Revised Proposal Attachment 8.07 Public Lighting Services

January 2019

Table of contents

1 Overview

We are proposing to apply a real (inflation adjusted) price decrease to all our public lighting prices in the 2019-24 regulatory period. We will also take action to install 125,000 LED luminaries, delivering a more energy efficient, environmentally friendly and cheaper way to operate public lighting service for our customers.

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 our entire network area.

Our public lighting service encompasses the provision, construction and maintenance of public lighting assets within our local network service network area. Public lighting services are separately identified and regulated but delivered by our distribution network business. This unlocks efficiencies in forecasting, planning and operations which are in the long-term interests of customers.

The AER's Draft Decision accepted our public lighting proposal. This is with the exception of adjustments to our allowed rate of return, labour escalators and luminaire failure rates. The AER also applied smoothing to our capital and maintenance charges and, in the process, accepted a zero X-factor for all lamp types.

We have considered submissions from stakeholders on our Initial Proposal and the AER's Draft Decision. This has resulted in Ausgrid revising our initial forecast for public lighting services. These revisions are summarised in the table below.

Table 1

Summary of our response to AER Draft Decision and submissions

	AER DRAFT DECISION / SUBMISSION	OUR RESPONSE
1. Failure rates	Both the AER and stakeholders had concerns about the 'theoretical failure rates' we used when forecasting unscheduled maintenance.	We accept the Draft Decision and, in line with stakeholder submissions, apply the AER's benchmark failures rates.
2. Engagement	Customers want us to maintain recent levels of engagement, and trial smart controls.	We are committed to working with our stakeholders and are formulating a plan for further smart control trials.
3. Rate of Return	The same rate of return (WACC) the AER accepted for standard control services was applied to public lighting.	Our Revised Proposal applies the AER's recently made Rate of Return Instrument.
4. Labour escalation	Our proposed escalators were substituted with an average of BIS Oxford's and Deloitte Access Economics' forecast of real price changes in labour.	We have applied the AER's approach in its Draft Decision, with the exception that we have updated our forecast labour escalators with the latest data available.

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 8.12 (Public Lighting Price List) lists our Revised Proposal prices for the 2019-24 regulatory period. Throughout the next regulatory period Ausgrid proposes that public lighting price increases will be lower than inflation.

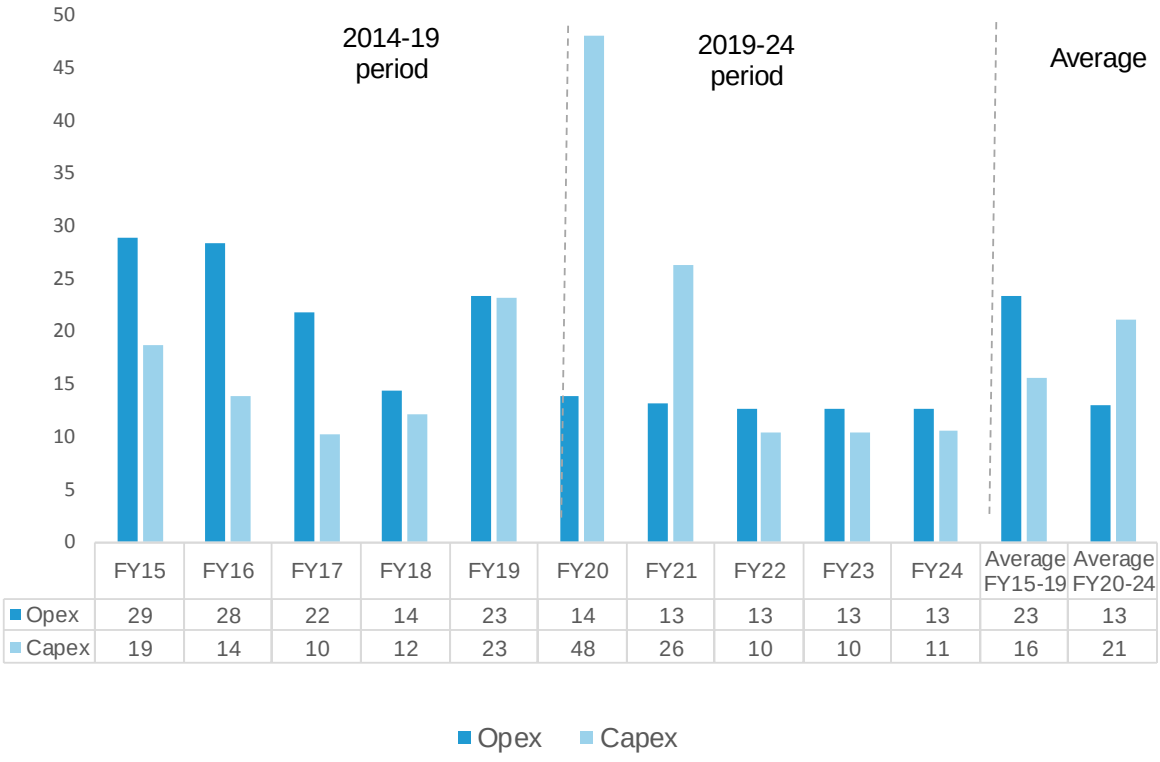
1.1.1 Summary of revised proposal

Our revised public lighting proposal forecasts $64.9 million in opex and $105.6 million in capex for the 2019-24 regulatory period. We have revised our opex forecast to incorporate the AER's Draft Decision for failure rates and labour escalation. Our revised capex forecast reflects our investment program to roll out 125,000 LED luminaires by the end of 2019-24 regulatory period. We have also adopted the AER's Final 2018 Rate of Return Instrument in the development of our Revised Proposal and applied the AER's smoothing approach to capital and maintenance charges.

The figure below sets out our public lighting expenditure profile for both opex and capex. It does this for each year of current 2014-19 regulatory period and our revised forecast for the upcoming 2019-24 regulatory period. The capex in 2019/20 reflects the step-up in our planned mass LED roll-out which will deliver customer benefits in the form of lower opex, as outlined in section 3.

Figure 1

Forecast and historical public lighting expenditure ($million, real FY19)



	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	Average FY15-19	Average FY20-24
Opex	29	28	22	14	23	14	13	13	13	13	23	13
Capex	19	14	10	12	23	48	26	10	10	11	16	21

It is shown above that our public lighting opex is forecast to steadily decline. This is primarily as we rollout LED luminaries which are less costly to operate than older lighting technologies. Our customers will ultimately retain the benefits from this rollout, as the operating cost savings LEDs unlock will be passed on to them through lower maintenance charges.

We are forecasting a step change in capex in FY20, as shown above. This too is driven by our planned rollout of LED luminaries – an investment program which our customers strongly support as LEDs deliver a total lower cost of service. Not only are they cheaper to operate, they also use less energy – delivering savings to our customer through lower energy bills and shrinking their carbon footprint through lower emissions.

By the end of the 2019-24 regulatory period, we aim to have rolled out 125,000 LED luminaires, equal to half of all our streetlights on minor and major roads, transforming our public lighting service and delivering significant benefits to both our customers and the environment.

Our approach to forecasting our public lighting opex requirement for the 2019-24 regulatory period is set out in section 2 below while we outline the capex inputs into our proposal in section 3. The input assumptions made when modelling public lighting pricing is set out in section 4. Each public lighting model is provided at attachment 8.08 to 8.10.

1.1.2 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 250,000 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.

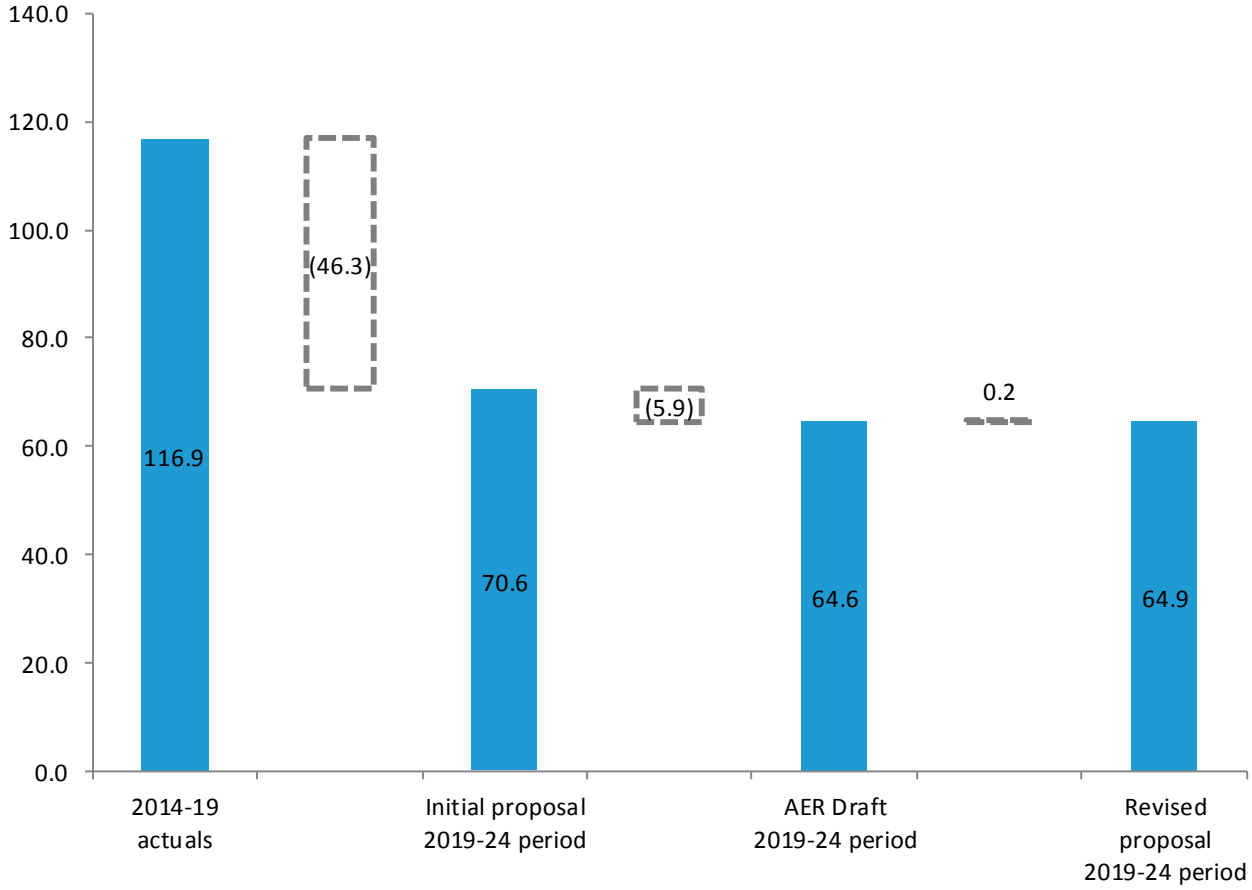
Lighting technology has evolved significantly over the past twenty years. HID lamps are being replaced with Light Emitting Diode (LED) luminaires and smart controls are being discussed. LED technology provides significant reductions in energy consumption and minimise the life cycle costs ultimately borne by public lighting customers.

2 Operating expenditure

Our revised public lighting opex forecast of $64.9 million in the 2019-24 regulatory period is set out below. For comparative purposes, also shown is our actual opex in the current regulatory period, our initial public lighting opex forecast for 2019-24 and the AER's Draft Decision.

Figure 2

Our public lighting opex forecast for 2019-24 ($million, real FY19)



The above figure shows that our revised 2019-24 public lighting opex forecast is $52.1 million lower than our 2014-19 actual operating costs and a further $5.7 million below our initial forecast for the 2019-24 regulatory period. It is slightly higher than the AER's Draft Decision.

Our revised forecast is lower than the opex we initially proposed for the 2019-24 regulatory period. This is because we have responded to feedback from stakeholders and the AER regarding the assumed failure rates that should be applied to our luminaries, when forecasting our unscheduled maintenance costs.

As noted above, the primary driver of our lower forecast opex in the 2019-24 regulatory period relates to our planned mass rollout of LED luminaires. Their improved reliability compared to older lighting technologies means they require less scheduled and unscheduled maintenance, thus making them cheaper to operate. These savings will be passed on to our customers in the form of lower maintenance charges.

We have updated the forecast escalators for real price changes in labour using more recent forecasts from BIS Oxford Economics, and applied the AER's methodology of averaging this with Deloitte Access Economics forecasts. This is driving the difference between our revised opex forecast and the AER's Draft Decision, along with other, relatively minor, forecasting assumptions.

2.1.1 Maintenance forecast

We incur operating costs when maintaining our public lighting assets. Maintenance for public lighting assets in turn consists of two direct sources of expenditure; scheduled and unscheduled maintenance. In the sections below, we outline our approach to forecasting these costs.

General assumptions

Our financial modelling of both scheduled and unscheduled public lighting maintenance costs includes general assumptions about inflation, labour price escalation, and other maintenance cost inputs such as the use of elevated work platforms (EWPs). These assumptions are outlined below.

Table 2

General assumptions for scheduled and unscheduled maintenance

	UNIT	REVISED PROPOSAL	ALIGNS WITH AER'S DRAFT DECISION (Y/N)
CPI in FY19	% p.a.	1.90%	N (2.24%)
CPI from FY20 to FY24	% p.a.	2.42%	Y
Labour real price escalation	% p.a.	0.89%	N (0.93%)
Base labour rate	$/hour, FY19	$54.43	Y ($54.61) ^
Labour rate - overtime (1.89 times base labour rate)	$/hour, FY19	$102.86	Y ($103.21) ^
Elevated Work Platforms (EWP) rate	$/hour, FY19	$32.70	Y ($32.81) ^
Average Visor cost	$/unit, FY19	$50.66	Y ($50.83) ^
Average PE cell cost	$/unit, FY19	$11.87	N ($11.29)
Average miscellaneous materials cost	$/unit, FY19	$15.29	Y ($15.34) ^
Proportion of work in overtime hours	% p.a.	7%	Y
Proportion of work in standard hours	% p.a.	93%	Y
Labour oncosts	% p.a.	52%	Y
Corporate Overheads (CAM)	% p.a.	11%*	Y
Overhead cost allocation (Direct + Indirect)	% p.a.	23%*	Y

^ Price differences are due to difference in CPI assumption in FY19. Our proposed prices are in line with AER's Draft Decision in $ FY18.

*The overhead rates have been back solved to cover corporate overheads and allocated overheads.

It is shown above that our general assumptions all align with the AER's Draft Decision, except for CPI in FY19, labour escalators and average PE cell cost We have applied the same CPI and labour price escalation assumptions as those used in our standard control services in the Revised Proposal. We have also revised average PE cell per unit cost to $11.87 ($real FY19) after consulting with public lighting specialists.

Scheduled maintenance

Our scheduled maintenance opex makes up $10.8 million in FY19 prices (or 16.6 percent) of our total public lighting opex forecast of $64.9 million in the 2019-24 regulatory period. The activities conducted during scheduled maintenance include:

- a periodic bulk lamp replacement (BLR)
- steel lighting pole inspection and night patrols

- routine tasks performed in conjunction with the BLR (cleaning the visor and adjusting out of position brackets and luminaires).

We review our BLR period regularly in order to determine the most cost-efficient cycle. During the 2014-19 regulatory period, we increased the cycle to 48 months for lamps, 60 months for LED luminaires and discontinued performing a bulk PE cell change. These adjustments to our scheduled maintenance practices are a prudent and efficient response to the introduction of LED street lights and more reliable lamp technologies. We still maintain some street lights that are not suitable for a 48-month BLR; however, it is forecast that these technologies will be replaced by FY20.

BLR cycles are determined such 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. The optimum timing of these cycles is dependent on technical and financial constraints. Technical constraints consist of the lumen depreciation and mortality characteristics of traditional lamp sources and LED light modules as well as the cleaning interval of the luminaire. Financial constraints largely focus around the difference in unit costs between scheduled maintenance (contractor BLR rates) and unscheduled maintenance (Ausgrid spot replacement costs). The optimisation of the BLR period is via the minimisation of the total cost of ownership.

Scheduled maintenance is mainly performed by external service providers. Rates are sought by competitive tender and expenditure is relatively predictable. Materials used as part of the BLR are issued free to the external service providers from Ausgrid stores and the rate of their use and procurement cost is also relatively predictable. The assumptions underlying our scheduled maintenance opex are shown in the tables below. These assumptions are unchanged from our Initial Proposal and are consistent with the AER's Draft Decision.

Table 3

Scheduled maintenance assumptions - Luminaires and LED Luminaires

	UNIT	REVISED PROPOSAL	UNIT	REVISED PROPOSAL	ALIGNS WITH AER'S DRAFT DECISION (Y/N)
Servicing minor luminaires	Cycle time (Yrs)	4.00	$/unit, FY19	$25.14	Y
Servicing major luminaires	Cycle time (Yrs)	4.00	$/unit, FY19	$29.28	Y
Servicing minor LED luminaires	Cycle time (Yrs)	6.00	$/unit, FY19	$25.14	Y
Servicing major LED luminaires	Cycle time (Yrs)	6.00	$/unit, FY19	$29.28	Y

Table 4

Scheduled maintenance assumptions – Other

	UNIT	REVISED PROPOSAL	ALIGNS WITH AER'S DRAFT DECISION (Y/N)
Replacement of luminaire visor	$/unit, FY19	$11.70	Y
Replacement of PE cell	$/unit, FY19	$5.68	Y
Minor non-electrical repair	$/unit, FY19	$24.60	Y
Apply temporary insulation	$/unit, FY19	$14.74	Y
Minor electrical work	$/unit, FY19	$40.96	Y
Night time traffic route patrol	$/unit, FY19	$8,448.01	Y

Unscheduled maintenance

Unscheduled maintenance (spot maintenance) of lamps and other components will be required regardless of whether Ausgrid has a bulk maintenance regime is in place or not. Though an effective bulk replacement regime will reduce the number of failures which occur between replacement cycles, unscheduled maintenance is still required to fix failures that occur between bulk replacement periods.

Our financial modelling calculates the cost of labour, vehicles/equipment and materials that will be required to maintain all components as they fail. In our Initial Proposal, the rates that individual lamp types were anticipated to require some form of unscheduled maintenance was determined using a combination of manufacturer's lamp failure rates and our actual failure data. We applied this 'theoretical failure rate' for individual lamp types because:

- as we only recently moved to a four-year BLR, we had no actual lamp failure rates for the fourth year
- the fourth year of data could have significantly increased the number of lamp failures if it had been available, given that most lamp types begin to fail at increasing rates over time.

The Southern Sydney Regional Organisation of Councils (SSROC), which represents councils that encompass around 90 percent of our streetlights, raised concerns about our application of theoretical failure rates for individual lamp types in our Initial Proposal. Among other things, SSROC noted we had not reconciled our assumed theoretical rates to our actual failure rate data. Nor were our proposed failure rates accepted by the AER, who applied its own benchmark lamp failure rates in the Draft Decision.

We have considered both SSROC's submission and the AER's Draft Decision and decided to apply the AER's benchmark lamp failure rates in our Revised Proposal. Ausgrid considers that without a full data set following our transition to a four-year BLR cycle, our actual failures rates are likely to be representative of our future requirements. We further maintain that the method we used to develop our theoretical rates in our Initial Proposal was robust. Notwithstanding, we have decided to apply the AER's rates used in its Draft Decision. We have made this decision to align our revised proposal with our stakeholder's views on a key issue of our proposal.

The assumptions we have applied when forecasting our unscheduled maintenance costs are outlined in the table below. The table below shows that our unscheduled maintenance costs assumptions align with those in the AER's Draft Decision.

Table 5

Spot maintenance assumptions

	UNIT	REVISED PROPOSAL	ALIGNS WITH AER'S DRAFT DECISION (Y/N)
Number of workers in standard crew	no. of people	2	Y
Additional workers on traffic route	no. of people	1	Y
Time required for average spot lamp replacement	no. of hours	0.76	Y
Time for PE Cell replacement	no. of hours	0.76	Y
Time for other spot maintenance task	no. of hours	0.76	Y
Annual average failure rate for PE cells	% p.a.	1.98%	Y
Annual average failure rates for other components	% p.a.	3.26%	Y

3 Capital expenditure

We have forecast $105.6 million in capex over the 2019-24 regulatory period. We revised our capex forecast to reflect updates to our investment program, particularly in relation to our planned mass rollout of LED luminaires. The main drivers of this expenditure are our major and minor road mercury vapour replacement program, as outlined below. All other aspects of our capex program (new public lighting, reactive public lighting, pole replacement) are forecast to remain in line with historical requirements.

Table 6

Forecast public lighting capex ($million, real FY19)

	FY20	FY21	FY22	FY23	FY24	TOTAL
Major road mercury replacement	$12.1	$5.3	$0.0	$0.0	$0.0	$17.4
Minor road mercury replacement	$25.5	$10.8	$0.0	$0.0	$0.0	$36.3
New public lighting	$1.6	$1.7	$1.7	$1.8	$1.8	$8.6
Reactive public lighting	$2.2	$2.0	$2.0	$2.0	$2.0	$10.0
Pole replacement – Public lighting	$6.6	$6.6	$6.6	$6.7	$6.7	$33.3
Total public lighting	**$48.0**	**$26.3**	**$10.3**	**$10.4**	**$10.5**	**$105.6**

3.1.1 Major road mercury replacement

Ausgrid has approximately 20,000 major road street lights that use Mercury Vapour lamp technology. This technology is highly inefficient and requires significantly more planned and unplanned maintenance when compared to the equivalent LED replacement.

In Ausgrid's 2015-19 Regulatory Proposal, these luminaires had been earmarked to be replaced with High Pressure Sodium "Active Reactor" equivalents. However, in consultation with our customers the decision was made to wait until LED became a more commercially and technically viable option. We are now at that point and are planning to proactively replace all major road mercury luminaires.

The servicing of these luminaires will be significantly impacted by the Minamata Convention on Mercury and the potential this convention has to limit the supply of mercury lamps, therefore this program has a required end date in 2020.

3.1.2 Minor road mercury replacement

Ausgrid has approximately 80,000 minor road street lights that use Mercury Vapour lamp technology. This technology is highly inefficient when compared to the equivalent LED replacement. Local councils have expressed an interest in replacing the existing mercury luminaires with LED as there are significant energy and operational savings. This program focuses on minor road mercury luminaires which are 125W and below.

As per the major road mercury replacement, the supply of lamps will diminish in 2020 so there is a requirement to replace these luminaires beforehand to reduce the risk of additional charges being levied for lamps due to a reduction in supply.

3.1.3 New public lighting

A relatively small expenditure has been forecast for new public lighting assets. This category covers street lights installed where there was no light previously. Typically, the construction of new public lighting is contestable, however Ausgrid's Minor Capital policy allows for customers to request for additional lights on existing poles. Expenditure of this nature would be captured under this program.

3.1.4 Reactive Public Lighting

Ausgrid is continually replacing street lights that fail due to age and any number of other reasons. The Reactive Public Lighting program covers luminaires and other street lighting components that are replaced which have not been targeted in a specific proactive replacement program such as the minor and major road mercury replacement programs. In the previous five years, the majority of street lighting capital work has been captured in this program as Ausgrid has not performed any proactive replacement programs, however the forecast expenditure through the 2019-24 regulatory period is relatively low due to the number of proactive replacement forecast.

3.1.5 Pole Replacement

This program is the proactive replacement of steel street lighting columns that have been condemned. Condemned poles are identified by pole inspectors using a detailed/planned inspection/condition assessment process. Poles which have been identified to be replaced are added to the program worklist by the responsible officer within Network Operations. The poles will then be replaced either by Ausgrid staff or contractors.

4 Pricing model inputs

As outlined in our Initial Proposal, Ausgrid proposes to retain the form of modelling used for the 2015 determination. Assets installed post July 2009 are priced using a cost build up model which then calculates an annuity based on the expected life of the asset. We have updated some inputs for this Revised Proposal, as outlined in this section. This model is attached at 8.09 (Public Lighting Post June 2009 Annuity Charge Model).

The total cost of installation of a component is given by the formula:

Total cost = Materials cost + Labour + EWP cost + overheads on capital

Customer annuity repayments are calculated by:

$$P = \frac{r(PV)}{1-(1+r)^{-n}}$$

Where:

P = Payment

PV = Present Value (Total cost)

r = rate per period

n = number of periods

4.1 Weighted Average Cost of Capital (WACC)

We have updated the WACC inputs for public lighting models consistent with those used in standard control service PTRM models. We apply the AER's Final 2018 Rate of Return Instrument as the basis for determining our allowed rate of return for the 2019-24 regulatory period.

4.2 Standard asset lives

The table below details the component lives in the annuity model. These are the expected lives of the asset and are the number of years used in the annuity model calculations. These assumptions are unchanged from the Initial Proposal and are consistent with the AER's Draft Decision.

Table 7

Public lighting asset lives (number of years)

COMPONENT	ASSET LIFE
Luminaire (traditional)	20
LED luminaire	10
Bracket	35
Support	35
Connection	20

4.3 Labour rates

The AER has accepted our proposed base labour rate and overtime labour rate in its Draft Decision, i.e., $52.91 in FY18 prices. We apply the same labour rate in our Revised Proposal.

4.4 Hours to install new components and the proportion of work performed in overtime rates

The man hours to install a new light are 2.01 hours for a residential road and 3.02 on a traffic route. The difference is due to the requirement of additional linesman on traffic routes. These time frames have been carried over from the 2015-19 determination.

The proportion of public lighting tasks completed in overtime compared to standard time was calculated using actual data from 2016/17. This figure has reduced from the previous regulatory period due to the introduction of afternoon shifts. These assumptions are unchanged from the Initial Proposal and consistent with the AER's Draft Decision.

4.5 Pole establishment costs

In the annuity pricing model labour is recovered by allocations of labour to the bracket and luminaire. As such when a new support is installed a specific capital expenditure amount needs to be included in the total cost to recover the costs associated with its installation. The specific capital expenditure amounts inputs are averages for the replacement of both in ground mounted and rag bolt assembly steel columns. This figure has been obtained by contractor tendered rates. This is unchanged from the Initial Proposal and consistent with the AER's Draft Decision.

4.6 Elevated work platform rates

All public lighting tasks require the use of an EWP. Ausgrid has three sizes of EWP's. A weighted average based on the actual usage of the various size EWPs has been calculated and included in this model. These assumptions are unchanged from the Initial Proposal and consistent with the AER's Draft Decision.

4.7 Material prices

Material prices for the majority of equipment used for public lighting are sourced by competitive tender. Where equipment is no longer purchased or used but is still required for price modelling, the last known price is used, or the 2015 AER determination figure is carried over. These assumptions are unchanged from the Initial Proposal and consistent with the AER's Draft Decision.

4.8 Allocations of labour to brackets and luminaires

The allocation of labour to the bracket and luminaires has been carried over from the 2015-19 determination. This is unchanged from the Initial Proposal and consistent with the AER's Draft Decision.

4.9 Overheads

We have revised overheads on capital based on the most updated information and adopted overhead allocation rate approved by the AER in its draft decision.

Table 8

Public lighting overhead allocation ($million, real FY19)

	FY20	FY21	FY22	FY23	FY24
Overhead allocation	0.87	0.86	0.41	0.88	0.60

4.10 Inflation

CPI figures for the regulatory period FY20 to FY24 have been forecast to be 2.42% each year of the regulatory period. We accepted AER's inflation forecast in its Draft Decision. Annuity component pricing from 2019/20 onwards is inflated by CPI only and updated each year with actual CPI figures.

We have updated the forecast escalators for real price changes in labour using more recent forecasts from BIS Oxford Economics, and applied the AER's methodology of averaging this with Deloitte Access Economics forecasts. This is consistent with the approach we have used for Standard Control Services, and the AER's Draft Decision. Average wage escalation is 0.89%. Any increase over CPI will be offset by efficiency gains.

4.11 LED Warranty Premium

In negotiations regarding LED prices, Councils opted to pay an additional 5% of the annuity charge for warranty to be covered by Ausgrid. This means that if a LED fails during the 10-year period, Ausgrid covers the cost of replacement. This was the topic of extensive consultation with our customers and was mutually agreed. This is unchanged from the Initial Proposal and consistent with the AER's Draft Decision.