Sustainable Street lighting Final Project Report
24 June 2015
18 pages
# Table of Contents

1. Executive Summary ........................................................................................................ 3
2. Project Objectives ........................................................................................................... 4
3. Project Energy Efficiency Activities .............................................................................. 4
   • Details of energy efficiency upgrade ......................................................................... 4
   • Choice of technology ................................................................................................. 5
   • Activity issues ........................................................................................................... 6
4. Project Demonstration and Communication Activities .................................................. 7
   • Target audience and stakeholders ............................................................................ 7
   • Key communication messages .................................................................................. 7
   • Communication Activity ......................................................................................... 8
5. Outcomes and Benefits of the Project ......................................................................... 9
   • Overcoming Issues and Lessons Learnt .................................................................... 10
   • Energy Efficiency Results ...................................................................................... 11
   • Community and other Benefits .............................................................................. 12
6. Budget ............................................................................................................................ 12
   • Budget Changes ....................................................................................................... 12
   • Budget summary ....................................................................................................... 14
   • Council in-Kind support ........................................................................................... 15
7. Project operations, mechanisms and processes ............................................................. 15
   • MAV procurement ................................................................................................... 15
   • Project Management ............................................................................................... 15
   • Economies of Scale ................................................................................................. 16
   • Internal Resources and Lessons .............................................................................. 16
8. Conclusion ....................................................................................................................... 18
9. Declaration ...................................................................................................................... 18
10. Attachments .................................................................................................................. 19

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*The views expressed herein are not necessarily the views of the Commonwealth of Australia, and the Commonwealth does not accept responsibility for any information or advice contained herein.*
I. EXECUTIVE SUMMARY

Bass Coast Shire Council's Sustainable Street-lighting Project began in November 2012 and was completed in June 2015. The project delivered a bulk-change-over of residential street-lights with energy efficient globes and hardware.

As part of Bass Coast Shire Council's Sustainable Street-lighting Project, a total of 2,540 residential street lights were upgraded to more efficient technologies. These replacements are predicted to reduce Council's electricity use by 714,800 kWh and annual emissions by more than 850 tonnes. The upgrade will save Council approximately $120,000 in the first year and 1.8 million over the life of the lights (15 years).

The project was delivered in four stages between September 2013 and June 2015. 2,357 80 watt mercury vapour lights were replaced with energy efficient T5 fluorescent lights across the Shire. Through the installation stage of the project 183 identified decorative lighting fixtures were identified where maps indicated that 80 watt globes were expected. The project was extended in November 2014 to include changing over these 183 identified decorative lighting fixtures. During the same period 2 mercury vapour street lights were installed in two carparks to improve lighting quality.

The Sustainable Street-lighting project was delivered under budget. Originally the total project costs were estimated to be $1,029,489 with $291,747 (28%) funded by the Australian Government. The bulk of the project (72%) was funded by Bass Coast Shire Council. At the conclusion of the project the total project costs were $947,564, resulting in a saving of approximately $90,500. Savings were brought about through:

- Working in partnership with the Municipal Association of Victoria (MAV) in the bulk procurement of lighting hardware.
- Our partnership with South Gippsland Shire Council also brought project savings through a shared contract for installation services, which created efficiencies.
- A reduction in the total number of lights changed over from 2,611 to 2,540, a result of physically not being able to make the changes.

Community interest in the Sustainable street-lighting project has been high, with project benefits being promoted throughout the project period. The project illustrates the importance of saving energy and reducing greenhouse gas emissions to the community.
2. PROJECT OBJECTIVES

This project met the broader objectives of the Community Energy Efficiency Program by encouraging and enabling Bass Coast Shire Council (a rural local council) to undertake a large scale energy efficiency project. The project also demonstrated to the broader Bass Coast community that energy efficiency can produce quality outcomes, as the lighting quality was improved. It also demonstrates that undertaking energy efficiencies can save energy and money.

Support from the Community Energy Efficiency Program allowed Council to undertake a project that was identified as 'a great project to do', however financially did not stack-up. With support from the Australian Government the business case was now supported and the project deemed viable.

The Bass Coast Shire Council Sustainable Street lighting Project aimed to replace 2,611 high energy use (80watt mercury vapour) streetlights with more efficient alternatives.

The objectives of Sustainable Street-lighting project were to:

- Maximise energy savings with the project budget
- Maximise greenhouse gas reduction
- Reduce Council electricity costs
- Improve the quality of street lighting benefit to the community
- Comply with the Local Government Act 1989 relating to proper procurement
- Use approved, safe and thoroughly assessed lighting technologies
- Communicate project benefits; energy saving and greenhouse emission reductions to residents, business and community organisations
- Engage with the energy distribution networks industry (Ausnet and lighting manufactures) to demonstrate how projects such as these can be successful.

3. PROJECT ENERGY EFFICIENCY ACTIVITIES

By improving the energy efficiency of residential street lights (Category P lights) Bass Coast Shire Council has gained a 67 per cent saving to street lighting greenhouse emissions. This equates to a saving of 714,800kWh per year.

This bulk upgrade to more efficient lighting covers a road network area of approximately 793 km.

Details of energy efficiency upgrade

In total, 2,540 mercury vapour fixtures were replaced with efficient lighting options. This lighting upgrade gained 67 per cent efficiency from the baseline for the MV80 and MV50 globes upgraded, and a 19 per cent efficiency for Council’s total street-lighting greenhouse emissions.

The majority of the bulk of the upgrade occurred throughout Council’s local road network. Attachment 1 provides a list of roads and townships where lights were upgraded.
Table 1: Energy use details pre and post project for 80W and 50W mercury vapour residential street-lights

<table>
<thead>
<tr>
<th>Residential</th>
<th>Baseline energy use</th>
<th>New energy use</th>
<th>Energy efficiency savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>kWh use per annum</td>
<td>1,061,192</td>
<td>346,392</td>
<td>714,800</td>
</tr>
<tr>
<td>MJ per annum</td>
<td>3,820,294</td>
<td>1,247,012</td>
<td>2,573,282</td>
</tr>
<tr>
<td>MJ per kms of road/yr</td>
<td>4,818</td>
<td>1,573</td>
<td>3,245</td>
</tr>
<tr>
<td>MJ per kms of road/day</td>
<td>13</td>
<td>4</td>
<td>9</td>
</tr>
</tbody>
</table>

**Choice of technology**

In Victoria at the time this project was developed, funded and implemented there was limited availability in choice when embarking on an energy efficient bulk fixture change for street-lighting. Ausnet, formally SpAusnet is the Direct Network Service Provider for Bass Coast. Ausnet had only approved two efficient lighting options at the time of this project, the T5 (2x24W) or the CFL (42W). AusNet have since approved one type of LED streetlight for installation to their network. This approval was granted in May 2014.

A business case was undertaken to compare these two technologies based on energy efficiency, running costs and ongoing OMR charges to Council. The T5 (2x14W) light was chosen for the majority of the lighting replacements due to the higher level of energy reduction achieved, when compared to the CFL. The T5 runs at 30.2 watts, where the CLF runs at 36.6 watts, this also meant that running costs were also more efficient in the long-term. T5s were used for replacement of lights mounted directly to power poles. CFLs were used in those areas where decorative fixtures (Figure 1) were identified as the shape of T5s meant it could not be used with decorative fixtures.

![Old lights – MVs](image1.png) ![New lights – T5s](image2.png) ![Decorative lights - CFLs](image3.png)

**Figure 1: Existing and new efficient street-lighting used under project.**

Aesthetic considerations were also taken into account when choosing the technology to install. The compact fluorescent luminaire is roughly the same size and shape as the old MV luminaries, whereas the T5 has a slimmer and more linear appearance. Even though the T5 look slightly different from the old lights it was decided that additional energy savings had priority over aesthetics. The general population rarely notices the appearance of street
lighting, as lights are typically mounted at a height of 7.5 metres. From such a height, and context of poles, wires and other pole mounted infrastructure, lights appear insignificant.

Council also uses the 'Infrastructure Design Manual' a set of standard designs for Victorian local government infrastructure. T5s lighting is the recommended design standard. This project aligns and standardises residential lighting across the municipality.

The project upgraded a total of 2,540 street-light fixtures, Table 2.

**Table 2: Energy Efficient lighting hardware upgrade for Bass Coast Shire Council.**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Original Project</th>
<th>Final Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1: replace 800x 80W</td>
<td>800x T5s (2x14W)</td>
<td>1,772x T5s (2x14W)</td>
</tr>
<tr>
<td>Stage 2: replace 1,000x 80W</td>
<td>1,000x T5s (2x14W)</td>
<td></td>
</tr>
<tr>
<td>Stage 3: replace 800x 80W + 11x 50W</td>
<td>800x T5s (2x14W)</td>
<td>572x T5s (2x14W)</td>
</tr>
<tr>
<td></td>
<td>11x T5s (2x24W)</td>
<td>11x T5s (2x24W)</td>
</tr>
<tr>
<td>Stage 4 - Decorative</td>
<td>0</td>
<td>183x 42W(CFLs)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2x T5s (2x14W)</td>
</tr>
<tr>
<td>Total light figures</td>
<td>2,611</td>
<td>2,540</td>
</tr>
</tbody>
</table>

**Activity issues**

Overall the installation of the energy efficiency lights was a success; however there were a number of issues encountered by the project:

- Approval from Energy Distribution Network AusNet took six months longer than expected, and lead to installation delays.
- AusNet's GIS data was different to what was on the ground. In a high number of cases decorative lighting was found were pole mounted MV80s were expected. This meant that T5 installation was not possible.
- A small number of lights were found to be faulty at the point of installation, and cannot be replaced.
- Approximately half of the T5 globes purchased in stage 2 of the project arrived without PE Cells, however PE Cells were couriered as soon as the issue was realised and installers were able to continue installation with minimal disruption to installation timeframes.
- The project was extended to include decorative lighting, however delays with colour matching the light fixtures to the existing poles caused project delivery delays at the end of the project. There are still 61 fixtures that require installation. This will be completed by 30 June 2015.
- There were minimal residential complaints (approximately six over three years) relating to the new lights. All complaints related to the lights being too bright. Lights
are deemed brighter when compared to older lights, which were not operating at standard lux levels and overdue for an upgrade. T5s also direct more light towards the ground where it is needed rather than spilling it upwards.

4. PROJECT DEMONSTRATION AND COMMUNICATION ACTIVITIES
The Sustainable Street-lighting Project provided an opportunity to demonstrate leadership to the community around issues relating to sustainability and direct action on climate change. The project communicated to residents Council’s commitment to reducing greenhouse gas emissions. The project was a good news story.

Communication between project partners; AusNet, third party contractors and the Department of Industry was an important consideration during the life of the project. Clear lines of communication provided all parties with clarity regarding specific roles, and ensured all reporting requirements were completed.

Target audience and stakeholders
The target audience and stakeholders involved with this project can be broken into two main audiences:

The community
- Bass Coast Shire Council residents
- Local environment groups
- Local commercial and industrial businesses
- Other government departments and agencies (eg. Department of Environment and Primary Industries (DEPI), Sustainability Victoria (SV) and Department of Planning and Community Development (DPCD)

Project Partners
- Councillors and staff
- Department of Industry (funding body)
- Ironbark Sustainability (Project managers)
- South Gippsland Shire Council (installation contract partners)
- AusNet (owner of street-lighting hardware)
- Municipal Association of Victoria (MAV) – (bulk purchase of lighting panel)
- OHMS (installation contractors)

Key communication messages
Key messaging for the project was clear and simple:

Overarching messages:
- Energy efficiencies are key to reducing greenhouse gas emissions
• Bass Coast Shire Council is leading the way in reducing greenhouse emissions and responding to climate change
• The Sustainable Street-lighting Project is the single largest project council can undertake to reduce electricity costs

The project replaced 2,540 street lights with energy efficient alternatives.

• 2,357 T5 – Category P lights
• 183 42W CFLs – decorative lighting and fixtures

The project has:

• Reduced greenhouse gas emissions by an estimated 850 tonnes.
• Reduced street-lighting energy use by approximately 67%
• Saved at least $120,000 per year
• Been estimated to save 1.8 million over the life of the lights (15 years)
• Met all Australian Standards relating to safety and light levels
• Delivered on the Council Plan and Council’s environmental sustainability strategies.

These new lights:

• Created greater uniformity of light across and along the streets
• Provide better colour rendering and visibility on the ground
• Have less depreciation of light output over time and provide lower glare.

Communication Activity
Various of communication tools were used throughout the life of the project, as depicted in Table 3. Key messages were communicated to the community and project partners.

Attachment 2 provides evidence of project media coverage.

Table 3: Communication activity throughout the project.

<table>
<thead>
<tr>
<th>Communication activity</th>
<th>Primary Audience</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Council report</td>
<td>Councillors and residents</td>
<td>4 July 2012</td>
</tr>
<tr>
<td>Staff Low Carbon Lunchbox session</td>
<td>Councillors and staff</td>
<td>5 June 2013</td>
</tr>
<tr>
<td>Media Release</td>
<td>Residents</td>
<td>23 July 2013</td>
</tr>
<tr>
<td>Toilet poster</td>
<td>Staff</td>
<td>3 June 2013</td>
</tr>
<tr>
<td>Shire Crier</td>
<td>Staff and residents</td>
<td>12/09/2013</td>
</tr>
<tr>
<td>Media Release x2</td>
<td>Residents</td>
<td>10 Sept 2013</td>
</tr>
<tr>
<td>Media Release</td>
<td>Residents</td>
<td>11 Sept 2013</td>
</tr>
<tr>
<td>Presentation to NAGA street-lighting working group</td>
<td>Local Government across Victoria</td>
<td>13 Sept 2013</td>
</tr>
<tr>
<td>Shire Crier</td>
<td>Staff and residents</td>
<td>4 June 2015</td>
</tr>
<tr>
<td>Councillor Project update – email</td>
<td>Councillors</td>
<td>23 Sept 2014</td>
</tr>
<tr>
<td>Toilet poster</td>
<td>Staff</td>
<td>3 June 2015</td>
</tr>
<tr>
<td>Presentation to KABV award nomination submission</td>
<td>Award Judge</td>
<td>3 June 2015</td>
</tr>
<tr>
<td>DL brochure – project completion</td>
<td>Residents</td>
<td>12 June 2013</td>
</tr>
</tbody>
</table>
The communications activities proved very successful. Local press releases were picked up by the three local papers – the South Gippsland Sentinel Times, The Star and the Phillip Island Advertiser. Based on the readership of the local papers it is estimated that approximately 6,500 people or 20% of the population within Bass Coast Shire Council were reached through the engagement activities of the Sustainable Street-lighting Project.

5. Outcomes and Benefits of the Project

In total, 2,540 watt mercury vapour street-lights were replaced with energy efficient fixtures. 2,357 standard fixtures were replaced with twin 14 watt T5 fixtures and 183 decorative fixtures were replaced with 42 watt compact fluorescent fixtures.

The installation of stages 1 and 2 ran between September 2013 and February 2014. Stages 3 and 4 ran between November 2014 and June 2015.

The original project was scheduled for changeover in three stages with a total of 2,611 lights changed over. Stage 1 equalled 800 lights, stage 2 equalled 1,000 and stage 3 the remaining 811 lights.

Seventy-one lights could not be installed. There are a number of reasons for this. Reasons include:

- Inconsistencies between mapping data and infrastructure on the ground. Often lights were recorded as existing on poles, where in the field there were no lights on the poles. This meant that lights were not replaced.
- Some lights were unable to be accessed to change over, there were a range of reasons for this including, not being able to physically get the truck to the pole to physically change it over; or faulty existing lights were identified. These faults needed to be fixed by AusNet before contractors could make changes. Although AusNet were contacted as soon as faults were realised throughout the project, these faults are still outstanding at 5 June 2015.
- A high number of decorative lights were identified in the field and were identified on the maps as being MV80 globes. The project was extended to increase the number of lights replaced in-line with the original project scope of 2,611, this was called Stage 4.

Stage 4 was introduced to address the high number of unidentified decorative fixtures in the field. The significant cost savings achieved through the bulk purchase of hardware and were used to address the high number of decorative lighting identified. This fourth stage focused on the purchase and installation of an additional 204 42W lights to change the decorative lighting identified.

The energy efficiency improvement from the project will be 714,800 kWh per year or over 850 tonnes of carbon dioxide equivalent in greenhouse gas emissions. This equates to a
saving of approximately $120,000 per year and up to $1.8 million over the life of the lights (15 years). The Council anticipates the project payback period to be 5 years based on the full project budget, including both grant contribution and Council budget commitments.

**Overcoming Issues and Lessons Learnt**

There were a number of issues and lessons learnt throughout the life of this project.

Stage 1 of the installation work was originally planned for completion in August 2013. There were a number of documents (network modification agreement, lighting maps and project plan) that needed to be either be approved or provided by the Distribution Business AusNet (formally SPAusnet) before works could begin.

This approval process was estimated to take two weeks, but actually took six months. There was no reason for this delay and was completely out of the hands of the project team. Persistence with following up and speaking with the correct people at AusNet was the only course of action. All of the required documents were provided and approvals given by August 2013. The project team had all other project elements ready to go and installation started almost immediately in September 2013.

At project commencement it was expected that a total of 2,611 streetlights would be replaced across residential streets across Bass Coast. The end result was a total of 2,540. These discrepancies are the result of differences between AusNet's Geographical Information Systems (GIS) data on street lighting and what actually exists within the field. The major discrepancies were from a high number of decorative 80watt MV streetlights where standard lighting was expected from the GIS mapping data. This lighting type was not eligible under the original project grant or compatible for replacement with energy efficient T5 lights, and lead to a significant number of lights not being upgraded, under stages 1 to 3. 183 decorative MV80 lights were able to be changed over between December and May 2015 using unspent project funds.

There were also a number of access issues during the installation phase of the project. Areas of ‘no access’ are common for bulk change projects; however they are especially prevalent in rural areas where street-lights can be set back a significant distance from the road reserve. During periods of sustained wet weather, the heavy elevated work platform vehicle used to changes over lights cannot travel across grassed areas as it will get bogged or cause significant surface damage. This caused delays as installation was put on hold during periods of inclement weather.

It was expected to take 14 weeks for complete stages 1 and 2, with completion due at 13 December 2013. In hindsight this timeframe was unrealistic, as it failed to consider periods of inclement weather, sick days, and contactor emergency call outs resulting in a temporary diversion from the project.

Stage 4 of the project has timing issues. There are currently 61 fixtures that require installation; this is 2% of the installation numbers for the entire project. The delays area result of issues with the return of stock from suppliers, which means that installation, is held up beyond the project completion timeframes of the funding body. Council is committed to
completing this project by 30 June 2015, and will provide an attachment to this report to provide evidence of installation.

Energy Efficiency Results
The energy efficiency improvements were estimated to be 1,090,108 kWh per year at the start of the project with a 68 per cent improvement in energy efficiency. This figure was based on upgrading 2,611 lights and all replacements being T5 globes.

The actual energy efficiency improvements from the project will be 714,800 kWh per year with a 67 per cent improvement in energy efficiency. 870 tonnes of carbon dioxide equivalent in greenhouse gas emissions will be reduced annually as a result of this project.

The reduction of 714,800 kWh per year will equate to a saving of approximately $120,000 per year and up to 1.8 million over the life of the lights (15 years).

The difference in estimated energy efficiency figures from the actual are a result of a reduction in the total number of lights changed over from 2,611 to 2,540, a reduction of 71 lights.

The Energy Efficiency Improvement and Cost Benefit (Attachment 1) provides a more detailed analysis of the energy and cost savings and includes the methodology for calculation.

The first four months of actual billing data (figure 2) shows significant cost savings and correlates with the projected savings for the overall project.

Figure 2: Sustainable street-lighting project cost savings 3, and 14 months after stage 1 & 2 installation

<table>
<thead>
<tr>
<th></th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
<th>March</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business as usual</td>
<td>$19,056</td>
<td>$23,657</td>
<td>$23,380</td>
<td>$28,732</td>
</tr>
<tr>
<td>Sustainable 3 months</td>
<td>$18,056</td>
<td>$23,002</td>
<td>$19,560</td>
<td>$21,291</td>
</tr>
<tr>
<td>Sustainable 14 months</td>
<td>$14,995</td>
<td>$15,302</td>
<td>$14,223</td>
<td>$18,550</td>
</tr>
</tbody>
</table>
Community and other Benefits
In terms of community benefit, the T5 efficient hardware used for this project is a significant improvement on the old 80 watt mercury vapour globes. Benefits include; a decrease in glare, a more even spread of light, reduced upward light spill, and a reduced mercury content in the hardware. In addition, the lights are owned and manufactured by Australian companies, and support local industry.

In preparation of the project plan, a meeting with local police and internal staff was held. This meeting provided the opportunity to identify areas of safety concern within the community and a number of areas had lighting upgraded.

The high level of media interest and subsequent promotion of this project across Bass Coast provided the opportunity to promote the project. This project clearly illustrates to the community the importance of energy saving and reducing greenhouse gas emissions within the community.

As a result of the Sustainable Street-lighting Project, Council is seen as a leader across Gippsland, and as a result the project was promoted across Gippsland, at State wide conferences and through the Municipal Association of Victoria (MAV). All Councils across Gippsland have now either started or are about to start similar bulk street-lighting upgrades, this can partly be attributed to leadership shown by Bass Coast.

The Electricity Distribution Business across Gippsland is AusNet. Through this project, the benefits of the energy efficiency upgrade have been proven to AusNet. The experience, lessons learnt and the relationships built will benefit other Councils in the area and should make the process easier for both AusNet and Councils.

This project has been identified by Council as a Key Strategic Action for 2014/15. The project progress is reported to the CEO and Councillors monthly.

6. BUDGET
The Sustainable Street-lighting Project was delivered under the projected budget. Original project costs were estimated to by $1,029,489, with $291,747 (28%) being funded by the Australian Government.

At the end of the project the actual project costs were $947,500, resulting in a saving of $90,520.

Budget Changes
The original project scope included upgrading 2,611 category P residential street lights on local roads across the Shire. Due to mapping discrepancies outlined under the ‘Lessons learnt section’ above there were only 2,540 of these lights on the ground differing from the original estimate of 2,611. This resulted in a reduction in costs.
### Table 4: Project Budget Approved under Schedule 2 of Funding Agreement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Estimate</th>
<th>Actual spent</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project costs from DNSP</td>
<td>Non-contestable project management costs and written down value</td>
<td>$106,998</td>
<td>$98,404</td>
<td>-$8,594</td>
</tr>
<tr>
<td>Supply and installation</td>
<td></td>
<td>$835,520</td>
<td>$745,534</td>
<td>-$89,986</td>
</tr>
<tr>
<td>Project management and consultation costs</td>
<td></td>
<td>$55,972</td>
<td>$64,032</td>
<td>$8,060</td>
</tr>
<tr>
<td>Council administrative costs</td>
<td>Manage the project, write reports, prepare community consultation materials, attend meetings, and manage grant funding.</td>
<td>$31,000</td>
<td>$31,000</td>
<td>$0</td>
</tr>
<tr>
<td>Ongoing maintenance provision</td>
<td>Reverts to DNSP</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Total Project Costs</strong></td>
<td></td>
<td>$1,029,489</td>
<td>$947,564</td>
<td>-$90,520</td>
</tr>
</tbody>
</table>
**Budget summary**
An external audit of expenditure for the 2015/16 financial year is the requirement of the final project milestone, milestone 9. An auditors report will become an addendum to this report as Attachment 3.

**Attachment 2: Project Budget**

<table>
<thead>
<tr>
<th>Item</th>
<th>Original Budget</th>
<th>Adjusted budget</th>
<th>Remaining</th>
<th>Budgeted</th>
<th>Expenditure</th>
<th>Budgeted</th>
<th>Expenditure</th>
<th>Budgeted</th>
<th>Expenditure</th>
<th>Budgeted</th>
<th>Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written Down Value</td>
<td>$ 105,998</td>
<td>$ 106,998</td>
<td>$ 8,594.22</td>
<td>$ 106,998</td>
<td>$ -</td>
<td>$ 98,404</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Hardware costs</td>
<td>$ 564,864</td>
<td>$ 494,879</td>
<td>$ 23,172.29</td>
<td>$ 125,328</td>
<td>$ -</td>
<td>$ 229,768</td>
<td>$ 402,316</td>
<td>$ 229,768</td>
<td>$ 115,733</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation costs</td>
<td>$ 250,656</td>
<td>$ 250,655</td>
<td>$ 68,098</td>
<td>$ 91,998</td>
<td>$ -</td>
<td>$ 79,329</td>
<td>$ 122,715</td>
<td>$ 79,329</td>
<td>$ 56,842</td>
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</tr>
<tr>
<td>Project management costs - Ironbark</td>
<td>$ 61,972</td>
<td>$ 70,032</td>
<td>$ 39,472</td>
<td>$ 10,836</td>
<td>$ 3,206</td>
<td>$ 27,347</td>
<td>$ 33,541</td>
<td>$ 27,347</td>
<td>$ -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Joint w Sth Gippy - Ironbark =$51,415)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General consultation support</td>
<td>$ 25,000</td>
<td>$ 25,000</td>
<td>$ 11,504.77</td>
<td>$ 3,750</td>
<td>$ 4,813</td>
<td>$ 12,500</td>
<td>$ 623</td>
<td>$ 8,750</td>
<td>$ 8,060</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other SPAusnet charges</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -128.64</td>
<td>$ -</td>
<td>$ 129</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ongoing maintenance provision</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Project Cost</td>
<td>$ 1,029,490</td>
<td>$ 947,564</td>
<td>$ 101,368</td>
<td>$ 338,910</td>
<td>$ 5,147</td>
<td>$ 348,944</td>
<td>$ 654,413</td>
<td>$ 345,194</td>
<td>$ 183,835</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Council contribution (Finesse, minus CEEP)</td>
<td>$ 757,742</td>
<td>$ 655,817</td>
<td>$ 66,366</td>
<td>$ 291,536</td>
<td>Carried over</td>
<td>$ 614,066</td>
<td>$ 295,479</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Total Amount being applied for under CEEP</td>
<td>$ 291,747</td>
<td>$ 291,747</td>
<td>$ 35,000</td>
<td>$ 90,000</td>
<td>Carried over</td>
<td>$ 143,747</td>
<td>$ 88,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Council in-Kind support
Council provided a significant amount of in-kind support for this project. Support included project management, and communications support for the Sustainable Street-lighting Project. The support provided is equivalent to $26,916, which was calculated, based on half a day per week at $35 per hour for two and a half years and one full day per week for six months.

7. PROJECT OPERATIONS, MECHANISMS AND PROCESSES

MAV procurement
Victorian Councils have been investigating the options for bulk upgrades to the street-lighting network for the last ten years, given the high cost and greenhouse savings potential of an upgrade to more efficient technologies. The first bulk upgrade projects started occurring for Councils in Victoria around 2008. Since then processes have become more streamline and affordable but given the many stakeholders involved in the process, it is still a very complex activity.

Given the technical complications involved, the Municipal Association of Victoria (MAV) went through a two tendering processes on behalf of Councils across the State. The first tender was for project management (including the procurement of installation contractors) and the second tender was for the supply of lighting hardware. Councils who signed up to this procurement process could utilise the hardware panel and professional project managers to assist with the complex project management, rather than tender individually for these services. This MAV procurement panel also ensured that Councils met the purchasing requirements of the Local Government Act 1986. The hardware panel provided a number of ‘networks approved’ hardware supplier options and consultants, Ironbark Sustainability were awarded the Project Management contract.

Project Management
Three Councils in Gippsland received Australian Government grant funding for street-lighting upgrade projects (Bass Coast, Baw Baw and South Gippsland). The three Councils and projects managers (Ironbark Sustainability) meet to see if project management for all three projects could be coordinated under one ‘project’. This was identified as an effective way to manage the Gippsland projects. The MAV provided a quote for project management which included a number of options: project management per Council, project management with Council’s grouped together. Bass Coast and South Gippsland accepted the quote for project management with a letter of acceptance of this quote by Council’s CEO (Attachment 4).

Project management consultants were invaluable in the whole project process. Without their technical expertise, contacts and professional advice Council would not have had the internal resources or expertise to manage the bulk upgrade project. Their regular
communication and updates throughout the project meant that mostly the project ran smoothly even in the case of unexpected delays.

**Economies of Scale**

Bass Coast Shire Council partnered with South Gippsland to utilise economies of scale when tendering for the installation phase of the project. Council used MAV procurement to coordinate the tender. Bass Coast held and managed contract payments with contractors OHMS.

There are no local approved installation contracts in either Shire. Contractors are predominantly metro-based, and it is a 400km return trip from either municipality from Melbourne. This extra travel time was expected to increase contract costs and project timelines significantly. By working in partnership Councils coordinated purchasing and installation delivery times. Coordination of the installation contract meant the contract could plan to work week or weeks at a time in the region. Council provided a local storage location for lighting hardware and contractor equipment. This significantly reduced project costs.

Utilising the expertise of the MAV and Ironbark Sustainability to coordinate procurement of installation work for the project work proved to be a significant time saver and resulted in an impressive project outcome and significant savings.

**Internal Resources and Lessons**

The project took more officer time than anticipated and was due to a number of different issues.

*Internal staff changes.* A number of staff changes meant that the internal project management team became a project management team of one. The officer became responsible for internal project management, contract management, financial management and liaison with external project managers. It was intended this workload would be spread across a number of officers within the organisation. This created flow-on workload issues for the officer’s other project delivery.

*Staff changes and differing reporting requirements from Department of Industry:* During the three year period of the project the Department underwent a number of name changes and this project had a number of contacts. More time was spent bringing staff up to speed on the project status, deed variations. These changes also meant more administration for milestone payments. The level of detail required between agency staff meant that milestone report detail that was approved for one milestone, but at the next milestone a greater level of information was required. This increased the time spent project reporting significantly. The milestone template changed over the cause of the project and more detailed information was required, which required more officer time.
Questions over the technology used

LED street-lighting was approved for use after this project was started. The hype around LEDs lead to many internal and external questions about why Bass Coast was not installing LEDs. Officer time was required to respond to these requests and explain why Council made the choice it did. Lighting suppliers also rang to ‘spruik’ their products, not understanding that lighting needs to be approved by both the Lighting standard and also the distribution network before it can be used. There were many calls with the successful CEEP project announcement.

Condensability of the lighting network:

During the life of this project a number of questions were raised by Local Government about the contestability of the lighting network. The distribution provider own the lighting network and infrastructure but Council pay for the electricity and maintenance of the lights. Purchasing the electricity for the use of the lights is contestable and Council are free to contract with an electricity retailer of their choice via approved tendering processes. The maintenance of the lights has not been seen as contestable in the past but some Councils have started to question this process. No Victorian Council has yet successfully started externally tendering for maintenance of streetlights, but the question is raised and the process started for change. This resulted in confusion as there were companies who were competing for the maintenance of lights who suggested Councils hold off on bulk upgrades until they could go through a maintenance tendering process at the same time. This again resulted in additional Council officer time to understand the process and then explain this to internal staff and Councillors. Firm guidance to Councils from the AER would have been beneficial.

Extension to project to include decorative hardware:

This was both a positive and negative to the project. The savings from the high number of decorative lights found and the savings from partnering with South Gippsland were used to changeover decorative lights, which went beyond the initial project scope. The officer time required to coordinate this extension with Ironbark Sustainability and the installation contractors increased. The project was extended by a further six months and time increased from 0.5 day per week to a full day.

A better understanding of our street-light network:

Council has gained a better understanding of its street-lighting network. Before procurement could take place Council was required to define its lighting requirements by assessing current lighting and identifying possible problem areas (such as high traffic areas, or problem areas identified by Victoria Police). This information was then used to compile a final lighting design and specifications in readiness for the procurement process. This final design will assist Council to make any future changes to the light network (both AusNet and Council owned) more sustainable. Council also now has the AusNet GIS streetlighting layer to assist with asset management.
8. CONCLUSION
The Sustainable Street-lighting project successfully upgraded 2,540 residential streetlights with more efficient globes. This will result in a reduction in electricity use of 714,800 kWh per year, and equates to over 850 tonnes of annual greenhouse gas emissions. The upgrade will save Council approximately $120,000 in the first year and up to 1.8 million over the life of the lights (15 years).

Bass Coast Shire Council is now seen as a leader in the area of street-lighting upgrade projects across Gippsland and has demonstrated the importance of energy efficiency and greenhouse gas emission reductions to the local community.

The partnerships and relationships built and strengthened as a result of this project will continue into the future and should result in further energy efficiencies to councils and the community.

9. DECLARATION

DECLARATION
The Authorised Officer of the organisation makes the following declarations:

☐ I declare that I am authorised to submit this Final Report (including any attachments) on behalf of Bass Coast Shire Council (Name of organisation)

☐ I declare that the information provided in this Final Report is true and accurate.

☐ I understand, and acknowledge that giving false or misleading information in this Final Report is an offence under the Criminal Code Act 1995.

☐ I understand that final payment will only be made in accordance with the Funding Agreement including on satisfactory completion of Milestones.

Authorised Officer Signature: ................................................. Date: 24/06/2015

Name: Liza Horsburgh Price

Position: Coordinator Climate Change and Sustainability

Organisation: Bass Coast Shire Council

Witness Signature: ......................................................... Date: 24/06/2015

Name: Deirdre Griebsma

Position: Manager Sustainable Environment

Organisation: Bass Coast Shire Council

The use and disclosure of information provided in this Final Report is regulated by the relevant provisions and penalties of the Public Service Act 1999, the Privacy Act 1988, the Freedom of Information Act 1982, the Crimes Act 1914 and the general laws of the Commonwealth of Australia.
## Baseline Energy Use

<table>
<thead>
<tr>
<th>PROJECT TITLE</th>
<th>Bass Coast Shire Council Street Lighting Bulk Change</th>
<th>PROJECT ID</th>
<th>CEKP1049</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUNDING RECIPIENT</td>
<td>Bass Coast Shire Council</td>
<td>DATE</td>
<td>12 June 2015</td>
</tr>
</tbody>
</table>

### Building, Facility or Site 1

<table>
<thead>
<tr>
<th>Name of Building, Facility or Site 1</th>
<th>Street Lights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of building, facility or site</td>
<td>Residential street-lights (Category P)</td>
</tr>
<tr>
<td>Activity Type and Measure</td>
<td>Street lighting replacement</td>
</tr>
</tbody>
</table>

**Energy Efficiency Estimate Method**

Figures are based on actual number of street lights changed over under this project (2,540). The initial baseline figures for this project had estimated the total number of lights to be changed as 6,664.

The methodology for the calculation of energy volumes for such unmetered supplies is set out in the National Energy Market (NEM) Metrology Procedures, which are managed by the Australian Energy Market Operator (AEMO). The methodology relies upon knowledge of the energy consumption of each type of approved load at an unmetered connection point. The values for assumed energy consumption are obtained from power consumption tests. The outcomes of these tests are agreed upon by AEMO, responsible persons, Registered Participants and other relevant parties. The results are then presented and published in load tables managed by AEMO. The load tables must be updated whenever a new unmetered device comes into use. It is from these load tables that retailers and network service providers are able to calculate energy use from unmetered supplies. This was undertaken by maintaining an inventory of bulbs for each council so that costs can be appropriately allocated.
<table>
<thead>
<tr>
<th>Baseline Energy Usage</th>
<th>Baseline energy use is <strong>1,061,193 kWh</strong> per annum, or <strong>3,820,294 MJ</strong> per annum</th>
</tr>
</thead>
</table>
| Baseline Energy Efficiency | Council's lighting stock primarily comprise standard 80 Watt mercury Vapour lights (80W MV), which uses around 60-70% more energy than more efficient technologies that are currently available and approved:  
  KMs of roads that are P category: **793 km**  
  Number of P lights: **2,872**  
  Energy consumption: **3,820,294 MJ**  
  Energy consumption per KM of road per year: **4,818 MJ/KM/Year**  
  Energy consumption per KM of road per day: **13 MJ/KM/Day** |
| Energy Efficiency Improvement | Energy savings from street lighting are very easy to predict because the exact number and type of lights and their operating conditions are well known, and do not change as it |
is regulated by AEMO (see above).

The new lights will be:
2,357 x 2x14W “T5s” (wattage 30.2w)
11 x 2x24W “T5s” (wattage 47w)
183 x 45W CFLs (wattage 42w)

To calculate new energy use the calculation is:
Number of Lights x Wattage x 365 (days/year) x 11.94 (hours operational per day based on the regulations cited above) / 1000 (to get to kWh).

The new energy use is **1,247,012 MJ** per year.

This project will save **2,573,282 MJ/year** which amounts to a saving of 67% when compared to the existing 80W lights that were replaced.

Energy efficiency improvement per KM of road per day is **9 MJ/KM/Day**

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**Reporting Data (Measuring Energy Efficiency and Additional Data)**

Council has a total of 925 KM of roads of which 793km are “P category” roads specific to this project

Average hours of operation of lights per day: 11.94 hours

Percentage of the day lights are operational 49.8%

**Assumptions**

- Energy price increases are a choice of a conservative approach used by the Federal treasury (using CPRS 15%), a pessimistic approach used by the Energy Users Association of Australia (from 2010-2020 and then using the Treasury modeling from then on) and the average of the two. These choices were made after consulting the authors of the Treasury modeling (who are also members of the EUAA) and realising that either of the two models are possible outcomes so by providing the option of either with a mid-point it will enable Councils to assess a variety of possible outcomes.

  The sources of information are as follows:

<table>
<thead>
<tr>
<th></th>
<th>Treasury Base</th>
<th>CPRS 5%</th>
<th>CPRS 15%</th>
<th>EUAA modeling</th>
<th>Average (Treasury modeling (Base Case + CPRS 15%) and EUAA)/2</th>
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</thead>
<tbody>
<tr>
<td>Base to 2050</td>
<td>63%</td>
<td>62%</td>
<td>77%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010-2020</td>
<td>16%</td>
<td>33%</td>
<td>24%</td>
<td>150%</td>
<td>100%</td>
</tr>
<tr>
<td>2020-2030</td>
<td>16%</td>
<td>64%</td>
<td>72%</td>
<td>88%</td>
<td>88%</td>
</tr>
</tbody>
</table>

Sources: Report to Federal Treasury, MMA, Impacts of the CPRS on Australian Electricity Market's, December 2008; Presentation by Roman Domanski, Executive Director EUAA
Electricity prices for street lighting are modeled to increase from 10.4 cents/kWh in 2010

OMR prices are for 2011 as stipulated in the October 2010 AER documents, plus $3 for all lights with electronic control gear (as this cost has been excluded from the OMR price but is a real cost that needs to be factored in);

All savings and cost figures are GST Exclusive;

For the CFL, the OMR charge has been estimated to be the same as the T5 because the CFL has not been formally assessed by the Australian Energy Regulator to determine an agreed OMR. This assessment can take around 12 months once initiated.

Operating hours of lights are 11.94 hrs per day in Vic

Emission factor is 1.37kg Co2-e per K Wh

For Aura T5 lights, the OMR price is based on the indicative T5 price with modification for less maintenance;

For 2x24 T5 lights where new OMR prices were not provided, the old price has been altered by the same percentage as the new price of the 2x14W T5’s

<table>
<thead>
<tr>
<th>Cost of Activity</th>
<th>$947,564</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Cost Savings</td>
<td>$122,441 per year until 2030</td>
</tr>
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</table>