Attachment 8.11

Public lighting investment plan- Replacement of 42W CFL with LED

May 2014

Contents

Document and Amendment History

Issue No.	Date	Approved By	Summary of Changes
1.0	April 2014	Reg Team	Final

About this document

This document is a supporting document to Ausgrids 2014-19 substantive proposal to the Australian Energy Regulator. It provides justification and explanation of a specific capital expenditure program as well as summarising the key financial information of the program.

This document should be read in conjunction with all submission documents, particularly those relevant to public lighting.

Investment Trigger

- Reliability issues 42W CFL luminaires
- Potential to increase the Bulk Lamp Replacement (BLR) period from 2.5 years to 4 years.

1 Understanding the Need for Investment

1.1 Identifying the need

Ausgrid's default category P street light was the 42W compact fluorescent (CFL). This street light was initially introduced as the assessment of this technology showed that there would be a significant decrease in energy consumption from its predecessor, the 80W mercury vapor (MV), as well as longer life and greater reliability lamps. However, soon after their introduction in late 2008 Ausgrid field staff reported poor performance of this product. Ausgrid investigated these anecdotal claims however found it difficult to pinpoint the issue. After a number of iterations of this product as well as many hours of testing of various scenarios there was still no single answer to what may be causing these luminaires to be prematurely failing. The supplier although helpful was unable to shed any light on the issues. These failures were a significant drain on Ausgrid's OPEX and resources, so it was decided there was a need to research other technologies to replace the incumbent 42W CFL.

The timing of this issue coincided with our customers expressing interest in LED technology, however at the time this technology was in its infancy for use in street lighting and not technically suitable for immediate use.

1.2 Impact of issue

The count of 42W CFL luminaires as at 30 April 2013 was 45,000 (Rate 1). Ausgrid has estimated that [redacted] of these are not performing to our expectations. The repercussions of the poor performance of the 42W CFLs have been twofold:

1. A significant drain on Ausgrid's resources where field crews have had to make numerous visits to luminaires they have just installed and replace or repair them again due to premature failures; and

[redacted]

Metric	Measure
CFL Population	42371
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]

It should be noted that the failure data referenced is based on the number of call outs per month on 42W CFL's. This annualised figure is then calculated based on our population to be approximately [redacted] This is not a CFL lamp failure rate but a representation of the frequency we attend these fittings because they have been reported not working.

Care should be taken in referencing these rates as they are not necessarily a reflection of the lamp or luminaire technology as it may be other components that fail (PE cell, fuse, wiring etc) however we have no mechanism to determine the actual cause of failure at present.

2 How we Assessed the Options

Ausgrid took a staged approach to assessing the options to transition away from the 42W CFL. Each stage is described below:

2.1 Technology assessment

The first stage is to assess the suitability of available technology types in the market which are able to meet the need. Characteristics such as compliance with relevant standard, light performance, reliability and compatibility with existing infrastructure are considered. Any technologies which are not suitable are not further considered.

Ausgrid has assessed a number of possible product alternatives for the 42W CFL's. The following technologies were considered:

Technology	Light Colour Output	Compliance with AS1158	Technology Efficiency (Lumen/Watt)
Mercury Vapour (MV)	White	No	32-60
T5 Fluorescent	White	Yes	70-105
High Pressure Sodium (HPS)	Yellow/Orange	Yes	70-120
Light Emitting Diodes (LED)	White	Proposed*	80-300**

Table 1 – Technology assessment

* Don't currently meet the requirements of AS1158 however, Ausgrid are working with the AS1158 committee to include LED as a permissible lamp type under this standard. It is envisaged an updated standard will be published late 2014)

** Theoretical limit

Up until now, Ausgrid have not had a suitable replacement for the 42W CFL for the following reasons:

1. The equivalent mercury vapour luminaire, although reliable and durable is now banned by the Australian Standard AS1158 for new installations due to their high mercury content;
2. The tubular fluorescent (T5) does not meet Ausgrid's maintenance requirements. This statement is based around a technical review and field trial of the Pierlight Greenstreet in 2007 where a number of concerns were raised about the reliability of this fitting. No further review of this fitting has been conducted and this fitting was not considered an alternative as the technology behind the T5 is similar to that of the CFL;
3. Ausgrid's technology options are further limited by the fact that high pressure sodium (HPS) luminaires are not considered an alternative as our customers have specified that a 'white light' solution is required. HPS lamps produce an orange light;

Ausgrid has been trialling LED technology since early 2012. It appears to be the case that suppliers are focussing their research and development on this technology at present and as such LED is now technically suitable for use for category P roadway lighting. It also appears that this may be the only suitable option.

2.2 Market research and council consultation

In order to ensure the technology is suitable for councils – internal and external trials were considered and councils consulted. Refer to the appendix for the results of the trial.

2.3 Financial assessment

There are three financial considerations when assessing the available options for rolling out new luminaires. First is the unit price off LED luminaires available in the marketplace. Second is comparing the forecast lifetime costs to the current 42W CLFs. The final consideration is the manner in which the new luminaires are rolled out.

2.3.1 Assessing unit prices

To obtain the best unit prices available for LED luminaires, Ausgrid obtained quotes from three manufacturers who were undertaking the LED trial. The quotations were calculated based on 12,000 units which is the estimated annual usage of the current technologies in use ie 42W CFL. The quotations received were as follows:

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

[redacted]

2.4 Financial Analysis

Ausgrid's financial analysis was based on the following:

- Capital costs;
- Operating costs;
- Energy consumption and savings.

[redacted]

The analysis has also been conducted by assessing the financial implications under three different scenarios:

[redacted]

Financial modelling was completed to determine the best NPV outcomes and thus the best financial strategy. The table below summarises the findings at both 5 year and 10 year horizons.

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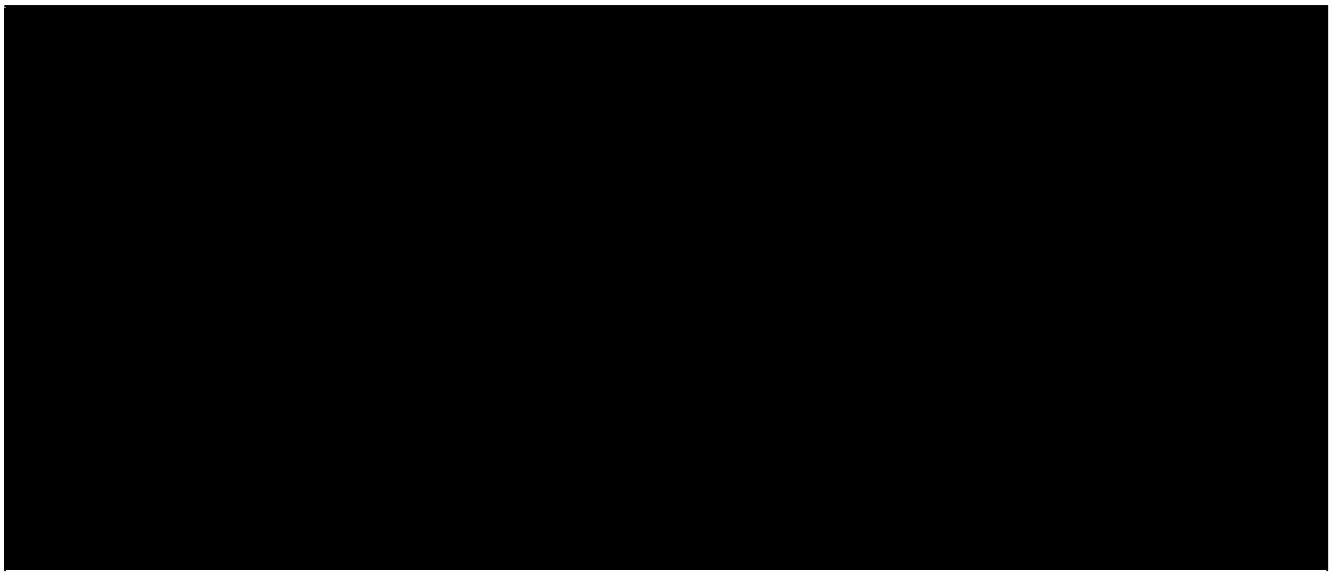
From the table above:



The results of the analysis concluded that the reactive targeted CFL replacement with pricing option 2 was the most economical. The financial information in section 3 is based on this roll out method.

It should be noted that the energy cost component is not included in the analysis because it does not have any impact on the NPV, however Ausgrid is aware that energy use is important to the councils so attempts are made to make the consumption lower than its predecessor.

3 Outcomes

Based on the available technologies and NPV analysis, Ausgrid is proceeding to rollout LEDs as the default replacement for 42WCFLs.

3.1 Strategy to Introduce LED's

The introduction of new technology poses significant risk to Ausgrid if the technology does not live up to expectations. As such, Ausgrid are taking great efforts to ensure these risks are identified and all appropriate risk mitigations plans are in place.

Ausgrid developed a risk mitigation strategy prior to introducing LEDs as the default luminaire for category P roadway lighting. The risk mitigation strategy is detailed below:

- Trial LED luminaires to determine their suitability;
- Ensure commercial risk is minimised by negotiating suitable warranties;
- Deploy LED's at a manageable rate by only installing LEDs to replace underperforming 42W CFL as they are reported and failed luminaires (80W mercury, 50W mercury and twin 20 fluorescent). No accelerated replacements will be undertaken;
- Closely monitor the performance of LED's and report failures immediately to supplier; and
- Test the market for alternative manufacturers and suppliers.

3.2 Consultation Process with Public Lighting Customers

Ausgrid's consultation process with its public lighting customers has been quite extensive over the entire process. It was Ausgrid's intention to ensure customers are well informed about the new technology and were provided with an open forum where they could directly ask questions and raise issues with Ausgrid and/or the LED suppliers. Four information nights were held in four different locations spread across Ausgrid's network to give all councils the opportunity to attend a session. The sessions gave councils the opportunity to:

- view the street lights first hand;
- Directly raise any issues or concerns with LED street lights with Ausgrid or the LED supplier who also attended the information nights; and
- encourage public lighting customers' involvement in the LED trial that commenced 2012.

Further Ausgrid did not initiate LED installations until all 41 letters from councils indicating their approval of the LED technology were received and signed. Ausgrid have received the last letter in late September 2013 and have commenced installations.

3.3 Recommended 42W CFL replacement Strategy

An NPV analysis was undertaken to determine the most economical roll out of LED streetlights to replace the poor performing 42W CFL's. There were two potential roll out methods analysed and these were compared to the ongoing costs to Ausgrid if no attempt was made to replace these fittings. The two methods were:

Proactive accelerated replacement of all poor performing 42W CFL luminaires

Reactive targeted replacements i.e. only replace the fittings as they are reported to have failed

The results of the analysis concluded that the reactive targeted replacement was the most economical. The financial information in section 5 is based on this roll out method.

3.4 Financial Information

The replacement costs of the poor performing 42W CFLs with LED technology are discussed in this subsection. Note that all costs are as at June 2013.

3.4.1 Cost Estimation Process

The capital cost estimates are based on real material and labour costs. Ausgrid has now varied its existing public lighting materials contract (EA0097) to include LED streetlights. [redacted]

The install costs are tendered amounts from a recent procurement process to obtain bulk lamp replacement contractors. These amounts are specific to this actual replacement program. The schedule of rates divided the Ausgrid network into regions (South, East, North and Central Coast) and the tendered rates varied between these regions.

The material and labour rates were obtained using Ausgrid's procurement policy. The value of the material and labour rates was such that formal procurement plan, recommendation and board report were required to be signed off for approval.

The labour rates included in these estimates are specific to the accelerated replacement of the twin 20 luminaires therefore there are no shared costs and overheads are included in the rates.

The labour costs are specific to a grid by grid accelerated replacement of the twin 20 luminaires. This was specifically detailed in the scope of the tender document to obtain these prices. As a result this does consider the efficiencies that come with an accelerated replacement process compared to spot replacements of these fittings.

Critical Dates:
Commencement date: July 2013
Proposed Completion date: June 2018

Unit Costs:
Install costs without bracket: [redacted]
Materials excluding bracket: [redacted]

Lamp Type	Total Population	Poor performing population	Cost per replacement	Total Capital Cost
42W	42,000	[redacted]	[redacted]	[redacted]

Note:

- Material costs do not include consumable items such as screws, connectors and cable
- The labour rates are at Ausgrid call out rate
- Replacements are worth [redacted] are planned for FY14

3.5 Total Costs

The summarised costs are presented in the table below

Real $FY14	FY15	FY16	FY17	FY18	FY19
Capex	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

3.6 Tender Arrangements

[redacted]

In line with Ausgrid's procurement policy and procedures a variation to the existing agreement with Sylvania to replace CFLs with LEDs has been made. The current standing offer agreement with Sylvania expires on

30 November 2014. Ausgrid are planning to commence the tender procurement to ensure that a new contract will be in place by this date.

4 APPENDIX - Light Emitting Diodes (LED) Technology Trial Results

To explore the current capabilities of LED roadway lighting, Ausgrid is currently staging an LED trial on residential roadways. Ausgrid selected three LED technologies to trial in locations chosen from the across the Ausgrid network. Each trial site consisted of at least six lights and the total trial consisted of 63 lights.

The purpose of this trial was to identify the following:

- Suitability of the construction of the LED luminaires for use on the Ausgrid network. In particular category P4 and P5 roads.
- Visual impact and minimisation of glare.
- Council and resident reactions to the new type of lighting.
- Understand what problems may be encountered introduction LED streetlights

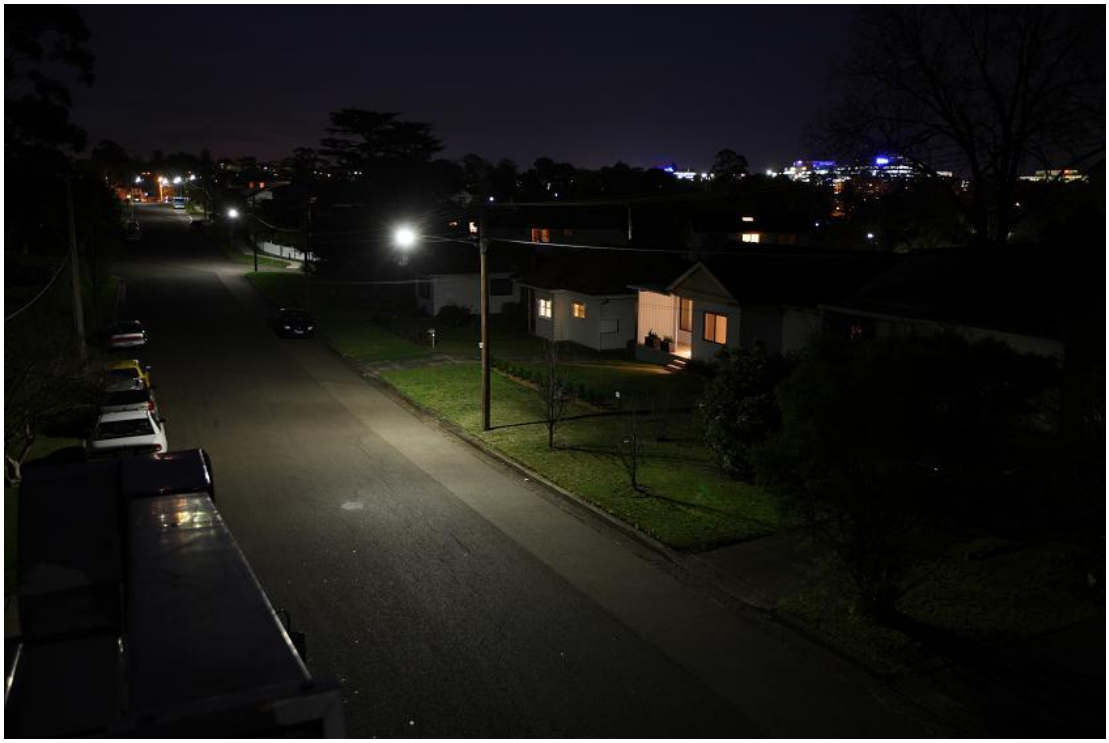
To date this trial has shown that LED technology can be used as a suitable replacement for the existing technology. However there are still some outstanding issues, particularly with light distribution that need to be addressed. This trial will continue until Ausgrid are confident that this technology is ready to be rolled out across our network.

Ausgrid's LED trial has demonstrated that:

- A greater range of lighting suppliers are now able to provide LED luminaires for residential roadways that meet the key requirements of AS/NZ 1158.
- The majority of residents prefer the LED's to the previous lighting (generally tubular fluorescent and mercury vapour) and residents did not find the LED's to be any brighter or glarier than the previous lighting.
- Residents prefer higher lighting levels than the minimum levels allowed for under AS/NZS 1158 P5.
- Photometric surveys substantiated LED performance claims and were generally consistent with photometric modelling.

All LED trial sites and technologies show marked improvements in both uniformity and the length of roadway that is effectively lit as compared with the previous lighting. Refer to the pictures below showing before LED lighting and after installation of LED lighting which gives a clear illustrations of the improvements discussed above.

Before – 42W Compact Fluorescent - Betty Hendry Parade, North Ryde



After – 29W LED - Betty Hendry Parade, North Ryde