all zone substations by the end of the period will have their initial stage works completed in order to comply with maximum oil discharge levels of 10ppm.
Kiosks with exposed 11kV cables	68 kiosks were replaced
Asbestos roofs - distribution substations	42 roofs replaced
Chamber substation security program	Security upgraded at approximately 330 substations
Low hanging mains	1,200 low hanging mains were rectified
Water crossings	Ausgrid assessed risk attached to 145 water crossings. It has completed works on approximately 30 of the 47 identified as being at risk.
Fire mitigation	66 oil circuit breakers were replaced
Replacement of asbestos floor tiles	21 floors at various zone and sub-transmission substations were replaced in order to reduce risks to staff.
Replacement of asbestos pit lids	74 pits lids were replaced at various zone and sub-transmission substations in order to reduce risks to staff.

Table 20: Duty of Care Plan jobs successfully completed

Arup's independent findings and assessment

Previous forecasts were overly ambitious and were made without consideration of the delivery of the overall capital works budget. In addition, as the regulatory period progressed, staff was drawn away from the Duty of Care Plan to work on other capex plans.

Elements of the Duty of Care Plan are subject to external factors beyond the control of Ausgrid. During this period these included planning approval issues and union related issues.

Ausgrid should ensure that the Duty of Care Plan is considered a focus of the organisation with assigned resources (e.g. supervisors) who are not directed to other activities (except in short-term emergencies).

B4.5 Lessons learnt

Ausgrid should ensure that the recent expenditure on asset management capabilities and the subsequent increase in network information is used to inform forecast expenditure for the next regulatory period. We understand that Ausgrid has adopted a revised approach for the implementation of the 2014-19 Duty of Care Plan with increased reliance on actual data and asset sampling to forecast risks.

B5 11kV Plan

B5.1 Description

Ausgrid's 11kV network consists of approximately 2,500 11kV feeders which total over 17,000 km in length. The 11kV Plan covers the capex incurred on 11kV network not driven by Area Plan or low voltage works. Investment under the 11kV Plan is triggered by growth in demand as a result of increased energy consumption of existing customers, or the additional energy consumption of new customers. The expenditure forecast for the 11kV plan for the current regulatory period focused on meeting design criteria levels specified in Schedule 1 of the 2007 licence conditions. These licence conditions are shown in Table 21.

Network element	Load type	Forecast demand	Security standard	Interruption
Distribution Feeder	CBD	Any	N – 1	Nil
	Urban	Any	N – 1	< 4 hr
	Non-Urban	Any	N	Best practice repair

Table 21: 11kV licence conditions[27]

B5.2 Expenditure

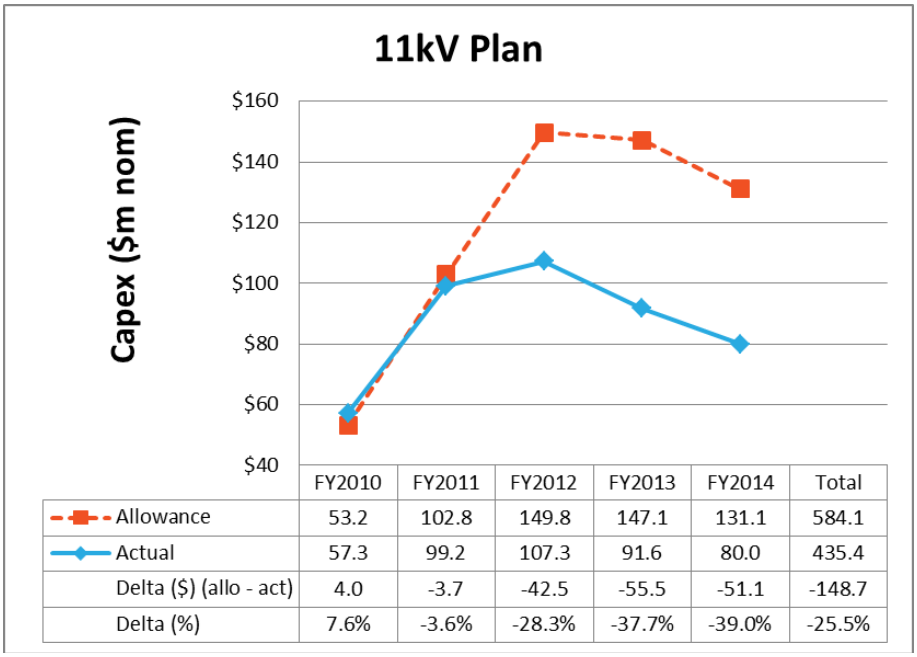
The forecasting approach adopted by Ausgrid at the time of the last regulatory reset was based on its 'Distribution Network Development Model' (DND Model). The expenditure sought by Ausgrid for the current regulatory period was categorised as:

- Catch-up compliance – based on bringing the existing network up to a standard to comply with the new licence conditions.
- Ongoing compliance – based on additional investment required to ensure continuing compliance given the expected growth in network load.

Ausgrid stated in its previous submission that the need for the significant increased spend for the 11kV Plan was influenced by the fact that the 11kV network did not have the required level of spare capacity to be compliant with the forecast increase in peak demand.

A comparison of this forecasted expenditure relative to actual expenditure on the 11kV Plan can be found in Figure 59. This shows that Ausgrid underspent relative to its regulatory allowance for the 11kV Plan by approximately 25.5%. Ausgrid increased its expenditure to an annual average of $87.1m this period with a peak of $107.3m in FY2012 which was significantly higher than the average annual expenditure of $46.5m during the previous regulatory period. For this expenditure Ausgrid has installed 295km of underground and 121km of overhead 11kV feeder this period. Ausgrid has stated that it is forecasting a $35m carryover from the 2009-14 Regulatory Period into the 2014-19 Regulatory Period. If the carryover is taken into account, Ausgrid has spent approximately 81% of its allowance.

[27] Minister for Energy (2007), *Design, Reliability and Performance Licence Conditions for Distribution Network Service Providers,* Schedule 1.



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	53.2	102.8	149.8	147.1	131.1	584.1
Actual	57.3	99.2	107.3	91.6	80.0	435.4
Delta ($) (allo - act)	4.0	-3.7	-42.5	-55.5	-51.1	-148.7
Delta (%)	7.6%	-3.6%	-28.3%	-37.7%	-39.0%	-25.5%

Figure 59: Actual and allowance expenditure for the 11kV Plan

Ausgrid contends that the remaining 19% underspend in allowance (when including the $35m carryover) is attributable to two key factors:

- falling peak demand; and
- A drop in large customers connecting to the 11kV network potentially as a result of the GFC (as indicated by a reduced number of high voltage connections).

A more detailed discussion of the work undertaken to meet licence conditions as part of the 11kV Plan is provided in Section 4.2.2 of this Report.

B5.3 Discussion

The number of non-compliances and work undertaken as part of the 11kV plan this period are summarised in Table 22.

Schedule of Work	Number this Period
Zones reviewed	294
Non-compliant feeders	502
Projects issued	384
Projects completed	225
Non-compliant feeders addressed	138

Table 22: Summary of the 11kV Plan and non-compliances

As can be seen, Ausgrid identified 502 non-compliances this period and addressed 138 of these non-compliances as a result of the 225 projects it completed. It should be noted that there is not a one-to-one direct relationship between non-compliances and projects. It is expected that as of FY2014 that there will be 364 non-compliances that will be required to be resolved in the following period, however, a significant number of these are close to being rectified as a result of

the large number of projects issued for action this period. The number of remaining non-compliances (new and backlog combined) as of each financial year is provided in Figure 60.

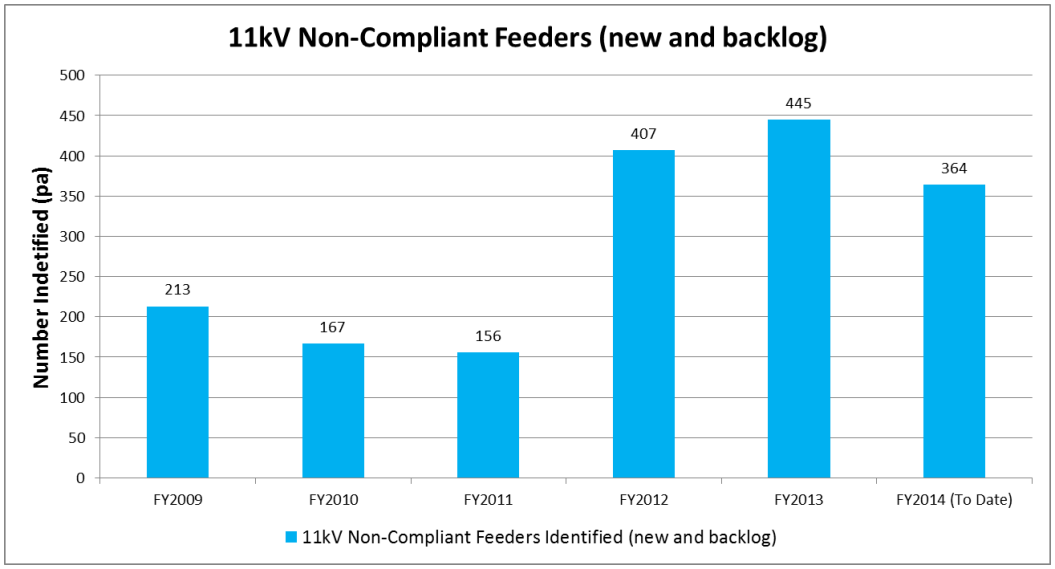


Figure 60: 11kV non-compliances

As can be seen in Figure 60 there has been a significant fluctuation in non-compliance numbers this period with non-compliances tracking downwards at the end of this period. Ausgrid states that when analysing its compliance performance, the period should be broken up into two sub periods.

This first period is the first two years of the regulatory period (FY2010 and FY2011). Based on discussions with Ausgrid planners as part of this review process, at the beginning of this period there were a significant number of high risk N non-compliances especially in the Hunter region of Ausgrid's network. N non-compliances are higher risk than N-1 non-compliances as they involve the asset being loaded to a higher level which can accelerate the premature ageing of the asset and therefore increase the risk of interruption to supply from that 11kV feeder. Because of this, a significant amount of 11kV resources were utilised on N issues in the Hunter region, while resources in the urban areas focused on both N and N-1 issues. The focus in the Hunter on resolving N issues in conjunction with Area Plan works meant that minimal surveying was undertaken in the Hunter during this part of the period.

The second period consists of FY2012, FY2013 and FY2014. As can be seen in Figure 60 there has been a significant jump in non-compliances for these three years. Ausgrid contends that because of its 11kV resources being utilised on N non-compliances especially in the Hunter, that there was limited ability to survey the 11kV feeder population in the first two years of this period. As a result, once Ausgrid had largely rectified its N non-compliance issues in the Hunter it increased its focus on surveying portions of the network which had not been surveyed in the first half of the period. This led to a spike in non-compliance numbers depicted for FY 2012 and FY2013 in Figure 60. Ausgrid states that is has been working towards rectifying these towards the end of the period and that this is represented by the reduction in non-compliances in FY2014. At the time of this review, Ausgrid spent $160m on projects that are in the process of being completed and relate to the remaining non-resolved non-compliances depicted in

FY2014. The forecast carryover of $35m into the next period represents the expenditure required to complete these projects and to officially resolve the remaining non-compliances.

Arup's independent finding and assessment

Ausgrid underspent relative to the regulatory allowance. This coincided with a plateauing in peak demand and fall in total energy consumptions. However, there was also an increase in overall non-compliances which was a result of Ausgrid allocating its 11kV resources to resolving identified non-compliances, especially N issues, carried over from the previous regulatory period or picked up in the first two years of the current period.

The remaining non-compliances should be on average relatively quick to address due to the significant amount of expenditure already incurred on these issues in the second half of the current regulatory period. Once the remaining non-compliances have been addressed, there is intended to be ongoing investment in 11 kV compliance to ensure reliability standards are met and to prevent a future backlog. As Ausgrid is undertaking less growth driven investment as part of its Area Plans next period, sufficient resources should be available for the 11kV Plan so that ongoing feeder growth issues can be addressed.

B5.4 Lessons Learnt

Ausgrid has stated that it has undertaken a detailed review of its DND Model and inputs to this model in order to improve the accuracy of its 11kV Plan forecast going forward. In particularly, the quality of input data has significantly improved as a result of investment made this period in Ausgrid's asset management systems and Geographic Information Systems (GIS). A prime example of this is more precise 11kV cable coordinates information as a result of GIS investment made this period.

Ausgrid also states that it has revised its peak demand forecasting methodology. Ausgrid notes that significant changes have been made to areas such as weather correction and probability of event (POE) thresholds which have reduced the forecast going forward so that it is more in line with historical actual peak demand. The peak demand forecasts are a key input into the DND model and should therefore increase its accuracy.

B6 Low Voltage Plan

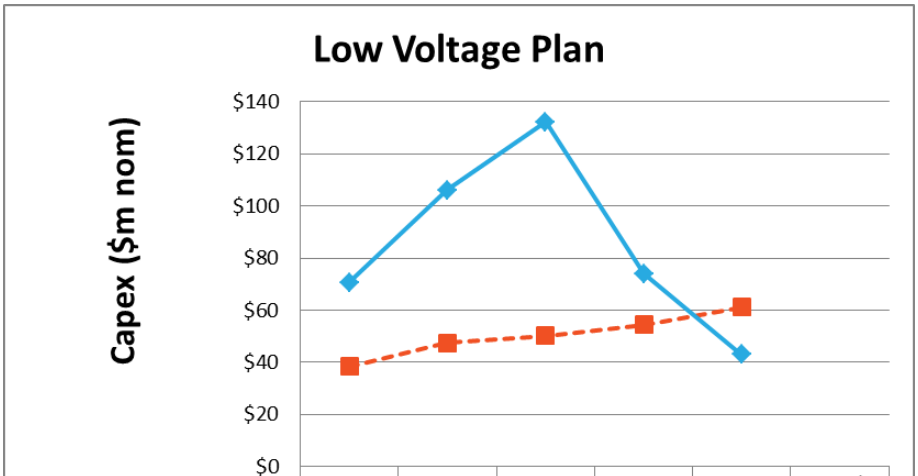
B6.1 Description

Ausgrid's low voltage network comprises roughly 30,000 distribution substations and 50,000 low voltage distributors. Ausgrid's distribution substation population is required to comply with NSW Licence Conditions. As part of its Low Voltage Plan Ausgrid specified triggers for investment on its low voltage network which it felt would allow it to ensure reliability and to consequently meet those licence conditions. Ausgrid stated that those investment triggers were approved by the AER as part of its determination. The primary triggers for growth driven investment specified were:

- when the utilisation of a distribution substation equals or exceeds 100% of its capacity rating; and
- When the utilisation of a low voltage distributor equals or exceeds 95% of fuse rating.

Expenditure for the Low Voltage Plan is generally forecasted using high-level modelling as there are a large number of assets and variables in Ausgrid's low voltage network which makes bottom-up estimating impractical.

B6.2 Expenditure



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	38.5	47.5	50.2	54.5	61.2	251.9
Actual	70.6	106.1	132.1	73.9	43.0	425.8
Delta ($) (allo - act)	32.1	58.7	81.8	19.5	-18.2	173.8
Delta (%)	83.4%	123.5%	162.9%	35.8%	-29.8%	69.0%

Figure 61: Low Voltage Plan comparison of allowance and actual

The expenditure profile in Figure 61 shows that Ausgrid significantly overspent its allowance for the Low Voltage Plan in all years but the final year of the current regulatory period. Ausgrid state that the significant overspend especially in the first three years of the period was largely incurred to address the significant backlog of non-compliances coming into the period. The reduced expenditure towards the end of the period represents Ausgrid's return to a more steady state of investment more in line with previous periods of investment.

B6.3 Discussion

The Low Voltage Plan was overspent during the current regulatory period by $173.8m or 69.0%. The major reasons for the overspend related to a significant increase in unit costs relative to those forecasted. The comparison showed that the average costs to resolve non-compliant distribution substations and low voltage distributors were approximately 260% times the costs forecasted. Ausgrid state that this was driven by three main reasons.

The first reason was that there was a significant difference between the historical solutions used in the previous regulatory period (upon which the unit costs were based) and the actual solutions undertaken during the current regulatory period. Ausgrid stated that the historical solutions that were used as the basis for the forecast were based on temporary solutions not equipped to address growth issues in an area over the longer term.

The second reason for the increase in overspend relates to the greater proportion of work than forecasted which was undertaken in urban areas of the network as opposed to rural areas. The forecasts for the 2009-14 Low Voltage Plan identified the Hunter region as requiring 48% of total works whereas only 16% of works were actually undertaken in this region. This means that the forecast was overly skewed towards above ground areas of the network which typically did not involve more costly undergrounding as part of the solution. This means that unit costs on average and the forecast as whole were understated.

The third reason for the increase in unit costs relates to the 'holistic' planning approach that Ausgrid undertook this period. Due to the large volume of work identified across all system capex plans and limited internal resources, Ausgrid undertook a planning approach to its low voltage network which sought to concurrently address multiple works often with different drivers in the same area. This often meant that works under other plans such as the Replacement Plan or the Reliability Plan were undertaken at the same time as low voltage reinforcement works. The result of this was that expenditure for these plans were often booked to the low voltage growth driven project and therefore, to the Low Voltage Plan. By undertaking a 'holistic' planning approach, Ausgrid states that it was able to:

- achieve expenditure synergies by reducing the duplication of activities within a given area;
- undertake a larger number of works than what may have otherwise been possible with a project-by-project approach; and
- Decrease the average length of interruption to customers and public infrastructure in a given area by only have to access the area once.

Finally, Ausgrid argue that it should be noted that the significant increase in unit costs was partly offset by a significantly lower number of non-compliant assets than forecasted. This was most observable in the backlog of non-compliances forecasted which was 4.6 times higher than the actual backlog of non-compliances recorded coming into this period.

Arup's independent findings and assessment

Ausgrid significantly overspent its regulatory allowance for the Low Voltage Plan for the 2009-14 Regulatory Period. The over expenditure was mostly the result of a disconnect between the nature of the historical projects and those actually undertaken. This in effect drove up average unit costs.

As a result of this overspend, compliance levels have increased over the course of the current regulatory period. There is expected to be minimal carryover of works into the next period as a result of catch-up expenditure incurred this period.

Ausgrid's expenditure in the final year of the current regulatory period should be consistent with addressing ongoing non-compliance issues as they emerge in coming years. Due to the size of Ausgrid's low voltage network and the increased number of variables which can affect compliance at this level of the network, it is to be expected that there will always be an ongoing need for work on these assets regardless of whether or not there is a high level of network growth.

B6.4 Lessons learnt

As a result of the overspend incurred on the Low Voltage Plan this period, Ausgrid should revise its unit cost forecast approach and ensure that unit costs proposed for the next regulatory period reflect intended planning philosophies. ICT investment in Ausgrid's Asset Management system this period should help facilitate this.

Ausgrid should also seek to amend its approach to forecasting the number of activities required. Historical job levels may provide guidance.

Lastly, Ausgrid should review its booking process and setup of financial systems in order to assist it in more accurately tracking its regulatory allowance for certain plans. It will be inevitable that even without a 'holistic' planning approach going forward, that Ausgrid will incur multiple works with different drivers concurrently. Therefore, its financial systems should be setup to accommodate split reporting. Ausgrid has stated that it has introduced multi-node reporting during the current regulatory period which should assist it to more accurately apportion expenditure between plans.

B7 Customer Connections Plan

B7.1 Description

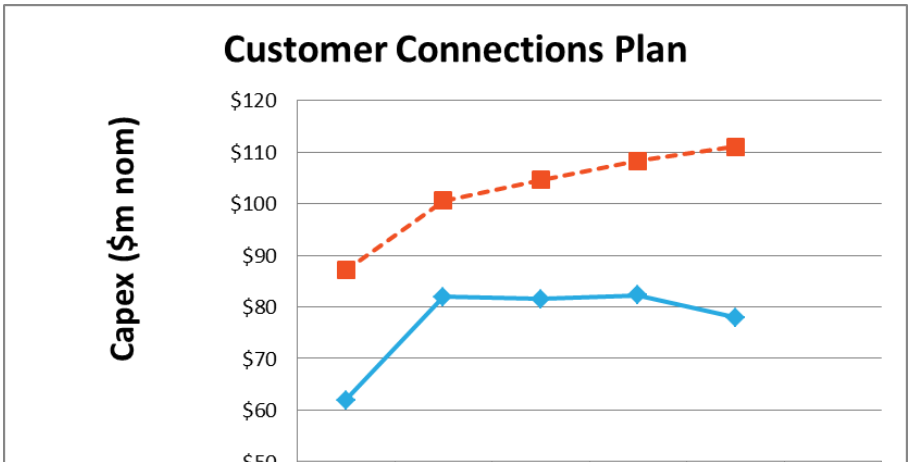
The Customer Connections Plan is based on expenditures incurred by Ausgrid in relation to connecting new residential and non-residential (commercial) customers to the distribution network. Customer connections are funded in three ways:

- Ausgrid funded – works undertaken and paid for by Ausgrid (or an Accredited Service Provider);
- Cash contribution – funded by customers and constructed by Ausgrid; and
- Gifted assets – funded by customers, undertaken by an ASP and gifted to Ausgrid.

Only Ausgrid funded works form part of expenditure incurred under the Customer Connection Plan The key driver of expenditure under this plan is the number of new residential and non-residential premises. This is outside the influence of Ausgrid and is related to broader economic conditions. In preparing the connection number forecasts for the current regulatory period, Ausgrid adopted forecasts which were aligned with independent forecasts and expected trends including the New South Wales Department of Planning. The impact of the GFC was unknown at the commencement of the current regulatory period and resulted in forecasts for customer connections above the actual outcomes experienced.

B7.2 Expenditure

Figure 62 compares allowed and actual customer connection expenditure.



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	87.1	100.6	104.6	108.3	111.0	511.6
Actual	62.0	81.9	81.5	82.3	78.0	385.7
Delta ($) (allo - act)	-25.1	-18.7	-23.1	-26.0	-33.0	-125.9
Delta (%)	-28.8%	-18.6%	-22.1%	-24.0%	-29.7%	-24.6%

Figure 62: Allowed and actual customer connections expenditure

B7.3 Discussion

The Ausgrid forecasts of expenditure were based on a bottom-up forecast of the number of new dwellings expected during the current regulatory period across the local government regions of Ausgrid's network. An allowance for non-residential (i.e. commercial premises) equivalent to 4.5% of residential approvals was then included. The final forecasts were below the NSW Department of Planning projections of the time.

Expenditure on customer connections was 25% below that forecast. The main driver of the 25% underspend was that new connections were 26% below that forecast. The lower number of connections is explained by the generally weak economic conditions experienced during the current regulatory period. The close relationship between the underspend and the lower than expected number of connections indicates that this type of approach to forecasting appears reasonable.

Table 23 and Table 24 show the break down in customer numbers against those forecasts and the split between residential and non-residential.

	2009/10	2010/11	2011/12	2012/13	2013/14	Total
Total forecast	16,080	17,739	17,612	17,612	17,612	86,655
Total actual	10,202	13,471	12,371	14,405	13,885	64,334
Variation	-5,878	-4,268	-5,241	-3,207	-3,727	-22,321
% variation	-37%	-24%	-30%	-18%	-21%	-26%

Table 23: Forecast and actual customer numbers

	2009/10	2010/11	2011/12	2012/13	2013/14	Total
Residential	8,073	10,367	10,195	12,175	11,951	52,762
Non-residential	2,129	3,104	2,176	2,230	1,933	11,572
Total	10,202	13,471	12,371	14,405	13,885	64,334

Table 24: Actual residential and non-residential customer numbers

Arup's independent findings and assessment

The lower than allowed expenditure is explained by the reduced number of customer connections due to the weak economic conditions over the current regulatory period.

Forecast customer connections are driven predominantly by external factors.

There may be opportunities to refine the approach to forecasting customer connections by considering residential and non-residential independently. Our understanding is that Ausgrid has undertaken this for its 2014-19 Regulatory Submission.

Forecasts of unit costs per connection appear reasonable given the close relationship between the reduction in number of connections and expenditure.

B7.4 Lessons learnt

Ausgrid has stated that it has separated out its connection forecasts into residential and non-residential for the upcoming regulatory submission. We consider that this should assist with more accurately forecasting connection numbers.

Ausgrid should investigate the possibility of increasing the use of Accredited Service Providers (ASPs) to undertake connections work. This would allow Ausgrid to focus more on other plans where internal resources may be more beneficially employed.

B8 Reliability plan

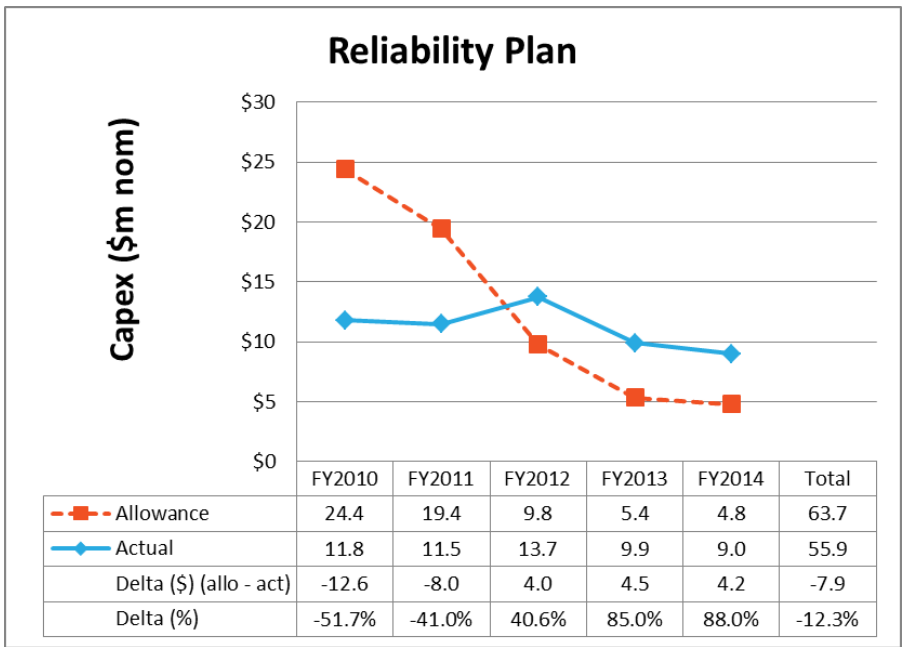
B8.1 Description

The Reliability Plan targets the 'gap' between network performance expected from the capital investment programs and the reliability performance requirements of licence conditions. The licence conditions set average performance requirements for customers (Schedule 2) and individual performance targets for distribution feeders (Schedule 3). The targets are based on the standard duration (SAIDI) and frequency (SAIFI) reliability standards and set different targets for the CBD, urban, short-rural and long-rural customers and feeders.

The Reliability Plan applies only to the 11 kV and some elements of the low voltage network. It should be noted that all capex adds to reliability and that performance cannot therefore be attributed directly to Reliability Plan expenditure.

B8.2 Expenditure

Figure 63 compares allowed and actual expenditure on the Reliability Plan.



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	24.4	19.4	9.8	5.4	4.8	63.7
Actual	11.8	11.5	13.7	9.9	9.0	55.9
Delta ($) (allo - act)	-12.6	-8.0	4.0	4.5	4.2	-7.9
Delta (%)	-51.7%	-41.0%	40.6%	85.0%	88.0%	-12.3%

Figure 63: Forecast and actual reliability plan expenditure

B8.3 Discussion

The allowance on the Reliability Plan was forecasted to fall throughout the regulatory period from approximately $24.4m to $4.8m. This compares to the actual expenditure which was reasonably even over the period with a downward trend towards the end of the regulatory period. Total expenditure on the Reliability Plan is expected to be 12.3% below the original allowance although actual expenditure it is approximately twice the allowance in FY2014.

The regulatory allowance included expenditure allocated to individual feeder reliability and average feeder reliability (Ausgrid's individual customer reliability

expenditures targeted at specific 'black spots' was not accepted by the AER). During the regulatory period, Ausgrid invested 128% of the individual feeder reliability allowance ($43.1m compared with $33.6m) and 40% of the average feeder reliability allowance ($12.0m compared with $30.2m). Ausgrid also spent $0.8m on individual customer reliability this period.

As shown in Section 4.1 of this report, Ausgrid has largely met the licence conditions in relation to CBD SAIDI and CBD SAIFI during the previous and current regulatory period. This performance is consistent with that for the urban, short-rural and long-rural SAIDI and SAIFI requirements.

The reliability performance shows that Ausgrid has achieved the required standard in the majority of cases, and in fact has met the standard by a reasonable margin in many instances. The significant capital expenditure program over the current regulatory period has assisted in achieving this outcome. A specific expenditure element which had an impact is the investment in Distribution Monitoring and Control (DM&C) which has resulted in quicker fault detection and restoration in those areas where its implementation occurred. The DM&C program was rolled out with a focus on targeting feeders with poor past performance. This investment sought to allow Ausgrid to meet its network monitoring and control requirements more cost-effectively than envisaged by the regulatory allowance.

Arup's independent findings and assessment

The reliability performance over the current regulatory period has been relatively strong and met the requirements in the majority of instances.

There are a series of factors which come into play and contribute to the reliability outcomes, including weather conditions, changes in peak demand, changes in customer connections, and all forms of previous investment (especially growth driven investment). While it is difficult to isolate the major drivers for the high level of reliability performance (at the levels reported), likely contributing factors are the high level of network expenditure, expenditure on network monitoring and control equipment such as DM&C, and strong performance in fault response processes..

While Ausgrid has exceeded its reliability targets, ongoing reliability investment is required in order to stay above specified thresholds in the future.

B8.4 Lessons Learnt

Ausgrid may consider allocating a larger weighting of expenditure towards individual feeder reliability performance as it has stated that this section of the network has experienced underinvestment during the current regulatory period.

B9 Metering Plan

B9.1 Description

Ausgrid has approximately 2.4 million meters and associated load control relays and time switches across its network. These are installed at approximately 1 million connection points. Ausgrid's approximate metering stock is shown in Table 25. [28]

	Type 6		**Type 5**		**Types 1-4**	**Smart meters**
	Accumulation	Electronic TOU	Interval	Communicating interval	Contestable	Trials
Meters	1,800,000	-	600,000	4,000	25,000	17,500

Table 25: Ausgrid's meter stock

Ausgrid's metering policy has evolved over time. From July 2000, Ausgrid commenced installing Type 5 manually read interval meters at selected new and upgraded premises. From July 2004 Ausgrid adopted a policy of installing Type 5 interval meters on a new and replacement basis while discontinuing the installation of accumulation meters (Type 6). This decision was made on the basis of facilitating time-of-use pricing and collecting more detailed load information for investment planning purposes. This strategy continued for the majority of the current regulatory period.

In mid-2012, Networks NSW took a decision to revert to an accumulation meter-based policy (Type 6).[29] This decision was in response to concerns regarding the additional cost of interval meters (Type 5) in terms of both the additional capital cost and costs incurred in data retrieval and storage. It was also due to the uncertainty of the metering environment with potential changes flagged to the contestable nature of all metering in the near future. Equity concerns also existed given the smearing of costs across the entire customer base.

The accumulation meter policy (Type 6) that will be effective from 1 July 2014 has implications for both the replacement and franchise elements of the metering plan. Key elements of the Type 6 metering policy are included in the following box.

[28] Ausgrid Board Paper for Meeting 28 August 2013: Item 14 – Metering Replacement and Technology Strategy (19 August 2013)
[29] Ausgrid Board Paper for Meeting 28 August 2013: Item 14 – Metering Replacement and Technology Strategy (19 August 2013)

Meter policy summary (as of 2013)

The key elements of the policy are:

- Policy principles relating to metering technology deployed will include the following outcomes for small customers (approximately 90% of all meters).
- The default type for new connections is an accumulation type meter.
- Meter replacement and upgrades will be like-for-like.
- Interval meters will be installed for embedded generation (including PV) sites (3-8%), CT meter (<1%) installations, and sites where the customer requests a time based tariff.
- The default meter type will be an interval meter for medium size customers (greater than 40MWh per annum) with interval data retrieval.
-

B9.2 Expenditure

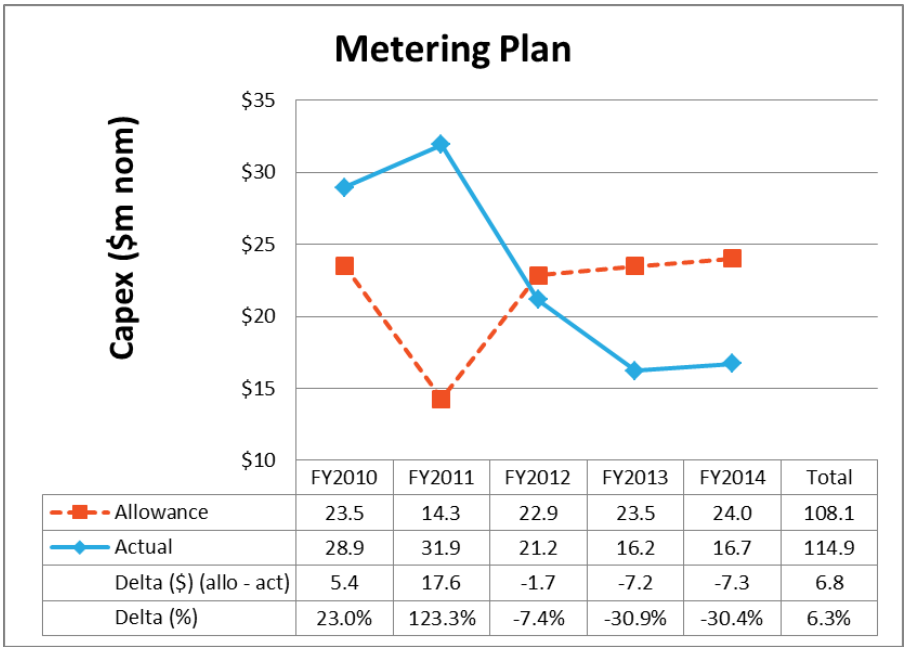
The metering plan consists of three elements:

- Metering Replacement Plan;
- Franchise Metering Plan (new metering); and
- Smart Metering Plan (known as AMI Development in the previous regulatory submission).

In Section 6.1 of this Report, these were grouped together as part of the Metering Replacement Plan. We have combined these elements into a single discussion in this Section B9 for ease of analysis and the linkages between the elements. The two main plans, the Replacement Metering Plan and Franchise Metering Plan have different drivers as well as controllable elements.

Figure 64 compares total allowed and actual expenditure on the Metering Plan during the current regulatory period. As can be seen in Figure 64, Ausgrid is expected to spend 6.3% or $6.8m above the allowance for its entire Metering Plan. This represents a reasonable outcome given the significant changes in the external and internal environment that have occurred and have had a significant impact on the two main sub-category plans. It is also a reasonable outcome considering the forecast error for the Metering Replacement Plan which was carried through to the AER's Final Determination which resulted in a negative allowance in the first two years of the period. Ausgrid contends that it should have reallocated approximately $8.3m from other areas to the Metering Replacement Plan allowance, and if this had occurred it would have meant that Ausgrid would have been slightly under its allowance for all Standard Control metering capex. Unfortunately this error was carried through leading to the outcome displayed.

A further discussion of these issues by individual plan is provided in the sections below.



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	23.5	14.3	22.9	23.5	24.0	108.1
Actual	28.9	31.9	21.2	16.2	16.7	114.9
Delta ($) (allo - act)	5.4	17.6	-1.7	-7.2	-7.3	6.8
Delta (%)	23.0%	123.3%	-7.4%	-30.9%	-30.4%	6.3%

Figure 64: Allowed and actual Metering Plan expenditure

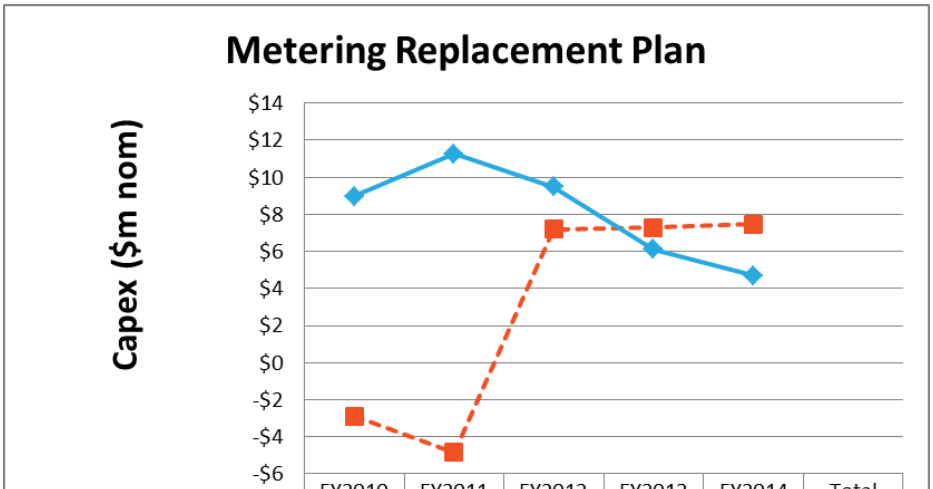
B9.3 Discussion

B9.3.1 Replacement Metering Plan

The replacement metering component is based on performance of the asset base and was previously included as a component of the Replacement Plan. The Replacement Plan for metering consists of reactive and proactive replacements. The reactive component relates to failed meters while the proactive component is based on annual reviews of sample groups of meters to test measurement accuracy and functionality determined under a sample testing regime (defined by Australian Standard 1284.13) and functionality determined under a sample testing regime (defined by Australian Standard 1284.13).

If a particular population of meters fails the required multi-stage sample testing process, a proactive replacement program is proposed to replace the defined population over a ‘reasonable’ timeframe as agreed with AEMO.

Figure 65 compares allowed and actual expenditure on metering replacement.



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	-2.9	-4.9	7.2	7.3	7.5	14.2
Actual	9.0	11.3	9.5	6.1	4.7	40.5
Delta ($) (allo - act)	11.9	16.1	2.3	-1.2	-2.8	26.3
Delta (%)	-410.2%	-331.5%	31.8%	-16.2%	-37.0%	185.8%

Figure 65 Allowed and actual expenditure on metering replacement

As can be seen in Figure 65, Ausgrid significantly overspent its meter replacement allowance by 185.8% or $26.3m[30]. The majority of this overspend occurred in the two first years of the period. The negative values regarding the allowance in FY2010 and FY2011 are due to a forecasting error made by Ausgrid during the previous regulatory reset process which was carried through into the AER's final determination. This error has had a material impact in relation to the size of the expenditure overspend within the replacement component of the Metering Plan.

Table 26 shows the quantity of meters replaced compared with the forecast number underpinning the allowance for the first four years of the regulatory period.

	FY10	**FY11**	**FY12**	**FY13**
Allowance	12,389	10,246	18,602	18,352
Actual	45,195	51,804	34,933	21,542
Variation	32,806	41,558	16,331	3,190
% variation	265%	406%	88%	17%

Table 26: Allowed and actual meter replacement quantities

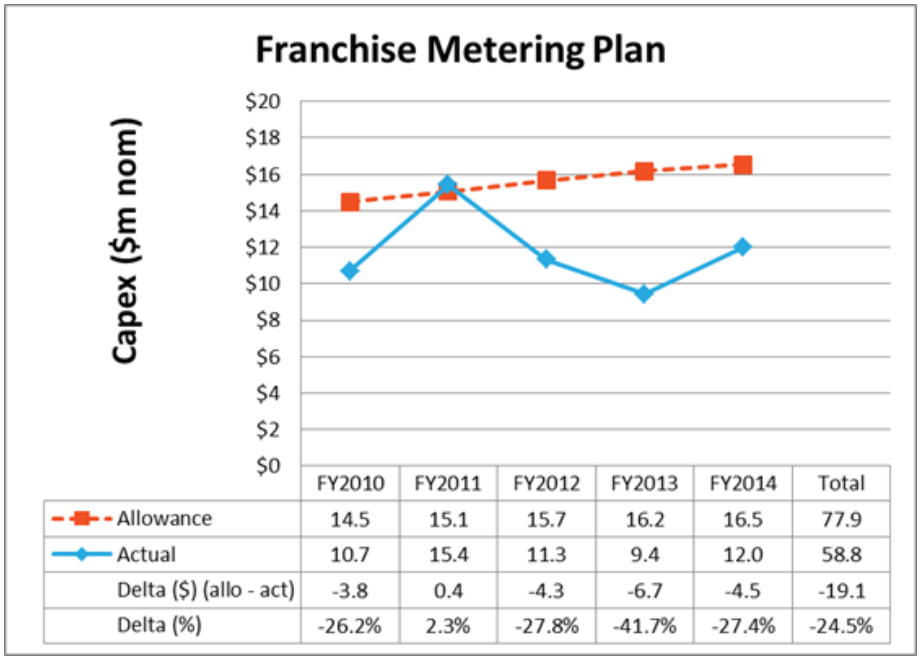
As can be seen in Table 26, there has been substantially more meters replaced than forecast which has led to the overspend highlighted in Figure 65. Ausgrid states that this is primarily due to a significant improvement in metering population data which has led to increased identification of meters requiring replacement based on compliance issues. This information became available as a result of a more proactive approach to grouping the meters into accurate populations and improved asset management platforms in which to store this information. It resulted in a significant subset population of the metering

[30] Note that due to incorrect posting of new and replacement meter expenditure in Ausgrid's asset management systems, an estimated breakdown was developed based on the Reset RIN.

population being identified as non-compliant with the regulatory and policy frameworks mentioned listed above.

B9.3.2 Franchise Metering Plan

The franchise metering component relates to new and upgraded (including solar PV connections) customer connections requiring new metering. Actual expenditure is therefore influenced by general economic conditions as discussed with respect to the Customer Connections Plan. Figure 66 compares allowed and forecast expenditure on franchise metering.



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	14.5	15.1	15.7	16.2	16.5	77.9
Actual	10.7	15.4	11.3	9.4	12.0	58.8
Delta ($) (allo - act)	-3.8	0.4	-4.3	-6.7	-4.5	-19.1
Delta (%)	-26.2%	2.3%	-27.8%	-41.7%	-27.4%	-24.5%

Figure 66: Allowed and actual expenditure on franchise metering

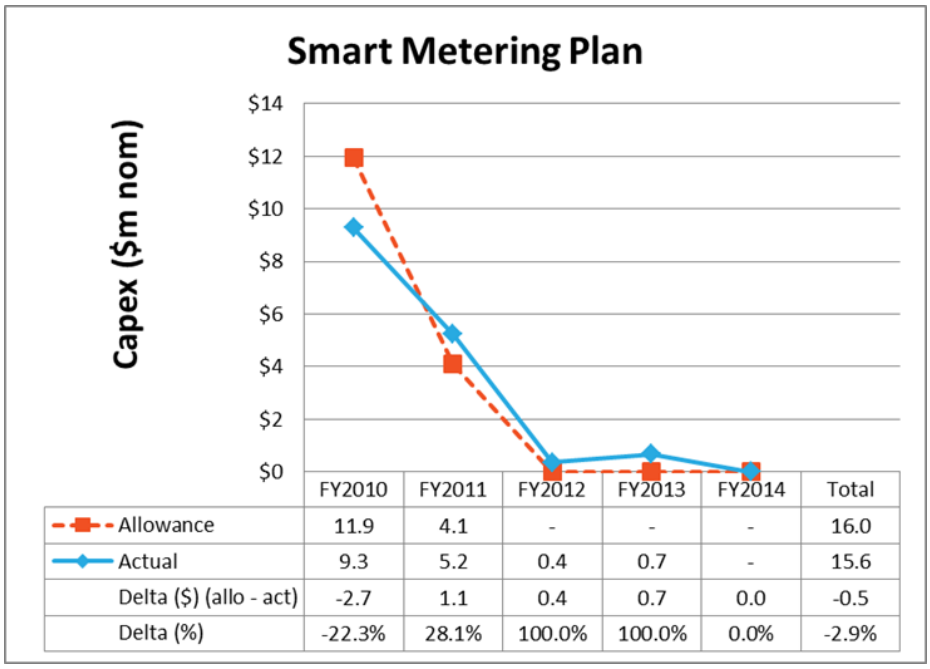
As can been seen in Figure 66, franchise metering expenditure was 24.5% lower than the allowance[31]. This corresponds reasonably with the reduced number of customers connected relative to forecast (26%) described under the Customer Connections Plan. Therefore, it is reasonable to assume that the impacts of the Global Financial Crisis on building development which led to an underspend in the Customer Connections Plan also led to the material variation for new metering expenditure this period.

In addition, the introduction of the NSW Government's Solar Bonus Scheme on 1 July 2010 also impacted the outcome. This scheme was introduced after the NSW distribution businesses had submitted their proposal to the AER and the AER made its Final Determination. As a result of the scheme, an additional 50,000 connections requiring Type 5 meters which were not due for replacement nor factored into Ausgrid's franchise metering forecast had to be installed. The Solar Bonus Scheme explains why actual expenditure was close to or above the allowance in FY2010 and FY2011 despite the reduced overall number of customers. The degree to which the reduced number of new customers relative to forecast was offset by the impacts of the Solar Bonus Scheme is unclear.

[31] Note that due to incorrect posting of new and replacement meter expenditure in Ausgrid's asset management systems, an estimated breakdown was developed based on the Reset RIN.

B9.3.3 Smart Metering Plan

The smart metering component relates to the roll-out of smart meters as part of a trial which commenced in the previous regulatory period. The expenditure profile matches the regulatory allowance as shown in Figure 67.



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	11.9	4.1	-	-	-	16.0
Actual	9.3	5.2	0.4	0.7	-	15.6
Delta ($) (allo - act)	-2.7	1.1	0.4	0.7	0.0	-0.5
Delta (%)	-22.3%	28.1%	100.0%	100.0%	0.0%	-2.9%

Figure 67: Allowed and actual expenditure on smart metering

A further discussion of smart metering is contained in the ICT Plan and Smart Grid Smart City Plan. Overall smart metering was in line with the determination.

Arup's independent findings and assessment

Overall Ausgrid overspent its total metering allowance by 6.3%. However, there is a degree of variation from year to year and between the replacement and franchise components. These variations are largely explained by a combination of government initiatives, better quality data, forecasting errors and global economic events. It is reasonable to assume that Ausgrid could not have envisaged the impact of these developments (with the exception of the forecasting error) at the time it prepared its last submission. Therefore, the fact that Ausgrid only slightly overspent its official allowance for the Metering Plan represents a considerable achievement by Ausgrid to remain close to prescribed budgetary constraints.

There appears to have been an issue this period with the quality and consistency of the data postings into Ausgrid's systems and how activities and costs were allocated between the three elements of the metering plan. Ausgrid has indicated better project controls are now in place.

The reversion to the installation of Type 6 meters as the default metering policy appears to be a serious attempt to reduce capital costs and costs incurred in retrieval and storage of data. While there will be ongoing costs associated with maintaining current systems, Type 5 meter growth will significantly slow which will, over time, flow to proportionately lower costs for the majority of customers.

B9.4 Lessons learnt

Ausgrid should review internal allocation standards to ensure expenditure and activities are being correctly booked. It is likely that better reporting will take place going forward as a result of the bedding down of Ausgrid's new asset management systems.

Ausgrid should review its unit cost forecasts for the next regulatory period based on actual expenditure during the current regulatory period, especially the later years where the new meter policy has been in place.

Ausgrid should ensure its forecast meter volumes are consistent (where relevant) with the approach taken to forecasting customer connection numbers. Ausgrid has indicated that it has used the same connections numbers underpinning its volume forecast for the 2014-19 Regulatory Submission. Broader trends, such as the NSW Solar Bonus Scheme policy, should be taken into account where sufficient reliable information is available.

B10 System Property Plan

B10.1 Description

The System Property Plan describes Ausgrid's plan for network land acquisitions and land disposals associated with major network sites. This typically includes zone substation, sub-transmission substations and sub-transmission switching station sites. Identification of future land requirements is in response to capex requirements as contained in the Area Plans.

The priority of acquiring suitable land within these areas is defined based on the timing of the proposed project; the strategic importance of the requirement; and the likelihood of acquiring a suitable site. Ausgrid has in place a general Property Acquisition Timing Guideline which provides a basis from which property acquisitions can be planned. These are described in Table 27.

Site location classification	Search time	Overall acquisition target date (years in advance)
Rural	2 years	4 – 5 years
Urban	3 years	5 – 7 years
CBD	5 years	8 – 10 years
Customer substation (sites provided by customer)	1 year	3 – 4 years

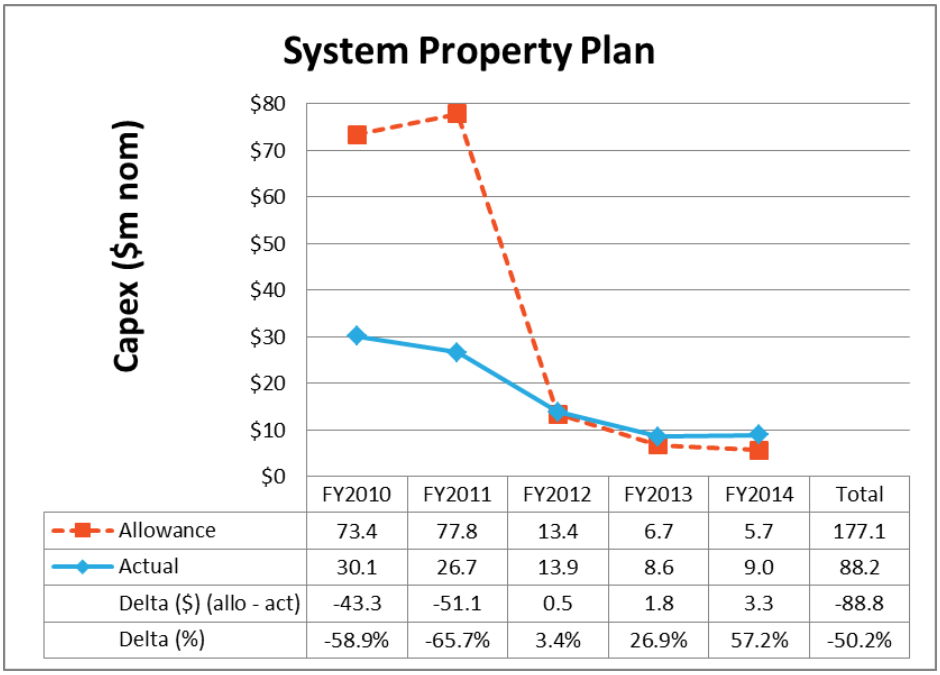
Table 27: Property Acquisition Timing Guideline

There are established communications practices within Ausgrid which include a monthly meeting (Key Property Meeting). These meetings include the relevant staff and cover progress on all current land acquisitions and disposals, as well as flagging likely future network property needs. It also covers any externalities that may impact the property acquisition or disposal process. Approvals documentation is required for sites up to a cost of $10 million and includes a business case for the purchase of a particular property. For sites costing more than $10 million, approval is by way of a Board Report.

The System Property Plan is a response to the physical land requirements of the business.

B10.2 Expenditure

Figure 68 describes the annual capital expenditure for the System Property Plan over the current regulatory period compared with the allowed expenditure.



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	73.4	77.8	13.4	6.7	5.7	177.1
Actual	30.1	26.7	13.9	8.6	9.0	88.2
Delta ($) (allo - act)	-43.3	-51.1	0.5	1.8	3.3	-88.8
Delta (%)	-58.9%	-65.7%	3.4%	26.9%	57.2%	-50.2%

Figure 68: Allowed and forecast system property expenditure

Ausgrid has underspent on its allowed system property allowance by around 50%; primarily because of a significant underspend in the first two years of the current regulatory period. Ausgrid has indicated that the primary underspend in the earlier years related to the purchase of the Bligh Street zone substation site in the Sydney CBD which in fact occurred towards the end of the 2004-09 Regulatory Period.

The opportunity to purchase this site arose just prior to the commencement of the current regulatory period. The Bligh Street site was purchased for $75.0m in FY2009 just prior to the period under review, however, post submission of its regulatory proposal. This purchase shows as an over expenditure in the prior regulatory period and an under expenditure in the current period, driven purely by the purchase timing. If the Bligh Street purchase is included as expenditure in the current regulatory period, total expenditure would have been $163.2m compared with the allowance of $177.1m, a difference resulting in an underspend of only 7.8%.

B10.3 Discussion

Accurately projecting system property expenditure is a challenge given that final decisions about the physical land requirements stem from load projections and are made a number of years in advance. Ausgrid acquired approximately 39 properties during the current regulatory period compared with 14 nominated in the 2008 regulatory submission. Ausgrid states that the requirement for extra sites was driven largely by more detailed refurbishment design work which identified the need for site enlargements or new sites.

Despite more property purchases than forecast, Ausgrid has underspent its system property allowance by approximately 7.8% (when the timing adjustment for Bligh Street is taken into account). Ausgrid state that the underspend is in large part due to lower than expected commercial property prices as a result of events such as Global Financial Crisis.

Arup's independent findings and assessment

Ausgrid have a well-defined property purchase strategy which responds to the requirements of the business over a medium-term timeframe

Despite the medium-term focus, the strategy is flexible and able to respond to market opportunities.

During the current regulatory period, Ausgrid was able to increase its property portfolio in order to meet current or expected investment needs within its regulatory allowance.

B10.4 Lessons learnt

Ausgrid has not articulated particular lessons learnt or strategic changes related to the outcomes of expenditures from the current regulatory period.

B11 Non-system Property Plan

B11.1 Description

The Non-system Property Plan encompasses all of the building assets that Ausgrid uses to support its business. Non-system property is segmented into the following broad categories:

- Office accommodation – which is located across Ausgrid's asset area and is required to house staff involved in direct planning of the network and project management of network investments.
- Depots – which are located across Ausgrid's network area and enables staff to construct network assets, undertake preventative and corrective maintenance on network assets, and respond to reliability incidents.
- Specialist sites that enable Ausgrid to store network equipment, conduct testing and learning / training facilities to train apprentices and maintain the currency of qualifications for field staff.

Ausgrid is required to invest in non-system property to replace, renew or create new assets. Replacement and renewal is in response to any underlying conditions or issues with the asset. Decisions are made based on the underlying obligations and guidelines, with respect to health, safety and environmental responsibility. In addition, decisions to invest or divest assets may be undertaken in response to changes to the business environment including:

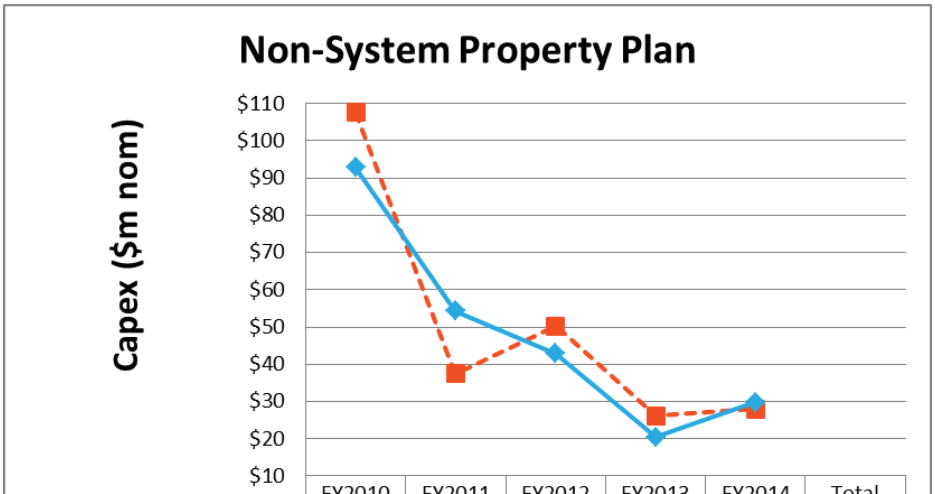
- Changes to staff numbers – during the current regulatory period, there was a need to take on additional apprentices which necessitated a review of the existing training facilities (and required the building of a new facility).
- Government zoning strategies – Ausgrid is responsive to changes in zoning strategies and may relocate facilities in response to these strategies.

Ausgrid also applies a number of planning principles which provide an overall framework for investment decisions for the non-system property portfolio. These planning principles include:

- Location of staff;
- Security of tenure; and
- Safety and compliance in line with the Building Code of Australia and current Workplace Health and Safety regulations.

B11.2 Expenditure

Figure 69 shows the capital expenditure for the current regulatory period in which Ausgrid spent around $240.3 million. This represented around 96.4% of the allowed capital expenditure for the current regulatory period and matched closely the expenditure profile granted by the AER.



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	107.5	37.4	50.2	26.1	28.0	249.3
Actual	92.9	54.3	42.9	20.5	29.8	240.3
Delta ($) (allo - act)	-14.6	16.9	-7.3	-5.7	1.8	-9.0
Delta (%)	-13.6%	45.1%	-14.5%	-21.8%	6.3%	-3.6%

Figure 69: Allowed and actual non-system property plan expenditure

B11.3 Discussion

The level of expenditure during FY2010 was high in comparison with subsequent years. The high level of expenditure corresponds with the increase in capex program which occurred at that time. The increased capex program required the need to house a significant increase in staff numbers as Ausgrid's workforce grow from about 5,000 to 6,500. There was also a need for increased depots to house the increase in fleet.

Ausgrid also undertook significant renewals of aged non-system facilities during the current regulatory period. During this period 10 depots were upgraded; four depots replaced and six sites purchased to enable replacement or enhancement programs. The need for an increase in the number of depot replacements in the current (and next) regulatory period is driven by the ongoing need to replace aged infrastructure. Many of the depots that are owned by Ausgrid were constructed in the late 1960's and 1970's and are in need of replacement. While some of the older depots requiring an upgrade have a site location which can accommodate new and expanded infrastructure and layout, others are site limited and will not support the upgrade route. These limitations and the need to be reasonably located with respect to growth areas in the network, drive the need for new depot sites.

Figure 70 provides a snapshot of the age profile of Ausgrid's depots as of the current regulatory period.

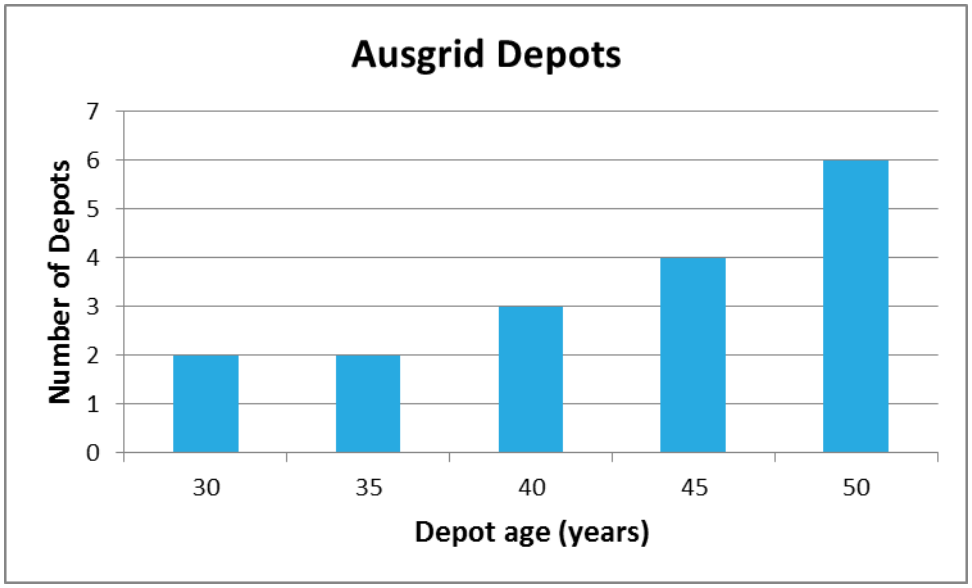


Figure 70: Ausgrid depots and their age profile

In addition four major office buildings were upgraded (major plant replacement and/or refurbishment of interiors). Several specialist sites were also upgraded or developed during the current regulatory period including:

- The Ausgrid Learning Centre which consolidated learning and training requirements (especially for apprentices) in a central location at Silverwater and was in part funded by the NSW Government.
- Data centres where existing storage and IT management systems were moved to offsite data centres to ensure business continuity (previously a significant risk which was identified but unaddressed).
- Establishment of a central store in Somersby to manage the inventory of Ausgrid.
- Development of a centralized records repository.
- Pole and transformer yards to manage inventory levels and meet current environmental planning requirements for the safe storage, handling and disposal of treated poles, transformers and transformer oil products.

Despite this significant property expenditure and refurbishment program, Ausgrid underspend its allowed investment by approximately $9.0m.

Arup's independent findings and assessment

Despite the significant refurbishment and development of new non-system properties during the current regulatory period, Ausgrid underspent its allowable capital allowance by approximately $9.0m.

Ausgrid has a significant number of aged depots which may need to be refurbished or replaced in coming years. Some of this work has occurred during the current regulatory period and more work is likely to continue in the next regulatory period to ensure that Ausgrid meets its legal requirements for a safe workplace.

B11.4 Lessons learnt

Ausgrid has not articulated particular lessons learnt or strategic changes related to the outcomes of expenditures from the current regulatory period.

B12 Non-system ICT Plan

Ausgrid has a Technology Strategy of which the key objective is to assist the business meet its required functions effectively at the least cost. The Technology Strategy identifies key principles and broad strategies designed to deliver this key objective within Ausgrid. These principles include:

Optimise the portfolio (standardization and simplification to enable the adoption of common business processes);

- Leverage existing applications;
- Increase utilisation of systems with spare capacity;
- Benefit quantification and realisation;
- Sustainability of the technology services;
- Least cost solutions;
- Explore options other than replacement; and
- Use commercially proven and standard packages.

Within the Technology Strategy, Ausgrid has two key capex plans relating to information, communications and technology (ICT) – system and non-system. This section looks at the Non-System ICT Plan and Section B.13 looks at the System ICT Plan. In summary the Non-System ICT is primarily the information technology (IT) supporting the network operations, asset management, human resource management and financial management processes which allow the DNSP to move towards more efficient service delivery. The System ICT is primarily the telecommunications infrastructure which connects the network monitoring, protection and control devices back to the network operations centres (NOCs) and the IT systems which gather the information required for network control, planning and , and allow billing and customer service delivery.

B12.1 Description – Non-System ICT Plan

Coming into the prior regulatory period, Ausgrid management believed that there had been significant underinvestment in Non-System ICT which had persisted from previous regulatory periods. The result of this was that at the commencement of the current regulatory period many of Ausgrid's key platforms were:

- Redundant or were aging and needed upgrading.
- Duplicating information which reduced efficiency and required further integration of legacy systems.

Other issues which needed to be addressed or required supporting investment in ICT included investment in:

- a GIS system to assist maintenance tracking of network assets, help fulfil legal requirements and assist better asset replacement forecasting through better asset information; and
- additional data storage to support the Type 5 Time of Use Metering Strategy which was adopted in July 2004 but later amended with changes arising from the introduction of Networks NSW from mid-2012.

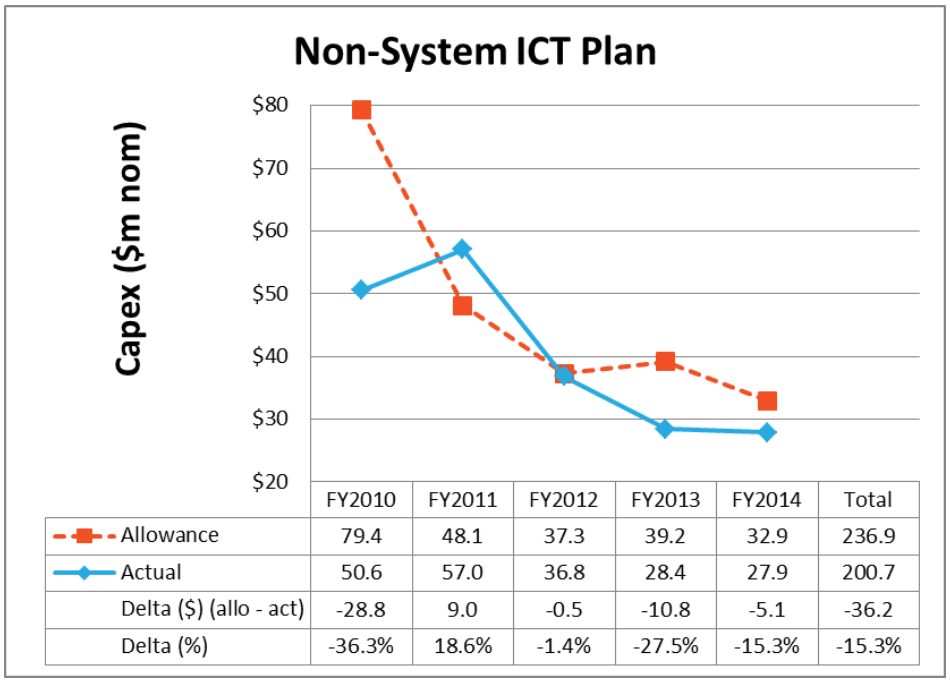
In some cases, the upgrades were required to ensure that Ausgrid met its compliance or licensing requirements, whilst in other cases, upgrades were about delivering efficiencies, managing risks (e.g. from identified systems failures or data losses), or by consolidating or integrating systems.

The Non-System ICT Plan within Ausgrid includes the following three broad business drivers:

- New compliance and regulations – new or upgraded systems as a result of changed compliance obligations. Key programs for the current regulatory period included:
    - Metering and Market rules and obligations;
    - National Energy Customer Framework;
    - Human Resource and Payroll;
    - Payment Card Industry Compliance;
    - Records and Document Management; and
    - IT Security.
- Maintaining core ICT operations and license compliance – maintain the quality, reliability and security of standard control services through the maintenance and upgrade of Ausgrid ICT Infrastructure and Applications in the most cost effective manner. Key programs for this period included:
    - Data Centre Consolidation;
    - End of Life Application Upgrades;
    - Critical IT Exposures and Risk Mitigation program;
    - Infrastructure and Telecommunications refreshes and business as usual (BAU) capacity upgrades; and
    - Metering Roadmap and Program.
- Business efficiency and continuous improvement - identification of manual and labour intensive processes within the business and ICT support functions which can be made more efficient through ICT investments and enablers. Key programs for this period included:
    - Mobility and workforce optimization;
    - Business process and operational efficiency and improvements leveraging the Integrated Asset Management System (iAMS) implemented in SAP; and
    - Enhanced decision-making and analysis capability through dashboards, scorecards and reports.

B12.2 Expenditure – Non-System ICT Plan

Unlike System ICT expenditure across the current regulatory period, Non-System, ICT expenditure was underspent. Figure 71 shows that the underspend was incurred across all years of the regulatory period except for FY2011.



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	79.4	48.1	37.3	39.2	32.9	236.9
Actual	50.6	57.0	36.8	28.4	27.9	200.7
Delta ($) (allo - act)	-28.8	9.0	-0.5	-10.8	-5.1	-36.2
Delta (%)	-36.3%	18.6%	-1.4%	-27.5%	-15.3%	-15.3%

Figure 71: Allowed and actual non-system ICT capital expenditure

Table 28 displays the breakdown of the allowed expenditures into the main cost categories, and Table 29 the breakdown of actual capex. The focus of the capex for this period was aimed at maintaining the core systems infrastructure and to provide ICT support to allow the workforce to become more productive.

Allowed Non-Sys Capex ($m)	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Asset Mgt	14.59	12.70	4.73	5.78	9.92	47.72
Work Mgt	7.23	4.13	3.67	4.09	4.03	23.14
Customer & Revenue Mgt	19.60	19.99	8.34	7.86	1.96	57.75
Commercial & Corporate	11.01	6.67	4.37	5.39	5.74	33.17
Enterprise Information Mgt	4.35	3.82	4.19	3.76	5.98	22.10
ICT Infrastructure	22.62	0.78	11.98	12.31	5.31	52.99
Other (inc Eng. & Tech)	0.00	0.00	0.00	0.00	0.00	0.00
Total Non-Sys ICT Capex	79.39	48.08	37.29	39.19	32.94	236.88

Table 28: Breakdown of Non-System ICT capex by cat. – Allowed

Actual Non-Sys Capex ($m)	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Asset Mgt	8.02	4.52	4.88	3.98	4.28	25.67
Work Mgt	4.35	2.41	1.58	1.06	6.44	15.85
Customer & Revenue Mgt	6.11	4.21	4.91	5.58	6.79	27.60
Commercial & Corporate	3.83	17.28	5.04	3.68	2.56	32.38
Enterprise Information Mgt	2.94	5.37	9.09	7.25	3.84	28.50
ICT Infrastructure	24.53	21.74	10.56	6.20	3.22	66.25
Other (inc Eng. & Tech)	0.80	1.50	0.73	0.66	0.75	4.44
Total Non-Sys ICT Capex	50.57	57.03	36.78	28.41	27.88	200.68

Table 29: Breakdown of Non-System ICT capex by cat. –Actual

B12.3 Discussion – Non-system ICT Plan

Although the Non-System ICT Plan has been delivered under budget, there was still variation on a number of projects from that approved by the AER in its determination. Ausgrid's approved regulatory Non-System ICT allowance of $236.9m was revised down by the Ausgrid Board in 2010 to $216.0 million to recognise capital efficiency savings. In addition following the introduction of the Networks NSW strategy, the Chief Operating Officer further reduced the overall ICT capital expenditure in July 2013 and deferred a number of projects which were originally planned in 2009. As of the end of FY2014, Ausgrid's forecast is to be underspent by approximately $36.2m from the expenditure allowed by the AER. The variation of the actual versus the AER allowance by regulatory category is shown in Table 30.

During the current regulatory period, Ausgrid has achieved the following in respect of its Non-System ICT program:

- Consolidated into properly designed data centres to ensure:
  - disaster recovery (prior unrecoverable regulatory data failure highlighted this need);
  - 4 year server hard drive refresh cycle; and
  - migration of primary GIS and SAP systems to controlled rooms;
- Upgrade enterprise resource planning (ERP) to a SAP version which is currently supported including:
  - systems integration;
  - new licences (one off capex but opex at 20% of one-off fee);
  - some hardware triggered by upgrade;
  - internal labour support for upgrade; and
  - training;
- Commencement of capex to support field automation program (the mobility strategy).

Despite variations in expenditure on individual Non-System ICT projects, Ausgrid has at the time of this report rectified all of its ageing platforms identified coming

into this regulatory period. It has also increased its asset management capabilities through combined upgrades to SAP and further development of its Integrated Asset Management Systems (iAMS). These improvements have substantially aided:

- More detailed forecasting for the 2014-19 Regulatory Submission especially in regards to unit costs and assessing internal resourcing capabilities.
- Have been significant in facilitating prudent investment decisions throughout the period by providing consolidated data that has been used for risk and project timeframe reassessments.

Ausgrid has indicated that areas where additional IT focus is required in the future include:

- Migration to a new meter application, as Logica does not have an upgrade path;
- The NEMS Star system requires an upgrade, and is running on 13 year old infrastructure;
- Additional data storage as data requirements are growing at around 3TB/year; and
- Capex on hardware and software to maintain sustainable business support and productivity improvement initiatives.

% Over / (Under) Spent	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Asset Mgt	-45.0%	-64.4%	3.0%	-31.2%	-56.8%	-194.6%
Work Mgt	-39.8%	-41.7%	-56.9%	-74.0%	60.0%	-152.4%
Customer & Revenue Mgt	-68.8%	-78.9%	-41.2%	-29.0%	246.7%	28.8%
Commercial & Corporate	-65.2%	159.1%	15.4%	-31.8%	-55.5%	22.1%
Enterprise Information Mgt	-32.5%	40.5%	116.8%	93.0%	-35.7%	182.2%
ICT Infrastructure	8.4%	2,705.6%	-11.9%	-49.6%	-39.4%	2,613.1%
Other (inc Eng. & Tech)	n/a	n/a	n/a	n/a	n/a	n/a
Total Non-Sys ICT Capex	-36.3%	18.6%	-1.4%	-27.5%	-15.3%	-15.3%

Table 30: Breakdown of Non-system ICT capex by cat. - % variation

The category with a major underspend by approximately $30.2m was in Customer & Revenue Management area, with the main savings occurring in FY2010 and FY2011. The category with the major overspend by approximately $13.3m was in ICT Infrastructure, with the main additional spending occurring in FY2011.

Arup's independent findings and assessment – Non-System ICT Plan

Non-System ICT is usually a fixed cost to any business, but cannot just be treated as just a fixed overhead which can be artificially reduced to ensure budget savings. In a business whose primary function is asset management, Non-System ICT is a critical business input which can lead to productivity and efficiency improvements in the delivery of system maintenance, system operation, asset management and customer service delivery. Therefore a sustainable level of capex (and its related opex), must be maintained to ensure the systems and software are available, used and (to the greatest extent possible) error free, so efficiencies are available to the business overall.

Arup's analysis of Ausgrid's Non-System ICT Plan for this period suggests that:

- Ausgrid has improved its approach to investment in Non-System ICT, but further steps are required to better utilise the systems available, and to unlock additional performance and efficiency improvements.
- Data on the benefits realisation of Non-System ICT needs to be defined, gathered and reported. However it is noted that such metrics are not easy to retain or measure in the ICT space due to the large number of variables which could affect performance and may have nothing to do with adequacy of investment made.
- Networks NSW has shown a clear intention to standardise ICT systems (both non-system and system) across the three NSW DNSPs for which it is responsible, and this should lead to a sustainable level of Non-System ICT system capex. It will also mean that less risky investment in terms of benefits realisation will be in focus going forward.

B12.4 Lessons learnt

Ausgrid has stated that it needs to ensure there is continuing and stable capex in Non-System ICT in order to have sustainable ICT systems which support the business and allow it to focus on aspects of its business strategy including:

- better and improving asset management strategies and execution;
- better mobility solutions implementation to support the workforce;
- proper and well run data centres;
- disaster recovery plans active and ready to implement;
- ICT infrastructure is refreshed on an efficient investment cycle;
- software is upgraded to maintain current (and lower cost) technical support;
- systems are integrated and older systems are retired; and
- there is continuous improvement in systems and system support to allow workforce productivity improvements.

B13 System ICT Plan

As discussed above, within the Technology Strategy, Ausgrid has two key capex plans relating to information, communications and technology (ICT) – system and non-system. This section looks at the System ICT Plan and Section B.12 looks at the Non-System ICT Plan.

During the current regulatory period, Ausgrid incurred capex and opex associated with the Federal Government's *Smart Grid, Smart City* Program which was not requested for approval by the AER at the beginning of the period. This trial program required a commitment of existing or new capex to combine with the $93 million grant provided by the Federal Government in order for the winning tenderer (a consortia of businesses with the requisite skills, experience and network access led by Ausgrid) to undertake and report back on the smart grid trails. Ausgrid already had a number of capex program components which were approved by the AER and were related to implementing equipment supporting its own smart grid strategy or could be used to support new smart grid trials with some additional capex above that approved. This additional capex has been posted primarily to the System-ICT Plan and therefore has become a contributor to the overspend for this capex plan above that regulatory allowance.

Because the additional capex for the *Smart Grid, Smart City* Program lies outside the prior regulatory approvals, additional and separate comment on this program has been included in Section B.14 below.

B13.1 Description – System ICT Plan

The System ICT Plan was designed to manage the technology support capabilities that are used to directly operate the electricity network. These key technologies include fibre optic and wireless telecommunications infrastructure which carries the SCADA[32] business support system. This in turn connects remote monitoring, switching and control devices at substations and other critical points in the electricity distribution network to the network operational control centres (NOCs). These interconnected systems are critical to the day to day operations of Ausgrid's electricity network and also help facilitate investment in the network. The System ICT Plan[33] for the 2009-14 Regulatory Period also incorporated support elements for key initiatives that are often referred to as smart grid technology, and in this plan the initial deployment of a Distribution Monitoring and Control (DM&C) devices in the 11kV/415v network.

In the current regulatory period, there were a significant number of elements delivered including those under the original System ICT Plan, and the additional elements brought in from other program areas to support the *Smart Grid, Smart City* Program, but delivered in parallel. In particular, there were several elements of investment within the Metering, Reliability and Replacement Plans that were leveraged by the System ICT Plan to enhance the overall delivery of network control and monitoring functions, under the *Smart Grid, Smart City* Program. These are discussed separately in Section B.14 below.

[32] Supervisory Control and Data Acquisition (SCADA).
[33] EnergyAustralia, System IT (Network Operational Technology) Plan 2004-14, May 2008.

Ausgrid's 2009-14 System ICT Plan indicated that there were a number of drivers for investment in network technology for this regulatory period including:

- Developments in technology had significantly reduced the costs of devices, telecommunications and IT systems. This has improved the business case and made the range of possible benefits expand and become more attractive. Ausgrid had the view that network and customer driven benefits could be achieved over time at a lower incremental cost, as a result of developments in technology.
- Ausgrid used the current regulatory period and its capital expenditure program to upgrade many parts of the network with new technologies at minimal incremental cost enabling the replacement of old assets by new assets with both enhanced functionality and lower unit cost which are designed to future proof the network.

In total, the 2009-14 System ICT Plan proposed to invest a total of $119.2m over the current regulatory period. In addition, $21.9m of capex on SCADA systems for the Replacement Plan was approved and for this discussion has been excised and incorporated in the System ICT Plan. Therefore the total approved capex was $141.4m for the current regulatory period. Figure 72 below shows the actual capex versus the AER allowance.

The program areas outlined in Ausgrid's proposal for the 2009-14 Regulatory Period included:

- SCADA / Distribution Network Management Systems (DNMS) covering:
    - Migration of the legacy SCADA1 and SCADA2 technology to DNMS (or the new standardised DMS platform).
    - Upgrade existing customised DNMS system to newer functionality for additional monitoring requirements or migrate onto a standardised Distribution Management System (DMS) platform which can support distribution and sub-transmission monitoring and control.
    - Refresh of SCADA display and projector replacements and wall displays in the NOCs at Sydney and Wallsend.
- Other Operational Support Systems programs, covering:
    - Distribution Monitoring and Control (DM&C) Program, which sought deployment of smart devices particularly at the 11kV/415v level in the network. This capex was to assist timely fault identification and resolution for better customer reliability. It also provided additional information for preventative maintenance and future network planning. It also provides support for a possible future move to integration of remote control capabilities to enable smart switching of the network.
    - Integration of systems and movement towards a Common Information Model (CIM) based on industry standards.
    - Standard testing equipment and software tools for engineers to assist in field testing and trouble shooting of the network.
    - A common web application and display environment to allow network information to be more widely and easily available.
    - Implementation of a standardised software based engineering platform to assist technical staff in their work and interaction with various legacy software systems.

- Operational Technology (previously called Telecommunications programs), covering:
  - Operational and business support systems (OSS/BSS) covering:
    - Updating a physical network inventory (or GIS) systems for telecommunications assets.
    - Updating the telecommunications network operating centre (NOC) for telecommunications.
    - Investments to move towards provision of VoIP to support voice and video services.
  - Connectivity covering:
    - 'Last mile' connection to more electricity distribution network locations to support daily information transfer needs and to connect to the DNMS (and Pinc[34]) infrastructure.
    - Data encryption and telecommunications network security enhancements, allowing sensitive control and monitoring services (SCADA and protection) to operate in parallel over the same infrastructure as voice & video.

For the current regulatory period, these programs also interfaced or supported the program of works under the *Smart Grid, Smart City* Program. The *Smart Grid, Smart City* Program elements are discussed separately in the following Section B.14.

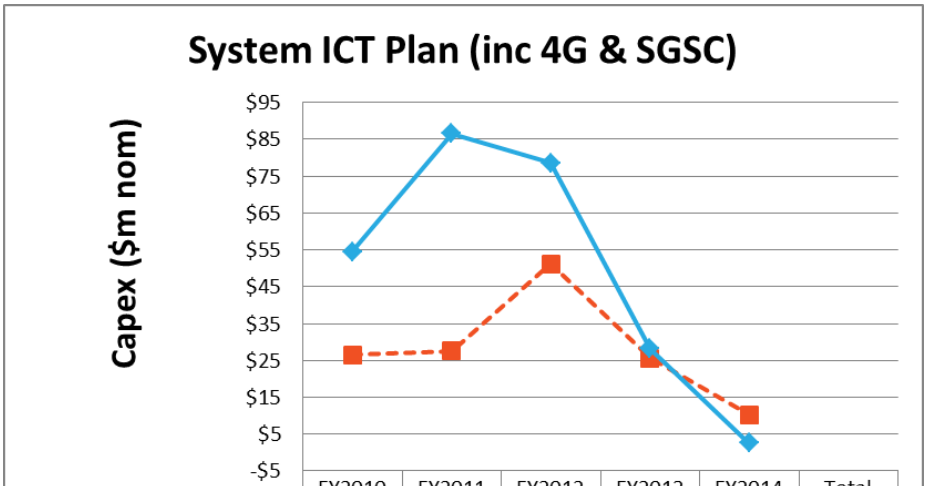
B13.2 Expenditure – System ICT Plan

As indicated above, there were several elements approved, programmed and delivered under the System ICT Plan which were required expenditures to move towards the use of smart technology within the electricity distribution network.

However, there was an additional amount of new expenditure required earlier in the regulatory period, to support the *Smart Grid, Smart City* project elements. These expenditures were in excess of the approved levels but in areas similar to those approved, and which were required to fulfil the requirements for Ausgrid to receive the Federal Government's contribution of $93m towards this exploration of electricity distribution network and retail innovation.

Total System ICT expenditure is shown in Figure 72. This analysis excludes the impact of the Federal Government grant of $93m.

[34] The Platform for Intelligent Network Communications (Pinc) was a project to install fibre optic to replace old copper backbone networks connecting various of Ausgrid's network infrastructure, which was capex in the prior regulator period.



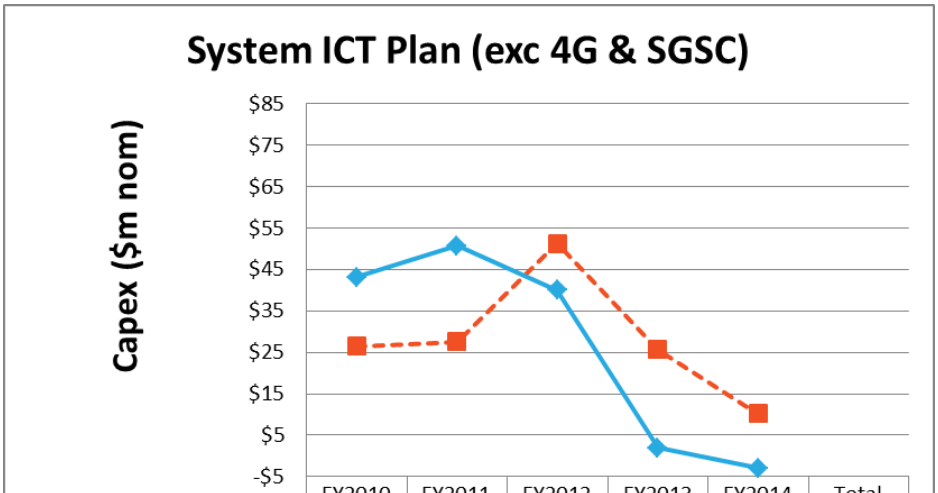
	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	26.5	27.5	51.2	25.7	10.3	141.1
Actual	54.4	86.5	78.5	28.2	2.5	250.1
Delta ($) (allo - act)	27.9	58.9	27.3	2.5	-7.8	109.0
Delta (%)	105.5%	214.1%	53.4%	9.8%	-75.6%	77.2%

Figure 72: Allowed and actual System ICT expenditure (inc SGSC)

As can be seen in Figure 72 Ausgrid has overspent its System ICT Plan by 77.2% above that allowed for by the AER for the 2009-14 Regulatory Period. The main reasons for the overspend is the support provided to undertake the *Smart Grid, Smart City* Program trials. This required additional capex including on a 4G wireless network build (WiMAX) and other smart grid capex undertaken by Ausgrid and booked to this System ICT Plan.

This over-expenditure however, needs to be considered in the context of the additional investment that was required as part of the *Smart Grid, Smart City* Program of works in order for Ausgrid to be eligible for the additional funding provided of $93m from the Australian Government. While the additional funding was not the only reason for tendering for this Federal Government program, Ausgrid's strategy at the time for exploration of smart grid technology was compatible with the *Smart Grid, Smart City* Program objectives.

System ICT capex without these specific additional expenditures for the *Smart Grid, Smart City* Program trials is shown in Figure 73. As can be seen the capex for FY2012 onwards is below the allowed capex, but it was still higher than allowed in the first two years of the current regulatory period.



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	26.5	27.5	51.2	25.7	10.3	141.1
Actual	43.1	50.8	40.0	1.9	-2.9	132.9
Delta ($) (allo - act)	16.6	23.2	-11.2	-23.8	-13.2	-8.3
Delta (%)	62.8%	84.4%	-21.9%	-92.6%	-128.3%	-5.8%

Figure 73: Allowed and actual System ICT expenditure (exc. SGSC)

Importantly, the *Smart Grid, Smart City* Program, which commenced in 2011, required a number of upgrades to Ausgrid's System ICT to support the investigation of innovative network control, monitoring, distributed energy supply and storage, billing and tariff services. In some cases this required capex on new network elements, whilst in other cases, components needed to be delivered earlier in the regulatory program than anticipated in 2009 when the original program was developed and approved by the AER. In other cases approved capex programs needed to proceed on a larger scope (ie. in greater numbers) than originally envisioned in order to meet the test requirements of the *Smart Grid, Smart City* Program. This is reflected by the early peak in expenditure which ensured that the appropriate ICT systems were in place in order to support the trial of different elements of the *Smart Grid, Smart City* Program. These investments are discussed further below, in Section B.14.

The allowed expenditure on the System ICT Plan by activity category is shown in Table 31. This summary excludes the expenditures on the *Smart Grid, Smart City* Program where these can be separately identified, so that a better comparison of approved versus actual capex can be considered.

System ICT Allowed ($m)	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Comms BSS/OSS	$3.16	$3.43	$3.32	$5.06	$3.94	$18.91
Reliability DM&C	$0.67	$1.23	$1.14	$0.00	$0.00	$3.05
Intelligent Network Information	$12.22	$12.92	$14.58	$8.98	$0.00	$48.71
SCADA/DNMS	$7.91	$5.93	$28.60	$7.72	$1.88	$52.03
Connectivity (Including Pinc)	$2.51	$4.01	$3.57	$3.91	$4.43	$18.44
Total System IT & SCADA Repl.	$26.48	$27.53	$51.21	$25.66	$10.25	$141.14

Table 31: Allowed System IT expenditure by sub-cat. – Exc SGSC & 4G

Information supplied by Ausgrid indicates that the SCADA replacement capex allowed by the AER within the Replacement Plan, has been removed from that plan total and added to the total of allowed capex for this sub-program. This has been added as the allowance in Table 31, and as the actual in the middle row total in Table 32. Even so the actual expenditures exceed the allowance in FY2010 and FY2011. The actual expenditure in FY2010 and FY2011 are significantly higher than the allowance because of trailing final expenditures on the Pinc deployment which was part of the DNMS program which was a prime focus for the prior regulatory period.

The actual expenditure on the System ICT Plan by activity category is shown in the bottom row of Table 32. The additional expenditures on the 4G wireless network and additional expenditures on the *Smart Grid, Smart City* Program (where they can be identified) are separately identified below the allowed capex components. The total actual capex booked against this System ICT plan is also provided in the last row.

System ICT Actual ($m)	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Comms BSS/OSS	$13.53	$19.54	$2.54	$0.11	$0.00	$35.73
Reliability DM&C	$25.00	$13.68	$15.28	$0.26	-$4.01(*1)	$50.19
Intelligent Network Information	$3.33	$6.69	$9.49	$0.26	$0.63	$20.40
SCADA/DNMS	$0.48	$2.45	$11.73	$1.28	$0.48	$16.43
Connectivity (Including Pinc)	$0.75	$8.41	$0.98	$0.00	$0.00	$10.13
Total System IT & SCADA Repl.	$43.10	$50.77	$40.01	$1.90	-$2.90	$132.88
SGSC (Ausgrid Funded)	$0.00	$8.85	$22.48	$22.66	$5.17	$59.16
4G Network Build	$11.33	$26.86	$16.04	$3.61	$0.23	$58.06
Total SGSC	$11.33	$35.71	$38.52	$26.26	$5.40	$117.23
Total System IT & SCADA Repl. & SGSC	$54.42	$86.48	$78.54	$28.17	$2.50	$250.11

Table 32: Actual System IT expenditure by sub-cat. – Inc SGSC & 4G

Note *1: The negative refers to the reversal of bought and yet to be installed DM&C units to inventory (opex). These remaining units will be installed next period and their cost capitalised as they are installed.

As can be seen in Table 32 the actual capex against the Reliability DM&C sub-category significantly exceed the allowance. As this was an early concern, a review of Ausgrid's DM&C program was undertaken by SKM in 2011[35] The review attempted to ascertain the reasons for the significant difference between the number of DM&C remote terminal unit (RTU) devices targeted to be rolled out and the number actually deployed up to that date.

The review showed that *"there was a lack of installation resources over the first two years of the current regulatory period to meet the delivery targets in the business plan"*. While the target for the roll-out was around 12,000 units, only around 7,500 were successfully rolled-out for the period. In addition, the average

[35] Sinclair Knight Mertz (SKM), Distribution Monitoring and Control (DM&C) Project, Review of Project Roll-out, 19 September 2011.

cost per unit of the roll-out was significantly higher than anticipated due to the need to use overtime to accelerate the roll-out, this increased the average costs for deployment, above that originally forecast.

Discussion with the Ausgrid team responsible for delivery of the System IT Plan suggests that, in managing these two influences on the cost of the DM&C roll-out, the expenditure on the roll-out of around 7,500 monitoring RTUs to substations in the 11kV/415v interface was significantly in excess of the AER allowed expenditure for the current regulatory period. The program was curtained in the last two years of the current regulatory period following changes to strategy implemented by Networks NSW and the desire to reduce additional cost overruns in this sub-category and contain overall actual capex to be within approved capex, for those System ICT elements which progressed for reasons other than the *Smart Grid, Smart City* Program.

The percentage over and under expenditure on the System ICT Plan (including the SCADA Replacement allowance, but excluding 4G wireless and identified direct SGSC expenditure) is shown in Table 33.

System ICT Actual vs Allowed (%)	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Comms BSS/OSS	328.1%	469.5%	-23.5%	-97.8%	-100.0%	89.0%
Reliability DM&C	3,624.1%	1007.8%	1,240.3%	n/a	n/a	1,548.2%
Intelligent Network Information	-72.7%	-48.2%	-34.9%	-97.2%	n/a	-58.1%
SCADA/DNMS	-93.9%	-58.6%	-59.0%	-83.4%	-74.3%	-68.4%
Connectivity (Including Pinc)	-70.2%	109.4%	-72.6%	-100.0%	-100.0%	-45.1%
Total System IT & SCADA Repl.	62.8%	84.4%	-21.9%	-92.6%	-128.3%	-5.8%

Table 33: % Actual exceeds Allowed System ICT sub-cat. – Exc SGSC & 4G

As can be seen the primary over expenditures relate to the development of the smart grid data gathering investment (DM&C), feedback channel investment (intelligent network or Pinc), and in business and operational support systems.

The WiMAX technology (4G wireless) was deployed to provide the 'last mile' connection between the smart devices rolled out with the DM&C program, and the fibre optic backbone between zone and sub-transmission substations under the deployment of Pinc. While expenditures in WiMAX could have been phased and hence be maintained within or closer to the AER's allowance[36], there are strong build synergies available for a single one-time deployment to cover the majority of the Ausgrid distribution network area[37].

Earlier deployment of WiMAX was also needed to support the *Smart Grid, Smart City* Program, which could not have delivered the required data without this data channel to allow the collection information on a number of the test scenarios.

[36] Knowledge of the technology function suggests it would likely have been allocated under the DNMS allowed capex.
[37] Synergies in roll-out build include the community consultation, sitting negotiation and local government approvals for antenna & tower location, as well as head end deployment and systems integration.

B13.3 Discussion – System ICT Plan

The intention of Ausgrid's System ICT Plan at the beginning of this period was to develop a smart network which would improve the accuracy of investment forecasts, assist in the pinpointing of investment needs, help achieve investment synergies and facilitate a move towards cost reflective pricing of electricity. In addition the real time nature of the information could assist reliability improvements through more rapid identification of fault locations, faster workarounds using more remote switching technology, and reduced lead time for fault reactivation by better dispatch of repair crews.

The basis for Ausgrid's Technology Strategy was its paper, Electric Thinking, Our Intelligent Network Plan (2007), which discussed the need for grid modernisation and defined some of the high level benefits. This plan encompassed a number of technology elements, many of which have ICT support systems at their core.

This step-change in technology required investment in both grid and customer-side technologies in addition to the ICT support systems. Given that the current regulatory period represented a once-in-a-generation step change in grid capital investment for the replacement of aged assets and to meet the then anticipated increase in demand, the plan to invest in 'intelligent' technologies was developed, and appeared to have a reasonable business case.

As part of the Electric Thinking Plan, Ausgrid prioritised the delivery on a number of projects including individual technologies / hardware solutions and standardisation of some ICT program areas. The eventual rollout of this plan was also influenced by the opportunities provided by additional external investment available for the *Smart Grid, Smart City* Program (in-kind investment and Australian Government investment) which presented the unprecedented opportunity to expand on the Electric Thinking Plan within the Ausgrid network.

Given the size, complexity and expenditure of the System ICT Plan, Ausgrid commissioned an independent assessment for one of the elements of the program. The particular assessment was on the costs incurred and benefits realized from the Pinc deployment project, and included review of elements which had been implemented in the prior regulatory period. The independent assessment of Ausgrid's platform for intelligent network communication (Pinc) project (KEMA Consulting[38]) which showed a 98% return on the investment (ROI) for this project, as compared to a 36% predicted return in the original business case. Further this report identified that the annual net benefits of this infrastructure meant that the ROI would increase for a longer period than was used for the analysis.

In 2011 Networks NSW was formed and as part of this restructure a detailed review of ICT systems investment was undertaken. The review sought to limit continued expenditure during this period on technology which would not be continued in use over the mid-term, under the new ICT strategy. This is demonstrated by a significant decline in spending in the last two years of this regulatory period.

[38] KEMA Consulting, Independent assessment f Ausgrid's Platform for Intelligent Network Communications (Pinc) Project, September 2011.

Arup's independent findings and assessment - System ICT Plan

It is clear that Ausgrid will continue to have a significant System ICT capex program in the future in response to a number of external compliance and internal efficiency requirements, plus the need to maintain the existing systems in a sustainable manner. In particular, as Ausgrid contemplates whether or not to deploy increasing automated ('smarter') devices on its network, the need to integrate and streamline control systems may need to increase. There will be a growing need for Ausgrid to more thoroughly identify and quantify the business and customer benefits within the business cases for these technologies, before firm decisions can be made on additional deployment.

Further, it is clear Networks NSW has paused the future roll-out of 'smart' technology, particularly as Ausgrid was leading this deployment with its involvement in the *Smart Grid, Smart City* Program. While there will be limited rollout of additional interval or smart meters, the challenges in managing 'big data' volumes will continue to increase as big data volumes will be driven by the collection of more asset and financial information and Ausgrid's greater use of these for making more prudent investment decisions. This focus on better asset management will require continued investment in productivity enhancements including a move towards mobility solutions, and the resulting need to adequately manage the increased asset data and the business risk of potential data losses.

B13.4 Lessons learnt

Ausgrid has found it difficult to track the benefits in the maintenance and planning functions to the enabling investment in System ICT (and indeed supporting Non-System ICT). Nonetheless benefits do accrue to both Ausgrid and the broader community through exploration (and likely eventual movement towards) smart grid technologies.

While it is difficult to quantify these benefits, Ausgrid has identified a need to develop metrics for measuring System ICT benefits realisation going forward.

While the *Smart Grid, Smart City* Program has highlighted the likely benefits of smart grid technology to the broader economy and DNSP customers, and indeed the likely impacts on the DNSP's networks from emerging technologies, it is unclear if and when these impacts will occur and necessitate response from the DNSPs in their investment programs.

B14 Smart Grid Smart City Program

While the *Smart Grid, Smart City* Program (SGSC Program) did not form part of the capex approved by the AER prior to the 2009-14 Regulatory Period, part of the expenditure incurred on the SGSC Program did form part of Ausgrid's System ICT Plan and therefore, has formed part of its regulated expenditure for this period. Over the 2009-14 Regulatory Period Ausgrid rolled $59.2m on SGSC projects into its regulated expenditure and incurred another $58.1m on developing a WiMAX (4G wireless) network.

Prior to the commencement of the current regulatory period, Ausgrid sought involvement in the Federal Government program as it had already identified opportunities for a move towards smart grid technology and had begun to invest in infrastructure which could support such trials. The Federal Government program was keenly contested by a number of DNSPs in the tender process with the successful DNSP being awarded a significant amount of government funding to undertake trials of the program.

Ausgrid participated in the tender process as it felt that the development of smart technology would better facilitate asset management and achieve long-term investment savings. These benefits were highlighted in the accompanying material to its tender submission.

A prime element which triggered the tender process was the Department of Industry report[39] to Federal Government on smart grid technology. This report noted the potential for smart grid technology to facilitate annual benefits across Australia of $1.3 billion through reduction in peak prices (reflecting lower generation costs) and overall energy conservation, and at least $500m through operational savings for DNSPs, such as through automated network control and monitoring features and remote meter reading. Given Ausgrid's network supports around 15% of the electricity distribution energy delivery in Australia, it was perceived that a significant proportion of this benefit could be available to its customers, and to itself, through support of new and emerging smart technologies.

B14.1 Description - *Smart Grid, Smart City* Program

The *Smart Grid, Smart City* Program built on Ausgrid's existing smart grid infrastructure, which itself was spread over a number of linked initiatives under the standard capex plans. In the tender process the Australian Federal Government provided $93 million to support the trials. This was used by Ausgrid for all of the opex for the trials, and some for capex for the demonstration of a range of new smart grid solutions which have been directed at activities that were either utilised by Ausgrid's existing infrastructure or were considered as 'future opportunities' for the industry.

The *Smart Grid, Smart City* Program commenced in late 2010, with the technical trials completed in November 2013 and the extended customer trials scheduled for later completion, at the end of February 2014. Arup understands that extended

[39] Previously the Department of Environment, Water, Heritage and the Arts, *Smart Grid, Smart City, A New Direction for a New Era*, The National Energy Efficiency Initiative, 2009, using input from a confidential McKinsey analysis. See www.innovation.gov.au/Energy.

customer trials and analysis will now extend through to mid-2014. Broadly the smart grid trials included:

- Investigating the impacts of electric vehicles and the emerging business models for their deployment.
- Evaluating the addition of battery storage, renewable generation and distributed solar PV generation, and solutions to optimize their connection to the network.
- Testing of innovative customer solutions that would provide insight into the benefits of the smart grid technologies trialled. In particular, the ability for customers to manage their electricity bill and for networks to manage / shift peak demand, were key aspects of the trials.
- Investigation of the synergies between smart grids and the rollout of the National Broadband Network.
- Potentially leveraging off smart grid technology to facilitate load monitoring and load transferring across the network. This potentially could lead to lower cost alternative for system related capital investment.

Alongside the technical evaluations were a number of community, industry and consumer engagement activities. These activities were designed to educate the community about the benefits of smart grids and enrol participants in the trials which in turn, would help Ausgrid understand the societal and consumer impacts of delivering smart grids.

The *Smart Grid, Smart City* Program impacted Ausgrid in a number of ways including:

- Deploying and trialling the impact of new technologies on Ausgrid's existing network, which impacted other approved programs.
- Moving expenditure from later in the current regulatory period to earlier years in order the meet Australian Government timelines for the trials.
- Moving underspent but allowed expenditure from a number of other capex plans to contribute to different elements of the *Smart Grid, Smart City* Program.

B14.2 Expenditure – *Smart Grid, Smart City* Program

The AER approved a total of approximately $141.1m for capital investment towards the Systems ICT Plan related projects over the 2009-14 Regulatory Period (including $119.2m on system ICT, $21.9m on SCADA in the Replacement Plan, and $16.0m on Smart Metering in the Metering Plan). Due to the advent of the *Smart Grid, Smart City* Program and the identification of other internal business needs, Ausgrid advanced an additional $117.2m of capital from its wider investment program savings.

Given the breadth of impact of the trials across Ausgrid's business, there are challenges in reconciling expenditure accurately from different *Smart Grid, Smart City* Program areas and across different work streams as this investment has often been done in conjunction with other planned and AER approved investment in the Metering, Replacement, System ICT and Non-System ICT Plans. However, separate Smart Grid; Smart City Program expenditures are identifiable, as seen in

Table 34. These capex costs provide an additional breakdown of expenditure labelled as Total SGSC in Table 32.

Capex Category	Capex ($m)
Customer Applications - Smart Metering Infrastructure	$6.4
SMI Meters, Installation and Support	$11.6
Grid Applications - FDIR	$8.5
Grid Applications - Substation and Feeder Monitoring	$4.8
Grid Applications - Active Voltage and Power Factor correction (active voltage)	$10.3
Grid Applications - Wide Area Measurement	$3.6
Smart Grid Smart City Integration Project	$5.7
Customer Contact Centre	$1.1
Other SGSC Related	$7.1
Total SGSC Direct Capex (exc. 4G Wireless)	$59.2
4G Wireless Network	$58.1
Total SGSC Direct Capex (inc. 4G Wireless)	$117.2

Table 34: Direct Ausgrid Capex on *Smart Grid, Smart City* Program

The primary expenditure was on the 'last mile' wireless connection between the fibre optic of the Pinc network and the SMI infrastructure and the other smart grid RTU controlled during the trials. This network was required as there was no alternative available at the time which allowed both secure data gathering and monitoring, as well as safe and secure network control going back to the smart grid infrastructure.

It is difficult to quantify the benefits of the additional investment in this space at this time, as the consortium responsible for delivering the *Smart Grid, Smart City* Program is finalising its findings and has not yet released its assessment of the value added from smart grid technology. Full recognition of the value added may take some time and may be at an industry level as opposed to an Ausgrid organisational level.

B14.3 Discussion – *Smart Grid, Smart City* Program

Ausgrid's initial broad strategy for the deployment of smart grid support technologies was based on its assumptions of the likely timeframe in which the technology would be cost effective to deploy and deliver benefits to the business and to consumers. Broadly these strategies were to:

- Build the foundation infrastructure to provide data that enables improved monitoring capability to manage the electricity network;
- Utilise the data arising from this new monitoring capability using analytics to improve business decision making; and
-
- Utilise the analytics to drive the automation of business functions and use the smart grid technologies to respond to the market introducing 'disruptive

technologies' (i.e. electric vehicles, distributed PV and energy storage) and to future proof the network.

Ausgrid sought to leverage opportunities presented by additional funding provided by the Federal Government in its *Smart Grid, Smart City* Program funding for technology and pricing trials for the betterment of the business and its customers. Specifically, *Smart Grid, Smart City* Program investment was intended to also support Type 5 Time of Use metering which was the default metering strategy for Ausgrid at the beginning of the current regulatory period, and Time of Use pricing. There were also expected to be synergies between *Smart Grid, Smart City* Program related investment and other system ICT investment such as the WiMAX network Ausgrid built to supports its regulatory approved DM&C program.

Trialling different smart grid technologies could not have proceeded as quickly for Ausgrid without this additional Federal Government funding. The *Smart Grid, Smart City* trials and deployments included:

- Advanced metering infrastructure trial – an allowance of $16.0m was made within the AER determination to fund the investigation of smart metering. Ausgrid used some of this funding to deliver a smart grid pilot at Newington including the building of a smart home, testing new customer solutions and investigating the impacts of solar PV. The balance of the funds (around $10m), were used to partially offset the smart meter infrastructure (SMI) investments brought forward as part of the *Smart Grid, Smart City* program.
- Active Volt Var Control – investment of $10.3m was made on new grid based technology that has the potential to optimize capacity on the network and allow better management of existing assets.
- Fault Detection Isolation and Restoration (FDIR) –investment of $8.5m was made on technologies targeted at providing new ways to control the network. These technologies are aimed at delivering significant improvements to network reliability.
- Other grid related trials – investment of $8.4m and included joint investigations with transmission network service provider TransGrid to quantify the benefits in the stability of the network. Trials included two key technology groups including:
- Substation and Feeder Monitoring which uses historical asset performance data to help predict (in real time) current asset performance events and issues. In turn this enables faster operational decisions to prevent outages and better understand asset performance to improve maintenance plans.
- Wide Area Measurement which provided a pilot of real time monitoring of high voltage transmission and distribution lines using technologies such as phase measurement units.

There were also a range of customer application projects which meant that the rollout of 17,500 two way communicating smart meters that underpinned the *Smart Grid, Smart City* Program trials. The deployment of the customer application projects aimed to:

- Collect near real time information about electricity, gas and water usage and enable it to be published to the consumer on an onsite display or web portal;

- Act as a gateway to send instructions to the customer's home area network; and
- Test load control (e.g. hot water), cycling of air conditioners and control pool pumps.

The majority of these technologies required additional system and non-system ICT support infrastructure.

Arup's independent findings and assessment – Ausgrid's support of the *Smart Grid, Smart City* Program

The proactive investigation of how additional investment combined with the existing electricity distribution network infrastructure can support innovative technology needs to be explored in a manner which allows the DNSPs to be prepared for and justify the additional investment. This may be required as new disruptive technologies are connected to the distribution and transmission grids.

While the unapproved nature of some of this investment may raise concerns with the AER, and has been undertaken at risk by Ausgrid, there would be a greater risk in not undertaking such trial investment, as the disruptive technologies emerging from customer demand during the next decade will require additional and complementary investment by the DNSPs. A lack of knowledge from either DNSPs or the AER in relation to what additional investment is required to support such disruptive technologies would likely lead to the wastage of larger capex sums in the future. Ausgrid undertook the SGSC program with a clear mandate to realise efficiency savings down the track from upfront trial investment.

Because the additional investment undertaken by Ausgrid (of $117.2m on projects not reviewed by the AER) has been drawn from under expenditure in other capex plans which were allowed for by the AER, and Ausgrid remains under spent in capex overall, there appear to be reasonable grounds for the AER to accept the capex committed by Ausgrid to the *Smart Grid, Smart City* Program as prudent expenditure. Clearly as some funds were granted by the Federal Government there is an expectation that Ausgrid and other trial participants will share the output of the trials with the other NSPs and industry stakeholders in an open manner. This disclosure needs to occur so that unnecessary over investment or misdirected investment in network infrastructure is avoided in the future, as smart grid technology and disruptive technologies which are connected to the electricity distribution and transmission grids are deployed. Efficiency of investment can only be measured when future systemic investment for a move to a smart gird is planned and approved by the AER.

B14.4 Lessons learnt

Ausgrid has not articulated particular lessons learnt or strategic changes related to the outcomes of expenditures from the current regulatory period.

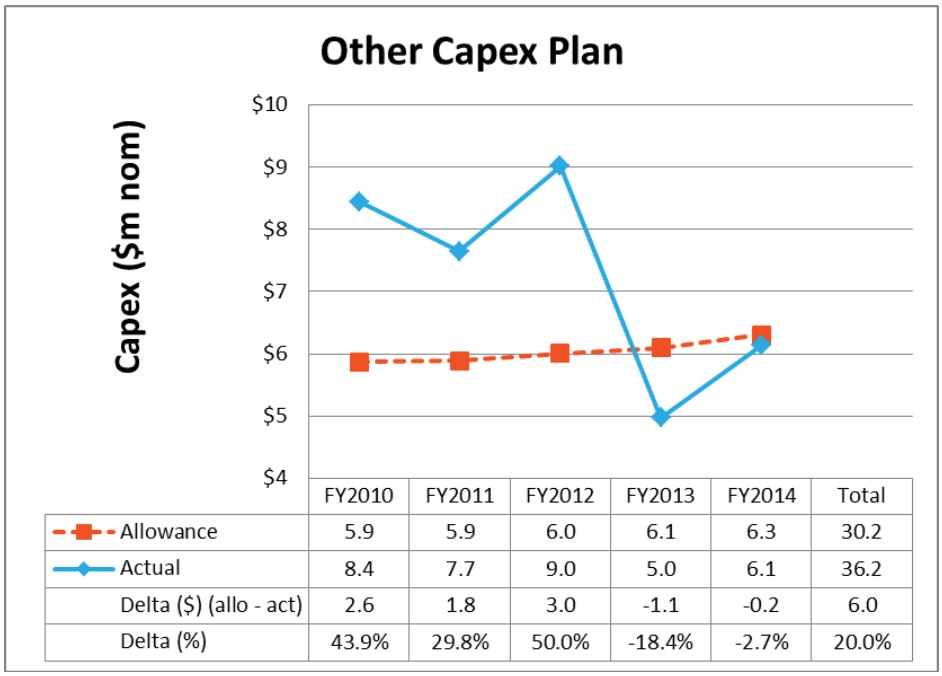
B15 Other Capex Plan

B15.1 Description

For the current regulatory period, the Other Capex Plan comprised capex for plant and tools, telecommunications and other office machines, and furniture. Ausgrid used this plan to bundle small unrelated capital which could not be easily allocated to other plans or specific divisions.

B15.2 Expenditure

As can be seen in Figure 74, Ausgrid has overspent its allowance for the Other Capex Plan by 20.0% or approximately $6.0m. The majority of this overspend is attributable to the first three years of the period where there was a significant ramp up in system capex. In these three years, Ausgrid spent a significant amount of money on plant and tools used in capex works, and also on telecommunications and other office machinery to facilitate more staff and a greater back office workload associated with the ramp up in capex.



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	5.9	5.9	6.0	6.1	6.3	30.2
Actual	8.4	7.7	9.0	5.0	6.1	36.2
Delta ($) (allo - act)	2.6	1.8	3.0	-1.1	-0.2	6.0
Delta (%)	43.9%	29.8%	50.0%	-18.4%	-2.7%	20.0%

Figure 74: Actual and allowance expenditure for the Other Capex Plan

A breakdown of the expenditure into the individual items which make up the Other Capex Plan is provided in Table 35. While the majority of expenditure was incurred on plants and tools, the majority of the overspend relates to expenditure incurred on office machinery.

Sub-Category	Total actual ($m)	Total allowance ($m)	Variance ($m)	Variance (%)
Plant & Tools	24.66	22.64	2.02	8.9%
Furnishings	4.53	7.45	-2.93	-39.3%
Telecommunications and Other	7.04	0.08	6.96	8,354.4%
Total	36.23	30.18	6.05	20.0%

Table 35: Actual and allowance expend. for the Other Capex Plan sub-categories

B15.3 Discussion

Expenditure on the Other Capex Plan was in excess of the allowance for FY2010, FY2011 and FY2012. However, with the reduction of the capex program in part as a result of the introduction of Networks NSW, expenditure was reduced below the allowance in the last two years of the period.

Ausgrid state that the overspend in the early years of the regulatory period was contributed to by a lack of centralised coordination of expenditure incurred on plants and tools, and office machinery. This could have led to the possible duplication of purchases. Ausgrid also needed to purchase additional tools for its Alliance Partners which had not been factored into its estimate of plant and tools.

As a result of a more centralised structure under Networks NSW, from mid FY2012 there has been a corresponding change to governance which has led to tighter controls on expenditure, especially for small value purchases. These controls have contributed to the underspend in the last two years of the period which has offset some of the overspend in the first three years of the period. .

Arup Independent findings and assessment

The Other Capex plan is a relatively minor expenditure item which should be able to be forecast more accurately due to the centralisation process associated with the introduction of Networks NSW and the increased accountability placed on divisions to monitor this expenditure.

The curtailment of the Alliance arrangement should also add to greater certainty going forward on required expenditure levels for items such as plant and tools.

B15.4 Lessons Learnt

Ausgrid has stated that the centralisation process will allow for additional oversight of expenditure and that this should result in more accurate forecasts due to better coordination and internal controls. Going forward, Ausgrid has delegated responsibilities of individual items such as furnishings to property and, telecommunications and other to its ICT division to increase financial accountability.

B16 Fleet Plan

B16.1 Description

Ausgrid is one of the largest fleet operators in NSW. Ausgrid's fleet consists of passenger vehicles (around 30%), light commercial vehicles (30%), trucks (10%), specialised fleet (20%) and plant units (10%). The number of leased, owned and plant fleet for the current regulatory period is shown in Figure 75.

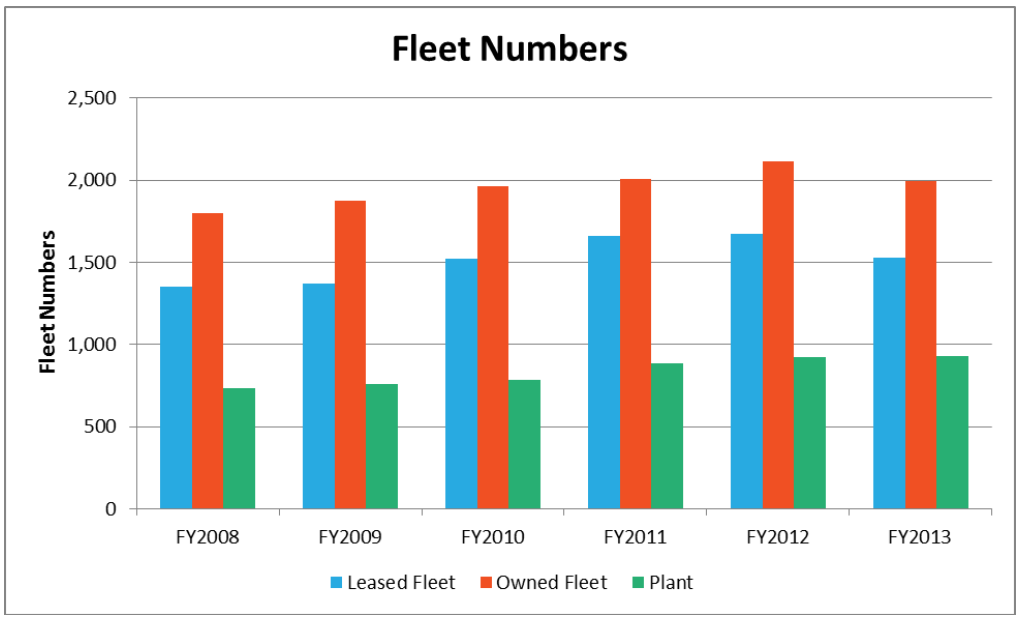
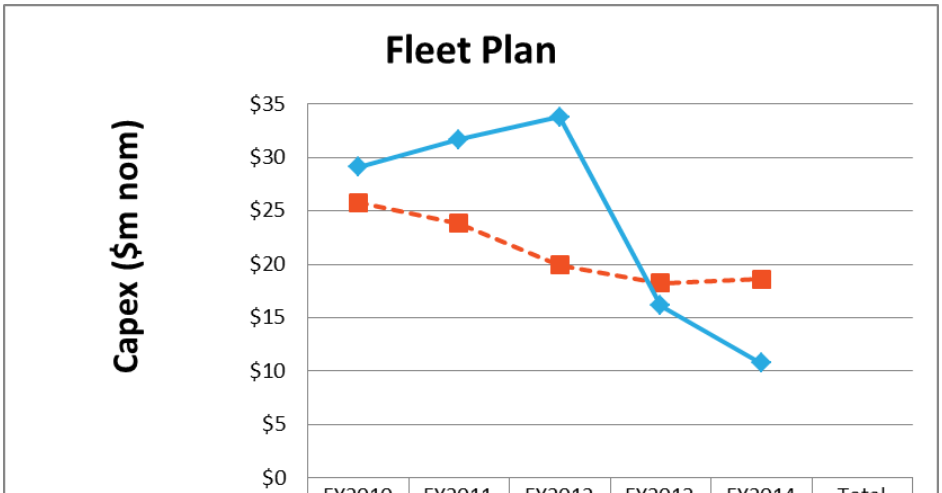


Figure 75: Fleet number breakdown by type & financing

In the early years of the current regulatory period, the total employee-to-vehicle ratio was around 0.85. Considering passenger and light commercial vehicles numbers on their own, the employee-to-transportation vehicles ratio was 0.5 passenger vehicles for each Ausgrid employee, or one vehicle for every two employees. As can be seen in Figure 75 the number of fleet vehicles began to fall in FY2013.

B16.2 Expenditure

The AER approved an allowance for Ausgrid's fleet vehicles in the order of $106.3 million. Ausgrid has overspent this allowance by around 14.2% as shown in Figure 76.



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	25.8	23.8	19.9	18.2	18.6	106.3
Actual	29.1	31.7	33.8	16.2	10.7	121.4
Delta ($) (allo - act)	3.3	7.8	13.9	-2.1	-7.9	15.1
Delta (%)	13.0%	32.9%	69.6%	-11.4%	-42.2%	14.2%

Figure 76: Allowed and actual fleet expenditure

B16.3 Discussion

There is evidence of well documented and consistent approaches to implementing Ausgrid's approach to fleet acquisition and maintenance. This approach was endorsed by the AER at the start of the current regulatory period and was based on delivering an unprecedented capital works program. As in relation to non-system property expenditure, Ausgrid's growing workforce and forward network capital expansion and maintenance program necessitated an expansion in its corporate fleet. Over the course of the regulatory period, Ausgrid overspent its allowance by around 14.2%.

Ausgrid maintains that there were a number of circumstances which occurred in the current regulatory period which necessitated increased expenditure beyond the AER allowance including:

- An increased intake of apprentices, requiring an increase in the number of fleet support vehicles such as crew trucks that were not identified or included in the previous regulatory submission.
- The relocation of the Ausgrid central warehouse from Chullora to Somersby on the Central Coast. A cross docking facility at Potts Hill was also introduced. Both of these locations necessitated a substantial increase in fleet with requirements for forklifts, heavy trucks, semi-trailers and prime movers to allow store deliveries across the franchise area.
- Changes in work priorities and streamlining of operational crews. As an example, increasing priority for street lighting services was projected to require additional street lighting crews and fleet including an additional truck and elevating platform vehicle for each crew.

At the same time as these changed internal business drivers, there were a number of external changes which impacted Ausgrid's fleet vehicle requirements such as an unanticipated reduction in consumer demand and the formation of Networks

NSW in mid-2012. Networks NSW introduced a number of fleet initiatives to reduce current and future costs associated with fleet management including:

- revision of fleet retention or replacement lifecycles;
- reduction in requirement for additional fleet;
- potential reduction in requirement of light commercial fleet unit numbers;
- reduction in private use travel of fleet;
- opportunity to standardise fleet and equipment across all network providers; and
- increase in refurbishment of heavy fleet in lieu of replacement following life cycle revision.

These measures appear (as shown in Figure 76) to be reducing fleet costs. Additional savings should continue to be identified over coming years.

Arup's independent findings and assessment

Up to and including FY2012, Ausgrid has significantly overspent on its vehicle capital expenditure - in the order of 36.0% above that approved by the regulator. The formation of Networks NSW saw fleet capital expenditure significantly reduced and at the end of this period, overspending was 14.2% above the regulatory allowance.

There is evidence that since the commencement of Networks NSW's efficiency strategies, that Ausgrid's number of lease and owned fleet has been falling and that Plant has remained stable since 2012 (as opposed to all of the fleet growing). Given the efficiency improvements in fleet management and changes to internal policies relating to own use access to light commercial vehicles it is likely that future fleet expenditure will be lower than Ausgrid's historical spending.

It remains unclear (without benchmarking) whether a passenger vehicle fleet-to-employee ratio of 0.5 as of June 2013 is commensurate with other similar businesses in Australia.

B16.4 Lessons learnt

Ausgrid should continue to reduce fleet costs as per the Networks NSW directives. It is unclear whether the current fleet-to-employee ratio of 0.5 is efficient and this should be investigated further.

B17 Business Support Plan

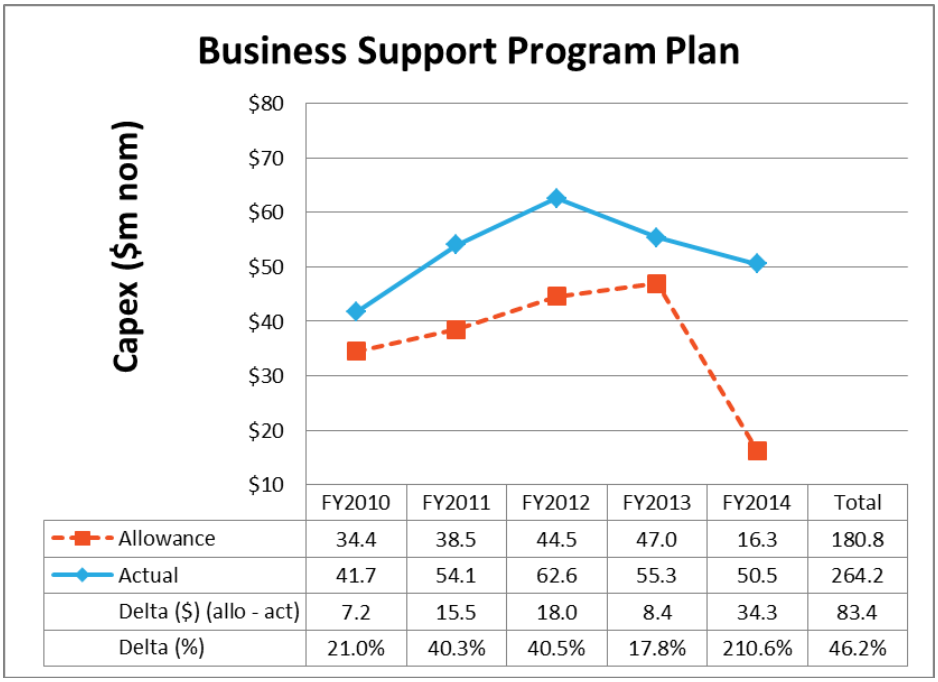
B17.1 Description

The Business Support Plan this period (with the exception of some elements of demand management) related to capitalised labour which supports a range of system capex plans that cannot be accurately apportioned to specific plans. The Business Support Plan comprises four areas of expenditure:

- Demand management – this relates to capex deferred as a result of demand management operating expenditure incurred as part of a least cost solution.
- Network planning – additional capitalised engineering planning expenditure which cannot be accurately apportioned to individual projects.
- Geographic Information Systems (GIS) – geospatial technology used for planning, asset management purposes, and outage management and legislative requirements (such as dial before you dig).

B17.2 Expenditure

As can be seen in Figure 77, Ausgrid has overspent its allowance for the Business Support Plan by 46.2% or approximately $83.4m.



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	34.4	38.5	44.5	47.0	16.3	180.8
Actual	41.7	54.1	62.6	55.3	50.5	264.2
Delta ($) (allo - act)	7.2	15.5	18.0	8.4	34.3	83.4
Delta (%)	21.0%	40.3%	40.5%	17.8%	210.6%	46.2%

Figure 77: Actual and allowance expend. for the Business Support Plan

Table 36 sets out the Business Support Plan sub-categories and shows that the major areas of over expenditure related to GIS and demand management.

Sub-Categories	Total actual ($m)	Total allowance ($m)	Variance ($m)	Variance (%)
Demand Management	0.77	-28.29	29.06	n/a (*1)
Network Planning	168.59	145.37	23.22	16.0%
GIS	94.85	63.68	31.17	49.0%
Total	264.21	180.76	83.45	46.2%

Table 36: Actual and allowed Business Support Plan sub-category

Note *1: The negative allowance is a measure of the capex savings sought from Demand Management initiatives.

B17.3 Discussion

B17.3.1 Demand management

Table 37 quantifies the capex that Ausgrid believes it has been able to defer during the current regulatory period as a result of demand management activities.

Capex Deferral from Demand Management ($m)	FY2010	FY2011	FY2012	FY2013	FY2014
Annual capex deferred	182.74	26.89	77.00	26.00	22.20

Table 37: Demand management deferrals by financial year

While Ausgrid was able to defer approximately $335.8m during the period, it was unable to achieve the forecast $28.3m deferral out of period. This was primarily due to a drop in peak demand which led to the deferral of a significant amount of growth driven investment on major substations which led to a reduced need for demand management initiatives. As seen in Table 37, the amount of deferred capex as a result of demand management drops off in line with the drop in peak demand.

B17.3.2 Network Planning

Table 38 shows that network planning expenditure was above the regulatory allowance by around $23.2m. Expenditure exceeded the allowance in FY2010, FY2011, FY2012 and FY2013 before reducing below the allowance in FY2014 corresponding with the introduction of Networks NSW. The increasing expenditure in additional network planning (above that which could be accurately capitalised to projects) in the first three years of the period and the peak in FY2012 followed the increase in system capex investment which also peaked in FY2012. The overspend to the allowance has been attributed by Ausgrid to a couple of key issues including:

- the need to provide additional planning support to its Alliance partners; and
- the unanticipated increased complexity associated with brownfield investment which increased planning time and therefore, drove up planning related expenditure.

Capex ($m)	2010	2011	2012	2013	2014	Total
Allowance	23.57	26.41	30.57	32.25	32.56	145.37
Actual	26.35	36.03	41.93	34.52	29.75	168.59
Variance	2.78	9.62	11.35	2.27	-2.81	23.22
Difference (%)	11.8%	36.4%	37.1%	7.0%	-8.6%	16.0%

Table 38: Actual versus allowed network planning expenditure

B17.3.3 GIS

Ausgrid has identified two major reasons which contributed to expenditure on GIS of $31.2m above the regulatory allowance:

- During the current regulatory period Ausgrid took on the responsibility for asset recording from external Accredited Service Providers (ASP). This was in response to issues regarding the accuracy of data provided by ASP's. By undertaking this work, Ausgrid incurred additional labour expenses which were capitalised.
- There was a ramp-up in capability of the GIS team due to increased reliance by Ausgrid planners and technical staff on GIS data for the expanded capex program.

Arup's independent findings and assessment

The findings for the three areas of supporting capex are separately summarised below.

Demand management

Demand management has been effectively used within the period to manage the impact of deferred projects where delays were encountered with wider capex delivery. While the overall forecast savings for this period as a result of demand management initiatives were not achieved, the demand management forecast was highly contingent on peak demand forecasts. As peak demand actual outcomes deviated significantly from the original forecast, so did the capex deferred out of period relative to forecast.

Network Planning

There is a relationship between network planning expenditure and the overall capex requirements of Ausgrid. Network planning expenditure has followed the overall capex profile described in Section 2.1.1. Additional planning needs of its Alliance Partners and unanticipated complexities with some brown field development contributed to the overspend.

GIS

Ausgrid has stated that the GIS team was not involved in the development of the proposed GIS expenditure forecasts as part of the current regulatory period. This is likely to have significantly contributed to the overspend of the allowance. In addition the need to take over the ASP data entry work was not anticipated at the time of the forecast. Ausgrid has noted that the GIS team now has the responsibility of developing their own forecasts for the next regulatory period. Also, due to the increasing expenditure on ICT related to GIS which has occurred during the current regulatory period, Ausgrid clearly has a strategy to rely more heavily on GIS services to facilitate efficient investment and to continue to meet its legal requirements.

B17.4 Lessons Learnt

In relation to demand management Ausgrid has incorporated its demand management requirements for the 2014-19 Regulatory Period into its individual Area Plans in an attempt to increase the accuracy of funding requirements. Previously, Ausgrid estimated demand management separately and treated it as a reactive program which means that it was not necessarily tied to forecasted regional growth on the sub-transmission network. This change towards a targeted broad-based demand management strategy is likely to improve the accuracy of identification of underlying demand management savings and costs when viewed separately from peak demand outcomes. Noted improvements to the peak demand forecast in the Area Plan discussion will also have flow on benefits to improving the demand management forecasts.

Furthermore, Ausgrid should also ensure that relevant business supporting divisions such as GIS have detailed input into to the capex forecasts related to their areas of activity. In particular, GIS should be consulted on the relationship to other business divisions within Ausgrid so that the impact on the GIS capex resulting from initiatives in other capex plans can be factored into the capex forecasts. This needs to be added to the full scope of work the GIS teams undertake on behalf of Ausgrid including their mandatory legal requirements such as ‘dial before you dig’. This will assist in increasing the accuracy of the business supporting capex forecasts going forward. Our understanding is that Ausgrid’s GIS team has overtaken complete responsibility for its own capex forecast for the 2014-19 Regulatory Period in consultation with wider organisational capex initiatives.

Appendix C

Opex Plans

C1 Opex Plans

This section discusses Ausgrid's opex for the current regulatory period adopting the categorisation that will be used for Ausgrid's 2014-19 Regulatory Proposal as follows:

- System Maintenance Plan
- Network Operations Plan
- ICT Plan
- Property Management Plan
- Finance Functions Plan
- Training & Development Plan
- Other Operations Plan

C2 System Maintenance Plan

C2.1 Description

As described in Section 7.2.1 in the Report, system maintenance includes activities such as routine inspection maintenance, corrective maintenance, breakdown maintenance, nature induced breakdown maintenance, engineering support, maintenance as a result of third party damage and non-direct maintenance. System maintenance consists largely of short-term activities which maintain network integrity until major capital works are more cost effective or required to be undertaken.

Ausgrid states that it has relied heavily on its maintenance program to deal with widespread issues associated with its aging network. Maintenance expenditure is also driven by the size or the increasing number of assets in Ausgrid's network. Figure 78 shows that Ausgrid's maintenance expenditure has steadily increased over time as the size of its network has expanded (as inferred by the number of zone substations).

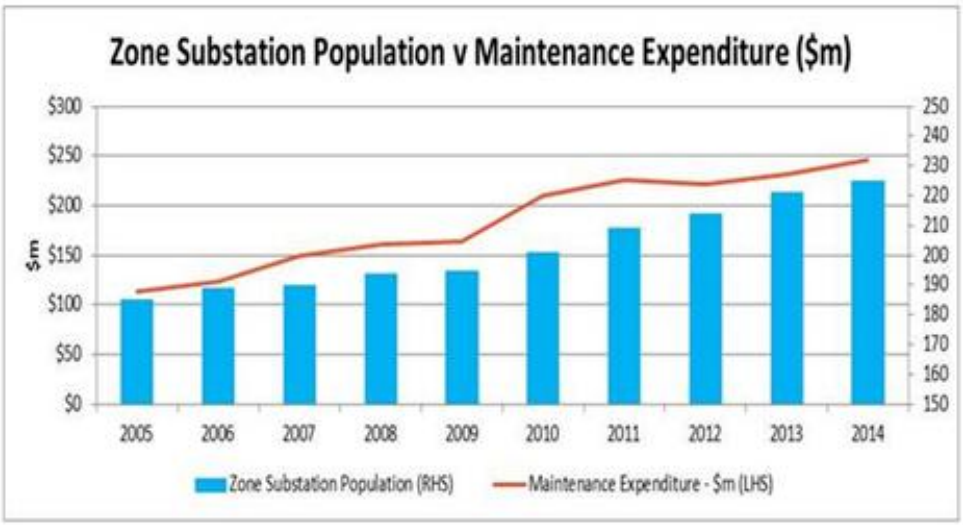


Figure 78: Zone substation population and maintenance expenditure

C2.2 Expenditure

Figure 27 in the Report showed there was a large increase in system maintenance compared with the previous regulatory period. Ausgrid states that this required increased in maintenance expenditure was in part due to insufficient allowed expenditure on categories such as the Replacement Plan in previous periods. Figure 27 also showed that total actual expenditure was approximately equal to the total allowance ($1,137.7m compared with $1,144.6m) and remained relatively constant throughout the regulatory period.

While actual expenditure was 1% below the allowance, there was variation in the individual components as shown in Table 39. Routine inspection maintenance accounted for the largest proportion (38.6%) of system maintenance expenditure. The 7.4% under expenditure on inspection maintenance was partly offset by

increased reliance on corrective and breakdown maintenance which was used to compensate for unanticipated asset condition issues and asset failures.

System Maintenance Plan Sub-Category	Total actual ($m)	Total allowance ($m)	Variance ($m)	Variance (%)
Inspection	439.0	474.0	-35.0	-7.4%
Corrective	266.4	243.1	23.4	9.6%
Breakdown	247.1	231.5	15.6	6.7%
Nature Induced	41.9	48.2	-6.3	-13.2%
Non-Direct Maintenance	5.0	0.0	5.0	n/a
Engineering Support	108.1	122.4	-14.3	-11.7%
Damage by 3rd Party	30.2	25.3	4.9	19.4%
Total	1,137.7	1,144.6	-6.8	-0.6%

Table 39: Actual and allowed system maintenance expend. by sub-category

A further breakdown of this expenditure as shown in Table 40 reveals that while the routine inspection of distribution mains made up the largest category of maintenance, the next four largest categories of expenditure involved breakdown and corrective maintenance for more serious asset issues. Three of these four categories involved distributions which Ausgrid states indicates a worsening state of the distribution network's condition.

Description of Maintenance	Section of the Network	Expenditure this Period ($m)
Inspection - Distribution Mains Overhead & Underground	Distribution	304.1
Breakdown - Distribution Mains Overhead & Underground	Distribution	174.2
Corrective - Distribution Mains Overhead & Underground	Distribution	112.1
Corrective - Zone Substations	Distribution	53.4
Corrective - Distribution Transformers & Substations	Distribution	52.6
Inspection - Zone Substations	Distribution	48.9
Inspection - Distribution Transformers & Substations	Distribution	48.7

Table 40: Top maintenance expenditure categories this period

C2.3 Discussion

C2.3.1 Inspection

Routine inspections are the major component of maintenance expenditure. During the current regulatory period, the regulatory allowance was underspent by around $35.0m or 7.4%. Despite this underspend Ausgrid achieved its forecast inspection rate across the regulatory period. The routine maintenance performance rate by year is depicted in Figure 79.

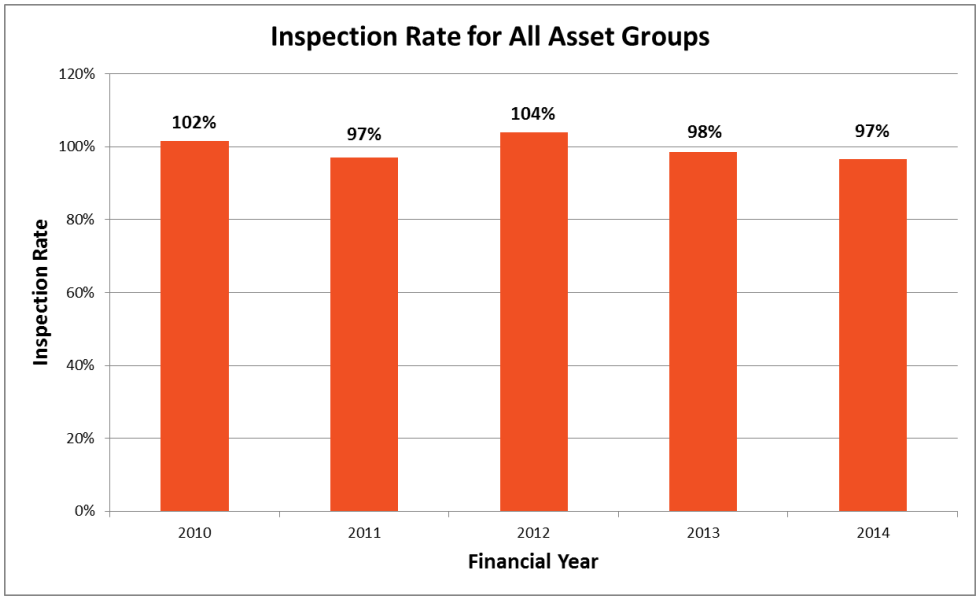


Figure 79: Inspection rate for all asset groups

Ausgrid was also able to generally reduce the average cost of inspection jobs over the regulatory period as shown in Figure 80. The figure show the average cost for distribution mains, distribution substations and zone substations. These three categories accounted for the majority of routine maintenance expenditure.

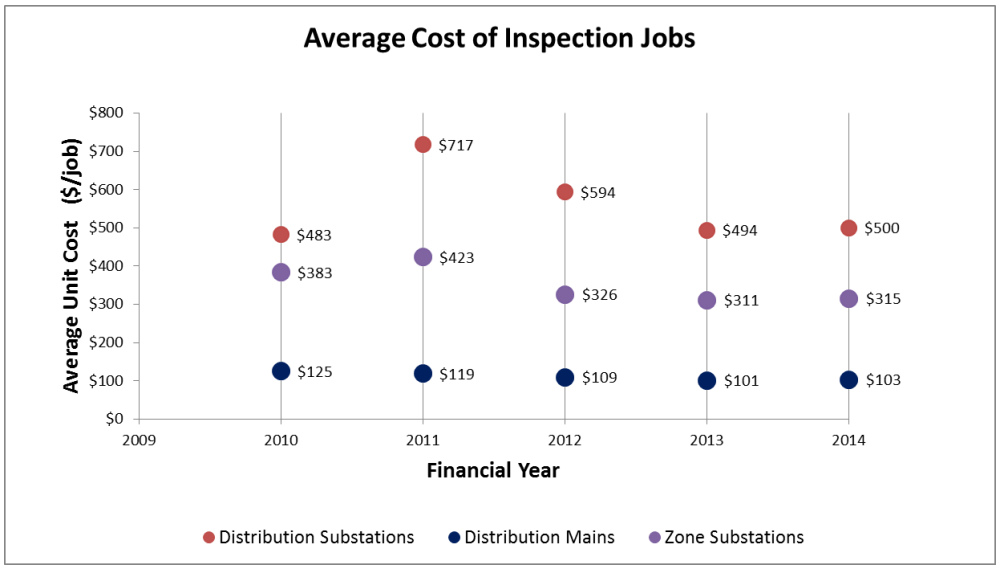


Figure 80: Average cost of routine maintenance jobs (Real 2013/14 Dollars)

Ausgrid state that the reduced average routine maintenance inspection costs over the period can in part be attributed to certain Networks NSW initiatives which have targeted labour force mobility.

C2.3.2 Corrective

Corrective actions are where issues are identified during maintenance and addressed prior to failure, thus preventing a breakdown. Section 7.2.1 in the Report highlighted the number of corrective actions undertaken on both the distribution and transmission elements of the network.

During the course of the regulatory period the number of corrective events increased which was associated with an additional $23.4m, or 9.6% overspend of the allocated allowance. The majority of this overspend occurred at the beginning of this period which is consistent with Ausgrid's claim that it had a backlog of condition driven issues coming into this regulatory period. As stated in Section 7.2.1, the number of corrective breakdowns are likely to have increased as a result of Ausgrid's asset condition and increased inspection programs, influenced by an aging network and to a lesser degree on underspend of its Replacement Plan allowance.

C2.3.3 Breakdown

Breakdown events are those that despite the maintenance program progress to full failure. Section 7.2.1 in the Report showed that breakdown events, like corrective actions, increased during the regulatory period. Breakdown expenditure was $15.6m or 6.7% higher than forecast. This may be driven by the under expenditure on the Replacement Plan and Area Plans. The increase in break downs towards the end of the period (depicted in Figure 28 and Figure 29 of the Report) may indicate that the ability to defer replacement through maintenance is either diminishing or that maintenance expenditure is not keeping up with the change in condition of the network.

As the majority of the breakdown overspend has occurred at the end of the period this may indicate that the condition of the network has worsened over the course of the regulatory period.

C2.3.4 Nature Induced

Nature induced expenditure is by its very nature somewhat dependent on natural causes. Expenditure on nature induced activities was $6.3m or 13.2% below that forecast. This is likely due to the relatively favourable weather conditions over recent years. Ausgrid has not incurred a significant storm event in its network which has led to widespread damage this regulatory period. It should also be noted that the favourable conditions likely had an impact on the relatively good performance of SAIDI and SAIFI indicators.

C2.3.5 Non-Direct Maintenance

Non-direct maintenance represents a small expenditure of $5.0m on a range of related activities and has been separated out for the next regulatory period.

C2.3.6 Engineering Support

Engineering support is required for the effective delivery of the wider System Maintenance Plan and relates to the technical planning aspects of maintenance work. Engineering support was underspent by $14.3m or 11.7% which, within the context of undertaking the forecast number of inspections and more than expected corrective and breakdown activities, indicates that engineering support services were delivered at a lower cost than envisaged.

C2.3.7 Damage by a Third Party

Damage by a third party was overspent by $4.9m or 19.4%. As with nature induced expenditure, it is largely beyond the control of Ausgrid.

Arup's independent findings and assessment

There is a relationship between system maintenance expenditure and that incurred on capital plans such as the Replacement Plan and Areas Plans. While maintenance expenditure remained relatively constant throughout the regulatory period there was a slight increase in FY2014 which may be due to the under expenditure on the Replacement Plan and Area Plans. Should the level of expenditure on these plans remain below sustainable levels, the need for maintenance expenditure required to compensate for low levels of replacement may continue to increase over time. The risk with this is that it may become less cost efficient to maintain assets after a certain point, than it would be to replace them..

Despite changes in the external environment and the significant change that Ausgrid has undergone this period as a result of industry reform, it has sustained a high level of maintenance while reducing the average cost of standard maintenance practices. This represents a significant achievement and highlights a well-defined maintenance strategy.

C2.4 Lessons Learnt

Ausgrid states that it has relied heavily on its System Maintenance Plan in the short term to mitigate an increasing number of asset issues that have arisen over the period. Ausgrid has contended that these asset issues have arisen from the overall condition and increased ageing of its network. Based on asset failure and network age data Ausgrid state that there is a significant backlog of replacement works that may take multiple regulatory periods to resolve and will require a mix of ongoing replacement and maintenance investment.

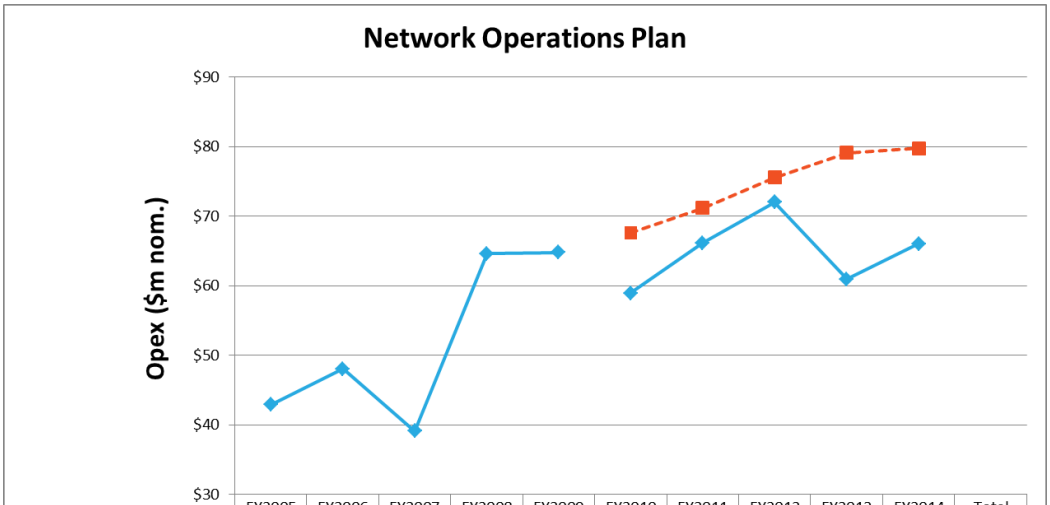
C3 Network Operations Plan

C3.1 Description

The Network Operations Plan includes customer operations; engineering planning and project management; and system control. These are engineering-related labour expenses which are not capitalised as they relate to the development of the network in general rather than the creation of a specific capitalised asset. The largest item of this expenditure (47.1%) this period related to customer operations which specifically supports connection works. This operation involves field inspectors, connection planners and administrative staff. The remaining 52.9% of expenditure relates to planning and engineering staff that support investment.

C3.2 Expenditure

Figure 81 compares allowed and actual expenditure on network operations during the current regulatory period.



	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance						67.58	71.17	75.57	79.11	79.72	373.15
Actual	42.85	48.00	39.10	64.62	64.76	58.94	66.15	72.00	60.93	66.02	324.05
Delta ($) (allo - actu)						-8.63	-5.02	-3.58	-18.18	-13.70	-49.11
Delta (%)						-12.8%	-7.1%	-4.7%	-23.0%	-17.2%	-13.2%

Figure 81: Allowed and actual network operations expenditure

C3.3 Discussion

As can be seen in Figure 81 Ausgrid ramped up its expenditure under the Network Operations Plan at the end of the previous regulatory period. Ausgrid state that this was in order to facilitate the immediate delivery of the large volume of work it had forecasted for the current regulatory period. The 25.0% increase in the total actual expenditure for the current regulatory period compared with the previous regulatory period coincided with the 67.0% increase in total capex incurred between the periods.

Despite this ramp up Ausgrid underspent its network operations allowance by 13.2% which compares with an overall underspend of 22.7% in systems capex[40]. This relationship between systems capex and Network Operations Plan expenditure can be seen in the first four years of the regulatory period. Like capex, network operations expenditure peaks in FY2012 and initially rolls off in FY2013 due to the range of internal and external factors described in this Report which led to a rolling off of capex. Ausgrid states that the slight increase in expenditure in FY2014 is the result of the trade-off effect between capex and opex in which more engineering labour was operationalised under this plan as a result of a significant reduction in capex.

When looking at the underspend in more detail the majority of this underspend relates to customer operations which accounted for $44.5m of the $49.1m total underspend (refer to Table 41). As described in the 11kV and Customer Connections Plans there was a significant drop of in overall high voltage and customer connections relative to expectations due to the effects of the GFC and generally weaker economic conditions.

Network Operations Plan Sub-Category	Total actual ($m)	Total allowance ($m)	Variance ($m)	Variance (%)
Customer Operations	152.6	197.1	-44.5	-22.6%
Engineering, Planning and Project Management	75.0	73.8	1.2	1.7%
System Control	96.4	102.2	-5.8	-5.7%
Total	324.0	373.2	-49.1	-13.2%

Table 41: Actual and allowed network operations expend. by sub-category

Arup's independent findings and assessment

Network operations expenditure is driven by investment requirements in the network and demand for new customer connections. As such, the reduction in peak demand, lower than forecast customer numbers and introduction of Network NSW contributed to the lower than expected expenditure.

C3.4 Lessons learnt

Ausgrid has not articulated particular lessons learnt or strategic changes related to the outcomes of expenditures from the current regulatory period.

It is difficult at this stage to gauge what the appropriate level of this opex would be for next period due to the significant organisational restructure, deferring of capex this period and changes to investment governance procedures as a result of Networks NSW which have led to an abnormally lower level of capex in FY2014 and therefore, has increased opex for this category.

[40] Taken as the sum of capex for Area Plans, Replacement Plan, Duty of Care Plan, 11kV Plan, Low Voltage Plan, Reliability Plan and Customer Connection Plan.

C4 Information, Communications and Technology Plan

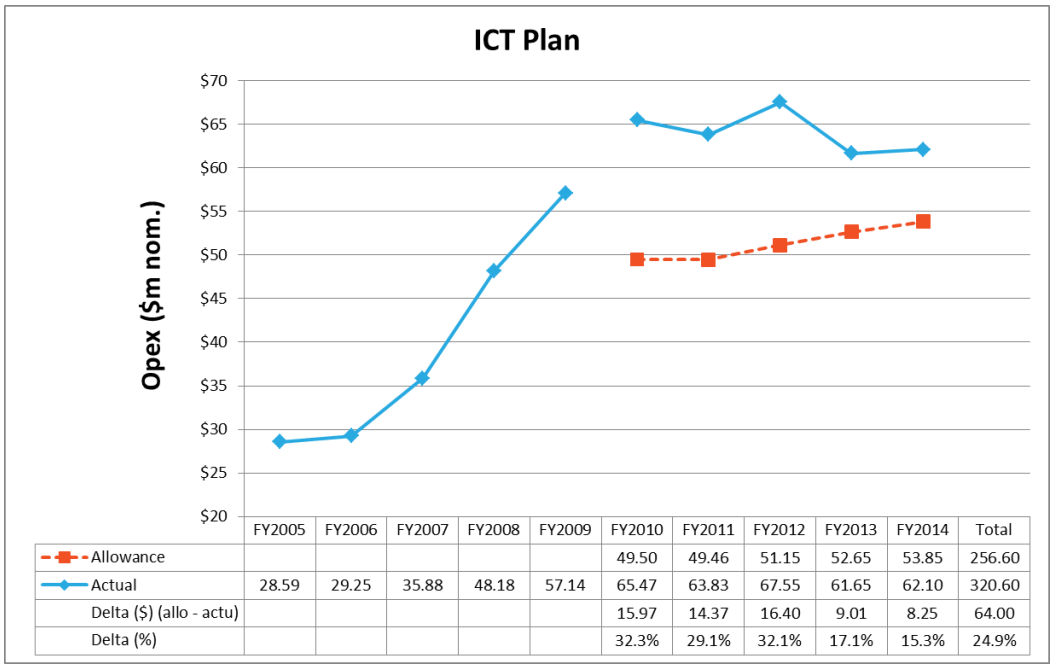
C4.1 Description

The Information, Communications and Technology Plan consists of opex incurred on Information, Communications and Technology (Non-System ICT), and Operational Technology (System ICT).

C4.2 Expenditure

Figure 82 compares allowed and actual expenditure on the total Information, Communications and Technology Plan during the 2009-14 Regulatory Period. This figure shows that actual ICT opex was above the regulatory allowance by 24.9%. Both subcategories contributed to the over spend as shown in Table 42 and are as follows:

- a $47.5m (26.1%) overspend on Non-system ICT; and
- a $16.5m (22.2%) overspend on Operational Technology (System ICT).



	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance						49.50	49.46	51.15	52.65	53.85	256.60
Actual	28.59	29.25	35.88	48.18	57.14	65.47	63.83	67.55	61.65	62.10	320.60
Delta ($) (allo - actu)						15.97	14.37	16.40	9.01	8.25	64.00
Delta (%)						32.3%	29.1%	32.1%	17.1%	15.3%	24.9%

Figure 82: Allowed and actual total ICT expenditure

Sub-Category Opex	Total actual ($m)	Total allowance ($m)	Variance ($m)	Variance (%)
Information, Communications & Technology	229.6	182.1	47.5	26.1%
Operational Technology	91.0	74.5	16.5	22.2%
Total	320.6	256.6	64.0	24.9%

Table 42: Actual and allowed ICT Plan expenditure by sub-category

C4.3 Discussion

Ausgrid has indicated that as part of its previous regulatory submission it sought a significant step change up in ICT opex from the 2004-09 Regulatory Period. This step change was requested in order to fund ongoing labour and maintenance required for previous ICT capital investment which was approved by IPART in that prior regulatory period. The step change requested by Ausgrid was not granted by the AER or the Australian Competition Tribunal.

Ausgrid argues that this previously approved capital investment was instrumental in driving the 24.9% overspend in ICT opex and formed the step change in ICT opex that took place from FY2008 to FY2009. These projects were previously approved by IPART and are consolidated in Table 43.

Capital Project	Project Value
iAMS (Investment Asset Management System)	$72m
Data Centre Consolidation Program	$60m
Removing Risks on It Critical Exposures	$12m
Field Computing Program	$44m
New Licencing Needs	$18m
Infrastructure Refresh Program	$12m

Table 43: Prior ICT capex which drove the step change in opex

The additional estimated opex Ausgrid requested to be factored into the 2009-14 Regulatory Period as result of this investment and its relationship to the broad groupings of Ausgrid's ICT infrastructure are provided in Table 44.

Capital Project	Additional Opex Required
iAMS and Field Computing	$44.86m
Data Centre Consolidation Program	$18.19m
ICT Network Systems	$14.57m
ICT Corporate Systems (Non-Network)	$19.36m
Financial Systems	$4.47m
Other IT infrastructure	$6.72m

Table 44: Breakdown of requested ICT opex step change

As can be seen in Table 42, Ausgrid contends that had it been granted its requested allowance for ICT opex at $108.2m in its previous determination, it would have underspent its ICT opex by 12.1% rather than overspent by 24.9%. The underspend corresponds with an 11.8% underspend in total ICT capex (Non System ICT plus System ICT excluding the *Smart Grid, Smart City* Program and 4G capex).[41]

[41] All *Smart Grid, Smart City* Program driven opex was government funded and therefore, was not passed onto customers.

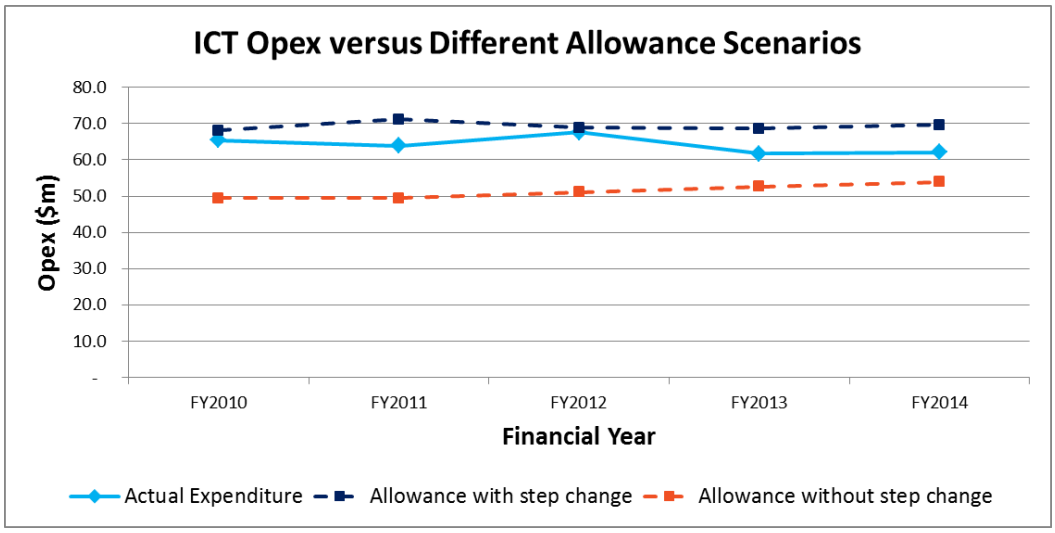


Figure 83: ICT opex versus different allowance scenarios

The data shows that despite the step change not being granted, Ausgrid spent up towards what it originally proposed as its necessary ICT opex allowance for the 2009-14 Regulatory Period. Ausgrid contends that had it not done so, it would have been forced to either take away limited ICT resources from capital works and the maintenance of other systems or it would have faced not being able to properly utilise the ICT investment to which the proposed step change in opex related. As Ausgrid had made savings of approximately $122.8m relative to the allowances in other non-maintenance opex it offset some of these savings by the $64.0m overspend in ICT opex. Ausgrid contends that this was a prudent decision.

Arup's independent findings and assessment

Ausgrid incurred the ICT capex expenditure it considered necessary which was in excess of the regulatory allowance and argues that this was a result of previous capex approved by IPART.

Ausgrid contends that it overspent its ICT opex allowance in order to realise the full benefits of previous ICT capital investment made. Ausgrid contends that if it had not done so, it may have been unable to deliver its ICT capital works program for the current regulatory period or maintain and fully utilise other previous investment.

The overspend in ICT opex was made in consideration of the underspend incurred in other non-maintenance opex plans.

C4.4 Lessons learnt

Ausgrid has undertaken a significant amount of work which has been charged to ICT opex and in relation to identifying what opex has supported the prior step

change to past capital projects. This may provide new or more detailed evidence that was not previously presented to the AER at the time of its last submission.

Furthermore, in recognition of its overspend of the formal allowance granted in the AER's Final Determination (incorporating the ACT's decisions) and Ausgrid's increased focus this period on reducing customer price pressures and debt, Ausgrid has undertaken its own benchmarking study to verify the efficiency of its ICT opex. Ausgrid contends that the results of this study have been factored into the level of ICT opex it is proposing for the next regulatory period.

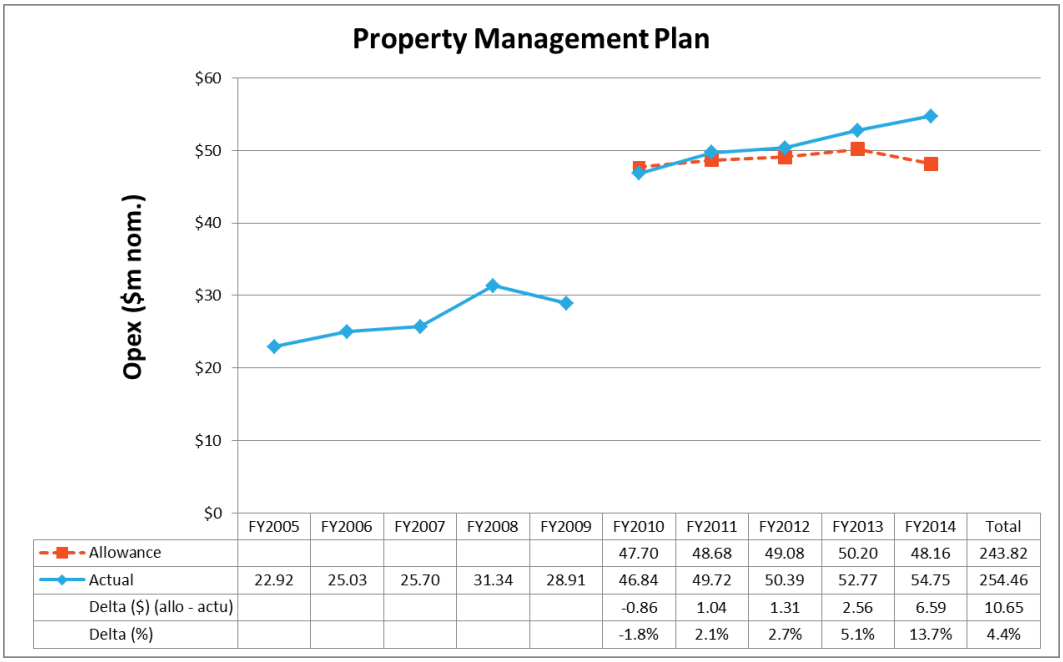
C5 Property Management Plan

C5.1 Description

The Property Management Plan is associated with expenditure that Ausgrid incurs in relation to its property portfolio. This expenditure primarily relates to electricity, water, rates, land tax and security.

C5.2 Expenditure

Figure 84 compares allowed and actual expenditure on property management during the current regulatory period.



	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance						47.70	48.68	49.08	50.20	48.16	243.82
Actual	22.92	25.03	25.70	31.34	28.91	46.84	49.72	50.39	52.77	54.75	254.46
Delta ($) (allo - actu)						-0.86	1.04	1.31	2.56	6.59	10.65
Delta (%)						-1.8%	2.1%	2.7%	5.1%	13.7%	4.4%

Figure 84: Allowed and actual system property management expenditure

Table 45 compares allowed and actual sub-category property management expenditure.

	Total actual ($m)	Total allowance ($m)	Variance ($m)	Variance (%)
Property Management	157.6	161.9	-4.3	-2.7%
Land Tax	76.5	65.7	10.8	16.5%
Non-System Maintenance	20.3	16.2	4.1	25.3%
Total	254.5	243.8	10.6	4.4%

Table 45: Allowed and actual system property management exp. by sub-cat.

C5.3 Discussion

Figure 84 shows a significant step change in Property Management Plan expenditure compared to the previous regulatory period. This is driven by a

combination of increased land ownership as Ausgrid's network and servicing requirements has grown, an increase in land taxes and increased land value as deemed by the NSW Office of State Revenue. .

The actual expenditure in the current regulatory period is relatively consistent with the allowance although it increases somewhat above the allowance in FY2013 and FY2014. The major driver of this increase is higher than expected land tax expenditure as shown in Table 46, which shows an increase in land tax as a result of an expanded portfolio, an increase in value of the portfolio and an increase in land tax rates. The expansion in the property portfolio this period was mainly related to additional system property acquired for Area Plan purposes which was unanticipated at the time of forecasting (refer to the System Property Plan).

Assessment Year	Aggregated Land Values	Land Tax Payable
2009	$ 679,734,668	$13,579,905
2010	$ 780,744,419	$15,599,776
2011	$ 841,367,407	$16,811,792
2012	$ 864,229,426	$17,268,668
2013	$ 897,890,067	$17,941,477

Table 46: Annual land tax payments

The lower than expected expenditure on property management of $4.3m was offset by an additional $4.1m on non-system maintenance.

Arup's independent findings and assessment

Property management expenditure was largely in line with the regulatory allowance with most the difference explained by increased expenditure on land tax. This was the result of unforseen increases to land tax rates and land values, compounded by Ausgrid's purchase of additional land during the period. The impact of the tax increases was unforeseeable at the time that Ausgrid prepared its last regulatory submission..

C5.4 Lessons learnt

Ausgrid has not articulated particular lessons learnt or strategic changes related to the outcomes of expenditures from the current regulatory period. Ausgrid has revised its Property Management Plan for the 2014-19 Regulatory Period based on the outcomes of this period.

C6 Finance Functions Plan

C6.1 Description

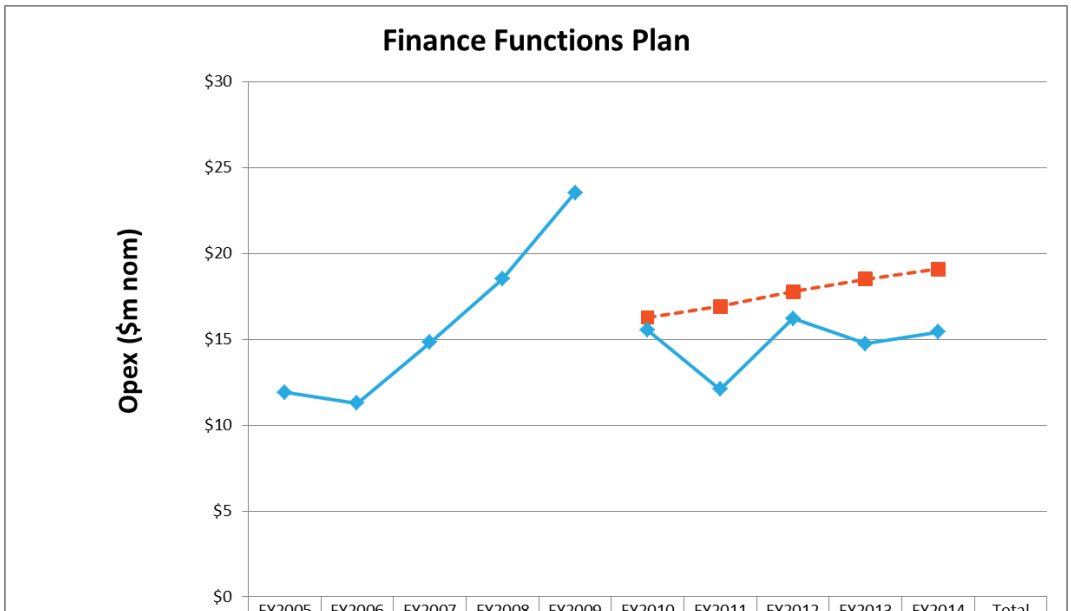
The Finance Function Plan relates to some of Ausgrid's back-office staff. The remainder of back-office staff (excluding ICT) are covered by the Other Operations Plan. The expense of these staff cannot be attributed directly to the creation of an asset and hence cannot be capitalised. The extent of finance back-office requirements is related to Ausgrid's business as usual financial requirements and in part to the size of Ausgrid's capital works program. Principle duties including:

- governing the organisation from a financial perspective; and
- complying with legislation and regulatory requirements.

In this plan, the majority of expenses are fixed and relate to the business as usual finance functions of the organisation. Other expenses are variable in nature and relate to the size of the organisation's investment programs and the amount of additional back office work generated by this investment. This additional back office work is dependent on the capex cycle and includes the processing of investment related financial transactions, and the legal and regulatory compliance tasks which accompany this..

C6.2 Expenditure

Figure 85 compares allowed and actual expenditure on finance functions during the current regulatory period. It shows that Ausgrid underspent on its Finance Function Plan allowance for current regulatory period by 16.4%. An underspend against the regulatory allowance occurred for each year of the regulatory period.



	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance						16.28	16.93	17.78	18.51	19.10	88.60
Actual	11.92	11.28	14.83	18.51	23.56	15.54	12.09	16.22	14.75	15.44	74.04
Delta ($) (allo - actu)						-0.75	-4.84	-1.56	-3.76	-3.66	-14.56
Delta (%)						-4.6%	-28.6%	-8.8%	-20.3%	-19.2%	-16.4%

Figure 85: Allowed and actual finance function expenditure

C6.3 Discussion

Figure 85 shows that costs incurred in finance functions have varied significantly over the last decade.

Ausgrid state that the increase in expenditure toward the end of the previous regulatory period was a ramp-up to assist delivery of the expected increased capital expenditure program for the current regulatory period and the associated back office workload. This increase saw the capex allowance increase from $3.9 billion to $8.4 billion in the current regulatory period.

Ausgrid state that the under expenditure of 16.4% during the current regulatory period was the result of its response to the lower than expected overall capex spend, particularly towards the end of the current regulatory period and the introduction of Networks NSW which in part sought to increase the efficiency of the organisation by reducing duplication of back office staff. Ausgrid states that it had initially employed additional labour hire for this work, or subsequently transferred, many of it back-office staff onto employment contracts (rather than the award). This allowed Ausgrid to reduce its back-office staffing numbers as it became evident the capex program was reducing and in order to meet the new objectives of the organisation under Networks NSW. The result was a flattened expenditure profile for the last half of the current regulatory period.

Arup's independent findings and assessment

The level of expenditure on the Finance Functions Plan is related to the number of back-office staff whose cost cannot be capitalised, but whose activities are linked to the size of the capex program. The level of staffing has a fixed component related to finance functions in the normal course of business, and a variable component related to the size of Ausgrid's expenditures and the resulting number of financial transactions requiring support. While a further reduction in capex may lead to an additional decrease in back office staff, a well-resourced back office will always be required for Ausgrid to manage its financial operations and externally imposed sizeable legal and regulatory obligations.

C6.4 Lessons learnt

Ausgrid has not articulated particular strategic changes related to the outcomes of expenditures from the current regulatory period.

C7 Training and Development Plan

C7.1 Description

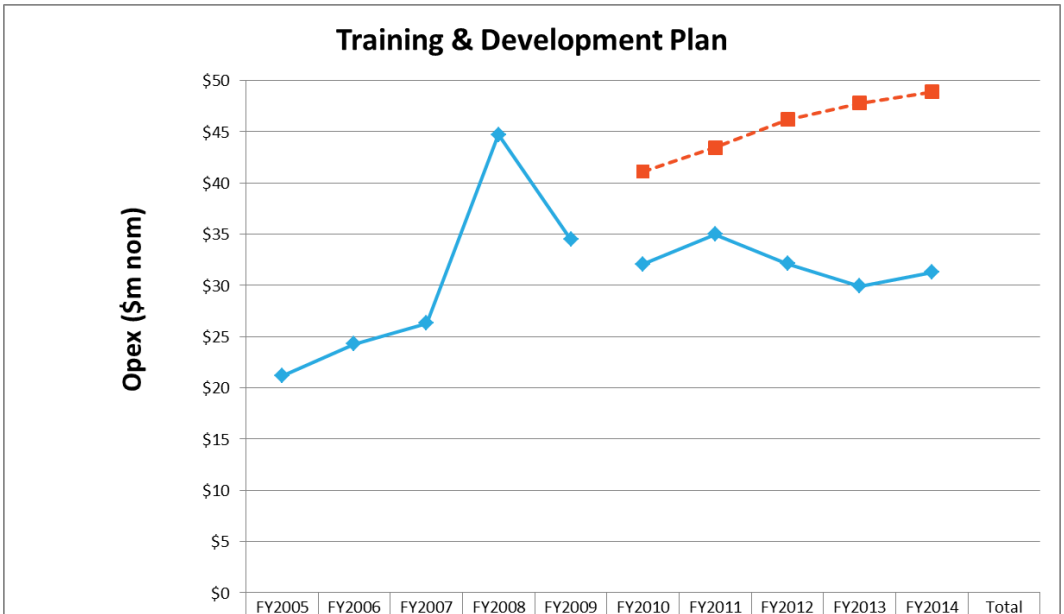
Expenditure incurred under the Training and Development Plan relates to the training expenses incurred on equipping certain Ausgrid staff with basic skill sets or further enhancing the skills sets of existing staff. The majority (approximately 98%) of this expenditure relates to training apprentices. Ausgrid invests in recruiting and training apprentices in order to:

- ensure that it has staff to fill positions as required especially in front line services to customers; and
- as part of its long-term workforce management so that it has staff that can easily be allocated to required vacated positions as a result of natural attrition.

These costs are not capitalised or operationalised elsewhere (such as in maintenance) until apprentices are trained to at least minimum requirements and can be deployed into the field.

C7.2 Expenditure

Figure 86 compares allowed and actual expenditure on the Training and Development Plan during the current regulatory period. It shows that Ausgrid has underspent its allowance for the Training and Development Plan by 29.5% with 52.9% of this underspend attributable to the last two years of the regulatory period.



	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance						41.12	43.45	46.22	47.81	48.90	227.49
Actual	21.18	24.27	26.30	44.71	34.48	32.09	34.98	32.12	29.94	31.29	160.42
Delta ($) (allo - actu)						-9.02	-8.47	-14.09	-17.87	-17.61	-67.07
Delta (%)						-21.9%	-19.5%	-30.5%	-37.4%	-36.0%	-29.5%

Figure 86: Allowed and actual training and development expenditure

C7.3 Discussion

Figure 87 shows a significant ramp-up in training and development expenditure compared with the level at the beginning of the previous regulatory period. A significant investment was made in apprentices during the last two years of the previous regulatory period in order to have apprentices who could be fully qualified and deployed to work on the anticipated ramped-up capex program over the current regulatory period. This is supported by Figure 87 which shows that the largest intake of apprentices over the last decade occurred during FY2008 and FY2009.

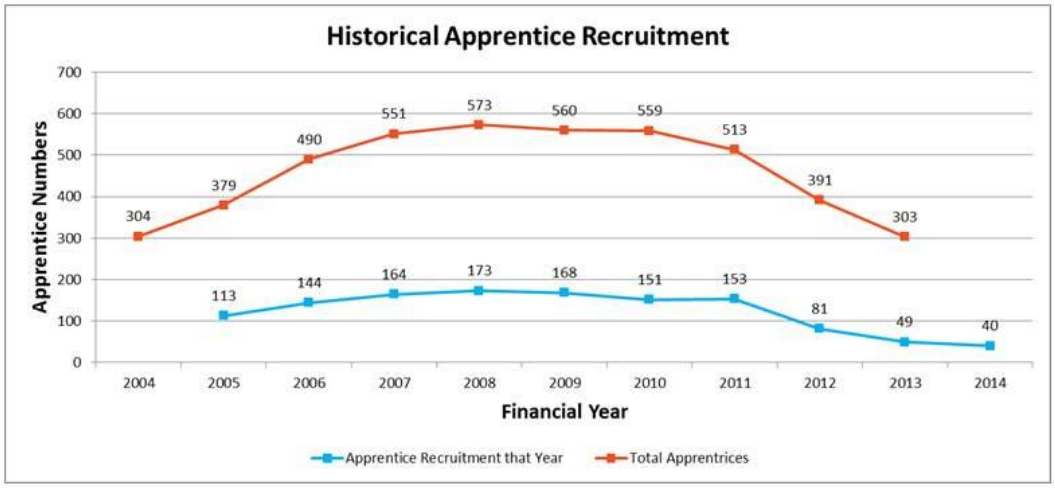


Figure 87: Annual apprentice intake and total apprentice numbers

As shown in Figure 86 and Figure 87, while Training and Development Plan expenditure remained high at the beginning of the current regulatory period it has declined in the back half of this period. Ausgrid state that this is as a result of the winding down in the capex program and initiatives by Networks NSW to reduce the overall workforce numbers. While Ausgrid has continued to take in apprentices in the later years of the current regulatory period, the annual intake in FY2014 of 40 is the lowest in the last decade and the total number of apprentices is at levels last seen in 2004, prior to the capex ramp up.

Arup's independent findings and assessment

Training and development expenditure is incurred in order to provide Ausgrid with the required skilled workforce to allow capital project delivery while also ensuring a sustainable composition of the workforce.

Expenditure on training and development has reduced in recent years and is at a level prior to measures undertaken to meet the capex ramp up this period. This is likely to represent a sustainable level going forward for the next regulatory period assuming that Ausgrid can continue to fund its existing apprentice base.

C7.4 Lessons learnt

Ausgrid has not articulated particular strategic changes related to the outcomes of expenditures from the current regulatory period.

C8 Other Operations Plan

C8.1 Description

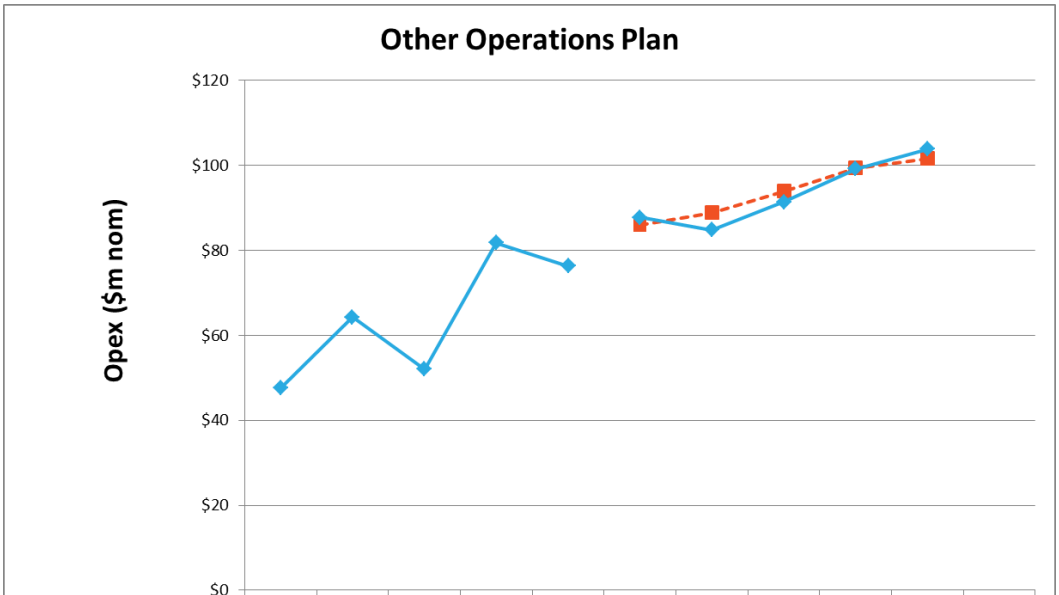
Other operations include activities related to the contact centre, data operations, insurance, management, metering, demand management, and other ancillary operational activities. While each of these areas are individually small in terms of expenditure, combined they make up 17.0% of Ausgrid's total underlying opex for the current regulatory period. The largest of these are:

- other operational activities, at 31.3% of the Other Operations Plan which is comprised of opex incurred on back office functions including human resources, health and safety operations, network regulation, customer enquiries and human resources; and
- metering at 27.7% of the Other Operations Plan.

The Other Operations Plan does not include opex related to finance functions, which have been separated out and are discussed at Appendix C6.

C8.2 Expenditure

Figure 88 compares allowed and actual expenditure during the current regulatory period.



	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance						85.93	88.88	93.87	99.33	101.57	469.57
Actual	47.59	64.25	52.03	81.76	76.31	87.75	84.79	91.33	99.17	103.80	466.84
Delta ($) (allo - actu)						1.82	-4.09	-2.54	-0.16	2.24	-2.73
Delta (%)						2.1%	-4.6%	-2.7%	-0.2%	2.2%	-0.6%

Figure 88: Allowed and actual other operations expenditure

As can be seen in Figure 88, Ausgrid underspent its allowance for the Other Operations Plan by 0.6%. Table 47 provides a comparison of actual expenditure against the allowance for all seven sub-category areas which make up the Other Operations Plan.

Sub-Category Opex	Total actual ($m)	Total allowance ($m)	Variance ($m)	Variance (%)
Contact Centre	14.6	22.3	-7.7	-34.5%
Data operations	45.6	43.4	2.2	5.1%
Management	89.1	53.2	35.9	67.4%
Metering	129.4	124.3	5.0	4.0%
Other	146.1	167.3	-21.2	n/a
Insurance	23.7	32.3	-8.7	-26.8%
Non-network alternative (demand management)	18.3	26.6	-8.3	-31.1%
Total	466.8	469.6	-2.7	-0.6%

Table 47: Other operations expenditure by sub-category

C8.3 Discussion

As can be seen in Table 47, while overall expenditure was in line with the allowance, there was significant variation from sub-category to sub-category.

The biggest variation in dollar and percentage terms was the management sub-category which was over spent by $35.9m or 67.4%. Table 48 shows management expenditure over the current regulatory period.

Sub-Category ($m)	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowed	9.93	10.23	10.67	11.05	11.35	53.23
Actual	8.11	10.11	15.56	27.10	28.23	89.12
Variation ($m)	-1.81	-0.12	4.89	16.05	16.88	35.89
Variation (%)	-18.3%	-1.2%	45.8%	145.3%	148.8%	67.4%

Table 48: Management expenditure by sub-category

The largest variation was in FY2013 and FY2014 which corresponds with the introduction of Networks NSW. The intention behind Networks NSW was to create an organisation that would improve the efficiency of all three NSW distribution businesses. The organisation sought to recruit a limited number of staff from all thee distributor businesses who it felt could assist in achieving this objective.

A large number of the staff were recruited from Ausgrid and due to the setup of the organisation, Ausgrid was required to incur a significant proportion of their operating expenses. As these staff are considered management and do not

technically belong to the team within Ausgrid, Ausgrid pooled their incurred opex in its management opex category. As can be seen in Table 48, there was a sharp jump in actual expenditure for management from FY2012 when the reform was first announced to both FY2013 and FY2014 when the recruitment for Networks NSW was finalised.

The over expenditure in the management sub-category was offset by under expenditure on other sub-categories of the Other Operations Plan. Ausgrid contends that the slight underspend was tied to Networks NSW initiatives which sought to reduce further increases to back-office staff, the ability to defer demand management as a result of prevailing external factors and economic gains made in areas such as insurance.

Arup's independent findings and assessment

Expenditure on management has increased since the unforeseen introduction of Networks NSW. This increase in management opex as a result of Networks NSW was unforeseeable at the time Ausgrid submitted its previous proposal.

Ausgrid should revise down its opex forecast for other areas of this plan going forward where there was a significant underspend this period unless there has been a change in circumstances which would suggest this was not warranted.

C8.4 Lessons learnt

While the overall variation to the allowance for the Other Operations Plan is not significant from a financial perspective, there have been significant variations with a large number of areas which make up this plan. Ausgrid should revise its opex forecasts going forward for the next regulatory period for this plan so that it reflects the additional expenditure incurred on management but also the underspend in other areas. Ausgrid has undertaken a review of this area of opex based on actual expenditure incurred this period and adjusted its underlying baseline going forward to reflect the outcomes of this period.

Appendix D

Alternative Control Services

D1 Alternative Control Services

Under the NER the AER was required to classify the construction and maintenance of public lighting as an alternative control service for the 2009-14 regulatory period. The following Appendix D2 looks at Street Lighting under this framework, where the primary regulatory guidance is provided in the NSW Public Lighting Code, and discusses both capex and opex in relation to this service.

D2 Street lighting

D2.1 Description

Street lighting services are regulated in NSW by the AER under alternative regulatory arrangements[42], outside the more prescriptive arrangements for the other main electricity distribution network services[43]. The customers for street lighting services are generally local councils or state or federal agencies (such as a roads authority). Generally all public lighting infrastructure projects are delivered under contestable arrangements:

The street lighting infrastructure is designed and charged for five components of the installation which are the:

- support (ie. the pole or support arm);
- bracket (ie. the connection to the pole which carries the light housing);
- luminaire (ie. the weather proof housing which carries the lamp);
- lamp; and
- connection (the wires and control & switch mechanism connecting the luminaire to the distribution network).

Ausgrid's network has a population of approximately 250,000 street lights. These are divided into usage for either pedestrian (P) or vehicular (V) applications. The majority of P lights are 80W mercury vapour and V are high wattage mercury vapour with active reactor power source. Under the transitional rules in chapter 6 of the National Electricity Rules (NER), public lighting services are classified as alternative control services.[44]

Ausgrid is seeking to comply with the following regulatory frameworks:

- the NSW Public Lighting Code[45] (a non-mandatory code);
- AS/NZS1158 series of standards pertaining to the lighting of roads and public spaces"[46].

[42] As "alternative control services" under the "transitional Chapter 6 rules" described in Chapter 11 of the National Electricity Rules.
[43] As "direct control services" usually referred to by the AER as "standard control services" under the "general Chapter 6 rules" in Chapter 6 of the National Electricity Rules.
[44] See clause 6.2.3B(b)(1) of the NER.
[45] NSW DEUS, NSW Public Lighting Code, 1 January 2006.
[46] Ausgrid, ID43734, Introduction to Public Lighting, March 2013.

This review has examined the performance of Ausgrid's Street Lighting Plan against its capex and opex allowances for the 2009-14 Regulatory Period.

D2.2 Expenditure

Ausgrid has both a capex and opex (maintenance) component to its Street Lighting Plan. It should be noted that the drivers of street lighting capex and opex may be identical but it is the nature of the work which distinguishes street lighting work as capex or opex. To be more precise, if the work involves the installation of a new structure or change to a permanent fixture's configuration it is capex. Street lighting capex can be broken down into the following categories:

- New street lighting – this relates to street lighting installed in new residential or commercial developments.
- Planned street lighting replacement – mass replacement of existing street lighting fixtures requested by local councils.
- Reactive street lighting replacement – replacement of existing street lighting fixtures for various technical reasons identified by either customers or Ausgrid.

Alternatively, if street lighting work occurs and it does not result in a change to the permanent fixture or the installation of a new structure then it is classified as street lighting maintenance opex. Ausgrid categories it street lighting maintenance opex as either:

- Scheduled maintenance – maintenance related to bulk lamp replacement or routine tasks.
- Unscheduled maintenance – maintenance in response to failures not sought to be addressed as part of bulk lamp replacement.

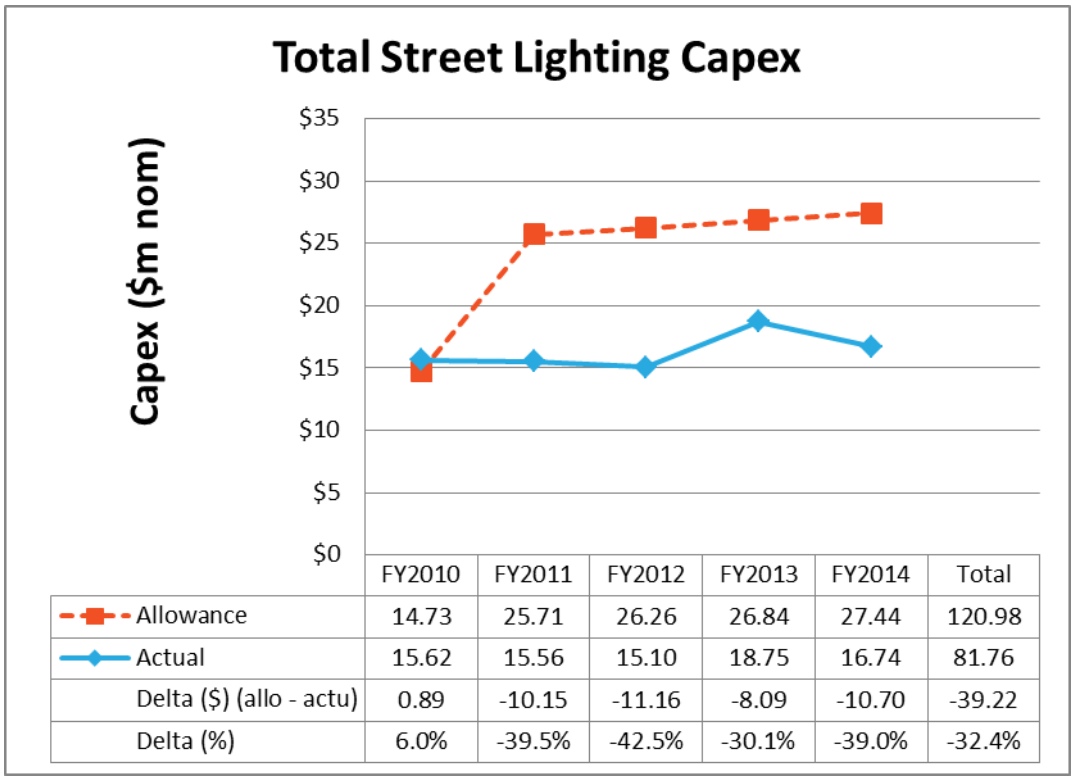
Ausgrid's combined street lighting capex and opex for this period was equal to 94.2% of its combined allowance for this period. A further breakdown of capex and opex is provided below.

D2.2.1 Capex

By the end of FY2014, Ausgrid estimates it will have underspent by 32.4% of the allowance provided in the AER's 2009 final determination[47] as varied following a direction from the Australian Competition Tribunal[48].

Figure 89 illustrates that the majority of this underspend can be attributed to the period from FY2011 and FY2013 of the regulatory period.

[47] AER, Energy Australia, Distribution Determination, 2009-10 to 2013-14, Alternative control (public lighting) services, Final Determination, 13 April 2010.
[48] ACT, Application by EnergyAustralia and Others [2009] AcompT 8.



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	14.73	25.71	26.26	26.84	27.44	120.98
Actual	15.62	15.56	15.10	18.75	16.74	81.76
Delta ($) (allo - actu)	0.89	-10.15	-11.16	-8.09	-10.70	-39.22
Delta (%)	6.0%	-39.5%	-42.5%	-30.1%	-39.0%	-32.4%

Figure 89: Allowed and actual street lighting capex

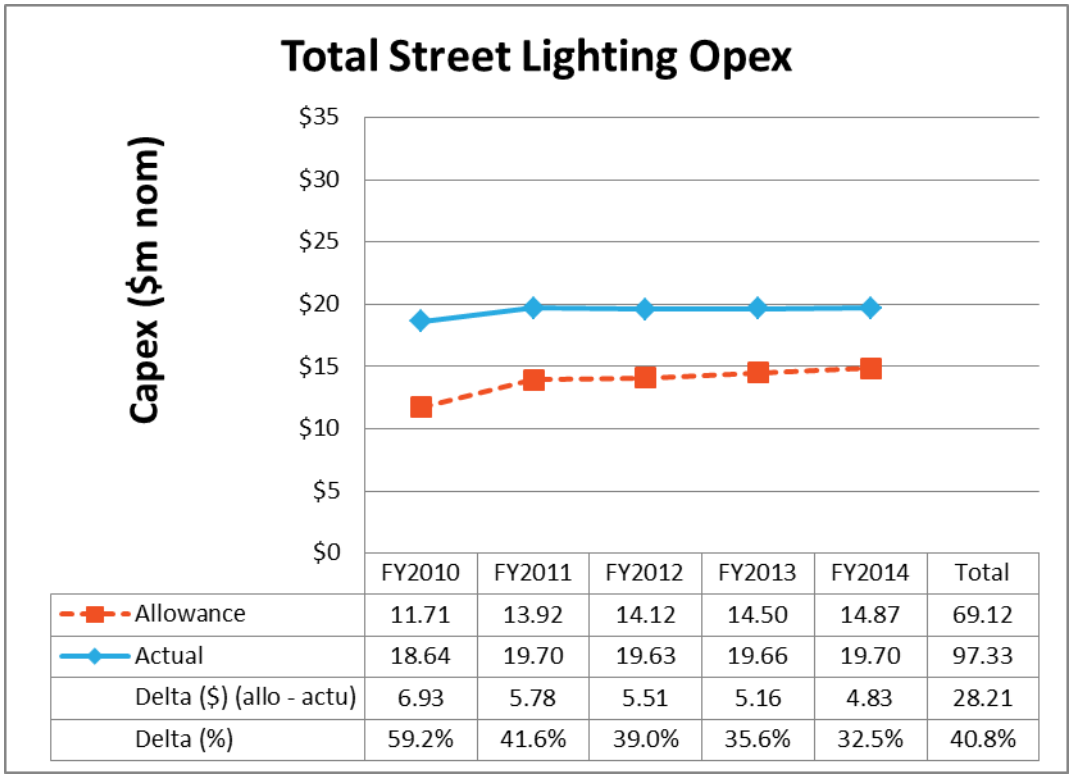
A further breakdown of street lighting capex in Table 49 shows that new street lighting accounted for 11.0% of expenditure and replacement (planned and reactive) for 89.0%.

Capex ($m)	FY2010	FY2011	FY2012	FY2013	FY2014	Total
New Street Lighting (Actual)	$1.79	$1.83	$1.77	$1.85	$1.51	$8.77
Street Lighting Replacement (Actual)	$12.99	$12.89	$12.83	$16.67	$15.49	$70.86

Table 49: Breakdown of street lighting capex

D2.2.2 Opex

For street lighting opex, Ausgrid estimates that it will spend 40.8% over the allowance by the end of FY2014. Figure 90 shows that Ausgrid has consistently overspent is opex allowance this period.



	FY2010	FY2011	FY2012	FY2013	FY2014	Total
Allowance	11.71	13.92	14.12	14.50	14.87	69.12
Actual	18.64	19.70	19.63	19.66	19.70	97.33
Delta ($) (allo - actu)	6.93	5.78	5.51	5.16	4.83	28.21
Delta (%)	59.2%	41.6%	39.0%	35.6%	32.5%	40.8%

Figure 90: Allowed and actual street lighting opex

There was some concern that repair crews may have booked activities which meet the capex definition to the opex program. To address this concern, Ausgrid has re-studied the account booking process on a sample basis and reassessed the split between capex and opex to derive the data presented in this Appendix D.

D2.3 Discussion street lighting operational impacts

Ausgrid's capex spend for street lighting varied significantly from its allowance. It is unclear what the final breakdown was between new and replacement street lighting sub-categories in the AER's final determination, so an analysis on the actual versus allowed expenditures at the category level for capex is not possible.

Ausgrid has provided information on the number of street light supports replacements over the current regulatory period. A prime issue which impacted capex was the need for a support replacement program in Newcastle. The prior power company responsible for the initial investment had used water pipe as the technology for street lighting supports. Sever corrosion has seen these supports fail and an inspection and replacement plan has been initialled. Therefore a significant proportion of the supports have had to be replaced within one year of inspection where the supports were found to be in a condition which required them to be condemned. Table 50 shows the impact of this support replacement program. As an unexpected program of capex to fix a systemic issue, this made a significant additional capital contribution to the Street Lighting Plan.

Pole Replacements	FY20010	FY20111	FY20112	FY20113	FY20114	Total
All	725	741	1,183	1,058	535	4,242
Newcastle	202	210	772	707	325	2,216
Newcastle (%)	28%	28%	65%	67%	61%	52%
Newcastle (Est. $m)	$2.2	$2.2	$8.3	$7.6	$3.5	$23.7

Table 50: Street lighting pole replacement numbers

In relation to street lighting replacement (planned and reactive) there appears to have been some confusion surrounding the definitions of these for this period particularly, when a sustained replacement need went from being classified as reactive to planned. Ausgrid staff have explained that according to revised definitions being applied to the 2014-19 Street Lighting Plan that all replacement for the 2009-14 Regulatory Period would have been classified as reactive replacement.

Ausgrid's opex spend for street lighting also varied significantly from its allowance. A significant event this period which was not anticipated was opex due to the accelerated ageing of the 42 watt Compact Fluorescent (CFL) bulb population than had been expected. Ausgrid has approximately 45,000 CFL bulbs in its network and estimates that 27,000 of those are showing performance issues. Ausgrid staff indicated that the maintenance teams replacing these bulbs also replaced the luminaire where more than two bulb replacements were required at one site. It is possible the definitional issue of opex versus capex saw much of the cost of luminaire replacement booked to opex rather than capex. Even though, it is likely that Ausgrid would have still overspent its opex allowance for street lighting opex due to accelerated ageing of CFL bulbs.

D2.4 Street lighting initiatives this period

During this period, Ausgrid has been testing a move from Mercury Vapour lamps to High Pressure Sodium lamps with Active Reactor power sources. The results of this testing show improved energy savings of around 50% to 55% and an increased bulk lamp replacement life which will reduce energy operating costs over the long term for its customers.

In addition, Ausgrid has undertaken trials for P light applications on newer LED technology which appears to offer better efficiency and potentially further operating savings to customers.

Ausgrid has also indicated that in order to undertake trials of LED-technology Street lighting it undertook capex of $1.1 million in FY2013 and $0.9 million in FY2014. These account for a proportion of the over expenditure in these years against the AER's allowance.

Data provided on the initial trials for P style applications in 8 streets which were run in FY2013, and indications are that energy savings on LED street lighting configurations show a 43% to 70% (average 54%). While the data looks promising, issues of the cost of the luminaire and lamp combination, and their service (and economic) life need to be explored further.

Ausgrid has indicated that it has subsequently undertaken a LED cost benefits analysis study and provided this as part of its supporting documentation for its 2014-19 Substantive Proposal. Ausgrid has stated that the key findings from the study are:

- LED has a greater up front capex cost but a reduced ongoing maintenance cost which offsets the increased up front capex cost; and
- Due to issues such as legislation, council stipulations and the manufacturing supply chain, LED street lights are the only practical option for mass rollout.

Arup's independent findings and assessment

The information provided by Ausgrid suggests it is reasonably proactive in identifying new and trialling new street lighting technologies which would improve the economics of street lighting for its customers. While energy savings are a benefit to customers, the costs of the infrastructure which is provided by Ausgrid, typically has a long economic life and Ausgrid is not the beneficiary of the energy savings. In these circumstances there is a natural tension between the economics for the customer and the economics for Ausgrid. Ausgrid has responded by allowing early retirement of older technologies where the residual costs to Ausgrid of the older technology are paid by the customer. This allows the customer to make rational economic decisions on migration to new technology, and keeps Ausgrid in a neutral financial position with lower investment risk.

The observance of the regulatory framework suggests the regulatory arrangements may be hindering or slowing the adoption of new technologies, and all stakeholders in street lighting need to increase their efficiency so that the costs to consumers are reduced over time as rapidly as possible.

Ausgrid needs to improve its posting of jobs and job costs into its accounting systems to allow better analysis of existing technology, life cycle costs and replacement programs.

Ausgrid should continue LED trials and trials of other emerging technologies, and actively engage with customers, the AER, standards and code setting stakeholders, in order to bring new and more globally efficient technologies forward to its customer base, in a timely manner.

Arup notes State Government funding initiatives for trials and introduction of more energy efficient street lighting technologies. This is to be encouraged where the economics of the funding arrangements continue to be supported.

D2.5 Lessons learnt

There are a number of issues to be addressed by Ausgrid in the next regulatory period which will have an impact on its approach to replacement of street lighting and the monitoring of its replacement and maintenance programs. These are:

- It has been identified from an internal review that job cost postings into the accounting systems need to be more consistent; Ausgrid proposes to move to a

single centralised accounting team to perform the postings and hence improve data accuracy.

- Ausgrid has also undertaken more detailed analysis and consultation on lamp lives to ensure that its replacement timelines for lamps are more accurate and therefore, its expenditure is also more accurate.
- In adjusting its forecasts for major issues that have arisen this period, Ausgrid has also undertaken cost benefit analysis to support its proposed solutions to and expenditure associated with resolving issues that have arisen.