Attachment 8.01

Public lighting overview

May 2014

Table of Contents – PUBLIC LIGHTING – Overview

Document and Amendment History

Version Number	Publish Date	Author	Summary of Changes
V2.0	10 March 2014	Phil McKee	Draft
V3.0	25 March 2014	John Bedding	Draft
V4.0	21 May 2014	John Bedding	Final

Summary of this chapter

Ausgrid's public lighting services encompass the provision, construction and maintenance of public lighting assets within its network area. Whilst public lighting services are separately identified and regulated, they are delivered by Ausgrid's network business, which enables economies to be made in forecasting, planning and operations. This ensures both public lighting services and network services are efficiently delivered.

This chapter describes:

- Regulatory framework in which public lighting operates;
- The methods by which Ausgrid delivers public lighting services;
- How Ausgrid makes investment decisions on new and replacement public lighting assets;
- The maintenance regimes in place for all public lighting assets;
- The various components of operational and capital expenditure;
- How the forecast costs of these activities meet the prudency and efficiency requirements set out in the National Electricity Rules (the Rules); and
- How the proposed prices for public lighting services are built up from Ausgrid's costs.

1. Introduction to public lighting

Public lighting is an essential service that promotes safety of communities and roadway users. Ausgrid is the largest operator of public lights in Australia and provides this service across its entire network area.

1.1 Snapshot of Ausgrid's public lighting business

Ausgrid provides public lighting services to over 90 customers including councils, community groups and government associations. There are over 240,000 public lights in Ausgrid's network area, which are typically installed on major and minor roadways. A conventional public light is usually made up of the following five components:

- ***Lamp:*** This is the device which produces the illumination. It is mounted inside the luminaire. A range of technologies are used in lamps.
- ***Luminaire:*** Provides the housing for the lamp. The luminaire protects the lamp and reflects and diffuses the light. This directs the light to the desired area of coverage, whilst ensuring stray light does not; for example dazzle motorists. Modern luminaires usually contain a photoelectric (PE) cell that automatically switches the light on at night time.
- ***Bracket:*** This supports the luminaire from a pole.
- ***Pole:*** This elevates the entire assembly above the ground. There are dedicated street lighting poles, but the majority of street lights are mounted on distribution poles.
- ***Connection:*** This is point where the electrical circuit of the public light is joined to the wider electrical network.

Lighting technology has evolved significantly over the past twenty years. Mercury Vapour lamps are now being replaced with more energy efficient High Pressure Sodium lamps on major roads and Ausgrid has recently begun to roll out Light Emitting Diode (LED) luminaires in residential areas. These new technologies each provide significant reductions in energy consumption and minimise the life cycle costs ultimately borne by public lighting customers.

Further information can be found in attachment 8.02 – 'An Introduction to Ausgrid's Public Lighting Business'.

1.2 Objectives of Public Lighting

Ausgrid's public lighting proposal is based on achieving a set of objectives which helps to ensure the prices proposed are reasonable for the level of service we offer. These objectives have been developed to provide an efficient and cost effective service to our customers while aiming to comply with the Public Lighting Code.

There are four key objectives:

1. ***Minimise total life cycle cost for Ausgrid and its customers***

   Ensuring that Ausgrid operates prudently and efficiently is fundamental to providing the required service at the lowest cost. This includes:

   - improving labour productivity;
   - reducing overheads through network reforms;
   - rationalising Ausgrid's lighting population; and
   - offering cost effective, energy efficient, lighting technologies.

2. ***Maintaining network performance as described in the Public Lighting Code***

   Attachment 8.04 – 'the NSW Public Lighting Code' (the Code), describes minimum performance standards and practices for the provision of public lighting services. This document references the Australian Standard (AS1158) for public lighting which details the illumination and other technical

requirements for various roadway scenarios. Ausgrid will be working towards meeting the targets of the Code throughout the 2014-19 regulatory control period.

3. Decrease complexity and provide more transparency to the customer

Currently, there are three categories of public lighting charges, capital, maintenance and residual charges:

- Fixed capital charge for assets installed prior to 2009;
- Annuity capital charge for assets installed post 2009;
- Maintenance charge that is applied to all assets; and
- Residual charges for assets replaced before the end of their economic life.

We have undertaken considerable analysis of other pricing options to attempt to reduce the price list from over 300 prices down to a standard list of prices for 24 services. We would like to work with the AER and our customers to develop our alternative to the AER's 2010 models to help provide pricing transparency and a simpler customer bill.

4. Cost reflective prices

Cost reflectivity at the highest level will ensure Ausgrid can recover the cost incurred in providing the public lighting service. It also means customers have a sound basis for decisions about technology and whether to seek an alternative third party to provide public lighting services.

1.3 Ausgrid's Public Lighting Management Plan

Ausgrid's Public Lighting Management Plan at attachment 8.05 has been prepared in accordance with the Code. This plan documents the objectives and strategies developed for the management of Ausgrid's public lighting assets. Ausgrid has forecast capital and operating expenditures that will enable the public lighting business to deliver many of the levels of service that are defined in the Code.

During the 2015-19 regulatory control period, Ausgrid intends to meet the requirements of the NSW Public Lighting Code, principally through the following actions:

- Routine maintenance of street lighting assets through bulk lamp replacement (BLR) every 30 months, throughout the network area;
- Spot maintenance as necessary, in response to reported faults, targeting the performance levels set out in the Code;
- Deployment of energy efficient lights (with the agreement of public lighting customers) to replace less reliable and high energy consuming luminaires; and
- Night patrols on main traffic routes as an alternative means to identify faults.

Ausgrid also intends to increase the BLR cycle to 36 months within the 2015-19 regulatory control period, with a view to further increase to 48 months after appropriate analysis has been undertaken on the effect of the roll out of new technology. The time frame in which Ausgrid moves to the longer cycle will be dictated by the roll out of these capital replacement programs. Further information on Ausgrid's intended capital programs can be found at attachment 8.08.

2. Regulatory requirements

Chapter 6 of the Rules governs how the pricing for network services is set and the responsibilities of the AER and the DNSP (Ausgrid). These requirements are applicable to public lighting services.

2.1 Classification of services

Public lighting is one of a number of services that have been classified by the AER as alternative control services under clause 6.2.2 of the Rules. Prices for public lighting services are separately determined from those for network services, which have been classified as standard control services[1]. Further, the AER has determined that the control mechanism that is to apply to Ausgrid's standard control services is a cap on the prices of individual services[2].

Ausgrid's response to the AER's proposed Classification of services is set out in attachment 9.2 'Demonstration of compliance with control mechanisms for standard control services and ancillary services' of this proposal. In summary, Ausgrid accepts the AER's proposed classification of public lighting services as alternative control services.

The AER has proposed the following control mechanism for alternative control services, to cap the prices of individual services[3]:

$$\bar{p}_i^t \geq p_i^t \qquad i = 1, \ldots, n \text{ and } t = 1,2,3,4$$

$$\bar{p}_i^t \geq \bar{p}_i^{t-1} \times (1+CPI_t) \times (1-X_i^t) + A_i^t$$

where:

$\bar{p}_i^t$ is the cap on the price of service *i* in year *t*

p_i^t is the price of service *i* in year *t*

CPI_t is the percentage increase in the consumer price index. To be determined in the final AER decision.

X_i^t is the *X*-factor for service *i* in year *t*. To be determined in the final AER decision.

$\bar{p}_i^0$ is the cap on the price of service *i* in the transitional regulatory control period. As specified in the transitional rules, $\bar{p}_i^0$ will be prices from the final year of the 2009-14 regulatory control period escalated by CPI.

A_i^t is an adjustment factor. Likely to include, but not limited to adjustments for residual charges when customers choose to replace assets before the end of their economic life.

Ausgrid has proposed prices and pricing parameters that comply with the AER's proposed pricing control mechanism.

2.2 Forecast expenditures

Clause 6.2.6 of the Rules establishes that a determination for alternative control services may utilise elements of Part C, in relation to a Building Block Determination for standard control services.

---

1 AER, *Stage 1 Framework and approach paper - Ausgrid, Endeavour Energy and Essential Energy - Transitional regulatory control period 1 July 2014 to 30 June 2015; Subsequent regulatory control period 1 July 2015 to 30 June 2019*, March 2013, p. 42.

2 Ibid., pp. 60-62.

3 Ibid., p. 60.

This proposal for public lighting as an alternative control service will not be subject to all of the provisions that apply to a building block proposal. Nevertheless, the AER is expected to subject the associated expenditures to a similar review process. Accordingly, this proposal has been designed to meet the following Rules requirements for supporting information that apply to a building block determination.

S6.1.1 Information and matters relating to capital expenditure

(2) the method used for developing the capital expenditure forecast;

…

(4) the key assumptions that underlie the capital expenditure forecast;

…

(6) capital expenditure for each of the past *regulatory years* of the previous and current *regulatory control period*, and the expected capital expenditure for each of the last two *regulatory years* of the current *regulatory control period*, categorised in the same way as for the capital expenditure forecast and separately identifying for each such *regulatory year*:

(7) an explanation of any significant variations in the forecast capital expenditure from historical capital expenditure;

S6.1.2 Information and matters relating to operating expenditure

(1) a forecast of the required operating expenditure that complies with the requirements of clause 6.5.6 and identifies the forecast operating expenditure by reference to well accepted categories such as:

(i) particular programs; or

(ii) types of operating expenditure (eg. maintenance, payroll, materials etc), and identifies in respect of each such category:

(iii) to what extent that forecast expenditure is on costs that are fixed and to what extent it is on costs that are variable; and

(iv) the categories of *distribution services* to which that forecast expenditure relates;

(2) the method used for developing the operating expenditure forecast;

(3) the forecasts of key variables relied upon to derive the operating expenditure forecast and the method used for developing those forecasts of key variables;

(4) the method used for determining the cost associated with planned maintenance programs designed to improve the performance of the relevant distribution system for the purposes of any service target performance incentive scheme that is to apply to the Distribution Network Service Provider in respect of the relevant regulatory control period;

(5) the key assumptions that underlie the operating expenditure forecast;

(6) a certification of the reasonableness of the key assumptions by the directors of the Distribution Network Service Provider;

(7) operating expenditure for each of the past regulatory years of the previous and current regulatory control period, and the expected operating expenditure for each of the last two regulatory years of the current regulatory control period, categorised in the same way as for the operating expenditure forecast;

(8) an explanation of any significant variations in the forecast operating expenditure from historical operating expenditure.

S6.1.3 Additional information and matters

(7) the Distribution Network Service Provider's calculation of the regulatory asset base for the relevant distribution system for each regulatory year of the relevant regulatory control period using the roll forward model referred to in clause 6.5.1 , together with:

(i) details of all amounts, values and other inputs used by the Distribution Network Service Provider for that purpose;

(ii) a demonstration that any such amounts, values and other inputs comply with the relevant requirements of Part C of Chapter 6 ; and

(iii) an explanation of the calculation of the regulatory asset base for each regulatory year of the relevant regulatory control period and of the amounts, values and inputs referred to in subparagraph (i);

2.3 Regulatory modelling

In the 2010 determination, the regulatory modelling of public lighting revenue did not use the building block approach set out in Part C of the Rules and the AER's PTRM, used for standard control services. Rather, the modelling approach for public lighting prices separately treated:

- Assets constructed prior to 1 July 2009, using an asset roll forward model;
- Prices for services provided after that date were derived using an annuity model; and
- Operation and maintenance costs[4].

Ausgrid proposes to retain the form of modelling used for the 2010 determination and has updated the 2010 models to reflect changes that have taken place in the intervening period.

2.4 Regulatory proposal

This chapter complies with Ausgrid's obligations concerning the submission of a regulatory proposal in relation to alternative control services. These obligations are set out in Rules clause 6.8.2, specifically:

- A demonstration of the application of the control mechanism set out in the Framework and Approach paper accompanied by the necessary supporting information (clause 6.8.2 (c)(3)); and
- Indicative prices for each year of the regulatory control period (clause 6.8.2(c)(4)).

2.5 Transitional proposal

As determined by the AER in the Framework and Approach paper, Ausgrid submitted a Transitional proposal for public lighting services to the AER for the 2014/15 year[5]. The AER made a Transitional determination in which it is anticipated that the current prices will be escalated by CPI.

2.6 Substantive proposal

This proposal for public lighting service prices constitutes Ausgrid's Substantive proposal for the regulatory control period from 30 June 2015 to 30 June 2019. It is accompanied by Attachments noted in this document and:

- Full pricing models for the regulatory control period (attachment 8.13 – Public Lighting Models); and
- Proposed public lighting prices (see price list at attachment 8.14 – Public Lighting Price List).

---

4 AER, *Final decision - EnergyAustralia distribution determination 2009–10 to 2013–14 Alternative control (public lighting) services*, 13 April 2010.

5 Ausgrid, Transitional Regulatory Proposal for 1 July 2014 to 30 June 2015, January 2014.

3. The current public lighting environment

Ausgrid's public lighting network has undertaken significant changes this regulatory period. This section highlights key issues that will be detailed in this submission.

3.1 Technical aspects of the current public lighting environment

Since the 2010 decision, Ausgrid has continued to upgrade its street lighting network by providing more energy efficient technology where it was proven to be cost effective. This reduces operational expenditure and the total life cycle costs associated with public lighting, which flows through to savings for public lighting customers.

Some key points that will be highlighted in this submission are summarised below:

3.1.1 Bulk lamp replacement cycle times

Scheduled maintenance includes bulk lamp replacement (BLR), pole inspection and routine tasks performed in conjunction with BLR such as cleaning of the visor.

Ausgrid currently perform bulk maintenance on a 2.5 year cycle. The AER's 2010 decision recommended that Ausgrid move to a 4 year BLR period for all High Pressure Sodium lamps on TRL roads and a 3 year BLR period for all other lamp types. Ausgrid believe that introducing two different BLR cycle times would reduce the economies of scale associated with having the BLR and instead focussed on introducing technology that would enable Ausgrid to ultimately move to a 4 year cycle for all lamp types. Listed below are the stages required for this to be achieved:

- Replace all high wattage Mercury Vapour luminaires with High Pressure Sodium equivalents
- Replace all Twin 20 florescent luminaires with current technology luminaires
- Introduce long life Mercury Vapour lamps for existing low wattage Mercury luminaires

Further information on the roll out of new technology can be found in the Public Lighting Investment Plans at attachment 8.08.

3.1.2 Increased level of unscheduled maintenance

Unscheduled maintenance (spot maintenance) occurs outside of the BLR. Spot maintenance is required when lamps or any other component fail prematurely. If the fault requires the replacement of a capital component i.e. luminaire, bracket or support, then this would be considered a capital expenditure.

Ausgrid has undertaken significant maintenance analysis of its major lamp types. This analysis has shown a much higher level of unscheduled maintenance being performed than was expected which represents a significant increase in unrecovered operational expenditure. Since this analysis was undertaken, certain technologies have been targeted to be replaced. Ausgrid has begun to replace these targeted technologies and it is the intention of this proposal that all underperforming and inefficient technology be replaced during the FY15 - FY19 regulatory control period.

These higher than expected failure rates are also hampering our efforts to increase the BLR cycle times. The optimal BLR cycle time is driven by technical constraints of the technology on the network and the financial constraints of the varying levels of spot maintenance associated with changing BLR cycle times. Increasing BLR cycle times increases unscheduled maintenance and until Ausgrid is confident that overall operational costs can be reduced Ausgrid will continue with its current maintenance regime.

Further information on this matter can be found in Attachment 8.12- Public Lighting Opex Forecast.

3.1.3 Introduction of new technology

Ausgrid has commenced installing High Pressure Sodium (HPS) luminaires equipped with "The Active Reactor" technology, which offers improved energy efficiency and lamp life compared with standard HPS fittings. These luminaires have been used to replace relatively inefficient high wattage mercury vapour

luminaires on traffic routes. Attachment 8.08 - Public Lighting investment plan summary contains details of the proposed rollout of these luminaires.

In 2011 Ausgrid undertook a trial of LED technology for residential roads. This trial was to determine the suitability of this technology for street lighting, gauge council and resident reactions and understand what problems may be encountered with its introduction. After trialling for 12 months Ausgrid decided, in consultation with it customers that LED technology would be a cost effective default luminaire for residential roads. The next stage of this trial will be to determine the suitability and cost effectiveness of this technology for main arterial roads.

Further information on Ausgrid's consultation with customers can be found at attachment 8.06 - Stakeholder engagement / customer consultation for public lighting.

3.1.4 Standardisation of luminaire range

Ausgrid has historically provided a variety of different light types including a range of lights designed for non standard or aesthetic purposes. As a result, Ausgrid has supplied and maintained a diverse population of light types, which complicates maintenance processes, stores inventories and the already complex billing arrangements for public lighting.

Ausgrid will continue to maintain these legacy non standard lights until they require replacement. At this time Ausgrid will consult with the customer to decide:

- Whether existing Ausgrid stocks of spare fittings exist, enabling the luminaire to be replaced; or
- Where no stocks of the decorative fitting are held, whether a luminaire from Ausgrid's standard range of fittings would be provided.

If the customer wishes to install a new decorative fitting, Ausgrid will decommission the existing fitting and the customer will become responsible for the provision and maintenance of the new decorative fitting as part of a privately metered installation.

More details can be found in attachment 8.05 - Public lighting management plan 2014-19 and the Policy for non-standard lighting in attachment 8.03.

3.1.5 Process improvements

Ausgrid has made a number of process improvements during the current regulatory control period:

- ***Electronic billing*** - Ausgrid provides electronic invoices and backing sheets to councils.
- ***Latitude / longitude*** - As part of the monthly extract of inventory data from the asset management system, the geographic co-ordinates are now included in the inventory list along with component and address information for each street light.
- ***Google based map reporting system*** - A Google maps-based tool was implemented in March 2014 to improve the service for Ausgrid customers who wish to report a streetlight fault. This is a simpler and more precise way for customers to report a streetlight fault. Ausgrid has been working on this project for a number of years.

  Further information on these and other process improvements can be found in attachment 8.07 – Public lighting process improvements.

3.2 Commercial aspects of the current public lighting environment

This proposal outlines the efficient costs of providing the standard public lighting services. These services are underpinned by our existing capital costs plus new capex and opex. Ausgrid's capex and opex forecasts include the ongoing maintenance of our lights and investment in programs to replace old lights with new technology. The tables below detail Ausgrid's capital and operational expenditure and the revenue received.

Table 1 - Public Lighting Capital and Operational expenditure ($M)

Expenditure	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
OPEX	15.8	18.8	19.7	19.6	19.7	20.7
CAPEX	19.0	15.6	15.6	15.1	18.7	16.9
TOTAL	34.8	34.4	34.4	35.2	38.0	37.6

Table 2 - Public lighting revenue ($M)

Revenue	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
OPEX	10.4		13.8	14.1	14.6	15.1
Capital returns	18.4	28.6#	26.5	27.7	28.7	30.4
TOTAL	28.8	28.6	40.3	41.8	43.3	45.5

* includes the return on and return of capital and is not directly comparable with the capex in table 1

the AER's 2009 determination mixed capital and operating costs so only total revenue can be shown here. It remade its determination in 2010, which allowed for separate revenue reporting.

3.2.1 Capital Expenditure

Capital expenditure has three main drivers, as follows;

1. **New Installations**

New installations are those where no public lighting previously existed. These arise from customer requests for additional lighting and are typically due to roadway augmentations or new housing developments. New installations represent the smallest amount of capital expenditure to Ausgrid as this work is typically deemed contestable and the capital cost component is customer funded.

2. **Reactive replacements**

Where an asset is no longer serviceable or where replacement parts can no longer be sourced, the asset will be replaced with the standard Ausgrid luminaire for the particular class of road or purpose. Reactive replacements are usually driven by customer and resident requests or fault reports.

3. **Proactive replacements**

Proactive (planned) replacements are driven by the need to replace all of a particular type of technology on our network. Typically this is to introduce more cost efficient technology that reduces operational cost for both Ausgrid and the customer. Customers may request an accelerated replacement of a particular technology however, they would be required to pay all residual costs associated with the technology being replaced and Ausgrid would need to consider the resources that may be required to undertake this request. Attachment 8.08 – Public lighting capex investment plan summary contains details of the proposed proactive replacements in the FY15 – FY19 regulatory control period.

3.2.2 New technology roll out

The majority of new and reactive replacement installations consist of installing more cost effective and energy efficient lighting. Table 3 summarises what technologies are currently being introduced into Ausgrid's network and the roll out to date.

Table 3 – New lighting technologies being introduced by Ausgrid

Existing Luminaire	Replacement Luminaire	Number Replaced
80W Mercury, Twin 20, 42W CFL	29W LED	3154
80W Mercury, Twin 20	42W CFL	43771
250W Mercury	150W HPS	800
250W Mercury	150W HPS Active Reactor	261
400W Mercury	250W HPS	9512
400W Mercury	250W HPS Active Reactor	289
700W Mercury	400W HPS	662
700W Mercury	400W HPS Active Reactor	124

Section 4 of this document details future capital expenditure and the basis on which the investment decisions are made.

3.2.3 Operational Expenditure

Operational expenditure is recovered on a year to year basis through public lighting maintenance charges intended to cover the cost of scheduled and unscheduled maintenance activities.

Table 4 summarises Ausgrid's operational expenditure and the number of luminaires that have undergone both scheduled and unscheduled maintenance during the 2009 - 2013 regulatory control period.

Table 4 - Operational expenditure FY10 - FY13 ($M)

	2009-10	2010-11	2011-12	2012-13	2013-14 (YTD)
Regulatory allowance	11.7	13.9	14.1	14.5	14.9
Actual Spend	18.8	19.7	19.6	19.7	19.9
Comprising:					
Maintenance undertaken on minor roads	86,083	85,035	80,359	90,552	84,103
Maintenance undertaken on major roads	38,499	37,939	39,474	39,753	38,052

During this period, Ausgrid's operational expenditure was in the order of 40% over the regulatory allowance for maintenance charges in the AER's 2010 determination. Ausgrid undertook a considerable study to determine the reason for this apparent overspend and it was found that this was primarily due to a higher than expected number of unscheduled maintenance tasks. Details of this analysis can be found at attachment 8.12 – Public Lighting Opex Forecast.

There are two main drivers of operational expenditure are described below:

1. **Scheduled Maintenance**

Scheduled maintenance includes bulk lamp and photoelectric cell (PE cells) replacement (BLR), steel lighting pole inspection, night patrols and routine tasks performed in conjunction with the BLR such as cleaning of luminaire visors. The BLR is currently performed on a 30 month cycle for lamps and a 60 month

cycle for PE cells. Ausgrid has adopted this strategy over this particular cycle time so that service availability and lighting levels are maintained and comply with the levels specified in the Lighting for public roads and spaces Australian standard AS1158 and in doing so minimise unscheduled maintenance costs associated with repairing failed lights and maintaining illumination levels.

2. Unscheduled Maintenance

Unscheduled maintenance comprises tasks performed in response to a reported fault or maintenance issue outside of the BLR. The most common unscheduled maintenance is spot lamp replacement or replacement of the PE cell. While staff are on site, an inspection is performed to check if any additional work needs to be performed. This inspection includes the rectification of:

- Lenses that are opaque or substantially discoloured, cracked, improperly secured, damaged or missing;
- Damaged or missing seals;
- Moisture within the luminaire;
- Damaged or corroded supports, luminaires, brackets or connections;
- Improperly aligned luminaire or brackets; and
- Any other circumstances or defects, which may affect the ongoing performance of the luminaire.

3.2.4 Forecast Expenditure

Forecast capital expenditure has been estimated by using historical new and replacement installations as well as the proactive capital replacement programs as described in attachment 8.08 - Public lighting capex investment plan summary.

Forecast operational expenditure has been determined using a cost build up method of all scheduled and unscheduled maintenance associated with the various lamp technologies. Further information regarding this build up can be found in attachment 8.12 – Public Lighting Opex Forecast.

Table 5 summarises the forecast operational and capital expenditure for the 2014-19 regulatory control period.

Table 5 – Forecast expenditure on public lighting services ($M)

Expenditure element	2014-15	2015-16	2016-17	2017-18	2018-19
Capex	20.5	25.9	16.8	10.7	9.2
Opex	19.4	19.9	20.5	21.3	21.8
Total	39.9	45.8	37.3	32.0	31.0

It should be noted that:

- The capex proposal is mainly based on assumptions concerning the rollout of energy efficient luminaires using new technologies. This is subject to acceptance by public lighting customers and represents an increase in activity in 2014/15 and 2015/16, followed by a progressive reduction in 2016-19.
- The opex forecast represents a continuation of the actual costs that Ausgrid currently incurs.

Forecast revenue based on the current population of public lighting assets and transitional FY15 pricing is tabled below.

Table 6 - Forecast Public Lighting revenue

Forecast Revenue ($M)	2014-15	2015-16	2016-17	2017-18	2018-19
Capex – Pre 09 Fixed charge	21.63	20.64	19.89	19.28	18.78
Capex – Post 09 annuity charge	3.25	4.94	5.07	5.19	5.32
Opex	15.24	19.85	20.46	21.09	21.74
Total	40.12	45.43	45.41	45.55	45.84

Table 7 represents estimated opex savings if the capital programs are carried out as per the intended schedule.

Table 7 Estimated reductions in operational expenditure if proposed capital programs are completed ($M)

	2014-15	2015-16	2016-17	2017-18	2018-19
Opex reductions	0.65	1.3	1.7	2.0	2.1

4. Investment in the public lighting network

This section describes the types of expenditure in public lighting, the reasons for this expenditure, and how our Public Lighting objectives guide those investment decisions.

4.1 Investment governance and planning

Ausgrid's governance procedures and documentation (which apply to both standard control services and alternative control services) are described in Supporting documentation, Ch 5 ID06709 – 'Capital planning + categories Network Investment governance framework'. This ensures the prudency and efficiency of Ausgrid's investment decisions in the provision of public lighting services.

Ausgrid's investment plans provide a practical demonstration of application of this investment framework including:

- Identifying triggers for investment;
- Linking to the Public Lighting objectives;
- Identifying future need; and
- Selecting the most efficient option.

4.2 Ausgrid's Procurement Process

The following criteria are considered in the course of establishing contracts for the provision of public lighting equipment and services.

4.2.1 Total lifecycle costs

Different technologies can vary significantly in both the initial capital cost and ongoing maintenance costs. Ausgrid takes this total lifecycle cost into consideration when evaluating the available technologies.

4.2.2 Supply position

Maintaining adequate supply whilst minimising the amount of product held in stores is critical to ensuring the cost effectiveness of Ausgrid's resources and security of supplies. Suppliers of product should have a strong financial position that enables them to hold enough stock to minimise lead times as well as fulfil any service level agreements that may be negotiated.

4.2.3 Customer considerations

Public lighting customers are consulted when new technologies are being considered. Their views are important in guiding the investment choice. Attachment 8.06 details Ausgrid's Stakeholder engagement / customer consultation for public lightingTechnical specifications

Ausgrid's technical specifications are written so that products procured are technically compatible with our network and that they meet the requirements of the relevant Australian and international standards. Specifically, lighting technology must be suitable for the target bulk lamp replacement cycle of 4 years. This criterion is assessed using manufacturers Lamp Survival Factor (LSF) which indicates the proportion of lamps that can be expected to fail after a given operating time, the Lamp Lumen Maintenance Factor (LLMF) which shows the reduction of light output by the lamp over its life and the Luminaire Maintenance Factor (LMF) which is the reduction of light output from the luminaire, from the build up of dirt on the inside and outside of the visor.

4.2.4 Quality Systems and accreditation

Ausgrid considers quality systems and accreditation to the relevant ISO 9000 series of standards for all suppliers.

5. Public lighting prices

In order to meaningfully charge customers, we need to convert the expenditure into prices which reflect the service being provided. The starting point is a basis for control which allows us to construct models to calculate the price. The inputs to the models are the key to ensuring all costs are accounted for.

5.1 Regulatory modelling

The goal of the regulatory models is to calculate the overall revenue requirements for the provision of public lighting services. Regulated revenue requirements are made up of a return on capital (financing costs), return of capital (recovery of depreciation expense), taxation liability and operational and maintenance costs.

For public lighting, there are three models being currently used to calculate the revenue requirements and hence public lighting prices. These are:

- ***Pre 2009 'Fixed' Capital Charge Model –*** this model rolls forward the regulatory asset base (RAB) with allowance for depreciation, indexation and assets that are written off. It calculates the return on and return of capital for each public lighting customer as well as the residual values of components that are replaced before the end of their economic life. There is no additional capital expenditure component;
- ***Post 2009 'Annuity' Capital Charge Model –*** this model derives an annuity charge for each asset, taking into account the capital cost, its expected service life and the Weighted Average Cost of Capital (WACC); and
- ***Opex cost build up model -*** contains a build up of costs associated with scheduled and unscheduled maintenance. Inputs to this model are based on Ausgrid's time and motion study, maintenance requirements analysis and the cost of labour, material and equipment associated with the maintenance of public lighting assets. These maintenance costs apply to both pre and post 2009 installed assets.

These models have been carried over from the 2010 determination with changes to inputs made to reflect the changes that have taken place in the intervening period.

5.2 Prices for public lighting services

Public lighting prices are split into operational (maintenance) and capital charges.

The capital charges are further split into the pre and post July 2009 installed assets.

Attachment 8.02 - An Introduction to Ausgrid's Public Lighting Business, details which components attract a capital or maintenance charge and attachment 8.14 – Public Lighting Price List, lists proposed prices for the FY14 – FY19 regulatory control period.

Throughout the coming regulatory control period Ausgrid proposes that public lighting price increases will be limited to CPI.

5.3 Ausgrid's Pricing Models

Ausgrid's public lighting proposal sets out to recover the efficient costs of providing the standard public lighting services. These services are underpinned by the existing capital costs plus new capex and opex. Our capex and opex forecasts include the ongoing maintenance of our lights and investment in programs to replace old lights with new technology.

The existing capital costs have been included in the roll-forward of a public lighting asset base, which has been carried forward from the AER's 2010 public lighting determination. As this only includes assets that were installed prior to 1 July 2009, new capital has not been added. This asset base has been depreciated and adjustments made for equipment that has been written off since 2010. The asset base has decreased from $140m in 2010 to $101m as at 1 July 2014. Attachment 8.13 – Public lighting models - Public Lighting Roll Forward Model 2010 to 2014, includes the calculations underlying this asset base value and attachment 8.13 – Public lighting models - Pre 2009 'Fixed Charge' model '2014 - details the allocation of the RAB to public lighting customers.

Ausgrid's prices for assets installed after 30 June 2009 include capital costs based on the annuity model from the AER's 2010 determination, which has been updated for the current inputs. As a result, there is no forecast for assets installed after 30 June 2009. See attachment 8.13 – Public lighting models - Post June 2009 Annuity Prices. Two key changes have been made to this model:

1. The allocation of labour to the installation of a luminaire and bracket has been split to better reflect the volumes of this work in reality. The 2010 determination split was 90% to the bracket and 10% to the luminaire. This did not allow for accurate cost reflectivity as brackets are not often replaced with luminaires and therefore only 10% of the labour is recovered in the annuity price when a luminaire is installed without a new bracket.

2. Overheads and on costs associated with capex, as well as a proportion of overtime labour has been included to better reflect the true costs associated with the installation of these assets.

Similarly, Ausgrid's opex forecasts are based on the AER's 2010 determination opex model updated for the most recent inputs. See attachment 8.13 – Public lighting models - Opex Cost Build up Model. Ausgrid has made two key changes to this model:

1. A flat rate of 25% overhead has not been assumed for each price. Instead, a percentage has been calculated, using the Ausgrid Cost Allocation Method (Supporting documentation for attachments 8.12 - Public Lighting Opex Forecast – 'Impact of Proposed CAM on Base Year' (ID00265) and '2014.04.29 Public Lighting Opex - Consolidated Supporting Figures v1' (ID00262)). On costs have been removed from the base labour rate, to ensure overhead costs have not been double counted.

2. Ausgrid has adopted actual historical asset failure rates, instead of the manufacturers' estimated lamp failure rates, to determine how much reactive maintenance will be required during the regulatory control period. This change is necessary, as Ausgrid has observed many more reactive repairs during the current regulatory control period than was assumed in the AER's 2010 determination. Previous failure rate modelling was based on manufacturer's claimed failure rates.

With the inclusion of these input changes, Ausgrid is confident that both Public Lighting capital and maintenance pricing is truly cost reflective to the service provided. Both the capital annuity and opex models have been used to reconcile capex and opex forecasts as well as historical expenditure.