# Attachment 6: Capital expenditure

**Access Arrangement Information for the 2016-21 ACT, Queanbeyan and Palerang Access Arrangement**

**Submission to the Australian Energy Regulator**

**June 2015**

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# 6 Capital expenditure

### *Key points*

- ActewAGL Distribution's capital program prudently and efficiently connects new customers (providing consumers with access to gas and lower average prices), increases capacity and renews assets to provide a reliable and secure supply for the long term interests of consumers.
- Capex is eight per cent lower than the regulated capex allowance approved by the Australian Energy Regulator (AER) for the 2010-15 period (the AER did not approve an allowance for 2015/16). ActewAGL Distribution has achieved this capex saving through deferral of some meter replacement expenditure made possible by statistical sampling and testing of residential meters which indicated that it was possible to extend meter lives. The cost of connecting new customers during the 2010-15 period was consistent with the capex approved by the AER while network renewal costs were higher due to the greater scope of work required to facilitate transfer of supply from Eastern Gas Pipeline (EGP).
- Over the 2016-21 access arrangement period, average annual capex is expected to be within one per cent of average annual capex over the 2010-16 access arrangement period, once real price escalation and a change in allocation of corporate costs is taken into account. While the aggregate average annual capex amount is stable, the composition will change. There is expected to be an increase in market expansion capex to connect greater numbers of medium-density housing, as well as an increase in meter renewal costs to replace meters installed during the rapid expansion of the gas network in the 1990s (25 years ago). Offsetting this increase, other categories such as capacity development and network renewal and upgrade are expected to decrease due to the natural variation in these categories over time.

### *Consumer benefits*

- ActewAGL Distribution's capex will enable new customers to be connected to the network (which lowers the average costs for all customers), ensures that the network can provide the capacity required to meet foreseeable variations in peak consumption, and ensures the network is safe and reliable by replacing and renewing assets.

This capital expenditure (capex) attachment provides information on ActewAGL Distribution's capex program. This attachment builds on attachment 4, where it was explained how ActewAGL Distribution manages the gas network. This information is vital to understand ActewAGL Distribution's capital program.

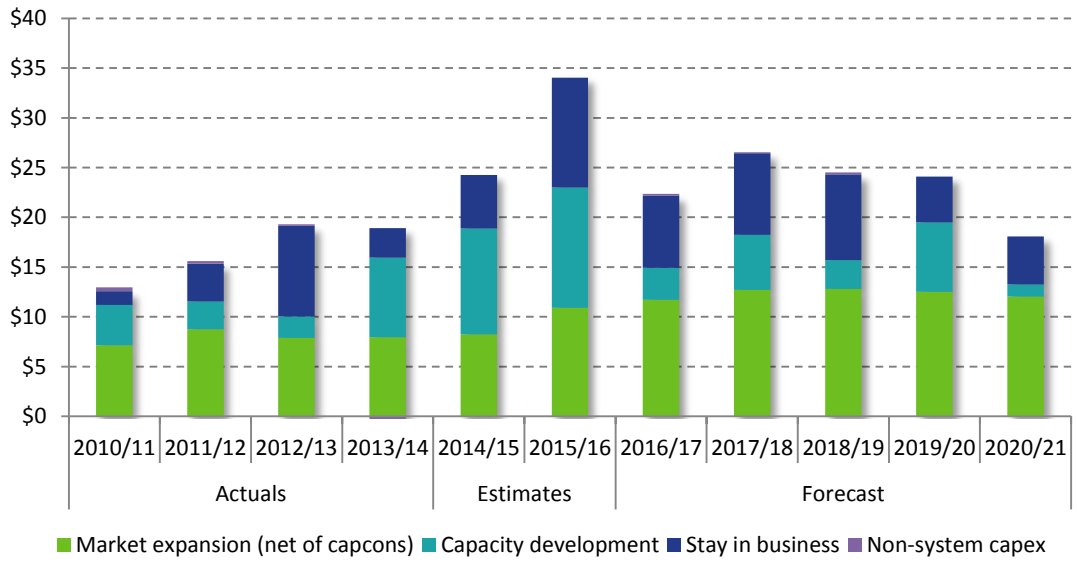
ActewAGL Distribution's capital program is focused on ensuring the continued safe, reliable, environmentally sustainable and efficient delivery of gas in the long-term interests of consumers.

To achieve this overarching objective, ActewAGL Distribution incurs capex that falls into four broad categories:

- market expansion – to connect new customers. This benefits new consumers, by providing access to gas, and existing customers, by lowering average prices;
- capacity development – to increase the capacity of the network to ensure consumers have a reliable and secure supply of gas;
- stay in business – renewing and replacing assets to ensure the safe and reliable operation of the network for consumers; and
- non-system – deploying assets which support the prudent and efficient delivery of services.

Actual and forecast capex by year and category can be seen in Figure 6.1.

**Figure 6.1 Capital expenditure over the two access arrangement periods, composition of actuals, estimates and forecast amounts ($millions, 2015/16)**




Note: Market expansion net of capital contributors has been shown as capital contributions will be netted off the amount that is added to the capital base.

Over the last access arrangement period, ActewAGL Distribution incurred capex to connect new customers to the network, increase the capacity of the network to ensure ongoing supply to the Hume and Tuggeranong districts, and replaced meters as they reached the end of their economic lives.

Over the 2016-21 access arrangement period, average annual capex is expected to be within one per cent of average annual capex over the 2010-16 access arrangement period, once real price escalation and a change in allocation of corporate costs is taken into account. From 1 July 2015,

ActewAGL Distribution will apply a new cost allocation methodology (CAM) consistent with the methodology approved for the electricity network business from 1 July 2014. The new CAM will increase the proportion of corporate costs allocated to the capex program which will better reflect the role corporate costs have in supporting the capital program. Independent forecasts by BIS Shrapnel indicate that the price of materials and labour will increase in real terms over the 2016-21 access arrangement period (i.e. after inflation is taken into account).

While the average annual aggregate level of capex will remain steady, market expansion costs will increase to connect a greater number of new customers to the network, particularly in medium-density housing. Stay in business costs will rise as the meters installed in the 1990s, a time of rapid growth of the gas network, reach the end of their economic life. ActewAGL Distribution will also rectify inlet piping, improving the safety of the network. These increases are offset by a smaller requirement for capacity development and network renewal.

### 6.1.1 The Energy Consumer Reference Council

As outlined in attachment 1, ActewAGL Distribution has held discussions with a range of community and business organisations to gather feedback on plans for the gas network over the next five years. Consumer groups represented by the Energy Consumer Reference Council (ECRC) have told ActewAGL Distribution that they:

- value reliability and safety;
- want price stability and certainty;
- want to support vulnerable customers;
- are interested in what the long-term energy infrastructure will look like for the ACT; and
- are keen to be involved in future energy discussions.

ActewAGL Distribution's capital program is aligned with its consumer's preferences as:

- the forecast capital program is designed to maintain the integrity and reliability of services that our customers value through asset renewal and projects to develop the capacity of the network.
- The capital program will also improve the safety of services, particularly by undertaking the inlet piping rectification project outlined in section 6.5.5.1.
- The capital program is steady across both access arrangement periods, assisting the delivery of price stability to consumers.

As shown by ActewAGL Distribution's 20-year asset class strategy (attachment 6.2), any reductions in the capital program over the next access arrangement period will result in a price increase in subsequent regulatory periods. This will be driven by lower customer numbers due to either limited market expansion capex or a reduction in service levels resulting in higher average bills. Further, short-term reductions in capex will result in higher costs over the long term to return to the current level of service provided.

The largest category of the capital program is market expansion which enables new consumers to benefit from access to gas. Existing customers will also benefit. Adding new customers enables ActewAGL Distribution to capture the economies of scale inherent in gas network infrastructure which has the effect of reducing the average cost of supply. [1] These economies of scale will be passed on to existing customers through reductions in network prices.

### 6.1.2 Wider economic benefits

ActewAGL Distribution's investment in its gas distribution business also has wider economic benefits to upstream and downstream stakeholders. In addition to end users/consumers these include:

- producer/explorers;
- gas transmission businesses; and
- gas retailers

All groups will benefit from continued and increased gas demand that is largely a result of the availability of the gas network and the access it provides to new and existing customers, and from margins accruing to them through increased sales.

[1] ActewAGL Distribution requires that forecast revenue from a new connection exceeds the cost of the connection, thereby lowering costs for all network users. If the connection cost exceeds forecast revenue the customer can pay a capital contribution to connect to the network.

## 6.2 Requirements of the National Gas Rules

The National Gas Rules (Rules) set out the building block approach in which total revenue is to be determined for each regulatory year of the access arrangement period. Of these two building blocks, two relate to capex, specifically the return on, and depreciation on the projected capital base for each regulatory year of the access arrangement period (Rule 76(a) and (b)).

The opening capital base is to include conforming capex made, or to be made, during the earlier access arrangement period (Rule 77(2)(b)). Similarly, the projected capital base is to include a forecast of conforming capex for the period (Rule 78(b)).

Capex is defined in Rule 69 as costs and expenditure of a capital nature incurred to provide, or in providing, pipeline services.

Conforming capex is capex that conforms with the new capex criteria in Rule 79. Rule 79(1) and (2) states:

> *(1) Conforming capital expenditure is capital expenditure that conforms with the following criteria:*
>
> *(a) the capital expenditure must be such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of providing services;*
>
> *(b) the capital expenditure must be justifiable on a ground stated in subrule (2)*
>
> *(2) Capital expenditure is justifiable if:*
>
> *(a) the overall economic value of the expenditure is positive; or*
>
> *(b) the present value of the expected incremental revenue to be generated as a result of the expenditure exceeds the present value of the capital expenditure; or*
>
> *(c) the capital expenditure is necessary:*
>
> *i. to maintain and improve the safety of services; or*
>
> *ii. to maintain the integrity of services; or*
>
> *iii. to comply with a regulatory obligation or requirement; or*
>
> *iv. to maintain the service provider's capacity to meet levels of demand for services existing at the time the capital expenditure is incurred (as distinct from projected demand that is dependent on an expansion of pipeline capacity); or*
>
> *(d) the capital expenditure is an aggregate amount divisible into 2 parts, one referable to incremental services and the other referable to a purpose referred to in paragraph (c), and the former is justifiable under paragraph (b) and the latter under paragraph (c).*

The AER's discretion under Rule 79 is limited (Rule 79(6)). Accordingly, the AER must approve a particular element of the access arrangement proposal if it is satisfied that the element complies with the applicable requirements of the Rules and National Gas Law and is consistent with any criteria set out in the Rules or National Gas Law (Rule 40(2)).

## 6.3 ActewAGL Distribution's approach to asset management

ActewAGL Distribution's objectives are to:

- meet or exceed all commercial, technical, safety and environment regulatory requirements;
- be known as a safe, efficient and reliable deliverer of energy;
- have a long-term focus reflective of the type of asset owned;
- be known as responsive to customers and other stakeholders needs; and
- respond to prudent customer growth opportunities.

ActewAGL Distribution applies these objectives through its contractual relationship with JAM. As described in Attachment 4, ActewAGL Distribution outsources the management and service delivery of the gas network to JAM who also provides similar services to Jemena Gas Networks (JGN) across NSW, ActewAGL Distribution is able to access JAM's economies of scale that could not be realised by insourcing these functions.

To ensure that synergies can continue to be realised, the JAM asset management system and capex governance processes are applied to the gas network. Further detail on JAM's asset management planning and capital expenditure governance is provided below.

### 6.3.1 Asset management planning

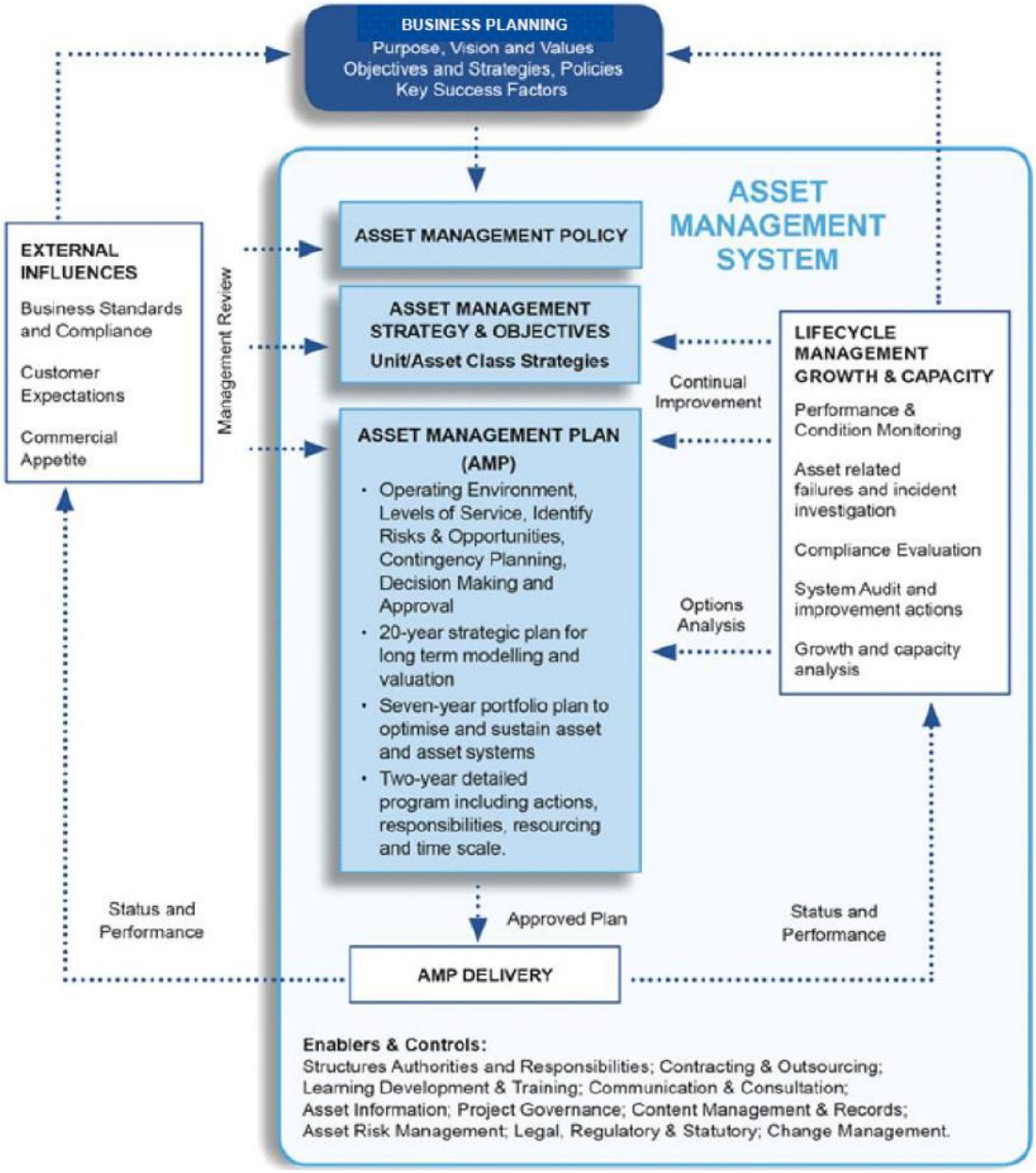
JAM has established and maintains sound systems and practices for asset management planning, capex governance, cost estimation and project management. Together, these systems ensure that capex is planned, managed and delivered prudently and efficiently.

JAM's approach to asset management is informed by Jemena's vision to be recognised as a world class owner and manager of energy delivery assets. That vision, in turn, informs JAM's asset management policy which is to:

- manage assets without compromising employees, contractors and public safety;
- manage assets in an environmentally sustainable manner;
- comply with all relevant regulatory and legislative requirements;
- develop asset management plans that deliver the corporate objectives and business plan;
- facilitate continual improvement in the safety and performance of the assets, through the establishment, maintenance and governance of effective asset and safety management systems;
- make best practice asset management an accepted and important part of our 'business as usual' approach, and measure it against an internationally recognised asset management framework;
- apply the a risk management approach to asset management activities;

- develop and maintain asset information systems that support asset management decisions and activities throughout the asset lifecycle;
- establish a consistent, collaborative and integrated approach to the management of the lifecycle of the assets, to ensure that the optimum outcomes are delivered in an efficient way across JAM; and
- develop the skills and knowledge of staff to sustain and reinforce asset management capabilities.

**Figure 6.2 Jemena Asset Management's Asset Management System**



### 6.3.2 Capital expenditure governance

As part of its Asset Management System, JAM has developed and adopted project governance guidelines which require that:

> *all capital infrastructure projects delivered by Jemena … have a level of project governance commensurate with their strategic importance, risk and complexity. This, combined with project management discipline, should ensure that project delivery within Jemena is effective and efficient.*

The guidelines:

- define the principles and requirements related to capital project governance; and
- identify the key roles and the associated accountabilities of those roles to ensure the effective implementation of project governance.

The objective of project governance within JAM is to protect investments. This is achieved through custodianship and timely and effective decision-making to ensure:

- sound scope definition;
- cost control;
- appropriate project planning; and
- defined accountabilities.

Project governance provides a structured and transparent decision-making framework that is logical, robust and repeatable to govern JAM's projects and to ensure continuous improvement for future projects and programs.

As one component of its governance arrangements, JAM uses a project gating process that provides the structure for managing and delivering projects from inception through to delivery and project close-out. The gating process consists of seven stages, with the first three (stages 1 to 3) governing project initiation, planning and design up to the point where JAM approves the business case. Stages 4 to 7 cover project mobilisation, construction, commissioning and handover of the project.

The JAM governance process is further strengthened by the Distribution Asset Management Services (DAMS) overlay and ActewAGL Distribution oversight, as detailed in attachment 4.

ActewAGL Distribution's and JAM's capex governance processes together with JAM's asset management system provide a level of assurance that the capex incurred (and forecast to be incurred) meets the requirements in Rule 79(1) in respect of prudency and efficiency.

## 6.4 Capital expenditure over the 2010-16 access arrangement period

### Key points

- During the period 2010-16 period, ActewAGL Distribution connected about 22,000 new customers to the gas network; increased capacity to the Hume and Tuggeranong districts to ensure reliability of gas supply for customers in peak periods; reconfigured the network to facilitate greater flexibility in supply arrangements to provide customers greater choice; provided infrastructure to better manage the integrity of the network; and replaced ageing assets to ensure technical compliance and ongoing safety and reliability.
- Actual capex is expected to be eight per cent lower than the regulated capex allowance approved by the AER for the 2010-15 period (the AER did not approve an allowance for 2015/16). This is primarily driven by the deferral of capex with the replacement of residential meters following statistical sampling and testing which indicated that their lives could be extended. The cost of connecting new customers during the 2010-15 period was consistent with the capex approved by the AER while network renewal costs were higher due to the greater scope of work required to facilitate transfer of supply from the EGP.
- Although the AER did not approve a capex amount for 2015/16, ActewAGL Distribution's capital program is based upon the same principles applied for the 2010-15 period. New customers will be connected, mains to support capacity growth will be installed, and aging assets will be replaced. ActewAGL Distribution will also commence a program to replace inlet piping and improve the safety of the gas network.

### 6.4.1 Overview

Over the 2010-16 access arrangement period[2] ActewAGL Distribution continued to prudently and efficiently connect new customers to its gas network, provide infrastructure to ensure reliability for existing customers and renewed infrastructure to meet regulatory requirements and ensure the integrity and safety of the gas network. Specifically, ActewAGL Distribution has carried out the following works.

[2] In the Australian Energy Regulator's (AER's) Regulatory Information Notice for ActewAGL Distribution, the AER defines the current regulatory period as the six-year period that commenced on 1 July 2010 and is intended to conclude on 30 June 2016. ActewAGL Distribution adopts the six-year definition in this access arrangement information. However, comparisons in this attachment with the amounts approved by the AER are made over the five-year period 2010-15 because the AER only approved forecasts for that period, not for 2015/16.

- *Market expansion* – Connected approximately 22,000 new customers, including large numbers from residential developments in Gungahlin (Casey, Bonner and Forde), Belconnen (Lawson), Molonglo (Coombs and Wright and North Western) and Googong.
- *Capacity development* – Strengthened supply to the Hume and Tuggeranong regions to ensure continuity of supply and expanded the secondary main network in Gungahlin and Molonglo.
- *Stay in business* – Upgraded network infrastructure to enable an increase in supply from the Eastern Gas Pipeline (EGP) driven by changes in the east coast gas market and increases in demand across the ActewAGL Distribution gas network, installed new pigging facilities to check the integrity of the network and replaced meters that were defective or had reached the end of their economic lives. In 2015/16 work will begin to rectify inlet piping required to improve the safety of the gas network.
- *Non-system capex* – Upgraded data completeness and accuracy of the Geographic Information System resulting in greater visibility and understanding of the network.

While the current access arrangement period covers the 2010-16 period (due to the extension year), the AER only approved capex amounts for the 2010-15 period. This section provides information on the capital program across the entire access arrangement period but also includes comparisons of approved capex and actual capex incurred over the 2010-15 period.

Total capex over the 2010-15 period is eight per cent below[3] the amount approved by the AER, as shown in Table 6.1.

**Table 6.1 Comparison between AER approved actual capex over the 2010-15 period ($million, 2015/16)**

| | AER approved | Actual/estimate | $ variance | % variance |
|---|---|---|---|---|
| Market expansion | 40.87 | 43.31 | 2.44 | 6 |
| Capital contributions | 0.35 | 3.31 | 2.96 | 834 |
| Net market expansion | 40.51 | 40.00 | -0.51 | -1 |
| Capacity development | 28.21 | 27.67 | -0.55 | -2 |
| Stay in business | 28.60 | 22.61 | -5.99 | -21 |
| Non-system capex | 1.36 | 0.52 | -1.84 | -62 |
| **Total capex (net of capital contributions)** | **98.69** | **90.80** | **-7.90** | **-8** |

The differences explained throughout this section are as follows.

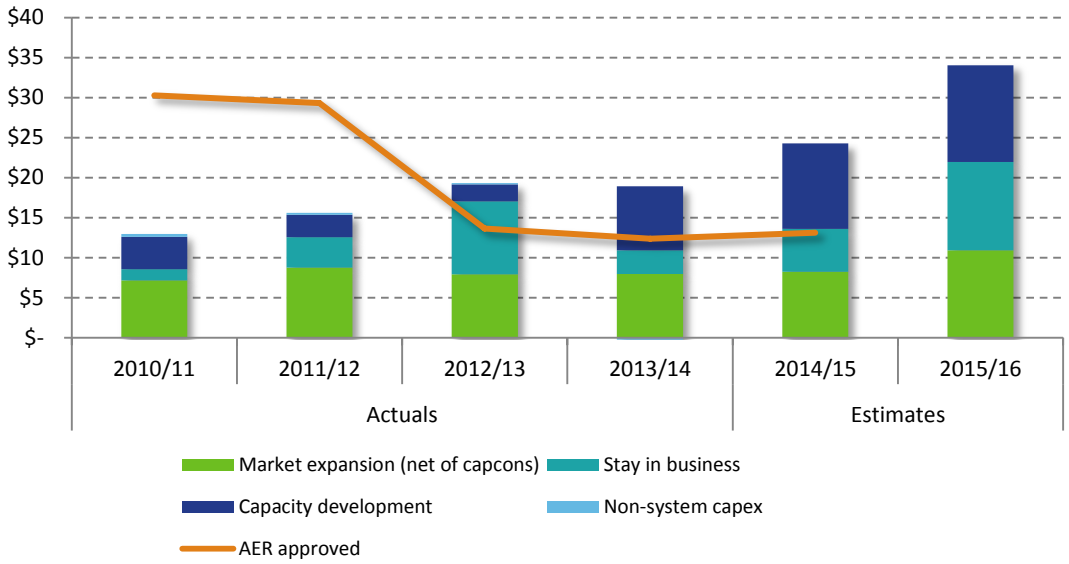
- Market expansion costs were similar to the amount approved by the AER once customer contributions towards connection costs (capital contributions) are taken into account.
- Capacity development costs were in line with the amount approved by the AER.

[3] Includes a combination of actual/estimate for 2014/15.

- Stay in business expenditure was lower than approved capex. The variance is primarily driven by statistical sampling of meters (which revealed that their life can be extended from 20 to 25 years) and savings in other projects, including pigging receiver/launcher installation, replacement of secondary regulator sets and Project MIMI (Multi-utility Integrated Meter Infrastructure, a multi utility smart meter trial). These reductions were offset by an enlarged scope to facilitate supply from the EGP following changes to the east coast gas market.

Although actual capex was lower than the AER approved amount, the expenditure schedule was different, as shown in Figure 6.3. Scheduling differences were largely driven by delays in the project for the strengthening of supply to the Hume and Tuggeranong regions and the delays in several projects caused by the introduction of new regulatory requirements related to the need for development applications for construction of gas mains. The Hume and Tuggeranong suite of projects was additionally delayed following an evaluation as part of the governance process which identified an alternative solution which more prudently met changes in the customer forecasts, leading to a delayed project establishment and delivery schedule.

**Figure 6.3 Capex over the 2010-16 access arrangement period, composition of actuals and estimates ($millions, 2015/16)**




Capital expenditure for 2015/16 is based on the same principles as the 2010-15 period and will be planned and managed within the three-layer governance framework outlined in attachment 4. Although the AER did not approve a capex amount for 2015/16, capex in 2015/16 will be higher than in the preceding years. The increase is due to steady growth in customer connections (market expansion), new mains in Gungahlin and Molonglo areas (capacity development); the commencement of inlet piping rectification and the continued growth in meter replacement (stay in business). This is explained in the following sections.

### 6.4.2 Market expansion

Over the 2010-16 access arrangement period ActewAGL Distribution expects that it will have connected approximately 22,000 new customers to the gas network.

Table 6.2 and Table 6.3 show the number of new connections and the capex incurred, both of which remained steady over the 2010-16 period. Particular areas of residential customer growth occurred in new areas of residential development including Gungahlin (Casey, Bonner and Forde), Belconnen (Lawson), Molonglo (Coombs, Wright and North Western) and Googong.

**Table 6.2 New connections volumes (thousands)**

| | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15[4] | 2015/16[5] |
|---|---|---|---|---|---|---|
| New estates | 1,972 | 1,691 | 1,931 | 1,642 | 1,763 | 1,530 |
| Electricity to gas | 785 | 802 | 861 | 624 | 628 | 781 |
| Medium density | 1,340 | 553 | 892 | 1,360 | 923 | 1,368 |
| Industrial & commercial | 25 | 71 | 114 | 102 | 117 | 120 |
| **Total** | **4,122** | **3,117** | **3,798** | **3,728** | **3,431** | **3,799** |

**Table 6.3 Market expansion capex 2010-16 ($millions, 2015/16)**

| | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15[6] | 2015/16[7] |
|---|---|---|---|---|---|---|
| Market expansion | 8.66 | 8.86 | 9.49 | 8.00 | 8.30 | 11.01 |
| Capital contributions | 1.51 | 0.11 | 1.58 | 0.05 | 0.06 | 0.09 |
| **Market expansion (net of capcons)** | **7.15** | **8.76** | **7.90** | **7.95** | **8.23** | **10.92** |

Notes: * Residential connection costs based on estimated meter unit costs for each residential meter category

***Comparison of approved and actual/estimate capex***

Table 6.4 compares the AER approved capex for market expansion both with and without capital contributions. To ensure that costs recovered as part of connection charges are not recovered twice, only capex net of capital contributions is included in the capital base.

ActewAGL Distribution received two large capital contributions over the 2010-15 period, one from a large commercial customer and another to construct a secondary main to Googong (a new suburb near Queanbeyan). These projects were not anticipated or included in forecast actual market expansion capex for the 2010-15 period. Consequently, both market expansion capex and the offsetting capital contributions amount will be above the AER approved amounts.

[4] Includes a combination of actual/estimate for 2014/15.

[5] Estimated connection volumes.

[6] Includes a combination of actual/estimate for 2014/15.

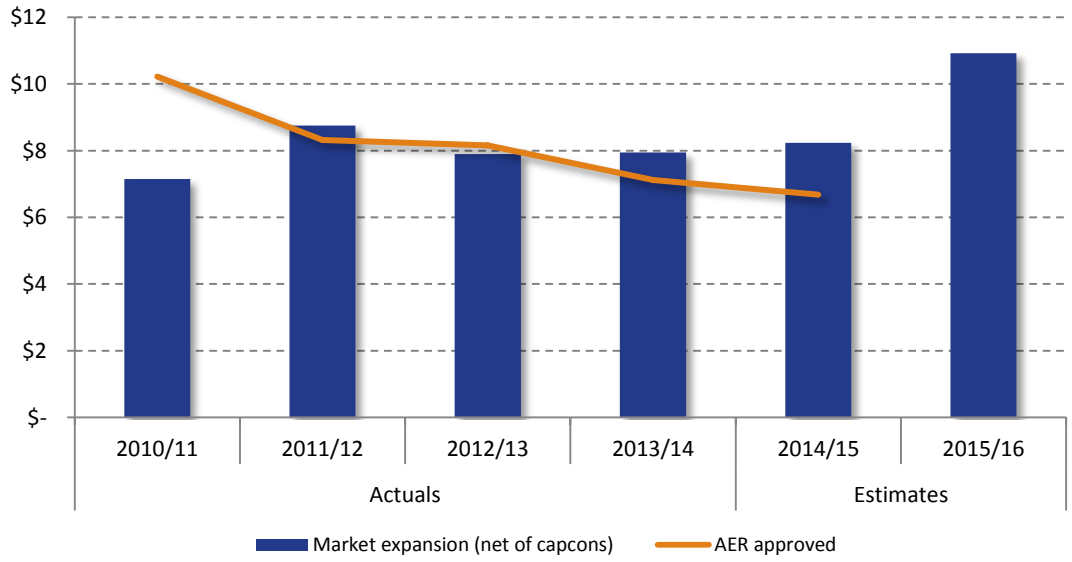
[7] Estimated market expansion capex.

**Table 6.4 Market expansion capex for 2010-15 ($millions, 2015/16)**

| | Total exl capcons | Total net capcons |
|---|---|---|
| Actual/estimate | 43.31 | 40.00 |
| Approved | 40.87 | 40.51 |

Although total capex is in line with the AER's forecast, the profile of expenditure was different, as shown in Figure 6.4. The forecast assumed that expenditure would fall over time, whereas actual capex remained steady. The downward sloping profile in the approved capex reflects the National Institute of Economic and Industry Research's forecast of falling private dwelling investment in the Australian Capital Territory (ACT) for the 2010-15 period. The Institute forecast private dwelling investment to fall by an average of 4.2 per cent per annum over the period 2007-2015, reflecting a range of its forecast of economic factors, such as ACT population growth, ACT Government investment and consumption, gross state product and employment. This forecast decline in connections did not materialise.

**Figure 6.4 Market expansion capex over the 2010-16 access arrangement period ($millions, 2015/16)**




### 6.4.3 Capacity development

Capacity development, to ensure reliability of supply for ActewAGL Distribution customers, over the 2010-16 access arrangement period was focused on meeting both short-term and long-term growth, particularly a suite of projects in the Hume and Tuggeranong regions (see box 1). Other capacity development of note occurred in the Gungahlin region, with projects for the western growth corridors having also commenced. Table 6.1 identifies the key projects undertaken.

***Box 1. Hume and Tuggeranong regions capacity development project suite***

The Hume and Tuggeranong regions suite of capacity development projects comprised the extension of the primary main to Hume, installation of a new primary regulator station at Hume and the extension of the secondary main from Hume to Tuggeranong.

Since the early 2000's, ActewAGL Distribution has monitored the effect of growth on the capacity of the network infrastructure in the southern sectors of the ACT. Across the years, various forecasts of growth, both in customer numbers and the type of customers (and subsequently the peak loads they would consume) has been generated. As early as 2004, ActewAGL Distribution, based on peak demand forecasts coupled with actual data from the network, identified the requirement for augmentation by 2009. At the time a 5.7km primary mains extension to Tuggeranong, with a new primary regulator station at Tuggeranong and Queanbeyan, was identified as a solution.

An updated forecast led to the rescheduling of this solution. Modelling, undertaken as part of the preparation of 2010 access arrangement, indicated that the existing Tuggeranong secondary system would approach its minimum sustainable pressure of 525 kPa early in the 2010-15 period. Accordingly, supply capacity would be required, most likely by winter 2012, to support peak demand growth and ensure continuity of supply to customers.

Project inputs were evaluated, consistent with ActewAGL Distribution's governance framework, to ensure the most prudent and efficient solution was implemented. The revised project inputs, being revised forecast of new customer connections and amendments to land releases across the southern ACT, plus the potential for new industrial loads in Hume, led to a revision of options and a new proposed solution. This revised solution comprised the construction of a primary main extension from Symonston to Hume, the construction of a primary regulator station at Hume and an interconnecting secondary main between the secondary system in Tuggeranong and the Hume primary regulating station. This had the additional benefits of enabling the decommissioning and removal of the Tuggeranong Packaged Off-take Station with associated savings in maintenance costs.

This project dominated the forecast for the capacity development with a total expenditure of greater than $20M, which was about 70% of the capacity development category.

**Table 6.5 Major capacity development projects over the 2010-16 access arrangement period, ($million, 2015/16)**

| Project | Expenditure |
|---|---|
| **Southern ACT** | |
| Hume primary main and primary regulating stations | 13.6 |
| Hume-Tuggeranong stages 1 and 2 | 6.5 |
| **Others** | |
| Gungahlin-Amaroo secondary extension | 2.8 |
| Molonglo secondary extension stage 1 | 5.2 |
| Moncrieff secondary extension | 4.5 |

ActewAGL Distribution's capacity development planning process identified that the secondary main network would need to be expanded in the Moncrieff, Gungahlin and Wright in the Molonglo areas. These projects are to be delivered in 2015/16 and will also support customer demand growth from new estates in the wider Gungahlin and Molonglo regions.

***Comparison of approved and actual/estimate capex***

Over the 2010-15 period, capacity development capex of $27.6 million[8] ($2015/16) is consistent with the AER approved amount of $28.2 million ($2015/16).

Figure 6.5 shows that the profile of actual/estimated expenditure was different to the AER's allowance. A large proportion of the capex allowance was forecast to be incurred in the 2010/11 and 2011/12, but actually occurred in 2013/14 and 2014/15. This shift was driven by two factors.

First, in 2007 the ACT Government introduced new legislation[9] that included a requirement to have development applications written and approved prior to the 'release' of a route for the installation of any significant main, including all primary or secondary mains. A clear understanding of the requirements and impact of this process was not evident at the time of the 2010 access arrangement review. The new development application process, especially in the early period of its implementation, added up to 18 months to project schedules.[10] Because of the projects affected, it is estimated that the introduction of the development approval requirement led to deferral of approximately $17 million in expenditure from 2011/12 to 2013/14 and 2014/15. For future projects, ActewAGL Distribution has revised its scheduling and planning to take the development approval process into account.

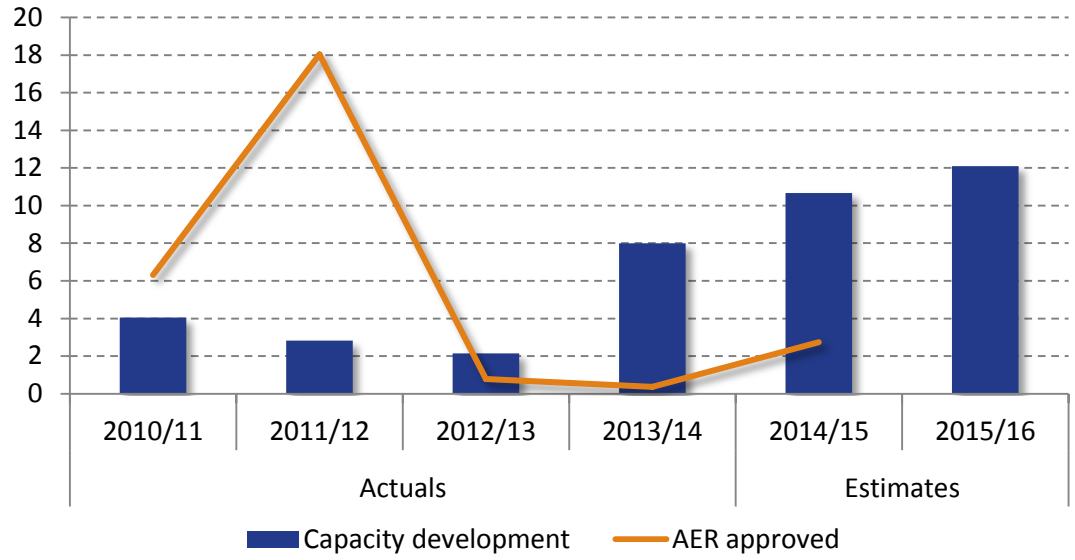
The second, lesser factor was a shift in cost due to the re-evaluation of the Hume and Tuggeranong regions suite of projects (Box 1).

[8] Based upon a mixture of actual and estimate for the 2014/15 year.

[9] *Planning and Development Act* 2007 (ACT).

[10] As a side note, the delay to projects substantially increased the potential for supply restrictions. To ensure there were no problems with supply as a result of the delays affected networks were closely monitored and contingency plans were prepared to avoid poor supply.

**Figure 6.5 Capacity development capex over the 2010-16 access arrangement period ($millions, 2015/16)**




### 6.4.4 Stay in business capex

The stay in business category comprises capex on upgrading, renewing and replacing assets to meet regulatory obligations and ensure the safe and reliable operation of the network. Stay in business capex over the 2010-16 access arrangement period, has two components.

- *Network renewal and upgrade* – related to the replacement and upgrade of network infrastructure (mains and facilities) to facilitate changes to ensure reliable transport of gas through the ACT network, to ensure the integrity of the gas network infrastructure and replace any outdated equipment.
- *Meter renewal and upgrade* – the replacement of meters and associated equipment as it reaches the end of its economic life (or is found to be defective) to ensure the safety of customers and accurate customer billing. ActewAGL Distribution identified the life of its meters could be extended by five years from 20 to 25 years thereby deferring the expenditure and lowering the cost to customers.

Over the 2010-15 period, stay in business capex was $22.6 million[11] ($2015/16) compared to an AER approved amount of $28.6 million ($2015/16). Overall, actual stay in business capex was lower than approved by the AER for the 2010-15 period primarily due to deferral of capex made possible by statistical sampling which indicated that the economic life of residential meters could be extended by five years to 25 years, lowering the costs incurred and in turn benefiting consumers. Further reductions in capex were attributed to:

[11] Based upon a mixture of actual and estimate for the 2014/15 year.

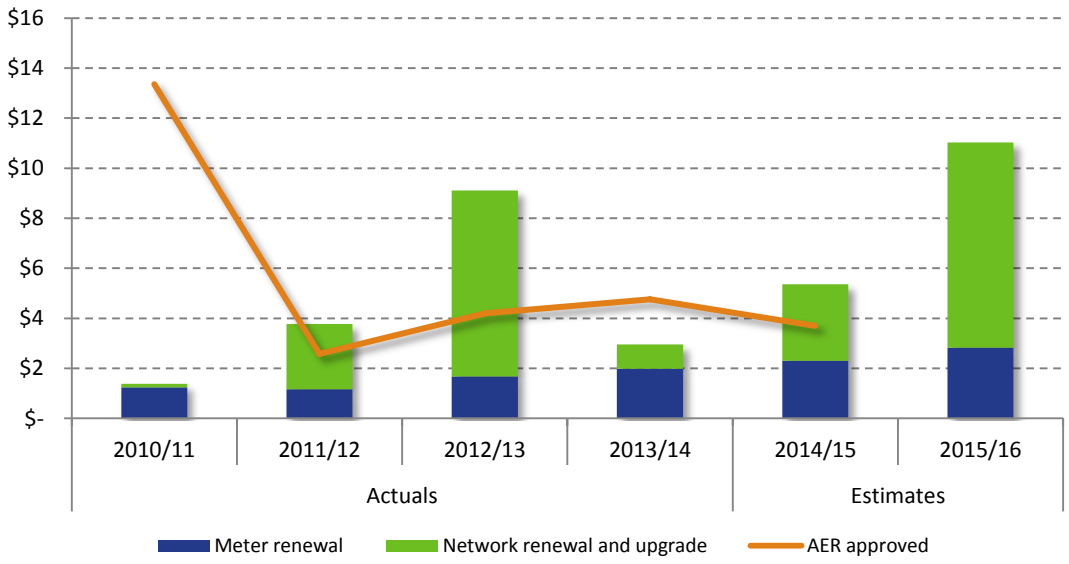
- the cancellation of Project MIMI when it was identified that economic benefits from progressing the trial would likely not be realised;
- the innovative use of temporary pigging traps; and
- refurbishing rather than replacing secondary district regulator sets.

Offsetting the reduction is an enlarged project scope to enable increased supply capacity from the EGP following changes to the east coast gas market. The drivers for the difference are described in more detail below.

Figure 6.6 shows a shift in the schedule of when the capex was incurred from 2010/11 to 2012/13. This shift reflects delays due to the reassessment of the scope of the Fyshwick trunk receiving station (TRS) upgrade to account for changes in the gas supply market.

This section provides further details on each category of stay in business capex. Although the AER did not approve capex at the sub category level, ActewAGL Distribution reflects on the amount implicitly approved (as the approved amount was based on ActewAGL Distribution's forecast) and actual capex incurred.

**Figure 6.6 Stay in business capex over the 2010-16 access arrangement period ($millions, 2015/16)**




### 6.4.4.1 Network renewal and upgrade

Network renewal and upgrade projects in the 2010-16 access arrangement period were focused on managing changes to the longer term supply of gas to the ACT and ensuring the integrity of infrastructure in the ActewAGL Distribution network. ActewAGL Distribution also includes third

party relocation costs in this category.[12] Significant projects in this category are identified in Table 6.6.

**Table 6.6 Significant network renewal and upgrade projects over the 2010-16 access arrangement period, ($ millions, 2015/16)**

| Project | Expenditure |
|---|---|
| **Managing changes to the longer term supply of gas** | |
| Fyshwick Trunk Receiving Station upgrade | 8.6 |
| Hoskinstown Custody Transfer Station upgrade | 1.5 |
| **Managing the integrity of the gas network** | |
| Canberra primary pigging facilities | 2.6 |
| Inlet Piping Rectification | 2.0* |
| Hoskinstown to Fyshwick truck mains pigging | 0.6 |
| Canberra primary main isolation valve | 1.1 |

* The remaining expenditure will be incurred in the next access arrangement period.

As has been widely published, the east coast gas markets are currently changing with gas from South Australia and Queensland being directed towards the Queensland market as a consequence of three large LNG projects. This means an increasing proportion of supply into the ACT network coming from the EGP in place of the Moomba–Sydney Pipeline. As a by-product of these changes and increases in overall gas consumption, the historical gas supply configuration for the ActewAGL Distribution gas network must be altered. These changes have, and will in the future continue, to require augmentation of the main facilities that control the supply of gas to the ActewAGL Distribution network. The upgrade of the Fyshwick TRS and the Hoskinstown custody transfer station are two critical projects required as part of this process. These projects allow for shippers, and in-turn retailers, to contract the (current and proposed) quantities of gas from the EGP, while maintaining appropriate levels of availability and reliability of the relevant facilities. This ultimately ensures not only continued supply to customers but also choice of supply sources and therefore the lowest wholesale cost of gas into the ACT market.

Following from the changes to the gas network to enable greater supply capacity from the EGP, in place of that from the Moomba–Sydney Pipeline, an isolation value was installed on the primary main. The isolation valve complements the changes to the network and strengthens the integrity of the network, by limiting the impact of a rupture to the primary main. In the absence of the valve, the entire network would need to be shut down, which has implications for public safety and the time and cost to restore supply.

The installation of pigging facilities was undertaken in 2014 to facilitate the first intelligent pigging assessment of ActewAGL Distribution's primary and trunk mains. Intelligent pigging

[12] In a majority of cases, the cost of relocation is covered by the third party seeking the relocation. However, ActewAGL Distribution cannot recover the cost when it does not have the right guaranteeing the location of its assets, (e.g. on leased land or privately held land where no licence or easement exists).

allows for detailed in-line inspections of pipelines, accurately detecting any defects or areas of concern, and is typically required every 10 years. Due to the accuracy of data collected, only the necessary excavations, remediation, or direct inspections are completed, eliminating needless maintenance costs and enabling better planning of future maintenance activities. These facilities will be used again for the next intelligent pigging runs around 2022/23.

ActewAGL Distribution will also commence the Inlet Piping rectification project in 2015/16. This project (or series of projects) will upgrade the infrastructure to improve the safety of the gas network. As the project will run across access arrangement periods further details are provided in 6.5.5.1.

***Comparison with AER approved and actual capex***

Actual network renewal and upgrade capex over the 2010-16 period was $13.9 million[13] ($2015/16) compared to the implied AER approved amount of $12.6 million ($2015/16).

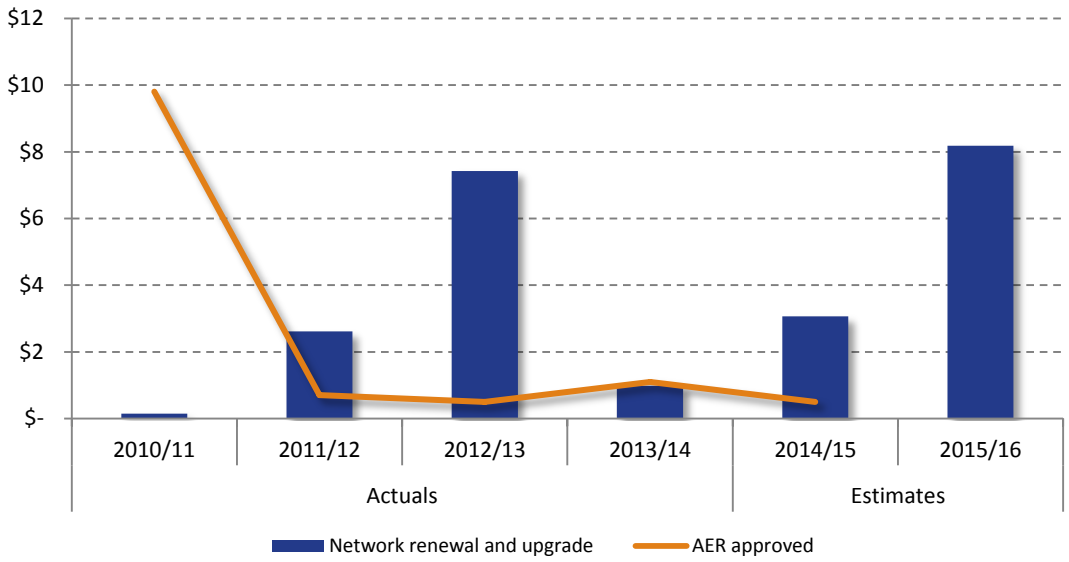
The higher capex incurred was primarily due to a significant increase in the technical scope of the Fyshwick TRS upgrade, as the requirements of the gas market continued to evolve, as the project progressed through the joint ActewAGL Distribution/JAM governance processes. The changes in scope included the use of boilers and heat exchangers in place of a waterbath heaters plus a noise-cancelling building required to meet environmental approval requirements. This, together with increased design and installation complexity, significantly increased the cost over the desktop estimate that was the basis of the 2010 access arrangement estimate.

The total impact was offset due to ActewAGL Distribution realising lower costs in other network renewal and upgrade projects. For example, the innovative use of temporary pig traps used in multiple locations along the Hoskinstown-Fyshwick pigging facilities reduced the costs associated with the installation of pigging facilities by over 60%. Furthermore, a detailed engineering review identified refurbishment as a more prudent solution to planned replacement of the secondary district regulator sets.

Similar to capacity development capex, the expenditure profile for actual/estimated network renewal and upgrade capex was considerably different to the AER's approved allowance. Figure 6.7 outlines the capex spend profile for the network renewal and upgrade projects. The key change is a movement of expenditure from that proposed in 2010/11 to 2012/13. This change is primarily due to the rapidly changing gas supply market requirements that delayed the final scope and therefore the delivery of the Fyshwick TRS project. This delay was compounded by additional processes related to development approval from the ACT Government (as outlined section 6.4.3 above).

[13] 2014/15 is based upon a mixture of actual plus estimate.

**Figure 6.7 Network renewal and upgrade capex 2010-16 access arrangement, ($millions, 2015/16)**




### 6.4.4.2 Meter renewal

Over the 2010-16 period, ActewAGL Distribution's meter renewal program replaced meters to ensure the ongoing accuracy of meters used to measure the quantities of gas consumed by customers and, in turn, their bills.

The meter renewal program replaced aged and defective meters for residential and industrial and commercial customers and residential hot water meters. The program also replaces ancillary equipment which includes pressure regulating devices (used for safety and metrological purposes) and electronic capture and communication equipment. Table 6.7 shows the meter renewals over the current access arrangement period.

**Table 6.7 Meter renewal volumes 2010-16 access arrangement period**

| Metering equipment | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 |
|---|---|---|---|---|---|---|
| Residential gas meters | 2,089 | 2,893 | 4,206 | 4,877 | 4,556 | 4,396 |
| Residential hot water meters | 26 | 89 | 169 | 151 | 248 | 466 |
| I&C diaphragm gas meters* | 105 | 113 | 261 | 206 | 177 | 165 |
| I&C rotary gas meters | 14 | 11 | 16 | 44 | 27 | 49 |
| I&C turbine gas meters | 1 | 3 | 7 | 1 | - | 5 |
| MDL equipment # | 8 | 7 | 7 | 7 | 7 | 97 |
| Metreteks | 35 | 35 | 18 | 23 | 28 | 22 |
| **Total** | **2,278** | **3,151** | **4,684** | **5,309** | **5,043** | **5,200** |

Notes: *Defective industrial and commercial (I&C) meters included with I&C diaphragm meters.
#Includes meter data logger (MDL) communications equipment.

***Comparison between AER approved and actual capex***

Actual meter renewal and upgrade capex over the 2010-16 period was $8.4 million[14] ($2015/16) compared to the implied AER approved amount of $15.8 million ($2015/16). ActewAGL Distribution incurred lower costs than the regulated allowance approved by the AER primarily due to the life extension of residential meters and, secondly, due to the cancellation of Project MIMI.

ActewAGL Distribution prepared its capex forecast (which the AER largely approved) on the assumption that residential meters would need to be replaced at 20 years. When forecasting meter replacement costs, ActewAGL Distribution had no test results that indicated that metering asset life could be extended past 20 years.

During the period, as some families of meters reached their 20-year life, ActewAGL Distribution conducted statistical sampling and testing of those meters which indicated that the residential meters lives could be further extended from 20 to 25 years, lowering the number of meters needing to be replaced. Adding five years to meter lives had a significant effect on the numbers of meters that were replaced and lowered ActewAGL Distribution's asset replacement costs, by shifting cost to later years and thus benefiting consumers.

While ActewAGL Distribution incurred lower costs than approved by the AER, meter replacement costs steadily rose over the 2010-16 period, reflecting the growth of the ACT market 20 to 25 years earlier.

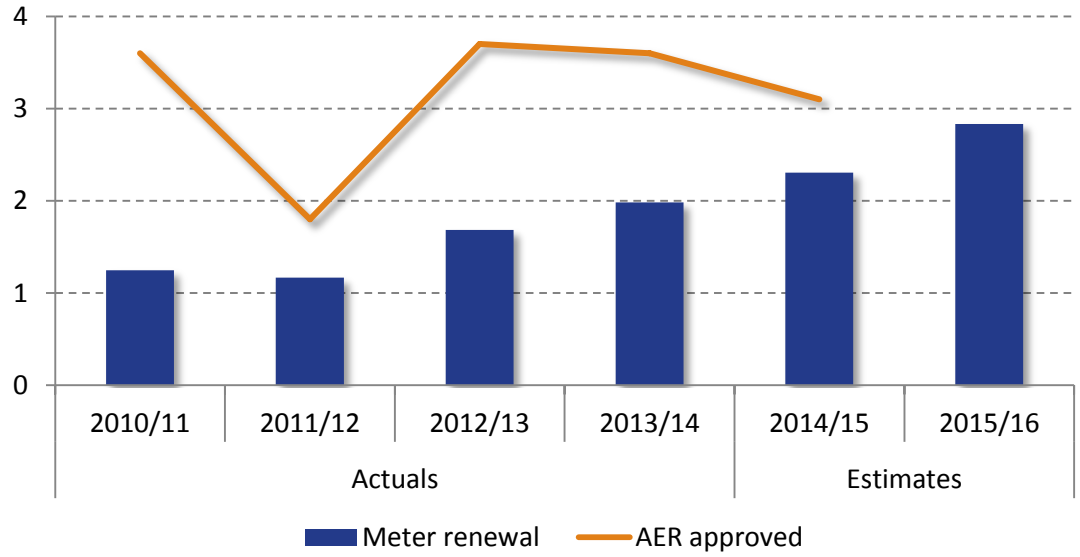
In this regulatory period, ActewAGL Distribution conducted Project MIMI for ActewAGL Distribution's gas and electricity business, together with Icon Water's (then ACTEW Water) water business. The aims of the trial included determining the costs and benefits of smart metering for gas, electricity and water, testing the performance and reliability of available technologies and vendors.

[14] 2014/15 is based upon a mixture of actual plus estimate.

Following two field trials, ActewAGL Distribution identified limited device and vendor choices, resulting in implied higher costs. Given the probability of low future economic benefits and the significant cost involved, ActewAGL Distribution did not progress the trial to stage 3.

Figure 6.8 shows that the profile of capex is different to the implied AER approved amounts. The cancellation of Project MIMI accounts for a majority of the difference between the approved and actual expenditure in 2010/11. The sharp increase in the profile of approved meter renewal capex in 2012/13 reflects the significant number of residential meters forecast to reach their 20-year lives and needing to be replaced. The actual lower numbers of in residential meter replacements was driven by the deferral of meter replacements by up to five years following the results of the statistical sampling.

**Figure 6.8 Meter renewal capex over the 2010-16 access arrangement period ($million, $2015/16)**




### 6.4.5 Non system capex

Non-system capex in the 2010-15 period has been attributed primarily to improving ActewAGL Distribution's Geographic Information System (GIS).

During this period, ActewAGL Distribution improved the data within its GIS, specifically information on the spatial accuracy of pipes. Additionally, an Automated Asset Information Request System, which was needed to facilitate ActewAGL Distribution's participation in the national 'Dial Before You Dig' program, was implemented. These improvements were implemented in the beginning of the access arrangement period and were completed by 2014/15, the base year for the operating expenditure (opex) forecast.

***Comparison between AER approved and actual capex***

ActewAGL Distribution incurred $0.5 million, rather than the $1.4 million approved by the AER, as capex. A portion of the forecast GIS costs ($0.3 million) that had been approved by the AER as

capex was subsequently identified as opex and consequently has not been rolled into the capital base.

### 6.4.6 Corporate overheads

There was no overhead allocated to AAD's capex until 2015/16. From 1 July 2015 ActewAGL Distribution will be applying a new cost allocation methodology (CAM) consistent with the methodology approved to apply for the electricity network. The new CAM will allocate a proportion of corporate costs to the capex program which better reflects the role corporate costs have in supporting the capital program. Further details are provided in appendix 5.04.

## 6.5 Forecast capex

### Key points

- Over the 2016-21 access arrangement period ActewAGL Distribution plans to continue to prudently and efficiently connect new customers to its gas network, provide infrastructure to ensure reliability for existing customers and renewed infrastructure to meet regulatory requirements and ensure the integrity and safety of the gas network.
- Two-thirds of forecast capex is based on program estimates built up using a combination of forecast volumes and unit costs. The unit costs were forecast using an approach analogous to the base step trend method used in opex. The remaining capex program was forecast upon a project by project basis.
- Average annual capex over the 2016-21 period is within one per cent of actual/estimated capex incurred over the 2010-16 period once real price escalation and a change in the allocation of corporate costs is taken into account.
- While the aggregate average annual capex amount is stable across the access arrangement periods, the composition will change. There is expected to be an increase in market expansion capex to connect an increase in medium-density housing and an increase in meter renewal costs as a large number of meters that were installed during the rapid expansion of the gas network in the 1990s (25 years ago) reach end of life. Other categories such as capacity development and network renewal and upgrade are expected to decrease due to the natural variation in these categories.

This section provides information on how ActewAGL Distribution's forecast capex conforms with Rule 79, specifically:

(a) the capital expenditure must be such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of providing services; and

(b) the capital expenditure must be justifiable on a ground stated in subrule (2).

First ActewAGL Distribution explains the forecast methodology used including identification, classification of capital projects and cost estimation method.

ActewAGL Distribution then provides details for each expenditure category, including the justification (in accordance with criterion 1(b) of Rule 79), drivers if applicable and further information on the estimation methodology applied. The previous 2010-16 access arrangement period is also provided as a baseline for comparative purposes, with an explanation of any material differences.

Finally, this section explains the analysis which demonstrates that the proposed capital program can be delivered over the 2016-21 period and a brief description of the capex model.

### 6.5.1 Overview

In accordance with Rule 72(c)(i) this attachment provides ActewAGL Distribution's forecast of conforming capex for the 2016-21 Access Arrangement period and the basis for the forecast.

Over the 2010-16 access arrangement period, ActewAGL Distribution will continue to prudently and efficiently connect new customers to its gas network, provide infrastructure to ensure reliability for existing customers and renew infrastructure to meet regulatory requirements and ensure the integrity and safety of the gas network. Specifically, ActewAGL Distribution will:

- *Market expansion* – Connect new customers, including increasing numbers of medium density connections. This benefits new consumers, by providing access to gas, and existing customers, by lowering average prices.
- *Capacity developmen*t – Strengthen the gas network in the Molonglo region to ensure continuity of supply.
- *Stay in business* – Upgrade network infrastructure including the replacement of inlet piping to improve safety and replace meters as they reach the end of their economic life.
- *Non system capex* – Development of the GIS through connection of data to mobile devices (including use of GPS integration at the point of data capture) and assist in data access, transfer and alignment between ActewAGL Distribution and JAM. These changes will improve data accuracy through reduced translation errors.

ActewAGL Distribution's capex program is summarised in Table 6.8.

**Table 6.8 Forecast capital expenditure 2016-21 access arrangement period ($millions, 2015/16)**

| | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | Total |
|---|---|---|---|---|---|---|
| Market expansion | 11.82 | 12.80 | 12.90 | 12.62 | 12.16 | 62.30 |
| Capital contributions | 0.10 | 0.10 | 0.10 | 0.11 | 0.11 | 0.53 |
| Market expansion (net capcons) | 11.72 | 12.70 | 12.80 | 12.51 | 12.05 | 61.78 |
| Capacity development | 3.21 | 5.56 | 2.91 | 6.99 | 1.22 | 19.89 |
| Stay in business | 7.23 | 8.18 | 8.60 | 4.59 | 4.83 | 33.43 |
| Non-system | 0.21 | 0.11 | 0.22 | 0.00 | 0.00 | 0.55 |
| **Total** | **22.38** | **26.55** | **24.53** | **24.09** | **18.10** | **115.65** |

In arriving at these forecasts, the majority of market expansion capex and the meter renewal component of capex (in total approximately two thirds of the capex program) were estimated at the program level. The unit costs in the base year are efficient as they were only accepted by ActewAGL Distribution following independently verified benchmarking of the costs against competitive market outcomes or, where costs were not comparable to the available market data, internal JAM costs were applied. Unit costs were then escalated to take into account real price escalation over the access arrangement period.

Other capex categories, such as capacity development, are more suited to being forecast on a project-by-project basis. These cost estimates are made using unit costs for standard elements or costs from knowledge of similar projects, quotations, or using detailed cost build ups. The cost estimation methodology, which is set out in the Project Estimation Manual, has been independently reviewed by Evans and Peck, see appendix 6.07.3.

Average annual capex over the 2016-21 access arrangement period is about 11% higher than expenditure over the 2010-16 access arrangement period. This impact is less than one per cent when the following two factors are taken into account:

- a change in ActewAGL Distribution's cost allocation methodology from 1 July 2015 allocating corporate costs to the capex program; and
- real price escalation over the 2016-21 access arrangement period.

Although the aggregate annual capex amount is not forecast to significantly change the composition of capex, it is expected to differ as shown in Table 6.9.

**Table 6.9 Annual average capex in each access arrangement period ($millions, 2015/16)**

| | 2010-16* | 2016-21 | % variance |
|---|---|---|---|
| Market expansion (net of capital contributions) | 8.49 | 12.36 | 46 |
| Capacity development | 6.63 | 3.98 | -40 |
| Stay in business | 5.61 | 6.69 | 19 |
| Non system assets | 0.09 | 0.11 | 26 |
| **Total** | **20.81** | **23.13** | **11** |

* Includes a combination of actuals and estimates

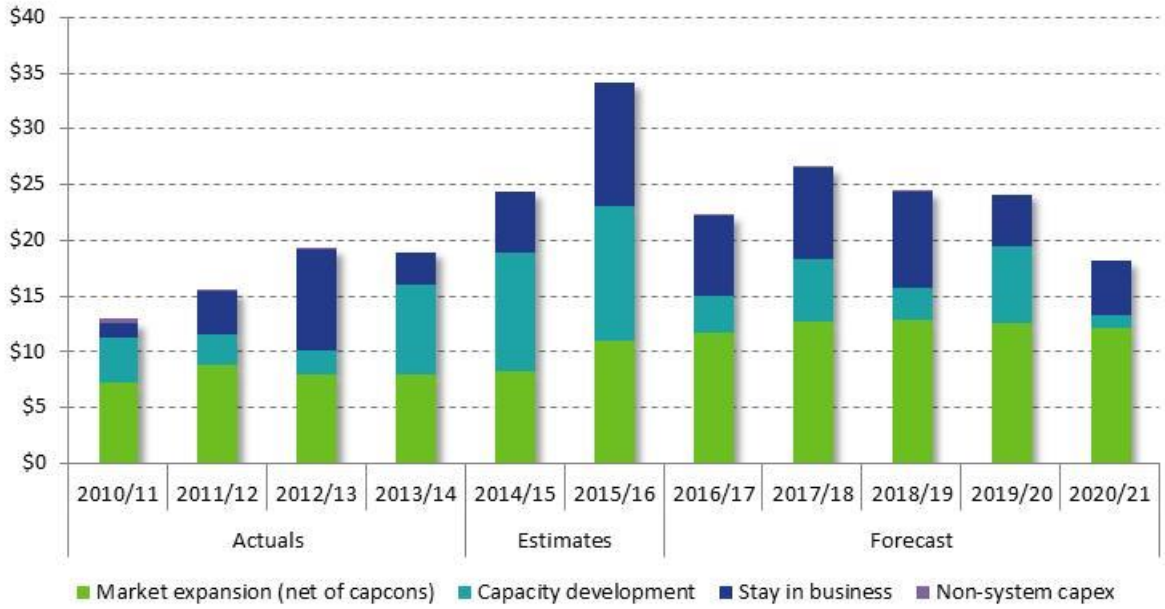
The variation in annual average capex between the two periods is due to the following factors.

- *Market expansion* – The increase in capex is largely a result of the 52 per cent increase in the number of medium density residential connections based on forecasts of growth in medium density housing in the ACT over the 2016-21 access arrangement period.
- *Capacity development* – The reduction in capex results from the variability in requirements for major capacity development projects from one access arrangement period to the next. In the current access arrangement period there were five major projects over $1 million compared with three major projects for the 2016-21 access arrangement period.
- *Stay in business* – The overall increase in capex reflects changes in two subcategories.
    - An increase in meter renewal capex as a result of residential meters reaching the end of their economic life of 25 years of age. ActewAGL Distribution also intends to replace a large proportion of its hot water meters due to a significant increase in failure rates.
    - A decrease in network renewal and replacement capex as a result of the variability of major projects in this category. For instance, while there are four projects costing

over $1 million in the 2016-21 access arrangement period, ActewAGL Distribution's engineering review has only identified two projects required for the first five years. This category now also includes integrity-related work, namely in-line inspections and integrity digs that have previously been included as opex.

These trends can be seen in Figure 6.9.

**Figure 6.9 Capex over the two access arrangement periods, composition of actuals, estimates and forecast amounts ($millions, 2015/16)**




### 6.5.2 Forecasting approach

ActewAGL Distribution's approach to forecasting capex for the 2016-21 access arrangement period including the nature and basis of the forecast is provided in this section, consistent with Rule 74(1).

The capex program has been forecast using a process which identifies and classifies projects, then applies a cost estimation methodology underpinned by four principles: fit for purpose, credible, transparent and approved.

Some capex elements (such as market expansion) were forecast at the program level. Program estimates typically combined a set of forecast volumes with a set of efficient unit rates. While the volume forecast is category dependent, unit rates are forecast using an approach analogous to the base step trend approach used for opex. Here, the unit costs for the base year are taken, escalated forward and any expected step changes are integrated into the unit costs.

The unit costs in the base year are efficient as they were accepted by ActewAGL Distribution following benchmarking, independently verified by Evans and Peck, against competitive market outcomes or, where costs were not comparable to the available market data, internal JAM costs.

Other capex elements, such as capacity development, are more suited to forecast on a project-by-project basis. The cost estimation methodology provides for a commensurate degree of rigour for the size and complexity of the project and may require an Opportunity Brief (OB) or Feasibility Assessment (FA). Costs estimates were made using the JAM cost estimation methodology as set out in the Project Estimation Manual and may use unit costs for standard elements or costs from knowledge of similar projects, quotations, or using detailed cost build ups. The cost estimation methodology was independently reviewed by Evans and Peck.

The process ensures the forecast is arrived at on a reasonable basis and represents the best forecast possible in the circumstances (Rule 74(2)). Further, the process ensures that the capex forecast may be such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of provided services consistent with Rule 79(1)(a).

The following sub-sections provide specific details on:

- The four-phase approach to identification of capital projects (section 6.5.2.1);
- Classes of capital projects and their qualifying criteria (section 6.5.2.2);
- Estimation methodologies (section 6.5.2.3) including:
    - cost estimation principles;
    - program estimations (including details on the base step trend approach for unit costs);
    - individual project estimates; and
    - the Evans and Peck review of the Jemena Cost Estimation Methodology.

#### 6.5.2.1 Identification of capital projects

The identification and planning of capital projects is based upon a four-phase process as outlined below.

***Phase 1***

The need for capital expenditure is most often identified in the course of developing asset class strategies where considerations include:

- the long term interest of consumers;
- technical and regulatory requirements;
- Australian standards and codes;
- technical policies;
- growth and capacity analysis;
- assessment of asset condition;
- lifecycle cost review;

- assessment of asset performance, quality and costs;
- service standards;
- analysis of incidents;
- organisational risk assessments; and
- technical risk assessments.

***Phase 2***

Asset Class Strategies are developed to provide a structured method for identifying, analysing and evaluating risks and opportunities for the particular asset class. The key features of asset class strategies are as follows.

- Classify and define the scope of the asset class. This includes documentation of asset systems and their constituent assets, including the function and relative importance of the asset class.
- Gather information about the asset class. This includes, but is not limited to management and control activities which affect the assets' performance, technical and regulatory requirements, levels of service required, operating and maintenance activity and trends (including reliability, opex, condition monitoring, predictive and corrective maintenance) future demand, technological changes and criticality.
- Identify threats, opportunities, strengths and weakness to ensure all issues, risks and opportunities are documented. Risks and opportunities are then compared against the asset objectives to confirm ranking or prioritisation.
- Undertake a scenario analysis varying such parameters as time, capital and maintenance costs, to confirm the commercial resilience in respect of the risks and opportunities that may arise as the commercial environment changes.
- Review the effectiveness of the controls and the processes in mitigating or managing key risks, including the effect of low-probability/high-consequence event. Document the life-cycle plan.

***Phase 3***

Activities in the asset class strategies are scoped into Opportunity Briefs (OBs) to define the scope, scheduling and potential options to be considered to respond to the issues identified.

Additional issues may also be identified at this phase, generally of a shorter term nature or due to environmental or external drivers within the review cycle of the asset class or regional capacity strategies (generally five years).

***Phase 4***

The outputs from Phase 3 are then used to define the activities that will be implemented and the resources that will be applied to meet the asset management objectives and consequently the organisational objectives. This is documented in the Asset Management Plan (AMP). The AMP contains a rationale for asset management activities, operational and maintenance plans, capital

investment (overhaul, renewal, replacement and enhancement) plans, and financial and resource plans, often based on a review of earlier achievements. The AMP makes allowance for any additional issues identified as part of developing a two-year firm program that becomes the basis of detailed schedule and resource planning. These issues and the subsequent projects are generally due to environmental or external drivers within this two-year period (e.g. market expansion, government authority works or remediation works).

#### 6.5.2.2 Classes of projects and their qualifying criteria

Once identified, capital activities are classified into one of the following groups:

- low complexity individual projects;
- moderate complexity projects;
- high complexity projects;
- sub programs; or
- minor capital projects.

***Low complexity individual projects***

These are projects with a generic scope which can be built up through standard constituent elements. Generally these projects are valued at less than $200,000 and do not require any direct project management. These projects are initially managed through an issues or project register; no OB is created.

***Moderate complexity projects***

These are projects that have a moderate level of technical or delivery complexity, and are built up from a mixture of standard and unique constituent elements. These projects are generally valued above $200,000, and the majority are less than $2 million. They require a level of direct project management, but generally minimal engineering support. When issues that may lead to this classification are identified, an OB is developed to scope the issue. In some circumstances, where the scope or cost is of a larger scale, a feasibility assessment may be undertaken.

***High complexity projects***

These projects have a significant level of technical and/or delivery complexity and are characterised by a substantial number of unique constituent elements. These projects are generally valued above $200,000, and the majority are less than $2 million and require a level of direct project management and engineering support. When issues that may lead to this classification are identified, an OB is developed to scope the issue. The next phase in the evaluation of the issues leading to these projects is the preparation of a feasibility assessment.

***Sub-programs***

Where a large number of analogous capital activities (projects) occur on a repeatable (recurring nature) basis, the projects are linked into a sub-program of work that is delivered as it was an individual project. As with other 'projects', an OB is developed to provide a basis of scope for the sub-program.

***Minor capital projects***

Minor capital projects are minor in size and significant in volume. It is not possible to forecast specific projects. Instead an allowance based on historical trends is used. There are five categories of minor capital allocations.

- Small main extensions for capacity development/security of supply and market expansion.
- Minor works to ensure compliance with standards during field work, such as shallow services, riser replacement and broken paddock markers.
- Valve installations (e.g. high-risk valve installation, bushfire isolation valves installation, secondary valve installation) generally to ensure the continued or improved safety of service due to either changes in urban areas (new or enlarged shopping centres) or areas identified with bushfire or other environmental risks.
- Minor secondary mains renewal for washaway remediation or rehabilitation minor capital works, generally being the replacement of section of infrastructure that have been identified as being affected by water flows, often due to changes in surrounding land usage or layout.
- High-pressure facilities on minor capital works, including installation of plant for gas quality changes, replacement of end-of-life elements of plant, or minor works associated with regulatory changes, enhanced work, health and safety requirements (e.g. earthing of stations), bushfire mitigation works due to changes in surrounding land use or vegetation density.

#### 6.5.2.3 Estimation methodologies

***Cost estimation principles***

Cost estimation for the 2016-21 access arrangement capital program follows the JAM cost estimation methodology as described in the Project Estimation Manual. This methodology is based on the following principles:

- *fit-for-purpose* – estimates are developed to a level of accuracy that ensures they are appropriate for the purpose for which they are to be used;
- *credible* – assumptions used in the development of the estimate have a reasonable basis and are commensurate with the level of confidence required for the estimate;
- *transparent* – supporting documentation explains the process, sources, and methods used to create the estimate and identifies the underlying data and assumptions used to develop the estimate; and
- *approved* – estimates are reviewed and approved to ensure appropriate accountability and responsibility, and confirm costing methodologies and controls are properly applied prior to the asset investment decision.

A number of estimates are undertaken in a project lifecycle as the project progresses through each stages of the gating methodology and to satisfy governance process requirements.

Distribution capital projects included the 2016-21 capital program apply Gate 0 or Gate 1 cost estimates (conceptual estimates based upon the OB or feasibility assessment).

***Program estimates***

Programs are characterised by large volumes of repetitive or similar works and account for a large portion of ActewAGL Distribution's 2016-21 capex forecast. Program cost estimates are derived by combining a forecast volume with the forecast price.

The forecast volumes are derived from:

- market expansion from the Core Energy connections forecast; and
- meter replacement from replacement forecasts based upon age of meters and historical patterns for meter failures.

While the program estimates forecast is a 'bottom-up' cost build up based on volumes multiplied by unit rates, the method to forecast prices is analogous to base step trend methodology used for opex. Generally, this methodology takes the actual unit costs incurred 2014/15 as the 'base', applies a 'trend' to account for forecast price changes and adds in expected 'step changes.' Further details on the mechanics of the forecast for market expansion and meter renewal is provided in section 6.5.3 and 6.5.5.2.

*Efficiency of the base year*

As outlined in attachment 4, on behalf of ActewAGL Distribution, JAM subcontracts capital works (under $500,000) to ZNX(2) Pty Ltd (ZNX(2)) through an Asset Services Agreement (ASA), based on the Field Services Agreement between ZNX and JAM for JGN.

The cost of these works is made up solely of the charges under the ASA between JAM and ZNX, which under the DAMS is passed on to ActewAGL Distribution. There are two parts to the ASA charges which reflect the underlying cost structure. The first represents the fixed costs incurred in managing the routine works such as project management, construction field supervision, quality assurance and administration costs of planning and organising the construction work and is called the Construction Management Fee (CMF). The CMF charged to ActewAGL Distribution does not vary with the amount of work undertaken. The second part is a set of unit rates which reflect the marginal cost incurred in undertaking each marginal unit of work.

To implement a forecasting approach which takes advantage of DAMS agreement reflecting the underlying cost structure, the capex model separately forecasts:

- the total marginal costs calculated by multiplying the unit rates (which only includes marginal costs and so vary in accordance with volumes) with the forecast volumes; and
- the total fixed costs – the CMF applicable to market expansion capex (which only includes fixed costs that do not vary with volumes).

The capex model then adds both the fixed and marginal elements together to provide the total forecast amount. The capex model apportioned the CMF to all work undertaken by ZNX below $500,000, not just program estimates.

The unit rates and the CMF which applied in the base year have been benchmarked and found to be efficient. The benchmarking was made possible by JAM's decision to split its New South Wales (NSW) network into Northern and Southern regions. JAM conducted an open, competitive

tender in the Northern Region to appoint subcontractors in four sub-regions to carry out construction, repair and maintenance services from 1 July 2013 and to establish market-tested prices for the provision of these services. JAM then undertook arms-length negotiations with Zinfra for the provision of an equivalent scope of services in the Southern Region, with pricing to match or better the Northern Region tender outcomes for similar risk activities. Further details are provided in JGN's explanation of its pipeline service delivery model in attachment 4.3.

As part of the JGN access arrangement process, the AER reviewed the change in arrangements and concluded that:

> *We reviewed the tender documents, the tender assessment and the decision to award the four contracts* [for each of the 4 Northern sub-regions]. *We are satisfied that this was a competitive tender process. As it was a competitive tender price, we are satisfied that the unit rates established in the contracts reflect competitive unit rates prevailing in the market. On this basis we are satisfied that the unit rates drawn from these contracts which form the basis of estimates used in JGN's proposed capex are efficient.*[15]

The market information generated from the process was also used to test ZNX's proposed unit rates in respect of the ACT, Queanbeyan and Palerang gas network. JAM matched the ZNX proposed prices for activities against those from the preferred tender in the central coast sub-region. The central coast region, the region with the lowest cost of all sub regions, was selected due to similar characteristics between the regions. The market rates were benchmarked against ZNX's proposed gas main and service connection costs, which represent about 54.5% of routine construction works. Other prices could not be compared on an equal basis. However, ZNX's proposed metering prices (44.6% of remaining program of works) were instead benchmarked against JAM's internal costs for materials and labour. Overall, 99% of routine construction works were benchmarked. In aggregate, ZNX's proposed unit rates were marginally (about one per cent) lower than the benchmark.

Evans and Peck reviewed the JAM pricing methodology, including the regional matching methodology and Northern Region tender process. Evans and Peck found the difference between the ZNX unit rates and ZNX CMF, and the benchmark within an acceptable range. Based on this independent verification, ActewAGL Distribution accepted the costs and executed the revised DAMs agreements. The Evans and Peck report is provided in appendix 4.2.

*Trend*

ActewAGL Distribution has applied price escalators to account for expected component price changes over the access arrangement period. Price changes over the next access arrangement period are not known and need to be forecast. The DAMS Agreement (appendix 4.1) includes provisions to ensure that the costs remain efficient, including retendering the rates against benchmark rates every five years and to account for tax changes, change in the cost of materials or any other event outside the reasonable control of JAM.

[15] AER 2014, *Jemena Gas Networks (NSW) Ltd Access arrangement 2015-20 Attachment 6: Capital expenditure, Draft decision,* pp. 6-47.

For each average unit rate and the CMF, ActewAGL Distribution has estimated proportion which is composed of labour or materials. These estimates are then used to weight expected to manage changes to the respective price components to escalate each unit rate to account for price changes. This calculation is provided in the capex model (appendix 6.04.1).

Labour and materials price component escalators have both been prepared by BIS Shrapnel (see appendix 5.03). ActewAGL Distribution has engaged an independent expert to forecast these price changes to ensure that the forecast is arrived at on a reasonable basis and represents the best forecast in the circumstances, consistent with Rule 74. Information on the nature of a forecast including the basis for the forecast is provided in BIS Shrapnel's report which provides:

- an overview of the macroeconomic outlook for the ACT (including a commentary on the logic and key drivers);
- a discussion on BIS Shrapnel's model of wage determination and provides an outlook for gas network-related labour cost escalation, based on forecasts of wage growth for the Electricity, Gas, Water and Wastewater services industry in Australia, NSW and the ACT;
- forecasts of external contractor labour cost escalation; and
- an outlook for a range of material cost escalators relevant to the operation and maintenance of gas networks in NSW and the ACT.

These escalators are designed to predict the price changes to the expenditure categories that are inputs to ActewAGL Distribution's capital expenditure, which mostly consists of specialised labour to install mains, connections of meters and station construction, plus the cost of combined materials used (e.g. a length of steel main).

The AER's expenditure forecast assessment guideline recognises the need to forecast both labour and material price escalation noting that '… labour prices changes are an important consideration when forecasting expenditure.'[16] and 'Materials price changes are an important driver of costs, particular capex, given their potential volatility'.[17]

The Consumer Price Index (CPI) measures only the change in the prices paid by households for goods and services to consume.[18] For these costs, as demonstrated by BIS Shrapnel, CPI will not provide an estimate of at least efficient costs as the price of labour and materials is generally expected to increase at a higher rate than the expenditure categories included in the CPI.[19]

[16] AER 2013, *Expenditure Forecast Assessment Guideline, Explanatory Statement,* p. 49.

[17] AER 2013, *Expenditure Forecast Assessment Guideline, Explanatory Statement,* p. 50.

[18] ABS 2011, Consumer Price Index: Concepts, sources and methods, p. 3.

[19] The CPI is made up for the following categories with the following weights food and non-alcoholic beverages (16.8%); Alcohol and tobacco (7.1%); clothing and footwear (4.0%); housing (22.3%); furnishings, household equipment and services (9.1%); health (5.3%); transport (11.6%); communication (3.0%); recreation and culture (12.6%); education (3.2%); and insurance and financial services (5.1%). See ABS 2011, Introduction of the 16th services Australian Consumer Price index-6470.0, p. 7.

Accordingly, ActewAGL Distribution, consistent with Rule 74, has applied the best forecast arrived on a reasonable basis and represents the best forecast possible in the circumstances—those developed by BIS Shrapnel.

*Step changes*

Two step changes have been applied to program estimates rates. The first relates to higher forecast costs for energisation due to the introduction of the National Energy Customer Framework (NECF). This is discussed in section 6.4.4.2. The step change has been applied through the market expansion unit rate model provided in appendix 6.04.2.

A second step change relates to an increase in the CMF. This step change is required as part of ActewAGL Distribution's compliance with changes to the Gas Safety and Installation Code, Gas Network Boundary Meter Code and the Gas General Metering Code. ActewAGL Distribution will incur costs that are both capex related and opex related. The capex-related costs will increase the Construction Management Fee. Further detail on this is provided in appendix 5.04 has been applied through the capex model in appendix 6.04.1.

***Individual project estimates***

JAM delivers projects on behalf of ActewAGL Distribution that are of sufficient size and complexity to require an individual project assessment and cost estimate. These estimates cover a range of project sizes and complexity, for which assessments and estimates are prepared with a commensurate degree of rigour. The estimation approach depends on the size and complexity of the project as detailed in Table 6.10.

**Table 6.10. Estimation approach by size and complexity**

| Individual project estimates |
|---|
| **Projects more than $200,000**[20] |
| *Low complexity*<br>These projects have standard constituent elements and so unit rates can be used. Cost estimates are compiled using the Jemena Project Estimation Manual, supported by a Gate Certificate (either Gate 0 or Gate 1, depending on the level of scope definition and the progress through the project lifecycle). The scope is defined in the opportunity brief which covers:<br>• the extent or volume of work to be undertaken; and<br>• environmental/construction considerations, such as restoration required, road crossings, traffic management requirements.<br>The assessment in the opportunity brief is based on desktop measurements supported by either a field confirmation visit or evaluation by an estimator with local knowledge. |
| *Medium complexity*<br>These projects predominantly consist of standard constituent elements with some additional non-standard constituent elements and therefore are mainly a mix of unit costs with some non-standard cost elements. The costs of the non-standard elements may be estimated either from knowledge of similar projects, quotations, or first principles. Cost estimates are compiled using the Project |

[20] It should be noted that for projects less than $500K, the project estimates in Opportunity Briefs do not include the component of the Construction Management Fee.

Estimation Manual and documented with a Gate Certificate (either Gate 0 or Gate 1, depending on the level of scope definition and the progress through the project lifecycle). The scope for this type of project is defined in an enhanced opportunity brief which covers:

- the extent or volume of work to be undertaken, based upon desktop measurements confirmed by a field visit;
- environmental/construction considerations, such as restoration required, road crossings, traffic management requirements based upon desktop measurements confirmed by a field visit; and
- extent and nature of the unique requirements.

*High complexity*

These projects predominantly consist of some standard elements and non-standard constituent elements and therefore are built from individually costed elements and some unit costs for the standard elements. The costs of the non-standard elements may be estimated either from knowledge of similar projects, quotations, or using a detailed cost build up. For these projects, cost estimates are compiled using the JAM Project Estimation Manual supported by a Gate Certificate (either Gate 0, or Gate 1).

**Projects less than $200,000**

A desktop summary is produced based upon a review of the scope which indicates the approximate volume of work to be undertaken (e.g. laying 100 m of 50 mm nylon pipe in Smith Street). Estimates apply unit costs to the scope of work overlaid with appropriate adjustments to reflect environmental or other construction factors.

**Minor capital projects**

A different approach is taken for minor capital projects as they are small in size and significant in volume for which no process of individual identification or assessment is made in advance for reasons of efficiency and practicality. There is a sound expenditure history for these projects and amounts included for these projects are based upon historical patterns of expenditure.

***Review of the cost estimation methodology***

JAM engaged Evans and Peck (E&P) to review its Project Estimation Manual as a means of producing a forecast of capex for its 2016-21 access arrangement period that meets the requirements of Rule 79(1)(a) and 74. This report was included in JGN's 2016-21 access arrangement submission to the AER. E&P validated the allowances that JAM includes in its estimates to provide for the scope-related cost increases that occur on average for all projects between initial scoping at Gate 0, Gate 1 and project completion. E&P's report is provided in appendix 6.07.3. In E&P's opinion, JAM's capital cost estimating methodology satisfies the requirements of Rules 74 and 79(1)(a). JAM has used the same processes and E&P's assessment in providing asset management services to ActewAGL Distribution.

### 6.5.3 Market expansion

ActewAGL Distribution forecasts to connect 21,000 customers to the gas network over the 2016-21 access arrangement period. Connecting new customers includes costs related to mains extensions and the installation of services, meters and associated equipment.

ActewAGL Distribution has regulatory obligations requiring new customers to be connected. Additionally, there is a benefit for the overall market, as connecting new customers allows the

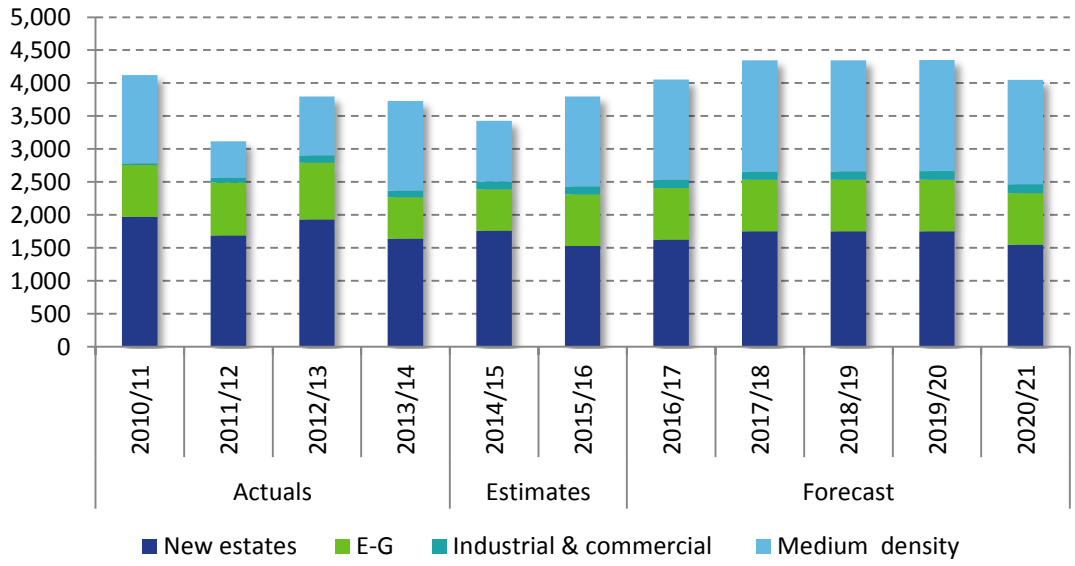
fixed costs of running the network to be shared across a larger number of users, thus lowering average costs.

Market expansion capex can be broken down into the following sub categories

- residential electricity-to-gas – customers currently not using gas, generally converting from electricity and/or LPG;
- residential new homes – customers connected in new estate developments;
- residential medium density – customers in medium-density villa-type housing and high-density apartments;
- industrial and commercial (volume market) – small-scale industrial users and commercial buildings; and
- industrial and commercial (contract market) – major commercial or industrial customers using more than 10 TJ pa.

Core Energy is forecasting an increased in medium-density connection numbers with the other sub categories steady or falling slightly, as shown in Figure 6.10.

**Figure 6.10 Connection numbers over the two access arrangement periods, composition of actuals, estimates and forecast amounts**




Forecast market expansion capex represents approximately half of forecast capex requirements for the next access arrangement period, and is set out in Table 6.11.

**Table 6.11 Forecast market expansion capex ($million, 2015/16)**

| | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | Total |
|---|---|---|---|---|---|---|
| Market expansion | 11.82 | 12.80 | 12.90 | 12.62 | 12.16 | 62.30 |
| Capital contributions | 0.10 | 0.10 | 0.10 | 0.11 | 0.11 | 0.53 |
| **Market expansion (net of capcons)** | 11.72 | 12.70 | 12.80 | 12.51 | 12.05 | **61.78** |

In a small proportion of cases, customers pay a 'capital contribution' (capcon) towards the capex incurred in providing a connection. The methodology to estimate these amounts is also provided below. Capital contributions amounts are netted off the market expansion capex to provide the estimate of conforming capex.

Annual market expansion capex forecast for the 2016-21 access arrangement period is on average about 46% higher than the average annual amounts incurred over the 2010-16 access arrangement period. When the effect of additional overhead allocation and input cost escalation are taken into account, this is approximately 33 per cent. The increase in capex reflects the higher connection numbers forecast by Core Energy.

#### 6.5.3.1 Justification

ActewAGL Distribution is required to connect customers as a general obligation under sections 31 and 81 of the *Utilities Act 2000* (ACT), under the NECF and as a specific obligation under ActewAGL Distribution's licence.

In addition to its statutory obligations, growing the network is an important component of ActewAGL Distribution's strategy to lower tariffs. By connecting new customers to the gas network, fixed costs can be shared across all customers, thereby lowering the average cost.

Market expansion programs and projects result from the identification of new customer connections to the ActewAGL Distribution gas network. ActewAGL Distribution tests that the revenue from a new connection exceeds the cost in net present value terms, using a discount rate of 10 per cent. Where a new connection does not meet the hurdle—based on forecast gas consumption at the standard tariffs—a capital contribution is payable. A hurdle rate of 10 per cent is used to allow for deep capacity development and to allow for variations in estimated loads and costs. This test ensures that:

- old customers do not subsidise the connection of new customers; and
- new customer connections lower average costs.

As a result, market expansion capex is justified under both Rule 79 (2)(iii) and Rule 79(2)(b) as conforming capex.

#### 6.5.3.2 Estimation methodology

As outlined in section 6.5.2.3, ActewAGL Distribution has applied a bottom up build using a forecast of volumes and unit rates for all categories. The exception to this is costs related to I&C contract connections and meter data logger (MDL) costs for medium-density connections.

The forecast connections have been developed on a network-wide basis identified by Core Energy. New connections are forecast to be higher in the next access arrangement period than in the 2010-15 period. Table 6.12 provides the volumes for each connection sub category.

**Table 6.12 Forecast new connections**

| | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | Total |
|---|---|---|---|---|---|---|
| E-G | 781 | 781 | 781 | 781 | 781 | 3,905 |
| New estates | 1,629 | 1,752 | 1,752 | 1,752 | 1,548 | 8,433 |
| I&C | 123 | 126 | 129 | 132 | 136 | 646 |
| Medium density | 1,521 | 1,686 | 1,686 | 1,686 | 1,584 | 8,163 |
| **Total** | **4,054** | **4,345** | **4,348** | **4,352** | **4,049** | **21,148** |

Historical data provides information on the historical average number of activity for each connection including metres of main, metres of service[21] and the number of meters installed. ActewAGL Distribution uses this information, together with the core forecast, to provide a volume forecast. Unit rates are forecast using an approach analogous to the base step trend methodology used for opex.

ActewAGL Distribution uses the unit rates incurred in 2014/15. The ASA includes over 200 different activity rates to reflect different costs related to the type of connection and the circumstances in which it is installed (such as installing a main in a built-up area or where there is a common trench). By using data collated from invoices issued over the last 4 years ActewAGL Distribution has calculated the historical split of ASA unit rates for mains, services and meters for each connection category. Using this historical data combined with 2014/15 ASA unit rates, ActewAGL Distribution has derived a set of average unit rates for mains, services and meters for each category.

No step changes for mains and services have been applied. However, a step change for new requirements as part of NECF has been applied and is explained in appendix 6.05.

Together the forecast of volumes and average unit rates are combined to provide a forecast capex for these categories.

Meter data logger (MDL) costs for new medium-density connections are forecast separately using a four-year average number MDL per medium-density connection.

For I&C contract customers there is no typical mix of unit rates as mains extension lengths and diameters, service length and diameter and meter set size can vary widely and the number of connections each year is small and variable. Consequently, the cost of I&C contract connections is forecast as follows:

[21] Unlike networks in other jurisdictions, such as JGN's, ActewAGL Distribution's medium density connections mains include the internal main within the site of the villa complex. For some other networks the main stops at the property and feeds a relatively short service. Accordingly, the ActewAGL Distribution's mains connecting villas are typically longer. As a result, the average cost of mains for medium-density connections may be significantly higher than would be observed for other gas networks.

- the mains and services components are the average cost of each for the four years of the current access arrangement period, to 2013/14;
- the meters component is the average cost of I&C contract meters for the four years of the current access arrangement period to 2013/14; and
- this average includes the costs of design, procurement of components (meters, regulators, valves, etc), fabrication and installation of the meter set and the Metretek[22] systems for these customers.

#### 6.5.3.3 Capital contributions

Capital contributions are required from customers or land developers when the cost of connecting the customer or the new residential area is less that the net present value (NPV) of the additional revenue from the new customer or customers (net of incremental operating costs). The capital contribution is calculated to just ensure that the NPV of the new connection or connections is positive.

Typically, ActewAGL Distribution requires between 30 and 100 capital contributions each year from residential and I&C tariff customers. From time to time, capital contributions are required for larger contract customers. These contributions can be in excess of $1 million where a long main extension is required. In the current access arrangement period ActewAGL Distribution received large capital contributions for one contract customer and one residential developer. Excluding these large contributions, remaining capital contributions for the current access arrangement period amounted to $0.5 million.

***Estimation methodology***

ActewAGL Distribution forecasts the amount of capital contributions by taking the five-year average of capital contributions as a percentage of gross capex for each connection type and applying this percentage to the forecast capex for each connection type. ActewAGL Distribution has only forecast capital contributions for E-to-G, New Homes and I&C tariff connections based on historic patterns. ActewAGL Distribution is not forecasting any major extensions for contract customers or for residential developments. Consequently, there are no matching capital contributions forecast.

Table 6.13 provides the total capital contributions for the current access arrangement period and the average forecast for the next access arrangement period.

**Table 6.13 Capital contributions ($million, 2015-16)**

| | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | Total |
|---|---|---|---|---|---|---|
| Routine connections | 0.10 | 0.10 | 0.10 | 0.11 | 0.11 | 0.53 |

[22] Metretek is a meter data logging and communications device that is attached to the gas meter. This allows the daily consumption to be downloaded to the contract meter management system. Further detail is provided in appendix 6.10.4.

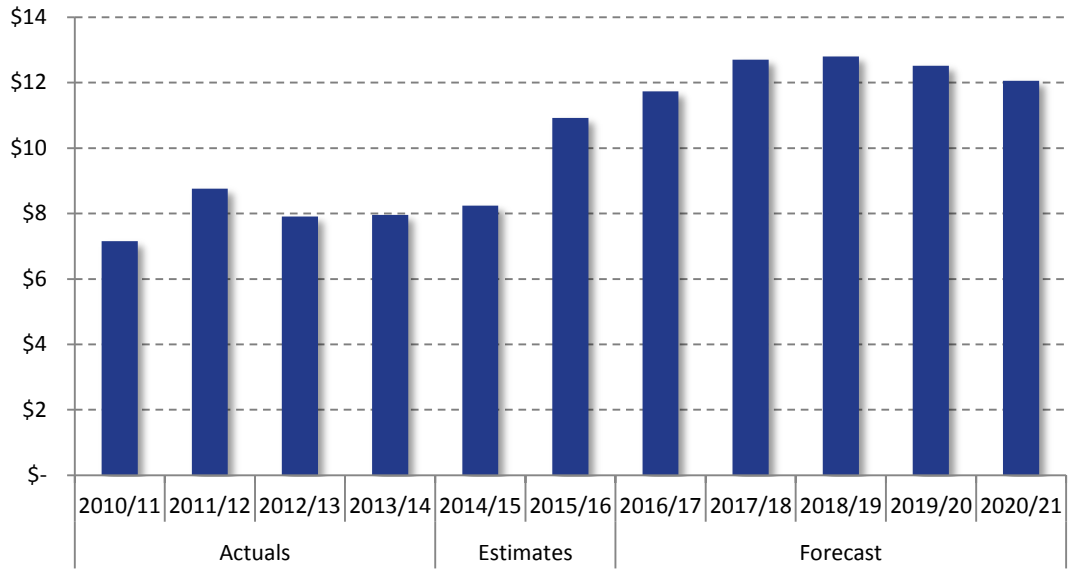
#### 6.5.3.4 Comparison against previous access arrangement period

Annual market expansion capex forecast for the 2016-21 access arrangement period is on average about 46 per cent higher than the average annual amounts incurred over the 2010-16 access arrangement period. Drivers of the increase (other than the reallocation of corporate overheads and price escalation include:

- a 15 per cent increase in the average annual number of connections forecast with, in particular, a 52 per cent increase in average medium-density connection numbers from 1,073 to 1,633 per year. Further details on the connection forecast are provided in attachment 3; and
- additional costs to comply with the NECF requirements and the changes in AEMO Retail Market Procedures to align with national business-to-business arrangements, see appendix 6.05.

Market expansion costs over the two access arrangement periods is shown in Figure 6.11. The forecast increase in medium-density connections drives the shift in capex between the 2014/15 and 2015/16 years.

**Figure 6.11 Market expansion (net capcons) capex over the two access arrangement periods, composition of actuals, estimates and forecast amounts ($millions, 2015/16)**




### 6.5.4 Capacity development

ActewAGL Distribution incurs capex to expand the capacity of the network (in terms of the peak hourly flow rate of the network rather than daily or annual throughput) of the gas network to maintain supply to existing customers and ensure the ongoing reliability and integrity of the network. This typically involves installing additional or higher capacity mains, and/or adding new pressure reduction stations or increasing the capacity of existing stations.

Capacity development projects are identified though a capacity development process which includes a series of analyses to inform ActewAGL Distribution whether a solution needs to be identified, and potential options. Once identified, further analysis of the projects and various options are considered consistent with the approach outlined in the asset management system and governance in place.

Key projects identified to occur in the 2016-21 access arrangement period include

- Molonglo Primary Extension – Stage 1;
- Molonglo Secondary extension – Stage 2; and
- West Belconnen Secondary Main.

These three projects make up over 80% of the forecast capacity development capex. Each of the capex projects are required to maintain the integrity of services and maintain the capacity to meet levels of demand for existing services. The Molonglo Primary extension is also expected to provide security of supply in the longer term, forming a link in a loop around the ACT. Capacity development projects also improve the safety of services because if the operating pressure drops below critical levels air can ingress into the system.

**Table 6.14 Forecast capacity development capex ($million 2015/16)**

| | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | Total |
|---|---|---|---|---|---|---|
| **Capacity development** | 3.21 | 5.56 | 2.91 | 6.99 | 1.22 | 19.89 |

Annual capacity development capex forecast for the 2016-21 access arrangement period is on average about 40% less than the average annual amounts incurred over the 2010-16 access arrangement period. The reduction in capex reflects the smaller number of projects identified to be required and the variation in the need for augmentation of the network over time.

***Justification***

ActewAGL Distribution invests in capacity development projects to provide supply security and maintenance of supply reliability, pursuant to Rule 79(2)(c)(ii); and to maintain capacity to supply existing services. This expenditure is justified under Rule 79(2)(c)(iv).

***Drivers***

Demand forecasts for purposes of capacity development capex are derived by JAM's capacity planning group using a range of data including pressure monitoring and network modelling. This forecasting exercise is separate to the forecasting of throughput and new connections undertaken by Core Energy. These forecast are being developed separately for the following reasons.

The demand, energy and connection forecasts developed by Core Energy are for the whole of ActewAGL Distribution's network and are designed to reflect the range of macro factors that affect annual energy, demand and connections. Capacity development forecasts are a function of peak demand in specific network segments where capacity is forecast to be constrained and a solution is required. Accordingly, the capacity development forecast reflects demand growth in specific network segments, which is not characteristic of the network as a whole. Some segments of the network will be relatively immature with significant growth from new customers as new

estates are connected. Other segments will be more mature and demand growth will be much lower.

The demand being considered in each local segment is not the annual demand, but the peak winter demand. Experience shows that peak usage is growing at a higher rate than annual usage as customers replace their appliances with more efficient models. This is particularly true where instantaneous hot water units are replacing storage hot water units. Instantaneous hot water units are inherently more efficient than storage units because water is only heated to the required temperature (typically round 40 degree Celsius) rather than the storage temperature (typically 65–80 degree Celsius) and because it is heated as it is used rather than stored, thus avoiding heat loss during storage. ActewAGL Distribution expects that in areas where there is significant new estate development, demand will be peakier as customers install modern high-efficiency gas appliances. In contrast, more mature areas will see a progressive replacement of older, less efficient gas appliances with more efficient high demand capacity ones.

Peak load growth is driven by changes in the consumption 'profile' (usage of gas across time) of existing customers as a result of appliance changes or additions. For example, continuous flow hot water appliances are characterised by peakier consumption than the storage hot water heaters installed historically. Peak load is also impacted by the number of connections to the network.

The capacity planning process uses the following inputs and analyses:

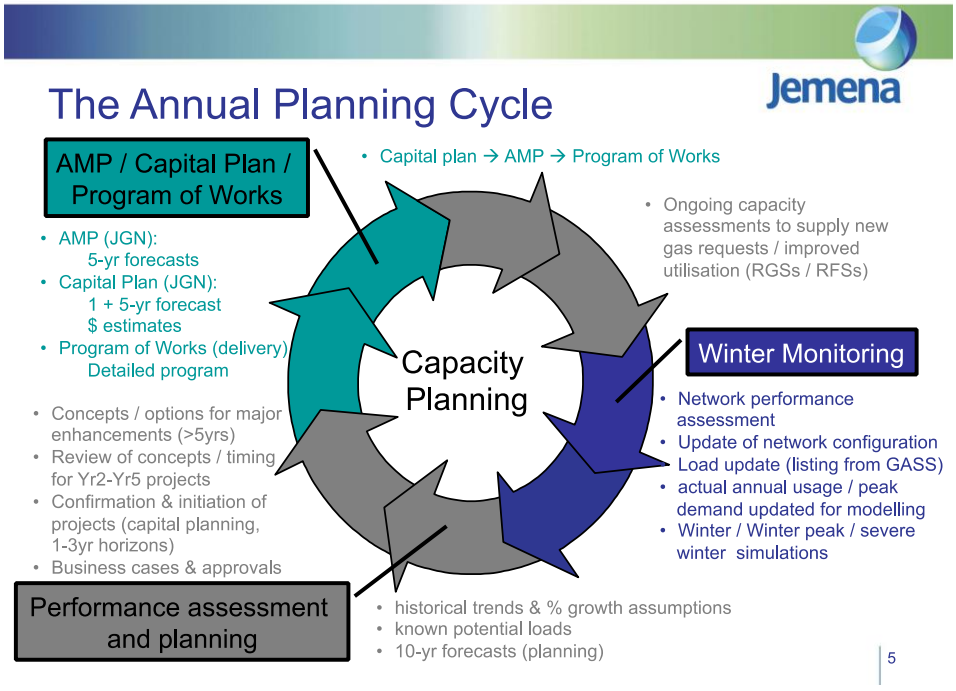
- network pressure monitoring – collecting data from SCADA and telemetry and winter pressure gauging;
- local network forecasts – includes top-down and bottom-up forecasts, load and customer growth trends in established and developing areas;
- review of gas supply requests;
- review of poor/loss of supply statistics; and
- network modelling, including validation against actual measurements and forecast.

Outputs of the capacity planning process are:

- risk-based capacity assessments based on network monitoring and modelling;
- capacity development plans for short-term (two-year program of works), medium-term (six-year Asset Management Plan) and long-term conceptual plans (20 years). These plans are aggregated and summarised in the Capacity Development Strategy and Plan (appendix 6.03);
- annual review and confirmation of timing for prudency assessment;
- consideration of staging options; and
- capacity management reviews for winter peak management, provision of operational support and recommendations for improvement of network utilisation.

The capacity planning process occurs over an annual planning cycle that provides timely updating of plans and management of capacity development investment decisions. As new information comes to light, ActewAGL Distribution adjusts its capital plan to ensure that all solutions delivered (if required) are prudent and efficient. The capacity development process and annual planning cycle undertaken by JAM on ActewAGL Distribution's behalf, is set out in Figure 6.12.

**Figure 6.12 Capacity development process and annual planning cycle**




***Estimation methodology***

Cost estimating processes for individual projects are set out in Section 6.5.2.3 above.

ActewAGL Distribution's forecast capex also includes a minor capital allocation for capacity development projects. This allocation is for small projects that typically involve less than 100 m of pipe for interconnections that will expand the capacity of a local area of network. The projects are identified on an as-needs basis, most often in response to low local pressures during the winter peak season. These allocations are estimated on the basis of the previous five years expenditure for minor capital allocations for capacity development, which is considered reasonable because actual annual expenditure tends to be reasonably consistent over time.

***Comparison against previous access arrangement period***

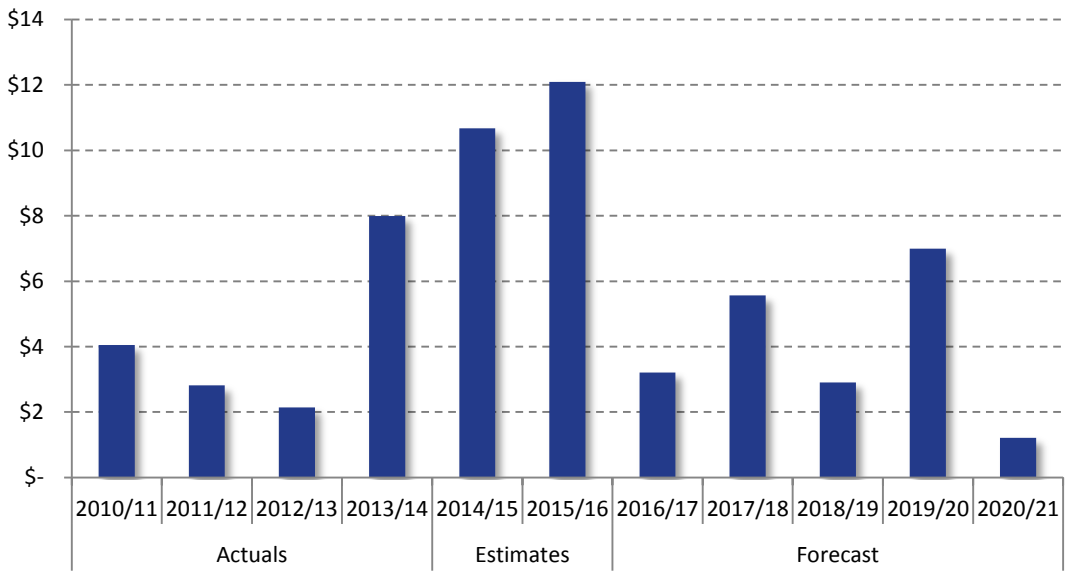
Forecast capacity development capex in the 2016-21 period is 40% lower than in the 2010-16 access arrangement period. This difference is largely due to there being a reduced need for major capacity development projects over the next access arrangement period, as shown in Table 6.15.

**Table 6.15 Profile of capacity development projects in each access arrangement periods**

| | 2010-16 | | 2016-21 | |
|---|---|---|---|---|
| Project size ($) | Number | Value ($m, '15/16) | Number | Value ($m, '15/16) |
| >1,000,000 | 5 | 24.3 | 3 | 16.7 |
| 200,000 - 1,000,000 | 5 | 1.4 | 7 | 2.1 |
| <200,000 | 28 | 1.2 | 17 | 1.1 |

The variability in the number of major capacity development projects reflects the variation in the need for augmentation of the network over time. This need for augmentation is dependent on the level of capacity utilisation in the various sub networks that make up the overall network. Coupled with the variability in the number of the major capacity development projects, this can create significant swings in capacity development capex required from one access arrangement period to the next. This can be observed in Figure 6.13 which shows actual and estimated capex for the 2010-16 access arrangement period again forecast capex.

**Figure 6.13 Capacity development capex over the two access arrangement periods, composition of actuals, estimates and forecast amounts ($millions, 2015/16)**




### 6.5.5 Stay in business

The stay in business category comprises capital expenditure on upgrading, renewing and replacing assets to meet regulatory obligations and ensure the safe and reliable operation of the network. Stay in business capex over the 2016-21 access arrangement period, has two components.

- *Network renewal and upgrade* – related to the replacement and upgrade of network infrastructure (mains and facilities) to facilitate changes to ensure the reliable transport of gas through the ACT network, to ensure the integrity of the gas network infrastructure and replace any outdated equipment. The biggest project ActewAGL

Distribution plans to undertake is to replace inlet piping at eight sites to improve the safety.

- *Meter renewal and upgrade* – the replacement of meters and associated equipment as it reaches the end of its economic life (or is found to be defective) to ensure the safety of customers and accurate customer billing. ActewAGL Distribution is forecasting an increase in these costs because a significant number of meters first installed during the 1990s are reaching the end of their life.

Forecast stay in business capex, by sub category, is presented in Table 6.16.

**Table 6.16 Forecast stay in business capex ($million, 2015/16)**

| | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | Total |
|---|---|---|---|---|---|---|
| Network renewal and upgrade | 4.13 | 5.33 | 5.06 | 1.10 | 1.63 | 17.23 |
| Meter renewal | 3.10 | 2.86 | 3.55 | 3.49 | 3.20 | 16.20 |
| **Total** | **7.23** | **8.18** | **8.60** | **4.59** | **4.83** | **33.43** |

***Comparison against previous access arrangement period***

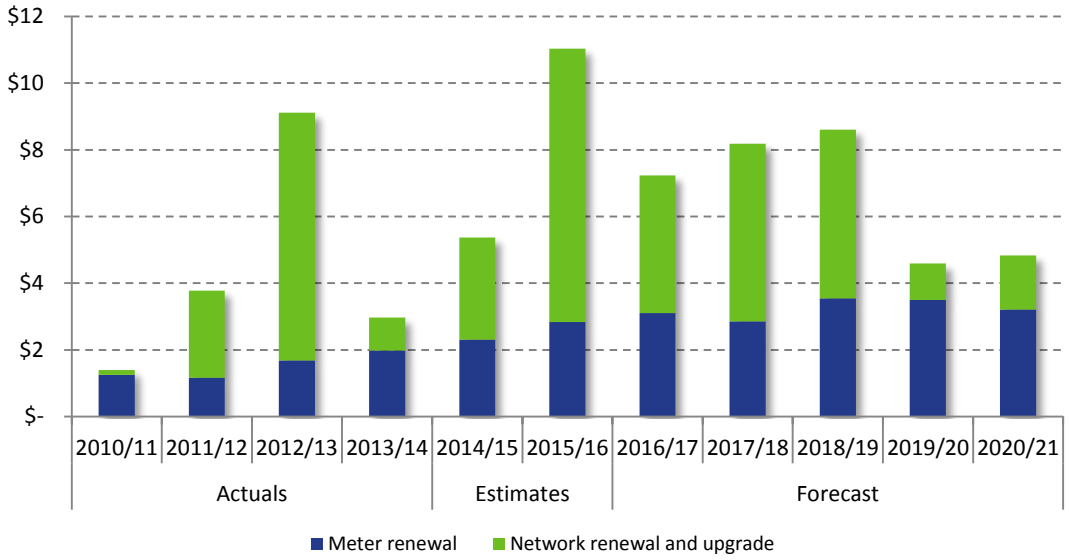
Overall, forecast average annual stay in business capex for 2016-21 is about 19% higher than in the 2010-16 period, as shown in Table 6.17.

**Table 6.17 Annual average stay in business capex in each access arrangement period ($millions, 2015/16)**

| | 2010-16 | 2016-21 | % variance |
|---|---|---|---|
| Network renewal and upgrade | 3.73 | 3.45 | -8 |
| Meter renewal | 1.87 | 3.24 | 73 |
| **Total** | **5.61** | **6.69** | **19** |

The increase is driven by the steady increase in meter renewal costs which corresponds to the greater number of meters reaching the end of their economic lives. Network renewal and upgrade costs are lower, reflecting the variability in this category of expenditure. The steady trend in metering capex and variable network renewal and upgrade costs can be seen in Figure 6.14.

**Figure 6.14 Stay in business capex over the two access arrangement periods, composition of actuals, estimates and forecast amounts ($millions, 2015/16)**




### 6.5.5.1 Network renewal and upgrade

Construction of ActewAGL Distribution's network began in 1980 with commissioning in 1982. The network is constructed from modern materials including cathodically protected high-tensile steel and high-quality polyethylene and Nylon 11. The jointing systems involve welding type systems that do not require the use of seals, and are considered leak tight. ActewAGL Distribution's network is relatively young. However, there is a range of activities that are necessary to maintain the reliability of supply and ensure security of the network.

This category of capex covers a range of activities related to condition assessment, refurbishment and replacement of facilities, pipes and large customer meter sets and addition of isolation valves based on risk assessments to maintain the safety and integrity of services. It also includes capex on electrical, instrumentation and communication equipment, which have shorter asset lives than most facilities and pipes. ActewAGL Distribution also includes third party relocation costs in this category.[23]

Key projects required over the 2015-21 access arrangement period include:

- inlet piping rectification (see Box.2);
- Watson custody transfer station pressure limiting station;
- Canberra primary main integrity digs;

[23] In a majority of cases, the cost of relocation is covered by the third party seeking the relocation. However, ActewAGL Distribution cannot recover the cost when it does not have the right guaranteeing the location of its assets, (e.g. on leased land or privately held land where no licence or easement exists).

- ACT facilities compliance upgrade program; and
- Hoskinstown to Fyshwick integrity digs.

Other projects include:

- intelligent pigging;
- validation and integrity digs;
- pigging facilities;
- station renewal and upgrades (mechanical);
- electrical and instrumentation renewal and upgrades;
- on-site communications equipment renewal and upgrades;
- isolation valves resulting from risk assessments (typically primary and medium-pressure systems);
- security fencing; and
- industrial and commercial meter set renewal and upgrade.

The forecast capex for network renewal and upgrade is set in Table 6.18.

**Table 6.18 Forecast network renewal and upgrade capex ($million, 2015/16)**

| | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | Total |
|---|---|---|---|---|---|---|
| **Network renewal and upgrade** | 4.13 | 5.31 | 5.06 | 1.08 | 1.63 | 17.20 |

ActewAGL Distribution's network renewal and upgrade capital expenditure forecast includes projects that have previously been treated as operating expenditure:

- in-line inspection (pigging) with associated validation digs; and
- integrity digs.

These activities do not produce a fixed asset, but are undertaken on a periodic basis, typically every ten years, and their value is in confirming the design life, directing any remedial work necessary and enabling the life of the pipeline to be extended. The benefits of these activities are realised over the period between each round of activity. It is normal statutory accounting practice to capitalise these activities. The AER accepted this change from expensing pigging to capitalising these costs for JGN.

***Box 2. Inlet piping rectification***

Since its introduction to the ACT in 1982, natural gas has been supplied to shopping malls from either a secondary or medium-pressure main. A boundary regulator, located outside of the shopping centre, reduces the gas pressure. The pipework downstream of the boundary regulator is located within the building premises, supplying gas to a number of commercial customers, mainly food halls. This section of main from the boundary regulator to the customer meter set is referred to as 'inlet piping'. The inlet piping includes the branches of main supplying the customers' meter sets. Since May 2013, the inlet piping has been part of ActewAGL Distributions gas network as a result of changes to the Gas Network Boundary Code.

ActewAGL Distribution is forecasting expenditure to replace the inlet piping across eight different sites. The expenditure included relates to the assessment and design combined with works to the meter sets and associated ring main. The justification for this expenditure is as follows.

Firstly, in 2013 a formal safety assessment, as required by AS 4645, was conducted on inlet piping as part of ActewAGL Distribution's gas network. It was identified that the safety of the network should be improved to reflect the most recent approaches to gas network management. Principally this involves replacing the pipework to ensure a lower (and therefore safer) gas pressure to be reticulated. Accordingly, the expenditure is justified as it improves the safety of services (Rule 79(2)(c)(i)). Compliance with Australian Standard 4645 is also required under the Gas Safety and Operating Plan Code, a technical code governed by the *Utilities (Technical Regulation) Act 2014* (ACT). Accordingly, the expenditure is justified under Rule 79(2)(c)(iii).

Lastly, in July 2013, the Gas Service and Installation Rules Code required the Gas service and Installation rules to require that no new gas meter set equipment shall be installed into an existing internal gas installation. Any alteration to the configuration of existing gas meter set installations, other than the gas meter, will require the relocation of the gas meter set installation to an external location. As a result, if ActewAGL Distribution needs to replace equipment other than meters such as the regulator, gas cannot be supplied until the gas meter set installation has been relocated, which could take weeks and could impact on other customers using gas in the shopping centres. To maintain the integrity of services, the internal gas meter set needs to be moved externally in advance of an equipment failure. This project is therefore also justified as it is required to maintain the integrity of services (Rule 79(2)(c)(ii)).

ActewAGL Distribution is forecasting a total cost for the project of $7.1 million, with $2 million to be incurred in the 2010-16 access arrangement period.

Cost estimates for the ring mains rectification have been based on advice from a building services consultant for the three largest shopping centres and a scaled estimate for the smaller shopping centres.

***Justification***

Network renewal and upgrade capital expenditure is justified under Rule 79(2)(c)(i) – (iv) as it is required to maintain the integrity and safety of ActewAGL Distribution's network and to ensure continued provision of existing services. The expenditure is also required to comply with obligations under the *Utilities Act 2000* (ACT), including the *Gas Safety and Operating Code*, and the *Gas Supply 1996 Act* (NSW), including the *Gas Supply (Safety and Network Management) Regulation* that call up AS 4645 and ActewAGL Distribution's approved Safety and Operating Plan, and obligations under the *Pipeline Act 1967* (NSW) and the *Pipeline Regulations* (ACT) that call up AS 2885.

***Estimation methodology***

Cost estimates for network renewal and upgrade are developed as part of either an Enhanced Opportunity Brief or a Feasibility Assessment, depending on the complexity and size of the project. Any projects greater than $200,000 are costed using the Project Estimation Manual.

This category also includes a minor capital allocation for reactive minor renewal projects typically below $100,000. These arise from time to time and are not part of a planned facilities renewal or upgrade project.

***Drivers***

The main drivers of capex on network renewal and upgrade are the aging of the assets and increasing safety and environmental obligations as described below.

- *Useful life* – Key assets affected are the pressure reducing stations (TRS, primary regulating stations (PRS), secondary district regulating sets, and I&C meter sets) for which key equipment has reached the end of its useful life and needs replacing. Useful life is informed by:
    - the age at which the risk of failure of equipment reaches a level where it may impact adversely on supply reliability, safety or environmental impact;
    - by manufacturers of equipment ceasing to provide spare parts and other maintenance support making equipment obsolete; and
    - new technology emerges that provides a saving in operating costs that will offset the capital expenditure over time.
- *Integrity management* – integrity management is the process of assessing the integrity of assets to determine if remedial work is required. A large component of this work focuses on the mains and facilities operating above 1,000 kPa and covered by AS 2885. The main assets are the Primary and Trunk Mains, TRS and PRS. The capex projects are:
    - installation of pig launchers and receivers, which enable in-line inspection of high pressure pipelines (in ActewAGL Distribution's case its Primary and Trunk Main Systems);
    - intelligent pigging (in-line inspection) and validation digs, which enables assessment of the condition of ActewAGL Distribution's high pressure pipelines

(validation digs involve the excavation at selected sites to validate the results of in-line inspection);

- integrity digs enables assessment of the condition of ActewAGL Distribution's high pressure pipelines where pipeline configuration prevents the use of intelligent pigging;
- reviews of the state of compliance of mechanical, electrical and instrumentation to a range of standards applicable to high-pressure gas facilities, together with any corrective works and updating of documentation assessed as being required by the review; and
- security upgrades as indicated by periodic reviews.

- *Public safety* – public safety is a driver for installation of isolation valves
  - on the primary mains system to enable management of this system through isolation of supply failures in the event of an emergency; and
  - medium-pressure network, where it traverses or supplies zones of high community risk (typically near shopping centres and schools or bushfire zones) so that the area can be isolated in the event of a main failure.

***Comparison against previous access arrangement period***

Forecast network renewal capex in the 2016-21 period is about eight per cent lower than in the 2010-16 access arrangement period.[24] The difference is largely due to less projects which need to be undertaken over the next access arrangement period, as shown in Table 6.15.

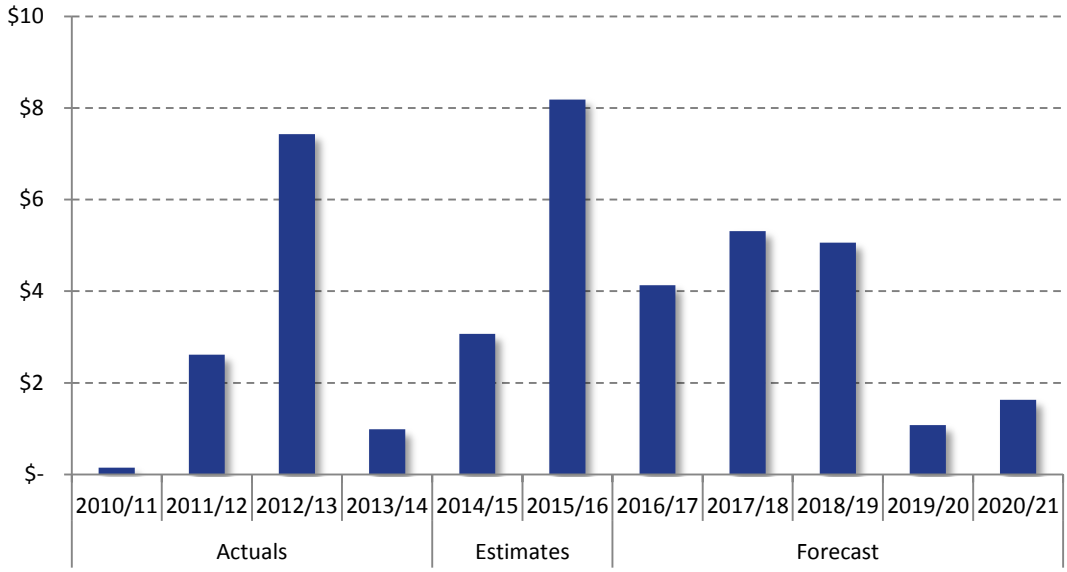
**Table 6.19 Profile of network renewal and upgrade projects in each access arrangement period**

| | 2010-15 | | 2016-21 | |
|---|---|---|---|---|
| Project size ($) | Number | Value ($m '15/16) | Number | Value ($m '15/16) |
| >1,000,000 | 2 | 10.5 | 5 | 11.2 |
| 200,000 - 1,000,000 | 5 | 2.4 | 10 | 5.1 |
| <200,000 | 24 | 1.4 | 2 | 0.2 |

As with capacity development, this category tends to be variable with specific major projects largely determining the overall expenditure profile. In addition, network renewal and upgrade capex include a wide variety of types of expenditure as described above. Some of these items will be reasonably regular whereas others will either be periodic (say every five to ten years) or one off. The overall result is that network renewal and upgrade capex can vary between access arrangement periods.

[24] Average annual capex in the 2010-16 access arrangement period is estimated to be $3.7 million while average annual capex in the 2016-21 access arrangement period is forecast to be $3.4 million.

**Table 6.20 Network renewal and upgrade capex over the two access arrangement periods, composition of actuals, estimates and forecast amounts ($millions, 2015/16)**




### 6.5.5.2 Meter renewal

ActewAGL Distribution replaces and upgrades meters and related equipment (includes filter /regulator or separate filter and regulator, data logging or telemetry equipment where applicable) when necessary to maintain the integrity of measurement of gas delivered and/or the safety of the metering installation. This ensures accurate metering of gas delivered necessary for customer billing. Forecast capex for meter renewal is set in Table 6.21.

**Table 6.21 Forecast meter renewal capex ($million 2015/16)**

| | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | Total |
|---|---|---|---|---|---|---|
| **Meter renewal** | 3.10 | 2.86 | 3.55 | 3.49 | 3.20 | 16.20 |

***Justification***

Meter renewal capex is required to replace aging and degrading meters and to meet the requirements of the *Utilities Act 2000* (ACT) and *Gas General Metering Code* administered by the ACT Environment and Planning Directorate, and the NSW Department of Fair Trading which administers the regulation for NSW. Accordingly, it is justified as conforming capital expenditure under rules 79(2)(c)(ii), 79(2)(c)(iii) and 79(c)(iv). ActewAGL Distribution has adopted the best practice of AS 4944 to ensure compliance.

***Drivers***

Meter renewal capex is driven by the volume of meters reaching the age at which they will fail the regulatory requirements for accuracy.

ActewAGL Distribution manages residential gas meters in accordance with the requirements of AS4944. This standard requires replacement of meters after 15 years unless granted a life extension. Life extensions are allowed, and advised to the Environmental and Planning Directorate for ACT customers and the NSW Department of Fair Trading for NSW customers, on

the basis of statistical sampling studies. Residential meters typically remain within the statutorily required limits of accuracy for up to 20 and 25 years. However, beyond this age a sufficient number become inaccurate to require their replacement to be confident of complying with AS4944.

Residential meters are divided into 'like families' for statistical sampling. This is undertaken on an annual basis, with families retested each year for meters reaching their 'in-service' test life. Based upon the test results the next 'in-service' test is reset for these families. JAM has been undertaking this statistical testing of various meter families for many years and thus has an understanding of the potential for the various families test results to lead to an 'extension of life'. The forecast for the meter replacement capital for the residential and I&C diaphragm is based upon Jemena's experience with the statistical sampling of the meter families that over the course of the 2016-21 access arrangement period will reach a 'in-service' test life. As each family is retested on an annual basis there is a potential for families that have historically not been eligible for 'life-extension' to become eligible and vice versa.

Other meters for I&C customers (diaphragm, rotary or turbine) are replaced at frequencies that reflect their aging characteristics.

Electronic equipment used to collect and transmit meter data for large customers (Mercury/Metreteks) and high and medium-density residential customers (MDLs) are replaced on a planned basis for reasons of technical obsolescence, typically when 15 years old and where they fail before reaching their economic life.

In summary, replacement activity is largely planned but with some breakdown replacement. This category of expenditure does not include new meters installed as part of new connection work. Capex on new connection meters is included in the market expansion category.

The specific frequency of meter replacement varies depending on the type of meter as follows.

- *Residential diaphragm meters and regulators* – replaced on reaching 20 years or 25 years of age depending on meter type, plus defective meters and meters removed as part of the residential meter statistical sampling program. Meters are also replaced when they fail, either as a result of a customer requested test or as they become non-registering. Approximately 60 per cent of filter/regulators are replaced at the same time as the meters. Some 29,943 residential meter replacements are forecast for the 2016-21 access arrangement period compared with 18,621 for the period 2010/11 – 2014/15.
- *Residential hot water meters* – ActewAGL Distribution has identified systemic deterioration of certain makes of hot water meters that is causing rapid decline in accuracy. Accordingly, ActewAGL Distribution has a six-year plan to replace about 5,043 aging and prematurely defective hot water meters, based on replacing an average of 840 meters each year.
- *I&C diaphragm meters* – The majority of I&C meters are normally replaced after 15 years of service. Regulators are replaced as required. There is a small proportion of meters that have failing indexes as a result of corrosion and are therefore the subject of a

replacement program. These meters are also replaced when they fail. Some I&C meter installations are replaced as a result of customers reducing their load, moving from a rotary meter to a diaphragm meter.

- *Rotary meters* – rotary meters are replaced after 10 years operation unless the meter fails, in which case it will be replaced as soon as the failure is detected. Typically, these meters require regulators. Regulators are replaced as required.
- *Turbine meters* – turbine meters are replaced with refurbished meters every five years and when they fail. Typically these meters require regulators.
- *Meter data loggers* – replaced on failure or after 15 years due to a range of factors largely oriented around obsolescence. ActewAGL Distribution's Asset Management Plan includes planned replacement of the MDLs based on a detailed review of functionality, reliability and the costs of new available technologies as MDL units have been in place for almost 20 years and the technology has advanced greatly in that time. The modem component for the MDLs needs to be upgraded to communicate over the National Broadband Network.
- *Industrial and commercial gas volume correction equipment and modem (Mercury/Metreteks)* – are replaced on failure, in response to obsolescence or technological requirements, such as the impact of the introduction of the National Broadband Network, or changes in gas market requirements. Planned replacement for obsolescence of the current fleet of Metreteks will be complete in 2016/17.

Table 6.22 set out the pattern of anticipated meter replacements over the 2016-21 access arrangement period.

**Table 6.22 Forecast meter renewal volumes**

| Metering equipment | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | Total |
|---|---|---|---|---|---|---|
| Residential gas meters | 6,107 | 5,747 | 6,421 | 5,808 | 5,860 | 29,943 |
| Residential hot water meters | 625 | 706 | 1,113 | 1,338 | 795 | 4,577 |
| I&C Diaphragm gas meters* | 174 | 199 | 291 | 321 | 416 | 1,401 |
| I&C Rotary gas meters | 29 | 23 | 37 | 11 | 24 | 124 |
| I&C Turbine gas meters | 2 | 1 | 3 | - | 5 | 11 |
| MDL equipment # | 82 | 6 | 15 | 44 | 27 | 174 |
| Metreteks | 24 | 3 | 3 | 4 | 6 | 40 |
| **Total** | 7,043 | 6,685 | 7,883 | 7,526 | 7,133 | 36,270 |

Notes: *Defective I&C meters included with I&C Diaphragm meters
#Includes MDL communications

***Estimation methodology***

Meter renewal capital expenditure is forecast using the program estimation approach outlined in section 6.5.2.3.

Volumes are forecast based the age of meters and their economic lives. The majority of meters are replaced based on their age and remaining life, which is forecast for each meter family based

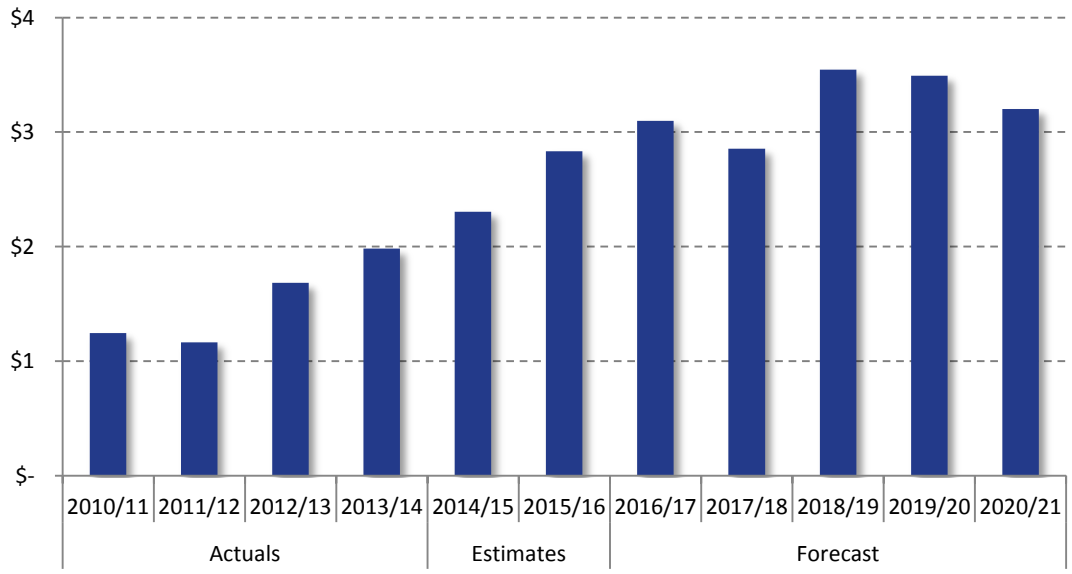
on the results of statistical sampling performed over the past five years. In light of the most recent statistical sampling the economic life of existing meters is not expected to go beyond 25 years. This process forecasts the number of meters requiring replacement to meet regulatory requirements. In addition the forecast includes numbers replaced as part of the planned statistical sampling process.

Unit rates are forecast using an approach analogous to the base step trend methodology used for opex. The cost for each replacement meter is based on the 2014/15 ASA rates. For a select number of unit rates costs have been added, such as the testing costs involved in statistical sampling for meters replaced as part of the statistical testing program. Similarly, ASA unit rates have not been used for complex meters installation for which there is no unit rate.

***Comparison against previous access arrangement period***

ActewAGL Distribution's meter renewal capital expenditure actuals and forecast for the 2010-21 period is set out in Figure 6.15. Average annual meter replacement capex is forecast to be 73% higher than in the 2010-16 access arrangement period.[25]

**Figure 6.15 Meter renewal capex over the two access arrangement periods, composition of actuals, estimates and forecast amounts ($millions, 2015/16)**




The growth in expenditure corresponds to the growth in meter replacement volumes shown in Figure 6.16.

[25] Average annual capex in the 2010-16 access arrangement period is estimated to be $1.9 million while average annual capex in the 2016-21 access arrangement period is forecast to be $3.2 million.

**Figure 6.16 Composition of actual, estimate and forecast meter renewal volumes**

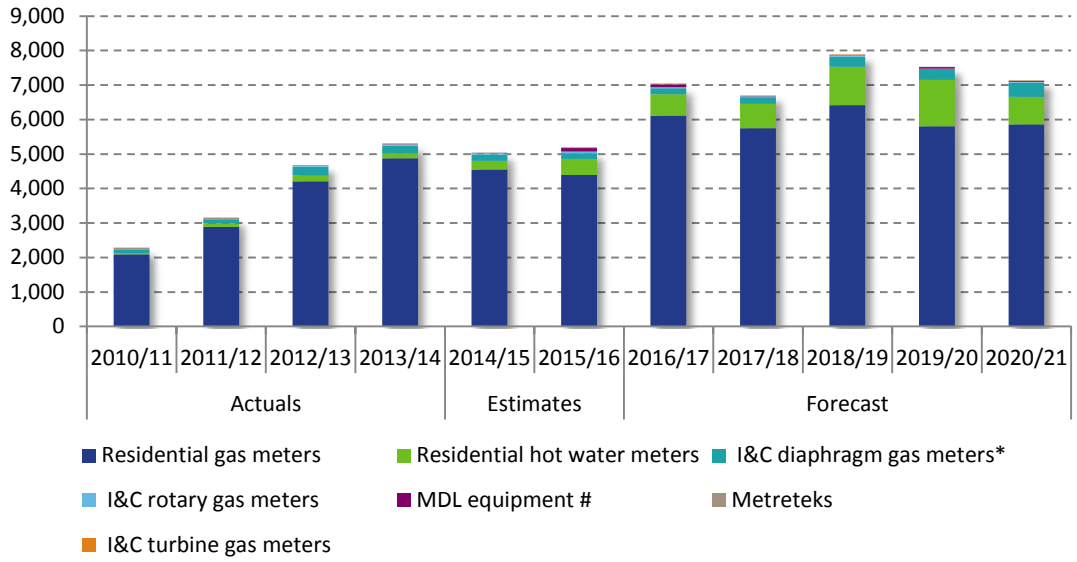



Figure 6.16 shows the impact of currently installed residential gas meters reaching the end of their economic lives over the 2016-21 access arrangement period. The increase in hot water meter replacements is the result of the six-year program to replace over 5,000 hot water meters experiencing marked deterioration.

### 6.5.6 Non-system capex

ActewAGL Distribution's GIS is a system for managing its electricity and gas network assets. GISs are sophisticated IT systems for organising data around their geographic location. This data can be displayed in map format, but this is only one of the ways in which the GIS can be used. The characteristics of network assets are captured as a database in the context of their geographic location. Use of a GIS streamlines processes that rely on network information. These processes include operations and maintenance activities and emergency management.

ActewAGL Distribution manages this system to take advantage of synergies in operating a single GIS across its electricity and gas assets. This is in contrast to other gas network specific systems where the greatest synergies are achieved by leveraging off JAM's systems.

The forecast capex for information technology is set in Table 6.23.

**Table 6.23 IT capital expenditure capex ($million 2015/16)**

| | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | Total |
|---|---|---|---|---|---|---|
| **Information technology** | 0.21 | 0.11 | 0.22 | 0.00 | 0.00 | 0.55 |

Capex for the GIS system in 2016-21 is to be directed to development of the GIS through connection of data to mobile devices (including use of GPS integration at the point of data capture) and assist in data access, transfer and alignment between ActewAGL Distribution and JAM. These changes will improve data accuracy through reduced translation errors.

***Justification***

ActewAGL Distribution's capex for GIS is necessary to maintain the integrity of services and improve the safety of services and is therefore justified under Rule 79(2)(c)(i) and (ii).

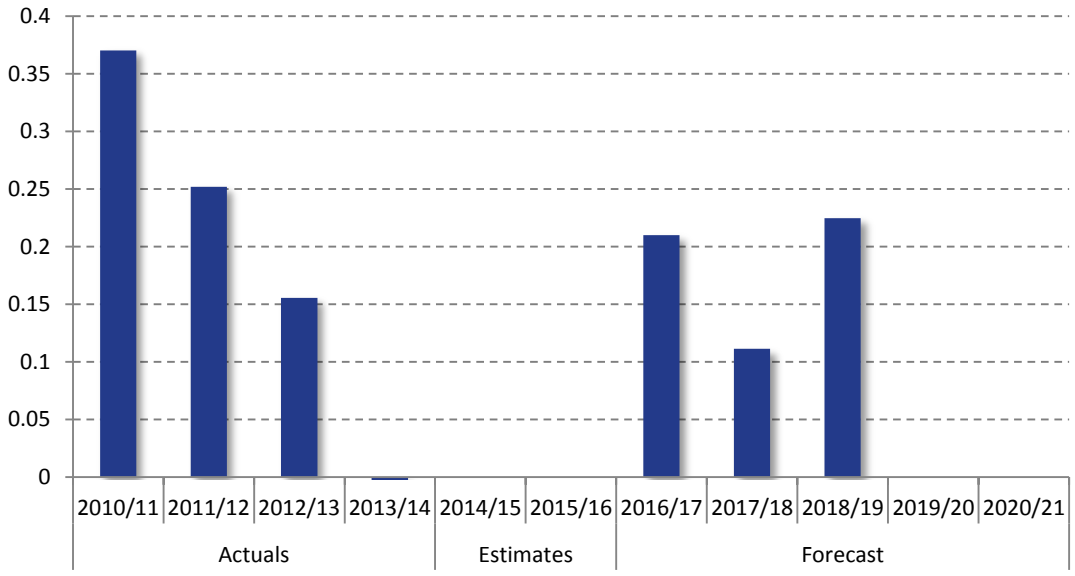
***Assessment and estimation methodology***

The costs estimates are based on estimates for the main system components gathered by ActewAGL Distribution's GIS/IT specialists.

***Comparison against previous Access Arrangement Period***

ActewAGL Distribution's GIS capital expenditure actuals and forecast for the period 2011-21 period is set out in Figure 6.17.

**Figure 6.17 Non-system capex over the two access arrangement periods, composition of actuals, estimates and forecast amounts ($millions, 2015/16)**




### 6.5.7 Corporate overheads

The capex model applies a forecast overhead allocation of six per cent across the forecast capital program to forecast. Further details are provided in appendix 5.4.

### 6.5.8 Forecast capex deliverability and capability

Forecast capex for the next access arrangement period is only slightly more than expenditure over the 2010-15 period. Nevertheless, JAM has confirmed it is able to undertake the proposed capital program.

JAM has assessed its organisational capability and reviewed the resourcing requirements for its proposed capex program. The assessment considers:

- organisational arrangements, including project governance and project management, key organisational roles and responsibilities, human resource management and

procurement management, and whether they are sufficiently well established and sufficiently resilient to cater for the requirements of the proposed capital program; and

- required resourcing levels, current level of resources and its ability to source the additional resources required.

***Box 3.Allowance for new development application processes***

As outlined in section 6.4.3, during the 2010-16 access arrangement period there have been delays in several large projects, leading to changes in the spend profile for capital expenditure, and also leading to an increased level of risk with respect to supply for ActewAGL Distribution's customers.

In order to mitigate these issues, ActewAGL Distribution has adopted a plan that has the front-end engineering and approval processes undertaken up to three years ahead of the proposed project construction schedule.

All projects that require a government development approval include consideration of the impact of the approval process on project timing and cost estimates. ActewAGL Distribution is developing processes that are designed to minimise the time and cost for the development approval process. This will involve closer commencing the development approval process well ahead of the planned construction and closer liaison with a number of government departments that are involved in the development approval process to anticipate requirements that can then be incorporated in the planning of projects.

The outcome of this assessment is the finding that JAM has the capability to manage the program and access to the resources necessary to deliver the proposed capital program. Further details on this assessment are provided in appendix 6.06.

### 6.5.9 Capex model

ActewAGL Distribution's capex model is developed to forecast ActewAGL Distribution's capex. The model builds the capital program by pulling together specific capital projects and sub-programs and taking into consideration real cost escalation and CPI inflation. Inputs to the model include:

- volumes and unit rates for low complexity routine programs;
- individually estimated project costs;
- the Construction Management Fee;
- ActewAGL Distribution corporate overheads;
- cost mix by capex category;
- real cost escalators; and
- CPI.

Inputs are taken through a series of transparent and traceable steps to develop the capex forecasts. The capex model is provided as appendix 6.04.1.

| Abbreviation | Full term |
|---|---|
| **ACT** | Australian Capital Territory |
| **AER** | Australian Energy Regulator |
| **AMP** | Asset Management Plan |
| **AS** | Australian Standard |
| **ASA** | Asset Services Agreement |
| **CAM** | cost allocation methodology |
| **capcon** | customer contribution |
| **capex** | capital expenditure |
| **CAM** | cost allocation methodology |
| **CMF** | construction management fee |
| **CPI** | Consumer Price Index |
| **DAMS** | Distribution Asset Management Services Agreement |
| **E&P** | Evans and Peck |
| **ECRC** | Energy Consumer Reference Council |
| **EGP** | Easter Gas Pipeline |
| **FA** | Feasibility Assessment |
| **GIS** | Geographic Information System |
| **GPS** | global positioning system |
| **I&C** | industrial and commercial |
| **JAM** | Jemena Asset Management Pty Ltd |
| **JGN** | Jemena Gas Networks (NSW) Ltd |
| **km** | kilometre(s) |
| **kPa** | kilopascal(s) |
| **m** | metre(s) / millions (when relating to financial information) |
| **MDL/MDLs** | meter data logger |
| **MIMI** | Multi-utility Integrated Meter Infrastructure project |
| **mm** | millimetre(s) |
| **NECF** | National Energy Customer Framework |
| **NPV** | net present value |
| **NSP** | Network Service Provider |
| **OB** | Opportunity Brief |
| **opex** | operating and maintenance expenditure |
| **PRS** | primary regulating station/s |
| **Rules, the** | National Gas Rules |
| **SCADA** | supervisory control and data acquisition |
| **TJ** | terajoule(s) |
| **TRS** | trunk-receiving station/s |
| **ZNX(2)** | ZNX (2) Pty Ltd |