Attachment 5.24

Overview of the Replacement and Duty of Care Plans for 2014-19

May 2014

Contents

Executive Summary

Ausgrid's proposed capex of $1.78 billion in Replacement and Duty of Care programs for the 2014-19 period is aligned to achieve our business purpose to efficiently distribute electricity to our customers in a way that is safe, reliable and sustainable. Our substantial program recognises the legacy of investment in the 1950s to 1970s and confirms we face an uphill battle in addressing condition issues associated with a large, old and degraded network. At the same time we have sought to minimise prices for our customers by looking at efficient ways to defer and limit capex in the period.

We are proposing total capex of $1.78 billion ($2013/14) for the 2014-19 period for our Replacement and Duty of Care plans. This includes:

- $1.34 billion to address assets that pose an unacceptable level of risk as a result of degraded condition or increased probability of failure (Replacement Plans).
- $346 million to address assets that do not meet compliance and infrastruture risk obligations not covered under the Replacement Plans (Duty of Care Plan).
- $90 million for associated support costs relating to strategic planning, control room and GIS data capture activities.

The plans set out capex to replace, refurbish or modify our existing network assets. For the 2014-19 period there is a shift in focus from transmission assets to distribution assets.

The proposed capex for the 2014-19 period is about 33 percent higher than the actual capex during the 2009-14 period (actual for 2009 - 2013 plus planned for 2014) and the two primary reasons for this are:

- In the last period, we deferred a significant portion of forecast capex on Replacement and Duty of Care plans due to a range of delivery issues associated with our total capex program. In light of these difficulties we focused on our immediate obligation to meet compliance, reliability and performance licence conditions, and sought ways to defer the forecast program of works in our Replacement and Duty of Care plans by applying risk tradeoff methodologies.
- Consequently, the age and condition of the assets in these areas of the network has progressively worsened during the 2009-14 period despite investments to remove the most risky assets. This has lead to an increased risk profile for the deferred work. Distribution assets, as a whole, have continued to deteriorate leading to increased risk and increased failures. If unaddressed, these issues may lead to an increase in safety and environmental harm, and will prevent us from meeting our obligations as an essential service provider.

Despite these issues, our program of works recognises that we need to minimise price pressures for our customers to the fullest extent possible during the 2014-19 period. Ausgrid has sought all opportunities to defer capex by prioritising our program within acceptable risk boundaries, and by seeking cost efficiencies in our Replacement, Duty of Care and, Maintenance solution

Introduction

The assets used to run an electricity network can carry significant risk to the community, our workers and the environment. For this reason Ausgrid has a strong asset management culture. Our key aim is to balance these risks to ensure we meet our regulatory obligations. Where economically prudent this may involve capex to replace, refurbish or modify assets.

The purpose of this document is to provide a high level overview of capex we propose to invest in the 2014-19 period, under the Replacement and Duty of Care Plans. This document is part of Ausgrid's regulatory proposal and contains proposed forecast capex, expressed in 2013/14 dollar terms, unless stated otherwise.

The document should be read in conjunction with other relevant attachments and documents provided in the 'supporting document' library of Ausgrid's regulatory proposal (support documents). These supporting documents are generally business-as-usual documents and we have provided these for the main objective of demonstrating that our investment decisions are based on an efficient and process. It must however be noted that these supporting documents have been prepared at a point in time and therefore reflects the forecast capex as at that time. Our Replacement and Duty of Care plans are based on the following network asset types:

What about large sub-transmission assets?

Replacement of major assets on the sub-transmission network (such as zone substations and entire transmission lines) are contained in our Area Plans. This is due to potential synergies in addressing capacity and replacement at the same time in an area. Further information is contained in our Area Plans.

- All assets on our distribution network including distribution substations, lines and cables.
- Smaller independent assets on our transmission network within our existing transmission and zone substations, and parts of our transmission lines and cables.

In the sections below we identify why Ausgrid is required to replace network assets in our role as an essential service provider. We then describe the difference between our plans, noting that Replacement plans are for assets in degraded condition. Lastly, we describe the key asset categories included in our plans.

Why do we replace assets?

As an essential service provider, Ausgrid has a strict obligation to manage our assets to meet safety and reliablty standards set by legislation, government, regulations etc. Our asset management principles are focused on ensuring we meet these obligations at least cost, and may include replacement where economically prudent. In the following sections we:

- Identify our key regulatory obligations that influence our asset management decisions.
- Set out our asset management principles, and the types of work we undertake to meet our obligations.
- Identify the conditions under which we consider incurring capex on Replacement and Duty of Care activities.

Regulatory obligations

We have a suite of regulatory obligations that guide our asset management practices. These obligations relate to keeping our network safe, reliable and sustainable and to do so in an environmentally responsible manner. The key obligations are:

- Public and workplace safety - There are inherent dangers of operating electricity networks. When assets fail in service they can cause serious harm to customers, the community and our workers. Key examples include fires, and explosions, and electricity shocks. Compliance with our obligations requires us to keep our assets in good order so that we do not harm the public or jeapordise the safety of our workers.

- Environment - Our network footprint spans areas of NSW which are highly sensitive to environmental damage. Electricity assets may contain hazardous substances or material that can be unsafe to the environment if not functioning properly. These substances are necessary to assist electrical assets in performing their function i.e. insulation material. However, exposure of these substances can harm the environment. For example, the fluid used to insulate electricity cables can leak and cause damage to waterways such as the Sydney Harbour. For this reason, legislation as well as Ausgrid's own corporate responsibility requires us to ensure that environmental risk is properly managed.

- Reliability – Our Design, Reliability and Performance (DRP) licence conditions recognise that customers expect a reliable supply of electricity. When assets fail, it may cause disruption to the supply of customers, particularly in cases where there is limited redundancy (back-up of supply) in the network. If failure rates increase due to asset degradation, then supply reliability may decrease. Ausgird aims through its Replacement plans to maintain reliability levels by preventing increases in failure rates.

In most cases our obligations do not provide specific actions or measurable standards for compliance. For example, the Workplace Health and Safety Act provides for a general requirement to ensure the health, safety and welfare at work of all of our employees and non-employees. The general nature of this requirement means that we must use prudent judgement based on risk methodologies when designing, maintaining, operating or replacing a network.

In some cases, our obligation does specify a particular standard we must achieve to be compliant. For example, we are subject to various regulations, standards and guidelines for our assets which set out the minimum obligations. In these cases, we will comply with the particular specification.

Asset management strategy

Ausgrid has a comprehensive and prudent strategy to manage assets across our network. The key principles underlying our asset management strategy include:

- Ensure compliance with all relevant safety, environmental and reliability obligations.
- Maintain current levels of safety, security and reliability.
- Create a network that is sustainable and stable over the long term.
- Cost effectiveness and efficiency.

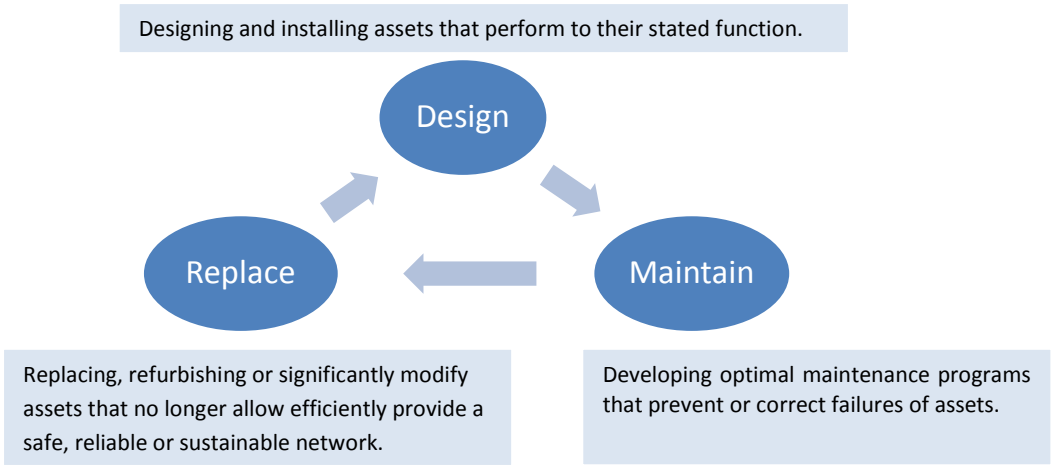
In meeting these principles, we have developed a number of diagnostic tools to monitor the health of our network assets. We undertake assessments of technology types on our network, and identify key markers of health such as age of assets, failure history, failure modes (i.e. reasons for failure), failure rates and failure consequences.

We monitor the legislative environment, to verify our existing assets are capable of meeting the current required performance standards. This recognises that new compliance obligations often arise after the asset has been installed. A key example is recent regulations that require the development of greater security to protect infrastructure from sabotage.

Based on our information, Ausgrid develops activities directed at meeting our obligations utilising a well established philosophy called 'Reliability Centred Maintenance' (RCM). At its core, the philosophy seeks to achieve economic efficiency in meeting our regulatory obligations to provide a safe, reliable and sustainable network in an environmentally responsible manner. This involves

adopting a whole of life perspective. This is depicted in Figure 1, which shows our asset management practices involve design, maintenance and replacement programs.

Figure 1 – Asset Management Process



In particular, Ausgrid's maintenance strategy aims to maximise the life of its assets through cost effective maintenance tasks. This life cycle view ensures that costs to consumers are minimised over the long term by putting in place strategies that optimise the whole of life cost potentially including deferring the need for replacement. However, as explained in the next section, in cases where failures can no longer effectively or safely be mitigated through maintenance, options such as replacement, refurbishment or modification are investigated to mitigate against potential failures.

When we choose to replace assets

Ausgrid replaces assets when it is economically prudent to do so. By addressing the whole of life cost Ausgrid ensures that our strategies are cost effective. For example, we will replace assets where:

- The asset fails in service, and it is not cost effective to remediate the fault. This is called reactive replacement and will occur as a result of deterioration in the condition of assets as they age, or a failure in the technical design of the asset.
- There is significant risk in meeting regulatory obligations by keeping the asset in service. This is called 'proactive' or 'planned' replacement. In these cases, we undertake risk assessments to evaluate whether replacement is required and conduct engineering and financial analysis to determine the timing and scale of the replacement.

In cases where there are large number of assets in the population, it is impractical to undertake detailed examination of risks of individual assets. In these cases asset technology types and vintages can be used to determine a risk profile for the entire population.

Chapter 3 provides more detail on the methodology we have used to identify assets that need to be replaced, refurbished or significantly modified in the 2014-19 period. More information on the difference between reactive and planned replacement is provided in breakout box 1.

Box 1: Reactive vs. Planned replacement

If economically prudent and if the risk of failure can be tolerated, Ausgrid will undertake reactive replacement of its assets. In other cases, Ausgrid proactively replaces, refurbishes or significantly modifies assets before failure. Planned replacement is prudent when we have evidence to suggest that keeping the asset in service exposes us to an unacceptable level of risk that compromises our regulatory obligations.

In making a decision as to whether we run the asset to failure we consider whether:

- The risks can be mitigated cost effectively through inspection, routine or corrective maintenance.
- The consequence of running the asset to failure will breach our regulatory obligations. In particular we consider whether this would be above the level of risk that a prudent DNSP would be willing to accept in our circumstances.

In particular, Ausgrid treats safety as our number one priority, and the majority of our planned replacement is directed at replacing assets that are unsafe to the public and workers. For instance, when the probability of an asset causing a fire reaches an unacceptable level, then proactive action should be taken to mitigate the risk. Using the hierarchy of controls, in some cases, eliminating the risk is achievable by replacing the asset. For example, replacement of oil filled circuit breakers with vacuum interrupted circuit breakers.

What types of capital plans do we develop for replacement?

Ausgrid has two types of plans for identifying our capex requirements.

- Replacement plans relate to assets that pose an unacceptable level of risk as a result of degraded condition or increased probability of failure.
- Duty of Care plans to rectify assets that do not meet compliance standards.

Replacement plans

The majority of our replacement requirements are for assets that have exceeded their technical life. As an asset ages its condition deteriorates, leading to a higher probability of failure. Further, the failure mechanism becomes unpredictable in nature, and becomes difficult to mitigate through maintenance programs. As noted in Chapter 2, Ausgrid has a significant population of assets that exceed their technical life and whose risks cannot be managed through maintenance programs.

In other cases, the reason for replacing the asset relates to a fault with the equipment that is not directly related to age, such as design, manufacturing or installation issues.

It is worth noting that some younger assets deteriorate much faster than older assets due to their design or the environment they operate within. Therefore, asset condition is the primary trigger for replacement, while age is used as an indicative measure. For example, CONSAC & HDPE cable is not the oldest distribution cable on the network. However, over 70% of all distribution underground cable failures can be attributed to CONSAC and HDPE. This is due to their design, resulting in a much quicker deterioration rate and increased safety risk.

Ausgrid develops Replacement plans based on technology types for our major assets, not generic age/standard life. Our planned Replacement plans identify technology that we consider needs to be removed from the network as a result of our risk assessments. Where asset condition can be directly linked to age (degradation), age is used to support the investment decision. Our reactive plans are a forecast of the assets that will fail on the network despite our alternative strategies or an acceptance that run to failure is the optimum strategy.

Duty of Care plans

Duty of Care programs are specific programs of work, unrelated to degradation of the asset , which ensure that Ausgrid's assets comply with specific statutory requirements and standards expected of a prudent DNSP. They relate to new obligations that did not exist when the asset was built, or changes in circumstances that cause the assets to pose unacceptable risks to either staff or the public. For example, we have a Duty of Care obligation to address asbestos and other Workplace, Health and Safety (WHS) and environment risks. Duty of Care programs are also categorised by one of the following risk drivers as shown in Table 1.

Table 1 – Duty of Care Drivers

Type of program	Description of programs
Workplace Safety	Programs to mitigate against the risk of workplace safety incidents such as covering some exposed electrical assets and rectification of assets to meet statutory requirements.
Public Safety	Programs to mitigate against the risk of public safety incidents such as installation of anti-climb devices on towers and substation fencing.
Environmental	Programs to ensure compliance with environmental regulations and to mitigate against environmental incidents such as oil containment installation and the replacement of noisy transformers.
Fire Mitigation	Programs to ensure compliance with applicable regulations and to mitigate against fire related risks such as the installation of fire stopping and smoke detection systems.
Asbestos Management	Programs to ensure compliance with applicable regulations regarding asbestos such as the removal of asbestos in cable pits, fire doors and other locations where found.
Security Management	Programs to ensure compliance with statutory requirements regarding the security of sites deemed to contain critical infrastructure.

What types of assets are covered in the plans?

All of Ausgrid's programs, whether reactive or planned, are categorised into one of six asset groups as shown in Figure 2 below. This assists with managing a large and diverse range of assets These groups are also used to analyse our maintenance expenditure.

These categories allow us to create strategies for groups of assets based on factors such as technology type and operating environment. For example, underground distribution cables are categorised differently to underground sub-transmission cables. Placing them in the same category would ignore differences in technologies, operating environment, maintenance requirements network configuration requirements/risks and consequences, for example reliability implications on sub-transmission assets versus distribution. Similarly, although there are some 11kV circuit breakers common to both distribution substations and zone substations, they are categorised differently to account for the different operating environments and risks associated with each.

Figure 2 – Asset Groups

Transmission Overhead

Transmission Overhead assets include steel towers, poles (wood, concrete and steel), special termination structures, overhead mains (132kV, 66kV and 33kV), access tracks and air break switches. These assets provide direct connections between Transgrid and and the Ausgrid network and interconnection between our Transmission and Zone substations.

Transmission Underground

Transmission Underground assets include underground cables, of a variety of insulation technologies operating at design voltages of 132kV, 66kV and 33kV, associated pressure monitoring and alarm systems, cross bonding systems, and cable tunnels. These assets provide direct connections between Transgrid and and the Ausgrid network and interconnection between our Transmission and Zone substations.

Transmission Substations

Assets include buildings, transformers, high voltage switchgear, protection systems and earthing systems. These substations are supplied at 132kV or 66kV, and supply local zone substation networks, mostly at 33kV, with smaller 66kV networks in the upper Hunter Valley and in Sydney at Epping/Hunters Hill.

Zone Substations

Assets include buildings, transformers, high voltage switchgear, protection systems and earthing systems. These substations are supplied at 132kV, 66kV or 33kV, and transform this to 11kV (with a small 5kV network) which supplies the local distribution network via overhead / underground mains.

Distribution Mains

Assets include but not limited to poles and other support structures (wood, concrete, steel and composite materials), overhead and underground 11/22kV and Low Voltage conductors, access tracks, overhead and underground services, pillars, reclosers and sectionalisers, voltage regulators, air break switches, under slung links and other equipment. These assets provide connection between Zone substations and customers via distribution substations and the LV network.

Distribution Substations

Assets include pole substations and ground type substations including kiosks, outdoor enclosures, chambers and underground structures. These substations are supplied at 11kV and transform this to 415V. The main assets associated with these substations are buildings, housings, enclosures transformers, high voltage and low voltage switchgear, fuses and earthing systems.

Benefits from previous investment

During the 2009-14 regulatory period Ausgrid made significant inroads into addressing condition and compliance issues on our network. Assets which posed unacceptable risks were replaced with modern day equipment. Our program of works varied significantly from our initial forecast as a result of improved data to inform our prioritisation processes, the development of more cost effective solutions and some delivery issues.

The purpose of this section is to identify the outcomes of investments during the 2009-14 period and the reasons for variations to forecasts. Examination of previous capex can provide insights into the proposed capex for the 2014-19 period, and the veracity of previous forecasting approaches.

In the sections below, we provide information on:

- Why Ausgrid proposed substantially higher replacement allowances in the 2009-14 regulatory period. We demonstrate that insufficient expenditure allowances in the 1990s and early 2000s resulted in the need to undertake significant replacement of assets.
- The benefits to our customers, workers and environment from replacing degraded assets on our network in the 2009-14 period.
- The reasons for variations to forecast.

1.1 Circumstances prior to regulatory period

Figure 3[1] provides an illustrative view of our business lifecycle, and shows the underlying reasons why Ausgrid needed to increase its rate of replacement in the 2009-14 period. While this graph shows mains and poles assets only, the diagram is reflective of the overall network.

In the diagram, it can be seen that a large proportion of Ausgrid's asset base was built in the 1960s, coinciding with a large increase in the demand for electricity. The assets built in this period had significant capacity to provide the backbone of supply for the next 40 years. Investment declined on the relatively young network between 1970 to 2000 as there was less focus on the need for a balanced long-term replacement strategy, routine and preventative maintenance.

In the early 2000s Ausgrid's analysis demonstrated that the network was potentially facing an impending health issue that would impact our ability to meet reliability and safety in the medium term. The assets that were installed in the 1960s were approaching the end of their technical life, and failures had started to increase on a variety of assets. We recognised that our maintenance and replacement strategies at the time were inadequate to deal with the ageing of our network and if not addressed could lead to an impending death spiral which we would not be able to recover from. Consequently, we adopted a holistic approach to address the issue including:

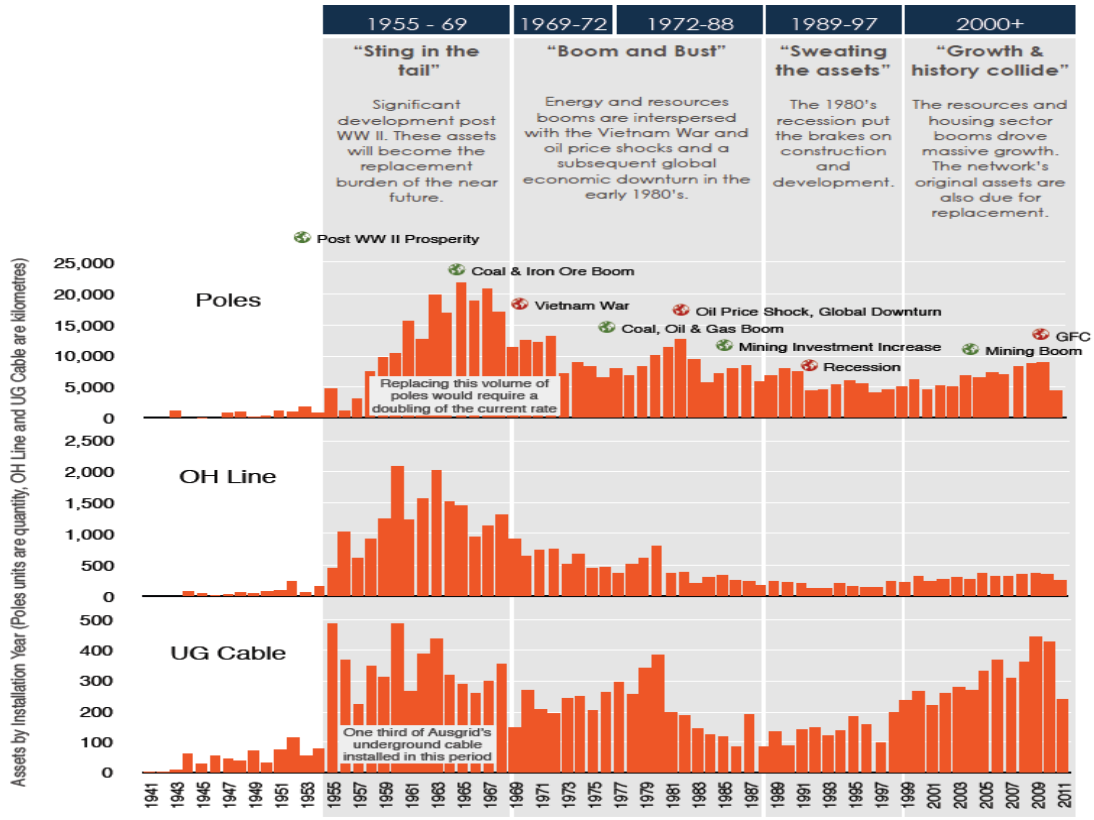
- A revision of Ausgrid's maintenance standards to ensure that objectives were consistent across the organisation. By the mid-2000s, maintenance completion was improving, as was

[1] Sourced from the Huegin 2012 Distribution Benchmarking Study

the collection and accuracy of asset related data. This included a shift towards Asset Management best practice including Reliability Centred Maintenance (RCM) and Failure Mode Effect & Criticality Analysis (FMECA).

- Targeted replacement programs were developed for assets that were highest risk of not satisfying the regulatory obligations defined in the Introduction. These programs commenced in the later part of the 2004-09 period, despite insufficient regulatory allowance provided at the time.

Figure 3 - Business Lifecycle



In the 2009-14 period, Ausgrid proposed significant replacement of assets at all levels of the network in an effort to combat rising failure rates and the looming issue of a bow wave of replacements. As part of the proposal we presented analysis that showed the sustained increase in the age of our network assets, and how the proposed replacement programs would serve to reduce these increases.

At the time we recognised that the ageing of the asset base was an issue that could not be addressed in a single regulatory period. Due to the sheer size of our asset base, certain parts of the network would continue to increase in average age despite large scale replacement.

1.2 Outcomes from investment in the 2009-14 period

By the end of the period, a significant numbers of asset risks will have been removed from the network. In the sections below we provide a summary of the risky assets we have replaced, and the Duty of Care programs we have undertaken.

Replacement program

The key highlights of our replacement program include the removal of assets on the network that posed risks particularly to safety. Table 2 describes the benefits from our targeted replacement program in the 2009-14 period.

Table 2 – Replacement Plan Outcomes

Type of program	Description of outcomes
Transmission mains	As at the end of 2012/13 financial year we have completed 926 replacement jobs on transmission mains assets including the replacement of 711 poles. These jobs range from replacing small assets like individual insulators to replacement of kilometres of underground cable. The transmission mains replacement plan for the 2009-14 period consisted of 15 sub-programs. It is expected that all of these will continue into 2014-19 although some will be bundled into new programs of work. Notable programs include: • Replacement of 132kV 'fog' insulators and certain overhead conductor types due to age related condition issues. This sub-program will be carried out under the sub-transmission overhead feeder refurbishment sub-programs. • Refurbishment of steel towers and their associated earthing systems due to age related degradation.
Sub-transmission and zone substations	As at the end of 2012/13 financial year we have completed 370 replacement jobs in our existing sub-transmission substations, and 960 jobs in our zone substations. Notable programs were: • Significant replacement of 33kV bulk oil circuit breakers (CB). The older CBs posed unacceptable safety risks due to a history of catastrophic failures and fires driven by poor asset condition. • Replacement of 11kV bulk oil circuit breakers. There were a number of catastrophic switchboard and circuit breaker failures experienced in Ausgrid. Replacing the oil circuit breakers with vacuum type circuit breakers largely removed fire risks from the substations, allowing cost effective extension of the switchboard life.
Distribution Substations	As at the end of 2012/13 financial year we have completed 2929 individual replacement jobs in distribution substations. These range from replacing small assets like circuit breakers to full substation replacement. The distribution substation replacement plan for the 2009-14 period consisted of 37 sub-programs. It is expected that of these, 12 will either be completed or closed off. Notable programs at or near completion include: • Replace "Cubicle" switchgear distribution substations. These substations contained some of the oldest electrical equipment on the network. They were commissioned from 1914 up until the early 1950s. The "cubicle" high voltage switchgear had major safety and operating concerns and was the subject of operational restrictions. The removal of this switchgear has seen a significant network risk removed. • Ex St George County Council Outdoor Enclosure distribution substations. These obsolete outdoor style substations were commissioned between 1944 and 1973. There have been a number of significant incidents because the high voltage and low voltage switchgear is housed in a timber enclosure. A fire in 2000 starting in the substation caused significant damage to an adjoining private property. These assets carried a significant safety and liability risk.
Distribution mains	As of 30/06/2013 we have completed 95,916 replacement jobs and replacement of just under 200kms of distribution mains assets. These range from replacing small assets like low voltage pillars or overhead services to replacement of kilometres of underground cable or overhead mains. The distribution mains replacement plan for the 2009-14 period consisted of 28 sub-programs. It is expected that of these,

	8 will be completed or closed off. Notable programs include: • Replacement of oil filled 11kV reclosers and sectionalisers due to oil-related fire risks, high maintenance requirements and their age. All assets of these types will have been replaced by the end of the 2009-14 period. • Replacement of LV underground CONSAC & HDPE cables due to known condition issues causing high levels of failure and electrical safety risks for both our staff and public. Replacement of these cables has been more difficult and costly than expected but more than 100km of these cable types will have been replaced by the end of the 2009-14 period. • Replacement of 11kV steel mains due to known condition and fire risk issues. The small steel conductors corrode and fail causing electrical safety risks to Ausgrid staff, farmers and livestock, as well as potentially igniting combustible materials in rural or remote areas. More than 130km of steel mains will have been replaced by the end of the 2009-14 period. • Replacement of condemned poles when they have failed our testing processes for structural integrity. More than 16,167 condemned poles will have been replaced by the end of the 2009-14 period. • Replacement of overhead service wires due to known age related insulation condition issues which pose electrical safety risks to both our staff and public. More than 78,800 overhead service wires will have been replaced by the end of the 2009-14 period. • Replacement of 11kV air break switches. Some types of air break switches are being proactively replaced due to known condition issues which pose electrical safety risks for both our staff and the public, others types are replaced reactively following failure. More than 2,300 air break switches will have been replaced by the end of the 2009-14 period.

Duty of Care

As at the end of 2012/13 financial year we have completed 485 individual Duty of Care projects. We made some headway into addressing concerns with assets that did not meet safety, environmental and compliance standards. For example:

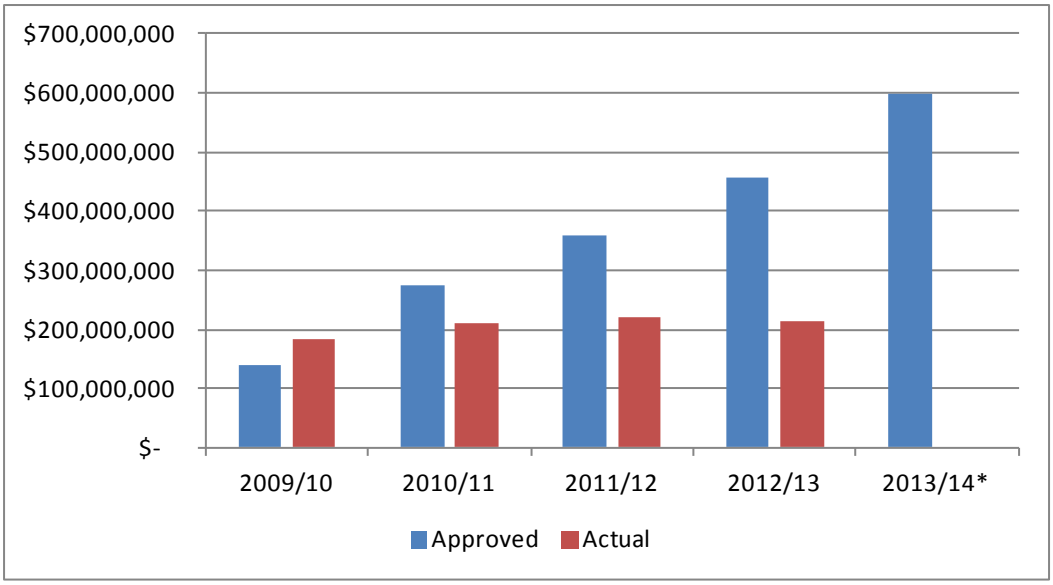
- We expect to mitigate the majority of fire related risks at zone and sub-transmission substations with completion of the 11kV vacuum circuit breaker conversions to remove the risk associated with oil in substations and the installation of fire hydrant sub-programs.
- Upgraded the anti-climb devices at over 70 steel towers.
- Replaced deteriorated concrete pit lid, including concrete cement, at 66 outdoor Zone & STS switchyards
- Replaced 54 kiosks that contained exposed 11kV
- Completed the replacement of 1.57km of Façade Mounted ABC
- Address the non-complaint 33kV busbar ground clearances at 8 substations
- Completed the risk assessment of all power line crossings of navigable waterways and implement the required controls to address the majority of the extreme risk rated crossings.
- We replaced asbestos roofs at a number of zone and distribution substation as well as the removal of asbestos from of the Sydney CBD pits.

- Improved fire safety at Ausgrid's zone & STS substation by installing Very Early Smoke Detection Alarms (VESDA) and upgrade the fire hydrants to comply with the relevant modern day standards.

1.3 Variations to forecast

During the 2009-14 period Ausgrid has significantly underspent on our capex allowance for Replacement and Duty of Care plans. We expect to incur $1.02 billion ($nominal) on Replacement plans by the end of the 2009-14 period as shown in Figure 4.

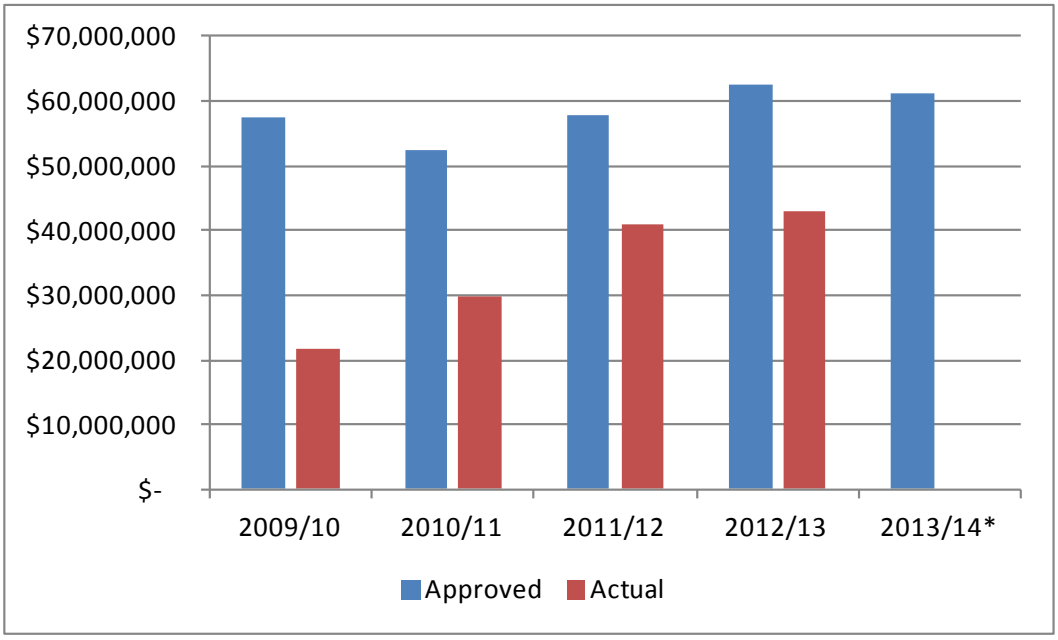
Figure 4 – Replacement Plan Expenditure (as incurred in $nominal)



*No actual expenditure for FY2014 has been included.

For the Duty of Care plans, we expect to spend $170 million ($nominal) by the end of the 2009-14 regulatory period, which is $118 million or 41 percent below the total planned expenditure for the period. Duty of care capex is shown in Figure 5.

Figure 5 – Duty of Care Plan Expenditure (as incurred in $nominal)



*No actual expenditure for FY2014 has been included.

The key reason for variation involves re-prioritisation of the program in response to the following issues:

- More detailed information on our assets – At the time of our forecasts in 2007/08 for the 2009 - 2014 period, we did not have an integrated asset management system in place to provide more detailed information on the condition and failures of our assets. More detailed information lead to greater accuracy in risk profiling allowing for work to be re-prioritised with minimal impact on total risk.

- Review of risk thresholds in response to price pressures – The adverse impacts from large price increases made us consider whether there were opportunities to take on greater risks by deferring capex programs. We recognised that this would enable us to lower price pressures in the next period by reducing the size of the opening Regulated Asset Base (RAB) for the next period, consistent with the incentive regime for capex.

- Higher than forecast costs – Our unit cost estimating system for the 2009-14 proposal was at a high level, and did not accurately estimate the actual costs of delivering our program. Higher costs led to a re-examination of whether full replacement was cost effective to mitigate the risk. Some of these additional costs were driven by design complexity and additional civil work not originally understood at conception last period.

- Delivery issues – Ausgrid faced a significant challenge in delivering a large step change in replacement and capacity expenditure. In the initial years of the regulatory period, we had significant issues with resource constraints to deliver the entire program. There was an expectation that overflow work would be managed through an alliance with external contractors. This did not prove to be as effective as originally anticipated. Our workplan placed higher priority on compliance with our new licence conditions, and with replacing the major assets on our sub-transmission network as set out in our Area Plans. This was due to the fact that much of the work identified under the Area Plans also had Replacement and Duty of Care issues, allowing for multiple drivers to be removed. Additional delivery issues included delays as a result of coordination of outages through lack of network redundancy and delays in procurement processes.

In recognising the shortcomings in the previous forecast, Ausgrid has adopted the following measures for 2014-19 to ensure a greater level of accuracy:

- Significant consultation and alignment of the forecast replacement plans with the delivery capability of the organisation and the market taken into account when developing forward programs.

- The successful delivery of a number of major Area Plans projects has allowed for greater network redundancy for easier outage coordination.

- The majority of programs for the 2014-19 period are continuing from the 2009-14 period, where procurement contracts were already established. Lessons learnt from the procurement exercises undertaken over the last period have improved our processes for the next period.

- Detailed risk profiling by asset group undertaken in developing the Asset Condition & Planning Summaries and Replacement sub-programs, allowing for improved risk profiles, programs and delivery plans. This greater accuracy allowed for work to be shifted with minimal impact on total risk.

- Detailed review of the anticipated price impacts of the proposed replacement and DOC expenditure forecast including community engagement surveys and adjusted risk profile models and tolerances.

- A full review of unit costs including market driven assessments and benchmarking studies aimed at delivering improved cost structures and deliverability.

Previous expenditure is a relevant reference point to assess our forecast capex for the 2014-19 period. Our evidence shows that the proposed capex can be explained at a high level by our previous and future circumstances.

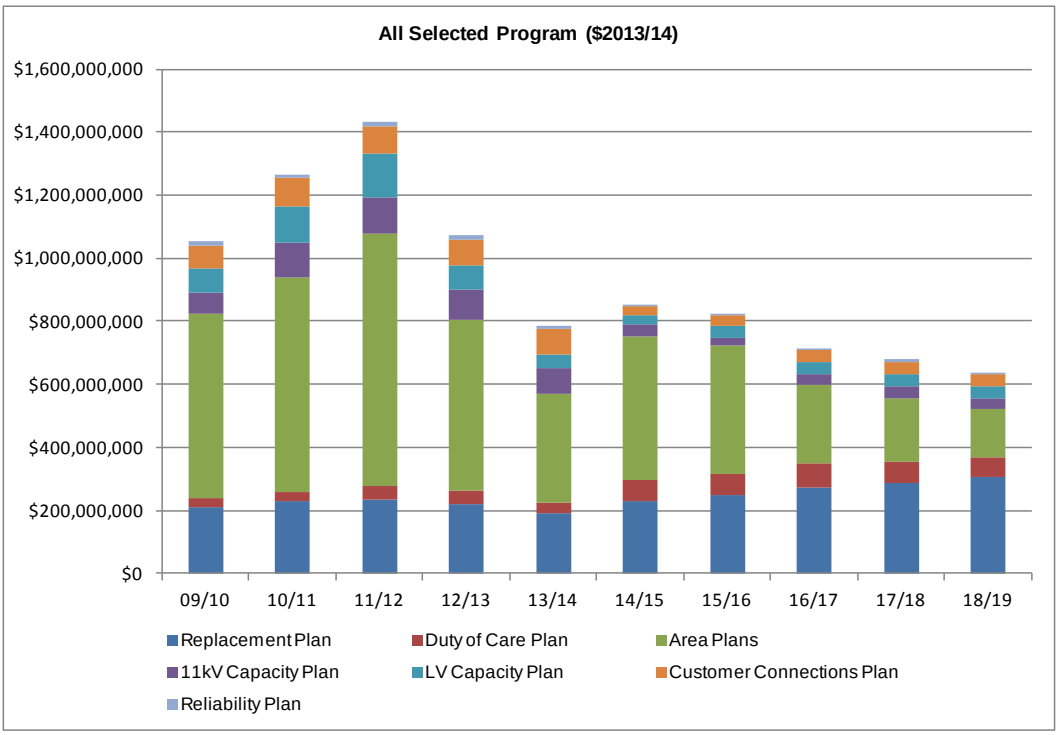
In the next period, we are delivering a far smaller capital program, which will not create the same delivery issues as last period. A new structure is being developed to overcome these issues and

will allow for a more competitive blend of internal and external service providers and enhanced delivery capabilities.

In light of an ageing asset base and deferral of work last period, leading to increased deterioration and increased risk, our ability to maintain a safe, reliable and secure network can only be met if a higher level of capex for Replacement and Duty of Care in the 2014-19 period is undertaken.

As stated, when combined with all other proposed plans, Ausgrid's total proposed capex is less than that actually spent last period. Figure 6 reflects the change in total capex for the first 4 years of last period (actual) against the proposed for next period, split by plan. The programs included are those where shared resources are required. We would therefore expect delivery resources to shift focus from other the delivery drivers to delivery of Replacement and Duty of Care.

Figure 6 – Total Core Network Capex ($2013/14)



The 2009 - 2014 period was the first time Ausgrid attempted to undertake a program of this size and complexity. The learning from this period has been adopted into our delivery plans for next period.

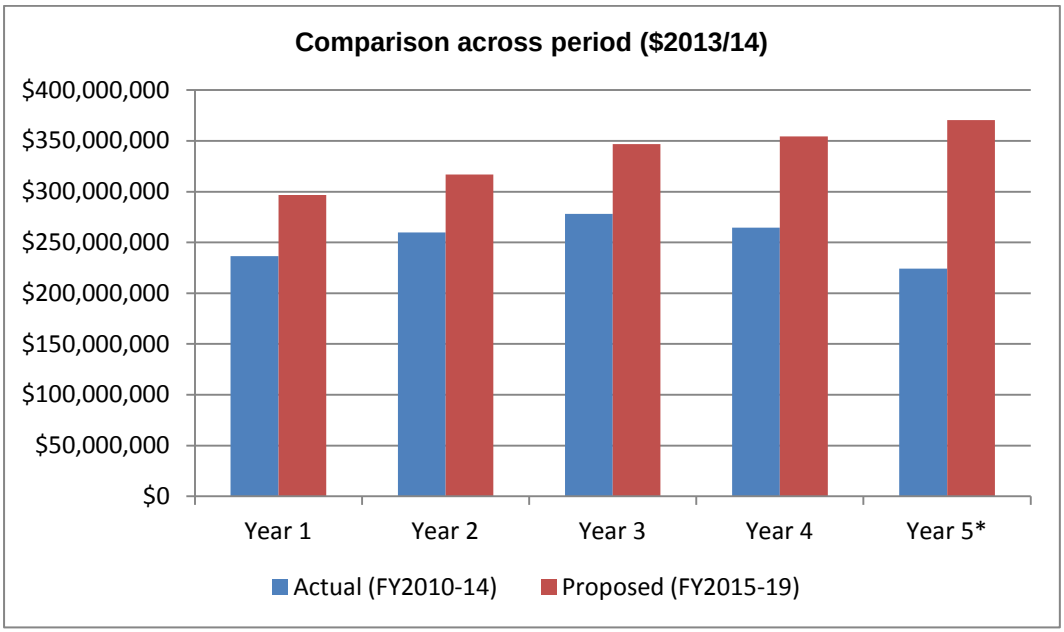
Circumstances in 2014-19

As the average age of our distribution assets continue to rise, with 34 percent over their standard life, Ausgrid's Replacement program carefully targets assets which pose unacceptable risk in meeting our regulatory obligations of delivering a safe, reliable and sustainable network in an environmentally responsible manner. We have sought to minimise price pressures to our customers by making economically prudent investment decisions and by deferring replacement where the risk can be contained within acceptable thresholds.

The purpose of this section is to identify the key circumstances driving Ausgrid's capex in the 2014-19 period, particularly in relation to previous expenditure.

At a high level, Ausgrid's forecast capex is above actual expenditure during the 2009-14 regulatory period for both Replacement and Duty of Care plans. For the Replacement plans, proposed capex ($1.34 billion) will be 24 percent higher than actual expenditure in the previous period ($1.08 billion), and for Duty of Care plans ($346 million) we are proposing 92 percent higher than the previous period ($180 million) as seen in Figure 7.

Figure 7 – Capex Comparison ($2013/14)



* Year 5 for the Actual (2009 - 14) period represents planned expenditure for FY2014.

In the sections below we show the focus of our expenditure drivers and our proposed program of work has balanced the need to minimise prices while still addressing unacceptable risks on the network.

- Further deterioration in condition of aged assets – In response to delivery issues during the last period, we chose to target our Replacement program at critical sub-transmission assets within our Area Plans where replacement drivers were also present, and consequently deferred replacement of distribution assets. In doing so, we were able to gain maximum risk mitigation by addressing Replacement and Area Plans risks in a single project. However, the implication is that age deterioration of our distribution network rapidly increased during the 2009-14 period, leading to greater asset degradation and an increasing risk of not meeting our regulatory obligations.

- Duty of Care issues – Many of Ausgrid's assets still fail to meet compliance standards for a modern day DNSP. A number of issues still remain on the network including but not limited to asbestos, oil containment and low mains.

- Minimise price pressures - We have sought to defer expenditure by prioritising the program to the full extent possible, and by identifying potential efficiencies in scope and costs. We have also undertaken whole of life costing to ensure the most economically prudent investment solution is selected.

2.1 Condition of assets deteriorated over the 2009-14 period

In the last period Ausgrid had significant delivery and cost pressure issues that resulted in a re-prioritised program that focused on:

- Compliance with new design, reliability and performance standards, which we were required to achieve by the end of 2014.

- Major replacement works for the sub-transmission network, which we considered critical for addressing large scale risks.

A key consequence of these delivery and cost issues was that Ausgrid sought all opportunities to defer investment on replacing distribution assets. We also deferred a number of jobs we were going to undertake on smaller equipment within existing sub-transmission population. The decision about which assets/jobs could be deferred was aided by a more refined analysis of risk and failure history, which enabled us to manage the network within acceptable risk boundaries.

Our re-prioritisation recognised that deferral had short term benefits by reducing the opening Regulated Asset Base (RAB) for the next period (and thereby reducing price pressures for our customers). At the same time, we understood that long term deferral would not be possible, given the substantial number of assets beyond their technical life.

Our most recent analysis reveals that the health of the distribution network will decline rapidly in the 2014-19 period in the absence of an increase in capex from current expenditure levels. In turn, this would result in unacceptable risks for our staff and customers that could not be managed through alternative means.

In the sections below, we show that the age of our assets on the distribution network increased markedly over the 2009-14 period, and that failure rates, in the absence of replacement, will likely rise during the 2014-19 period.

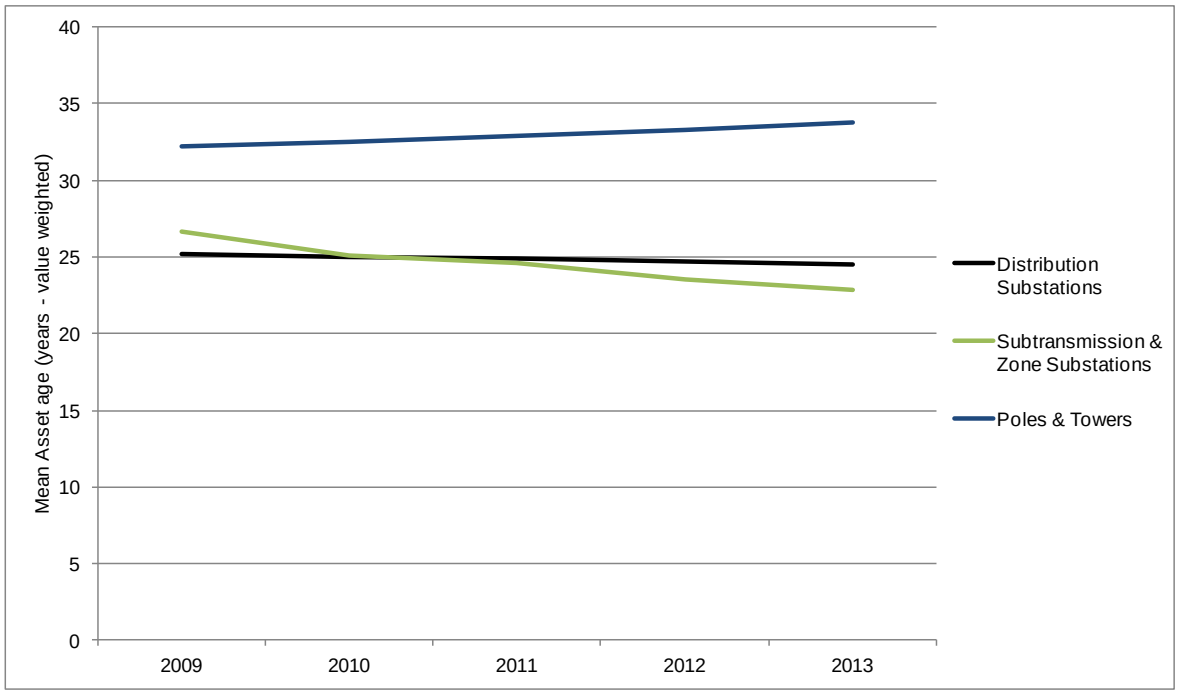
Age and condition of network

While we have sought to focus and prioritise expenditure, our proposal recognises a continuing need to replace assets to avoid a decline in safety and reliability. Our analysis shows that the mean age of some assets has continued to increase despite investment in the 2009-14 period.

Figure 8 shows the change in the value weighted average age of several classes of our assets from 2009 to 2013. It demonstrates that the replacement investment over the period has had a significant effect on the mean age of our sub-transmission and zone substations, that the average

age of distribution substations has remained effectively constant, and that the average age of poles and towers has increased.

Figure 8 – Value Weighted Mean Asset Age by Asset Category



This demonstrates the nature of our program over the period. Subtransmission and zone substations have been impacted by a proactive replacement program directed at the assets with the most significant condition issues and greatest failure consequences. The renewal effect of growth driven investments over the period has also contributed. The change in distribution substations, by contrast, is mainly a result of a small replacement program focused on the worst risks and a large impact from adding new assets – the total number of distribution centre's has risen by 3-4% per year each year. In the case of poles, the replacement program is based on condition assessment of individual assets leading to replacement or life extension class. The aging profile demonstrates that this approach is enabling the risks associated with these assets to be managed while the overall profile ages.

Poles are also a good example of the potential impacts of a distorted asset age distribution. Of our almost 300,000 low voltage poles, 43% were installed before 1968 and are therefore already beyond what would normally be regarded as the 'standard age' of 45 years.

In a network with the volume of assets Ausgrid operates, and with an age profile distorted by the rapid expansion of the 1960s, renewal of large classes of assets must be addressed over time. Resource and operational constraints mean it is sometimes not feasible to replace large numbers of similarly aged assets "just in time". In these cases a renewal program must be staged over several regulatory periods. While our 2009-14 program has focused on those assets with the highest risk profiles, a large number of aged assets remain to be addressed over the next 10 to 15 years. The balance of our replacement program for the next period is more toward the distribution network assets.

Average age is a high level but relatively simplistic indicator of the health of the network. Our asset management strategy is based on in-depth condition assessment and analysis at the detailed asset class level. A more appropriate indicator of the success and drivers for our replacement program is failure statistics, and these form a key tool for developing our program. Figure 9 and Figure 10

show that overall corrective[2] and breakdown[3] failures have been stable or increased for both transmission and distribution assets types despite investment undertaken this period.

Figure 9 – Breakdown and corrective failures for 2010-2013 for distribution

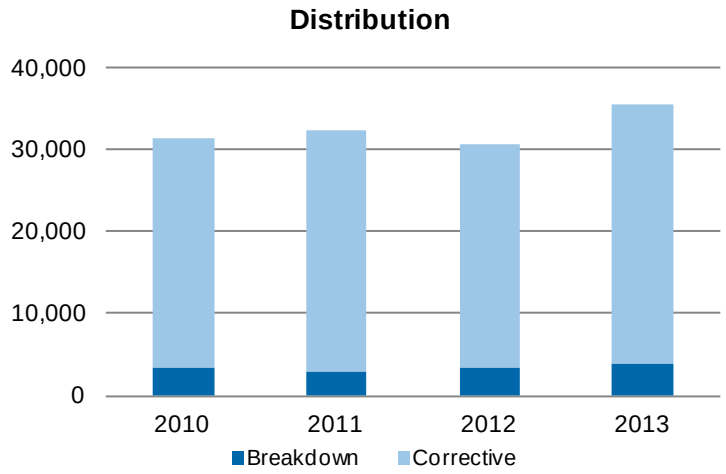
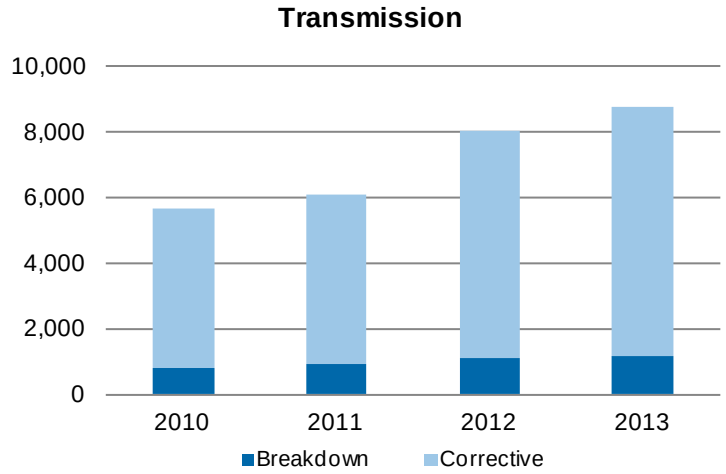


Figure 10 – Breakdown and corrective failures for 2010-2013 for transmission



The introduction of an integrated asset management system in 2009 has enabled a continuing improvement in data capture and improved analysis. Some of the upward trend in the failure data may arise from this steady improvement in visibility of failures. However, the trend is at best stable. The ratio of corrective to breakdown failures suggests that our inspection and preventative maintenance programs are effective in capturing issues before they become in-service failures – effectively avoiding the higher consequences and costs.

These high level indicators of increasing asset age in most asset classes and steady or slightly increasing failure rates supports the outcome of our detailed condition based replacement planning. Our proposal is for a generally consistent overall level of replacement expenditure that represents a long term sustainable level of expenditure. Improved outcomes will come from ensuring that our maintenance and replacement planning is well targeted and prioritized to ensure that risks are managed at the most economical cost.

[2] The correctives show the number of conditional issues identified during maintenance and addressed prior to failure, thus preventing a breakdown.
[3] The breakdowns show the number of issues that, despite a well developed and implemented maintenance program, went through to full failure.

2.2 Duty of Care issues

With many of Ausgrid's assets built between the 1960s and 1970s, a number of our network assets do not meet modern day safety, environmental and compliance standards. In response firstly to delivery issues and price pressure, Ausgrid re-prioritised our program for the 2009-14 period to focus on addressing assets that did not meet modern day safety standards, and sought to manage our risks for our environmental and compliance programs. A hierarchy of controls approach to risk mitigation has been adopted to optimise risk based decisions. In some cases, controls such as PPE and administrative controls have been adopted to deal risks such as asbestos in the short-term.

Ausgrid recognised that ongoing deferral of these risks was not optimal or sustainable. Not optimal because we weren't addressing all of the risks and not sustainable because although deferral was acceptable in the short term. Continued deferral of these risks is not an appropriate strategy for Ausgrid operating as a DNSP as ultimately such deferral is likely to lead to a breach in regulatory obligations. Our program of works for the 2009-14 period recognises that even in a price constrained environment, we still need to focus on compliance with modern day standards to avoid untenable risks.

2.3 Focus on efficiencies to minimise price pressures

A key focus of Ausgrid's proposal is to minimise price pressures faced by our customers in the 2014-19 period in response to the price shocks experienced in the 2009-14 period. As part of our capital reduction strategy, we have re-considered the following aspects of our planning approach:

Deferral of capex

Ausgrid has considered how we can reduce capex by deferring replacement of assets. Our methodology has looked at whether we can manage the risk through alternate means, or whether we could tolerate the risk without serious consequence to the community or our workers.

The resultant program of works is therefore highly focused on assets that pose unacceptable risks and defer capex to the full extent possible in the period.

Cost efficiencies

We have also focused heavily on identifying potential for cost reductions in delivering the program. There are three ways Ausgrid has sought to find cost efficiencies:

- We have examined whether the scope of works could be minimised to reduce costs.
- We have also examined whether there could be efficiencies in scope required to deliver the program.
- Finally, we have considered efficiencies that may occur at time of delivery. In particular we have revised our plans downward to our plans to account for the delivery synergy with the distribution capacity plans. Section 3.4 provides more detail on how this adjustment was carried out.

Our forecast process

For the 2014-19 proposal, we have refined our method to develop the optimal replacement and duty of care programs. Our approach allows us to identify emerging issues on our network and select the least cost solution to address the issue including replacement activity.

The purpose of this section is to provide an overview of the process used to derive our Replacement and Duty of Care capex for the 2014-19 period.

Ausgrid's method for developing the proposed Replacement and Duty of Care plans for the 2014-19 period draws on the principles in our asset management strategy. In Chapter 1, we noted that we incur capex where economically prudent.

For the 2014-19 proposal, we have refined our processes to develop a program of planned and reactive works. Ausgrid's refined methodology involves a more detailed consideration of options including the optimal mix of replacement / refurbishment and maintenance using Net Present Value (NPV) analysis to determine economic prudency. Learning from our experiences in the 2009-14 period, we have also deeply considered whether there are opportunities to defer replacement in the period by refining our assessment methodology. A Risk Quantification Model was used to determine if the proposed program was efficient.

In the section below we provide further information on our methodology including:

- Identifying the need - Explains how Ausgrid identifies a need for an asset management response to a condition issue or new legislative requirement.
- Prioritisation of the program - Explains our process for assessing options to address the issue including maintenance, managing the risk of asset failure (which would trigger reactive replacement), or planned (proactive) replacement / refurbishment or Duty of Care works.
- Cost methodology - Identifies our cost methodology for deriving the total expenditure for our proposed planned and reactive programs.
- Impact with other capital plans - Calculates synergies with capacity plans to take into account potential overlap with our proposed plans at time of delivery and during the planning phase.

3.1 Initial identification of need

Consistent with our existing method, we used a holistic approach to identify the most efficient solution to address emerging issues with assets in the 2014-19 period. Our approach was directed at understanding the changes we need to make to our current practices to address emerging condition or compliance risk.

Our options analysis sought to find the most efficient solution to address the risk. This was generally a combination of changes to existing maintenance practices, planned replacement / refurbishment activity, or allowing for reactive replacement when assets fail in service.

In the section below we describe how we identify emerging issues on the network, identify triggers for further investigation, and how we undertake a risk matrix exercise to establish the severity of the situation.

Identifying emerging issues on the network

In developing the forecast for Replacement and Duty of Care plans for the 2014-19 period, we have analysed the most recent information on the condition of our assets and changes to our underlying compliance obligations.

Ausgrid has sophisticated data and systems to monitor the condition of assets on our network. We collect data from the field, examine test results and review recorded information. At a granular level, we track failure modes, asset condition, asset related costs and defects. At a high level, we also monitor age and replacement profiles. Our sophisticated asset management systems allow us to view the data from a number of perspectives including by asset type, asset group, region and manufacturer.

As a prudent asset management organisation, Ausgrid constantly monitor changes in legislation or obligations. This includes incorporating the findings of coronial inquests in other jurisdictions which provide guidance on acceptable standards for a modern day DNSP. Changes in our obligations may require us to undertake mandated actions to meet compliance, or may require a consideration of whether we are at risk of meeting a general (unspecified) standard.

Analysis triggers

For the 2014-19 period, we have used our existing method for identifying triggers for formal investigations of particular asset types where an emerging issue has been identified.

While we constantly monitor all the asset types on our network, it is unrealistic and inefficient to undertake detailed reviews of all our assets on a continual basis. Instead we undertake targeted investigations of specific technologies where identified by planned and reactive maintenance. The outcome of the investigation may lead to changes to maintenance or operation practices, modification of assets, or where economically prudent, development of a replacement program.

There are many events that may trigger investigations including information received at the time of maintenance reviews, failures of assets, changes to cost structures and new obligations. The trigger events are depicted in the Figure 11 below.

Figure 11 – Investigation Trigger Events

Once a trigger has been identified, Ausgrid asset managers perform a detailed investigation of the asset type/technology including:

- Technical details from the enterprise asset systems and equipment manuals.
- Population information from the enterprise asset systems.
- Age information from the enterprise asset systems.
- Condition information from test reports and maintenance reports.
- Failure information from failure reports, the enterprise asset systems, regional and engineering staff.
- Industry knowledge and liaison including other DNSPs and suppliers.

The initial investigations we conducted in developing our 2014-19 plans provided us with a view on whether we are at risk of not meeting our obligations if we continue our current approach. For example, our investigations may have shown that an asset is experiencing an increasing failure rate, or evidence may show that the consequence of a failure led to a 'near miss' with a customer or worker's safety.

Risk Assessment matrix

Consistent with Ausgrid's existing processes, we applied a formal asset risk assessment to objectively determine the level of risk on assets with our current practices.[4] In turn, this helped us to provide an initial assessment on whether the severity of the situation may require planned replacement.

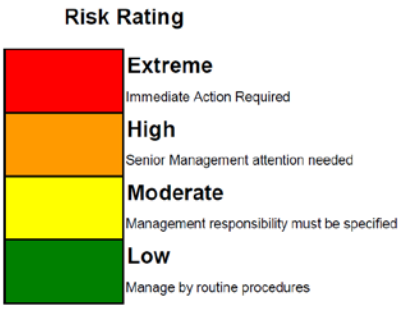
We applied our existing risk matrix to assist with this step of the investigation. We examined the probability of an event occurring (such as the failure of an asset) and paired this with the consequence of this event across a number of areas. The consequences we considered related back to our regulatory obligations. The following 5 factors were considered in the analysis; safety, environmental, reliability, liability and adverse publicity. We have clear guidelines on how to score probability and consequence so that our investigations are consistent and objective. Our risk matrix is provided below in Figure 12.

Figure 12 – Risk Matrix

Likelihood		Consequences				
		1	2	3	4	5
		Insignificant	Minor	Moderate	Major	Catastrophic
A	Almost Certain	A1	A2	A3	A4	A5
B	Likely	B1	B2	B3	B4	B5
C	Possible	C1	C2	C3	C4	C5
D	Unlikely	D1	D2	D3	D4	D5
E	Rare	E1	E2	E3	E4	E5

For example, a score of C1, has a recommendation of 'Manage by routine procedure,' whereas a score of B3 has a recommendation of 'senior management attention needed'.

[4] This is the same approach we use to design our maintenance requirements analysis manual (MRAM) to develop a cost effective maintenance program



3.2 Options analysis and prioritisation of program

After performing the initial investigation and risk assessment, the next step was to identify potential options to mitigate against the risk/s posed by the current asset, if the risk assessment deemed action was necessary. This is an area where Ausgrid has refined its existing process for the 2014-19 proposal. We now use additional tools to guide our analysis such as Net Present Value (NPV) analysis to guide the optimal development of replacement programs.

Options Analysis

In some cases, capex is the only option to address an emerging issue. This is generally in response to a mandated action Ausgrid is required to perform under a compliance obligation. An example of this is the development of the Waterway Crossing program – the NSW Maritime legislation was changed and it contained significant new requirements and strict time frames.

Generally, however, decisions to incur capex are not as clear cut, and require prudent analysis and judgement. In developing our expenditure proposals for 2014-19 we undertook options analysis to determine the least cost option to solve an identified need. This includes looking at the optimal mix of capex (Replacement or Duty of Care) and system opex to manage our network assets over the period.

NPV analysis is undertaken in order to find this least cost option. This allows options with different time spans to be compared directly and is carried out in an Excel spreadsheet that has been specifically tailored to suit single asset options (i.e. replacement of a single circuit breaker or distribution substation) that may have different routine maintenance requirements. The outcome of this analysis is a preferred option which may involve a combination of maintenance, refurbishment, planned replacement or expected reactive replacement.

When undertaking our options analysis we seek to quantify the risk and the costs of potential solutions. We assess the risk posed by the assets, compared with the costs required to undertake the program. The Risk Quantification Model allows us to identify the optimal timing for replacement programs. Ausgrid performed the following tasks:

- Assessed the cost of undertaking a program in a particular time frame (for example, replace five units a year for five years).
- Calculated the risk cost of that particular program timing based on the risks of removing the assets at that particular speed.
- Compare the program cost with the risk cost. If the risk cost to be mitigated exceeded the program cost, then the program was considered positive and was accepted.

Prioritising the program

When prioritising individual assets, a set of risk criteria was developed. This inturn determined the priority for investment.

Priority at a high level was performed by comparing the relative risks of each program. High risk programs were given greater priority over lower risk programs.

3.3 Cost methodology

Our options assessment draws on accurate data on the costs of different solutions. This in turn provides us with a level of confidence on the forecast costs of completing our planned and reactive works.

For the 2014-19 proposal, we have used a number of sources to identify the costs of planned and reactive replacement:

- Estimating systems: We use a system called ATAD to estimate the costs of completing projects at Ausgrid. The system uses labour rates, allocations, material costs and contracted services rates.
- Site specific costs: There is the ability to vary for individual site or regional differences, such as travel time or known site conditions.
- Historical project information: If available, cost information regarding previous projects of a similar nature is useful when costing options. This is drawn from Ausgrid's integrated asset management system (SAP). It may prove useful as there may be costs that are not apparent when initially estimating that should be taken into consideration. It should be noted that, depending on the project, this information may not always be available. However, as a result of the works completed in the 2009 - 2014 period, more information is readily available.

More information on the exact cost method we have used to determine different elements is contained in the Unit Rate Justification document in the key inputs folder for Replacement and Duty of Care plans.

3.4 Impacts and synergies with other capital plans

We have taken great care in ensuring that we have accounted for synergies with other capital plans, and considered the reliability performance impact.

Synergies

Our forecast process has considered whether our planning estimates are the most likely estimate of the total costs we incur at the time of delivery. In doing so, we have considered how our plans inter-relate with other parts of the proposed capital program.

We have adjusted our Replacement and Duty of Care plan estimates to account for synergies that may occur at the time of delivery. This includes:

- Synergies within the Replacement and Duty of Care Plans - For example, a distribution substation may contain high voltage switchgear and low voltage switchgear, both of which have been identified as requiring replacement in a similar time frame. At the time of delivery, we may find a location where both assets require replacement and undertake a single project to resolve the issue. Where time frames are not exactly the same, projects are aligned so long as the residual risk in doing so can be tolerated for the period of delay. Alternatively projects may be brought forward to align and any increased costs in doing so would have to be overcome in cost savings therefore delivered through planning efficiencies.
- Synergies with the Low Voltage Plan[5] - At the time of delivery there are sometimes cases where the need to install new equipment on the Low Voltage network coincides with the need to replace an asset, leading to a synergy. For example we may need to install a higher capacity distribution transformer.

Depending on the nature of the project, carrying out a single project to address two issues may result in more efficient delivery model, reduced setup costs and reduced project management costs.

[5] It should be noted that due to the nature of the customer connection plan, which typically involves the installation of new assets to deal with connecting/upgrading customers, there is little overlap between this plan and the replacement and duty of care plans. Similarly, there is little overlap between the 11kV plan and the replacement and duty of care plans. This is due to the minor nature of 11kV underground cable replacement that is forecast for the 2014-19 period.

Ausgrid notes that the nature of our planning means that there are no synergies, in delivery, with other capital plans not explicitly identified and rationalised. In particular, we note there is a clear demarcation between the assets addressed in our Area Plans and in our Replacement and Duty of Care Plans and that no overlap exists. Any overlaps in these programs are recognised at the planning stage and accounted for in only a single plan.

Reliability impacts

Ausgrid programs are heavily targeted at removing high risk assets rather than addressing reliability issues. We aim to do this systematically before our customers experience any decrease in reliability from greater rates of failure.

Accordingly, the expected impact on reliability of the program is forecast to be negligible, as the aim of the program is to maintain our current levels of reliability. Most reliability incidents in the Ausgrid network are caused by nature induced factors such as fallen tree branches.

The most significant impact will be in the area of low voltage cable interruptions, through the removal of CONSAC and HDPE type cables. These cables pose significant safety risks to both staff and the public, but also experience a high number of failures. However, the overall network impact of a low voltage distributor failure is low due to the small number of customers that are generally supplied from each cable.

Summary of program

Our 2014-19 program of works is targeted at replacing degraded assets on our distribution network. The program is heavily focused on replacing high risk assets. We have a small program of works related to Duty of Care, with a heavy focus on addressing safety issues for our workers and the public.

The purpose of this section is to provide a summary of our plans, including our investment profile and key programs of work. Section 4.1 provides a breakdown of the program at a high level, with sections 4.2 and 4.3 providing a summary of the key projects in our Replacement and Duty of Care programs. Appendix A provides more detail by asset class and program.

In addition to the material provided, further justification and detail on each of our programs is contained in our Asset Condition and Planning Summaries (ACAPS) documents which identify the need, timing, options and costs related to each asset type. The format of our ACAPS document can be found in ACAPS methodology document and the 'Justifications' in the supporting document library.

4.1 Investment profile

Our proposed capex for Replacement and Duty of Care plans is $1.78 billion. Table 3 below provides the profile of expenditure for our major asset types in the Replacement plans and by driver for Duty of Care plans. Support costs shown are capitalised wages costs associated with plan delivery, as required for planning, switching and data capture.

Table 3 – Proposed Replacement Plan Expenditure for 2014-19

	2014-15 ('000)	2015-16 ('000)	2016-17 ('000)	2017-18 ('000)	2018-19 ('000)	Total ('000)
Replacement Plans	**228,598**	**249,482**	**270,718**	**286,765**	**304,495**	**1,340,059**
Transmission Mains	21,969	26,808	28,341	27,487	28,918	**133,523**
Sub-transmission Subs	17,523	22,368	29,654	25,866	25,554	**120,966**
Zone Substations	30,871	28,513	35,319	40,359	38,126	**173,187**
Distribution Substations	42,323	47,032	51,074	57,260	57,902	**255,590**
Distribution Mains	115,912	124,762	126,330	135,792	153,996	**656,792**
Duty of Care Plans	**68,232**	**67,398**	**76,158**	**67,780**	**65,937**	**345,504**
Safety	52,649	52,601	57,186	52,743	51,190	**266,369**
Environmental	12,144	10,701	13,589	9,282	8,953	**54,670**
Infrastructure Risk	3,439	4,096	5,384	5,754	5,793	**24,466**
Support Costs	**16,413**	**17,197**	**18,122**	**18,859**	**19,864**	**90,455**
Planning, Forecasting and Compliance	4,343	4,475	4,628	4,772	4,924	**23,144**
Switching and Control	2,278	2,417	2,659	2,779	2,943	**13,076**
GIS Data Capture	9,792	10,304	10,834	11,308	11,997	**54,236**
Total Proposed Capex	**313,243**	**334,077**	**364,998**	**373,404**	**390,296**	**1,776,018**

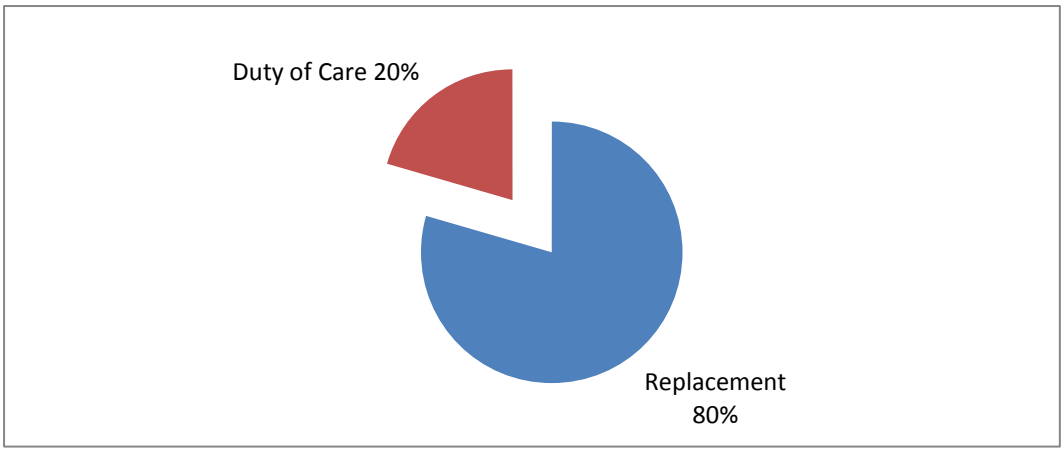
Split by asset class and plan (based on Replacement and Duty of Care Plans only)

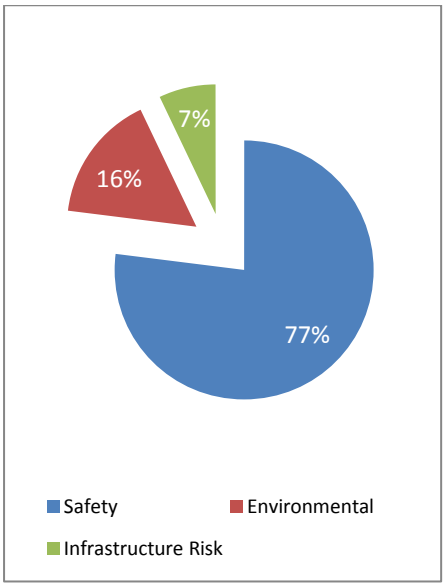
As can be seen in Figure 13, our Replacement plans account for the majority of the proposed investment (approximately 79 percent of the $1.69 billion proposal). This reflects that the majority of investment is to address deterioration issues on the network. The remainder of the program (21 percent) relates to Duty of Care capex. The diagram also highlights our key focus for the 2014 - 2019 period within our respective plans:

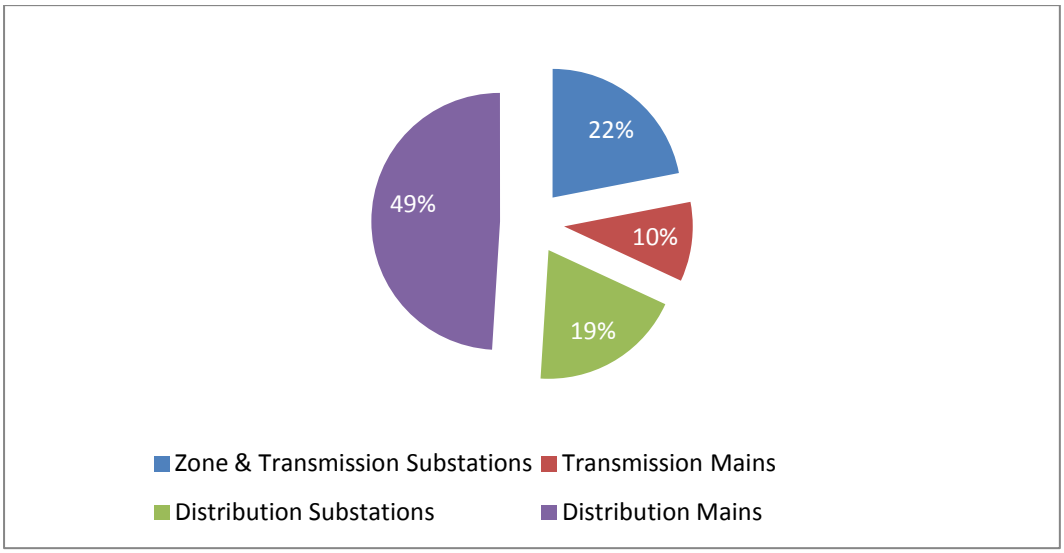
- Programs for Distribution Mains account for almost half of the replacement plans, while distribution substation programs account for 19 percent of the overall replacement forecast. Transmission works only account for approximately 32 percent of the program.

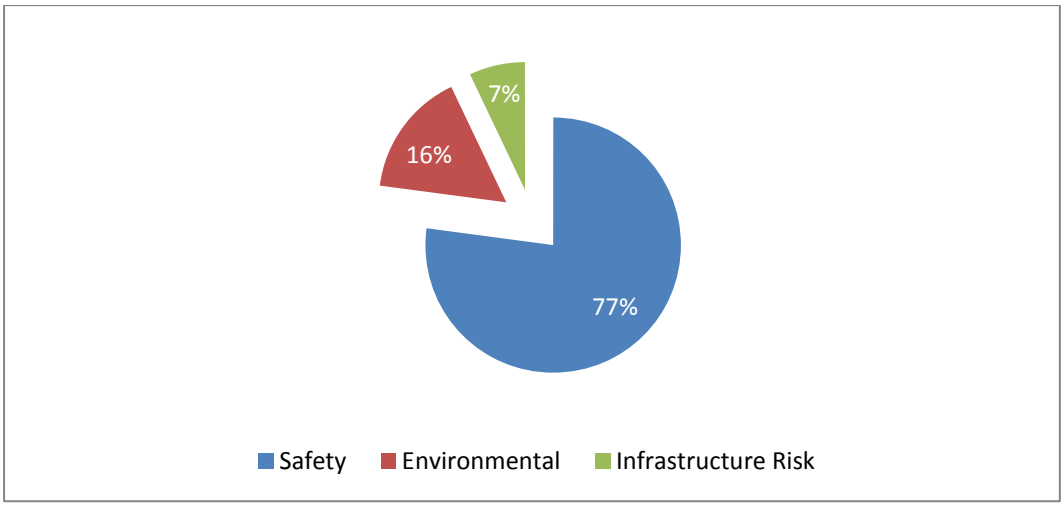
- Safety programs account for 77 percent of the proposed capex within the Duty of Care capex, with environmental obligations accounting for 16 percent and infrastructure security accounting for 7 percent.

Figure 13 - Split by asset class and plan







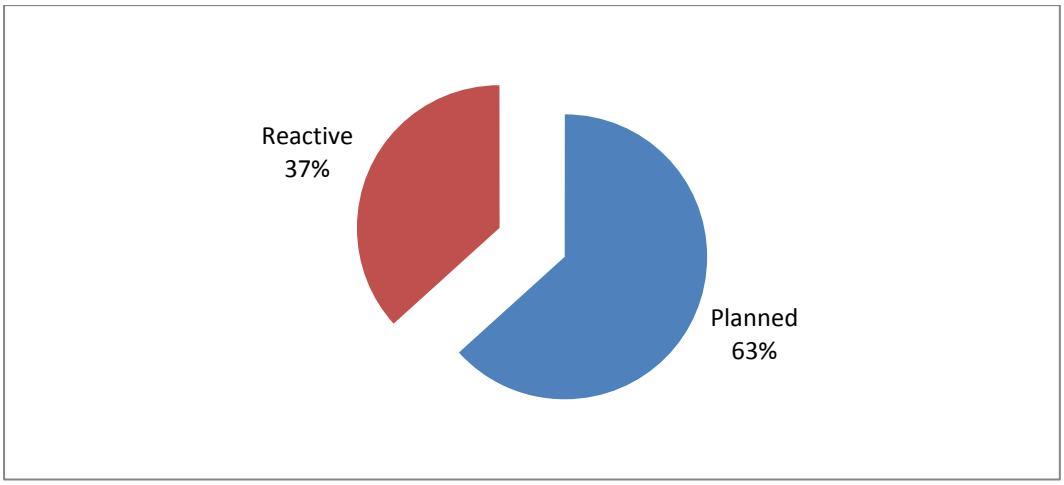


Split by reactive and planned replacement

A key consideration in our asset management strategy is whether there are alternative options to planned replacement, such as maintenance or reactive replacement or repair. Ausgrid generally only undertakes planned replacement when the risk (technical and financial) of keeping the population of assets in service is too high. In these cases, we consider the optimal timing and a mix of reactive/planned replacement.

The diagram below shows that 37 per cent of Ausgrid's proposed capex is for reactive replacement, while 63 per cent is for planned replacements as seen in Figure 14.

Figure 14 - Split by reactive and planned



4.2 Key programs in our replacement plans

Ausgrid has substantial populations of distribution assets including more than 420,168 poles, 46,484 pillars and 9,553 pits associated with 36,640 kilometres of distribution mans, excluding street lighting mains, and over 30,000 distribution substations. For this reason, our focus is on ensuring that we continue to manage the risks of these assets at a portfolio level.

In particular, we have looked at managing known risks for particular technology types within the population where our analysis shows there are high safety risks. This includes:

- Steel round pillar replacement
- Pole and service wire replacement
- CONSAC and HDPE underground cable
- We are also replacing high risk distribution substations and switchgear. There are many types of substations on the Ausgrid network which pose significant safety hazards to staff operating and working around this equipment. The replacement of substations that reside on condemned poles is also included in this category.

In terms of our program for smaller existing Transmission assets including Transmission mains, Zone and Sub-transmission substations, our program is focused on:

- Protection relays
- Non-motorised I & E switches
- 11kV circuit breakers
- Pole replacement
- Refurbishment of overhead feeders
- Replacement of gas and oil filled underground cable

4.3 Key programs in our Duty of Care plans

Key programs to address our Duty of Care plans are:

- Replacement of non-compliant low mains
- Replacement of noisy transformers
- Replacement of asbestos fire doors

- Oil containment in Zone & Sub-transmission substations
- Optical Arc Flash Protection
- RTA blackspot poles
- Kiosk substations with exposed 11kV

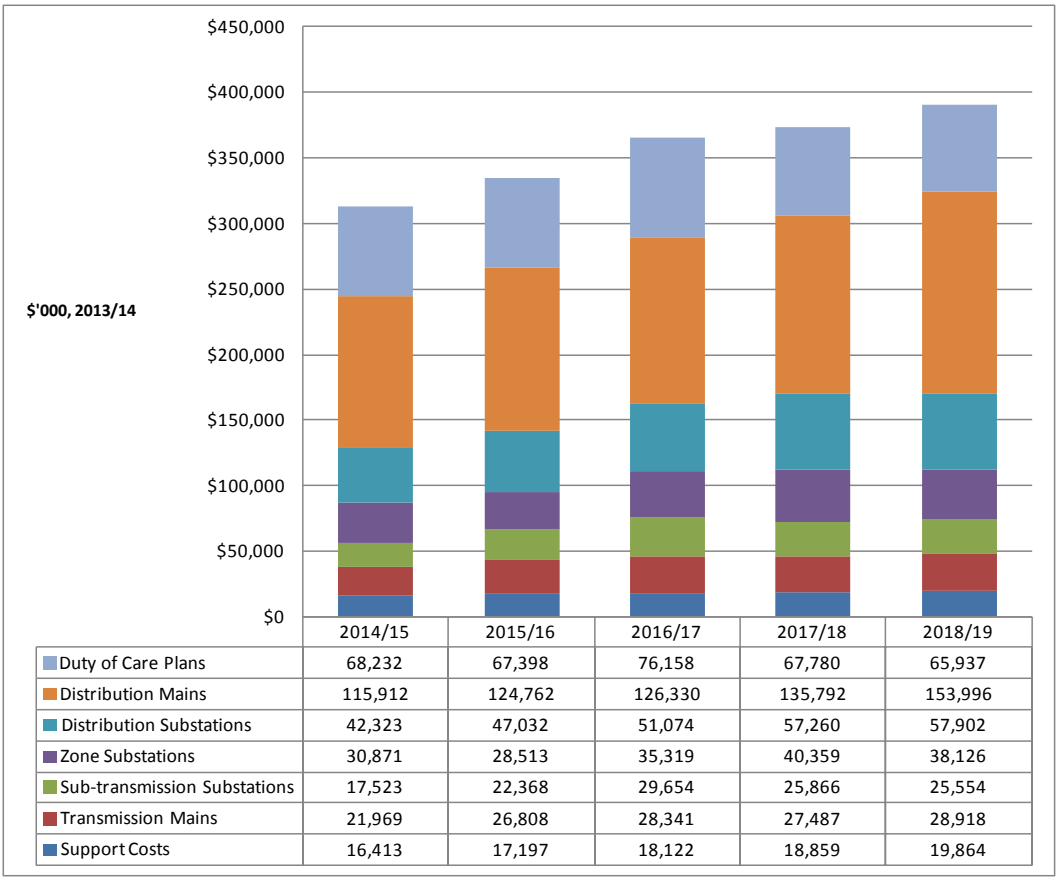
For details on each of these programs, refer to the respective ACAPS documents.

Appendix A Summary by major category

The purpose of this appendix is to provide an overview of the funding requirements for the six asset groups comprising the Replacement and Duty of Care plans. Ausgrid grouped the assets in six main areas to assist in managing a large and diverse range of assets. The asset groups are divided into the following with forecast capex summarized in Figure 15:

- Transmission mains
- Sub-transmission substations
- Zone substations
- Distribution substations
- Distribution mains
- Duty of Care programs

Figure 15 - Split by major asset category ($2013/14)



	2014/15	2015/16	2016/17	2017/18	2018/19
Duty of Care Plans	68,232	67,398	76,158	67,780	65,937
Distribution Mains	115,912	124,762	126,330	135,792	153,996
Distribution Substations	42,323	47,032	51,074	57,260	57,902
Zone Substations	30,871	28,513	35,319	40,359	38,126
Sub-transmission Substations	17,523	22,368	29,654	25,866	25,554
Transmission Mains	21,969	26,808	28,341	27,487	28,918
Support Costs	16,413	17,197	18,122	18,859	19,864