Unlocking the potential of energy efficiency within local governments

LED Streetlight retrofit project - Final Report
Shires of Laverton, Menzies, Dundas and Ravensthorpe (CEEP 2202)

This activity received funding from the Australian Government.
1 EXECUTIVE SUMMARY

This report summarises the outcomes of the “LED Streetlight retrofit in the Shires of Laverton, Menzies and Dundas” project (the Project), delivered by the Shire of Laverton (SoL) with co-funding from the Australian Government through the Community Energy Efficiency Program (CEEP). The project was managed on behalf of SoL by the Goldfields Voluntary Regional Organisation of Councils (GVROC), as the leveraged funding provided by the WA Department of Regional Development was awarded to GVROC to complete the project. In line with the broader goal of CEEP which is to increase the energy efficiency of street lighting, the project aimed to improve the energy efficiency of the Shires streetlights and promote the outcomes to the broader community. This initiative was designed to achieve measurable gains in street lighting, energy efficiency and asset management cost reductions. Additionally, the initiative will assist in community security and reducing anti-social behaviour in the shires of Laverton, Menzies and Dundas. The Shire aimed to do this by replacing 506 existing street lights with energy efficient LED (Light Emitting Diode) lamps.

The project was heavily reliant on the Western Australian State Government owned utility, Horizon Power (HP). The utility was responsible for the supply and installation of the new LED technology. HP provides power on the North West Interconnected System (NWIS) in the Pilbara, the connected network between Kununurra, Wyndham and Lake Argyle, and 34 stand-alone systems in regional towns and remote communities across Western Australia.
The Project initially had three Activities:

**Shire of Laverton (SoL)** – This activity was implemented in Laverton, a regional city in the Goldfields-Esperance region of Western Australia, about 370 kilometers north-east of the city of Kalgoorlie-Boulder and about 950 kilometers east-northeast of Perth. This activity involved the replacement of 149 existing streetlights.

**Shire of Menzies (SoM)** – This activity was implemented in Menzies a town also in the Goldfields-Esperance region of Western Australia. Menzies is situated 95kms north of the city of Kalgoorlie-Boulder and involved replacing 48 street lights.

**Shire of Dundas (SoD)** – This activity was implemented in Norseman a town in the Shire of Dundas within the Goldfields-Esperance region of Western Australia. Norseman is situated 726kms east of the city of Perth and involved replacing 263 street lights.

As the project progressed an additional shire was included in the project. This will be discussed further in the Project Operation, Mechanisms and Processes section on pages 33 and 34.

**Shire of Ravensthorpe (SoR)** – This activity was implemented in Hopetoun a town in the Shire of Ravensthorpe within the Goldfields-Esperance region of Western Australia. Hopetoun is situated 590kms south-east of the of the city of Perth and 160kms west of Esperance and involved replacing 269 street lights.

The project’s objectives were in line with the broader CEEP objective to increase and promote energy efficiency while reducing greenhouse gas emissions of community street lighting. The SoL main objective was to improve community security and reduce anti-social behaviour in the communities. The existing technology used to illuminate the local streets was inefficient and provided poor light levels. The new LED technology has the additional benefit of reducing operational costs for the communities and the Utility. The project has benefited the local community by providing a more consistently lit environment which has benefited not only the local community but also disadvantaged groups.

At the outset of the CEEP project it was estimated that energy would be reduced from 1,017,488MJ per annum to 642,277MJ per annum achieving a saving of 375,211MJ per annum. As the scope of the project developed the total number of lights across the 4 municipalities changed from 506 to
729. This increased the predicted energy efficiency improvement from 375,211MJ to 723,204MJ per annum, an overall reduction in energy use of 56%. The correct baseline energy usage for Laverton, Menzies, Norseman and Hopetoun is 1,285,394 MJ per annum and this has now been reduced to 562,190 MJ per annum which gives the aforementioned reduction in energy use of 723,204 MJ per annum.

Total financial savings realised from reduced streetlight tariffs for Shires of Laverton, Menzies, Dundas and Ravensthorpe are $34,551 per year, with Shire of Laverton expected to save $7,076 per year, the Shire of Menzies $1,240 per year, the Shire of Dundas expected to save $10,922 per year and the Shire of Ravensthorpe $15,313 per year. These cost savings are lower than originally estimated, as Horizon Power initially indicated the tariffs for new LED streetlights would be 28.62c/light/day for 25W U2 lights and 45.96c/light/day for 120W U4 lights. The eventual tariffs were considerably higher; 30.22c/light/day for U2 lights and 54.42c/light/day for U4 lights.

In an attempt to be cost effective, this project, CEEP2130, was undertaken in conjunction with another CEEP project, CEEP2202. CEEP2202 was within the GVROC region and was also managed by GVROC as a separate project. By combining the delivery of both projects, it was anticipated that costs and delivery times would be reduced. This did not occur due to several factors.

- Due to the tax liabilities, which are associated with gifting of assets to Utility companies, there were delays to the project until an exemption could be granted by the Minister of Energy in Western Australia. This also caused budget changes.
- Both projects suffered further delays in the tendering phase for the LED streetlight due to safety concerns which were to be addressed prior to award.
- Due to remoteness of participating Shires, both projects were subject to changing installation schedules due to changing priorities of the energy provider.

The project met all of its communication objectives which served to highlight the benefits of improved technologies which can provide not only cost savings but environmental and social benefits. The interest this project has generated in other regional WA councils indicates the effectiveness of the communications of the project. These local councils now understand the benefits LED technology can provide and in a bid to realise the same benefits, including reducing
vandalism and maintenance costs are beginning to adopt lighting retrofits. The City of Kalgoorlie Boulder (CoKB) has begun installing LED lights in the main street of Kalgoorlie. This demonstrates the positive example that this project has set and the flow on effects that it will cause with other local governments in the region following suit with their own LED light installations.

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.
2 PROJECT OBJECTIVES

The CEEP program objectives were to:

1. Support a range of local councils and community organisations to increase the energy efficiency of different types of non-residential council and community-use buildings, facilities and lighting; particularly where this would benefit low socio-economic and other disadvantaged communities or support energy efficiency in regional and rural councils.

2. Demonstrate and encourage the adoption of improved energy management practices within councils, organisations and the broader community.

This project was established to reduce the energy usage and associated maintenance costs of running Shires of Laverton, Menzies, Dundas and Ravensthorpe (the Shires) streetlights. The project was awarded funding through the CEEP program because of the alignment between the Shires’ objectives and those of the CEEP program. These will be discussed further but the main objectives were to:

- Promote energy efficiency
- Improve community security;
- Reduce anti-social behaviour;
- Reduce operational costs of street lighting for Communities and the Utility;
- Reduce greenhouse emissions through improved energy efficiency; and
- Increase awareness of energy efficiency technologies by Community education and promotion

The project was designed to support the Shires broader aims improving security, reducing anti-social behaviour in local shires and reducing the cost of the shires highest energy use item. The objectives of SoL’s project were designed to run in parallel with the objectives of the Department of Industry and Science. This involved the selection and installation of new LED lighting technologies to improve the street lighting outcomes and reduce energy consumption. Engaging with the community through various visual mediums including print/social media and educational presentations demonstrated the energy efficiency benefits of the project.

The Shires planned to improve the amenity of the community streets which have previously suffered from poor lighting due to aging technologies which included High Pressure Sodium, Mercury Vapour
and Compact Fluorescent. By selecting a more efficient LED technology, which significantly reduces energy consumption, and upgrading the photoelectric cells, which determine when the shires lights are switched on, the street lighting would be improved.

The project’s objective of demonstrating energy efficiency by making the benefits of energy efficiency visible and tangible aligned with the Departments objective of demonstrating and encouraging the uptake of energy management practices within councils, organisations and the broader community. The project was able to significantly improve the energy efficiency of the shires streetlights and slightly reduce operational costs while promoting and showcasing the project benefits.

A significant objective of both SoL and the Department was a desire to build knowledge and capacity of local energy services and construction industry by sourcing from local vendors/installers. Additionally, where possible the intent was to procure locally manufactured equipment. The project was completed by the local utility Horizon Power using a variety of local installation crews. Not only did this build local knowledge of energy efficient technologies but contributed to the local economy.

SoL’s and the Department’s objectives included an overarching goal of contributing to the national effort to reduce greenhouse gas emissions which this project was able to achieve. The project has adequately demonstrated and encouraged the adoption of improved energy management practices in the broader community and the key target audience.

The local audience is exposed to the energy efficient street light upgrade first hand which is particularly evident by the significant improvement in light coverage and perceived brightness of the new LED fittings. To showcase the energy efficiency improvements of the new technology a comprehensive communications program was required.
3 PROJECT ENERGY EFFICIENCY ACTIVITIES

Project Activities

Prior to the lighting upgrade project, the shires relied on a combination of lighting technologies to illuminate the local streets in each town. The following section details what equipment was existing and what upgrade activities took place as a result of the project.

The Horizon Power network, owned and operated by the utility, consists of 42W Compact Florescent Lamps (CFL), 80W Mercury Vapour (MV), 125W, 150W and 250W High Pressure Sodium (HPS) lamps.

MV, MH and HPS fall into the category of High Intensity Discharge (HID) lamps which require a spark to ignite gas and metal salts within a transparent arc tube. These lamps are inefficient and require a considerable amount of energy to produce the same light levels which can be achieved by more modern LED fittings. The lifespan of HID lamps typically ranges from 7,000hrs for MH, 15,000hrs, MV, 10,000hrs to 20,000hrs for CFL and typically 20,000 hrs for HPS. The existing fittings are made up of single piece, pressure die-cast aluminium and glass (see Figure 1 & 2).

The new LED lamp replacement supplied by Lightsense have a typical lifespan of over 50,000 to 100,000hrs and require less than half the energy to achieve the same light levels as the redundant technology. The fitting does not use glass protection lens but a polycarbonate compound which increases the shock resistance and reduces the effects of vandalism.

Figures 1 & 2 – The redundant 150W light fitting which typically contained a High Pressure Sodium lamps.

The LED technology is a two lead semiconductor light source and when power is applied to semiconductors (usually gallium, arsenic and phosphorus) they are stimulated by the movement of
electrons; thus creating photons, the light that can be seen by humans.

The new Lightsense LED fittings are supplied in two types, the U2 and U4. The U2 type uses 25W of power and replaces the 42W CFL, 80W MV and the 125W HPS light fittings. The U4 Led light type uses 120W and replaces the 150W HPS and the 250W HPS lights (see figure 3 for the Lightsense LED fitting).

![Lightsense LED fitting](image)

*Figure 3 – Lightsense supplied U2 (25W) and U4 (120W) series LED fitting supplied for the SoL project*

The reduction in power used by the LED lights has reduced the level of CO2 emissions and reduced the ongoing cost of electricity. The robust technology of LED’s and small size of the diode creating the light means the fitting is much less prone to external damage. This is particularly important to the shires of Laverton, Menzies, Dundas and Ravensthorpe as vandalism accounts for a large portion of the maintenance costs associated with the street lights.

Horizon Power ensured the new LED fittings were supplied with a photoelectric cell which is positioned on the top of the fitting and senses available light levels. Once the light levels drop to a predetermined level the light automatically switches on. This technology ensures lights are not operating during the day when the light is not required and is not reliant on seasonal clock adjustments.

The installation of the new lighting technology was coordinated by the utility which owned the streetlights within each shire. Horizon Power contracted their installation works to local electrical companies which were specifically trained to maintain the infrastructure. The majority of the
contracting companies were based in the Goldfields and sourced their electrical tradesmen from the regional areas within the GVROC.

A street light audit was conducted by Horizon Power in each town prior to the retrofit project starting. This provided Horizon Power with a better understanding of the highest priority streetlights to be upgraded and assisted with planning and the mobilisation of installers.

As each delivery of lights arrived into Esperance from the supplier, a team of electricians were dispatched to locations nominated by Horizon Power. Figure 4 features the installers removing the redundant fittings and replacing with the new LED fitting. The redundant fittings were removed and sent to landfill facilities in each participating shire.

![Figure 4 – Horizon Power installation crew midway through the streetlight retrofit in the main street of Norseman.](image)

The project faced some issues during the implementation phase. Prior to the installation phase beginning the project was delayed by the release of a tender conducted to source a new LED light fitting. The main reason for this delay occurred when HP implemented large scale redundancies during 2013/2014. The tender evaluation period was extended from 3 months to 12 months as the technical experts assessing the tenders no longer worked for HP. This delay meant the order for the lights could not be placed. The programmed installation phase was further delayed after the award of the contract as the lights had a lead time of 12 weeks from manufacture to delivery in Western
The lighting tender was further delayed by an unforeseen OH&S issue, where a Horizon Power streetlight pole in the Pilbara region was electrified due to the incorrect installation of an LED light. Tenderers were requested to provide evidence of how this issue would be addressed and to satisfy Horizon Power that any future LED light installation would not incur this risk.

Horizon Power did not have an accurate record of the total amount of lights to be replaced. Prior to an accurate order being placed with the lighting supplier, a comprehensive audit was undertaken. Once the final light fitting figure was found, orders were placed with the supplier and installation contractors.

The project faced a significant challenge with an unforeseen tax implication resulting from the transfer of ownership of LED lights from SoL and the Shire of Esperance through the related project CEEP2130 to Horizon Power. The ‘gifted assets tax’ was not considered a critical issue to the project until Horizon Power hired an external consultant and it became clear the tax liability would be passed onto SoL and the Shire of Esperance in full. The tax of 13.9% would have derailed the project with an impost of close to $800,000 for both projects being removed from the project to fund the tax. The CEEP program guidelines precluded the use of CEEP funds to cover the costs related to tax liabilities associated with the gifting of streetlights. Such an expenditure did not comprise an eligible expenditure under the program guidelines and after discussions with both Horizon Power and the GVROC shires, it was agreed to request an exemption from the Western Australian Government. After a period of 3 months the Minister of Energy in Western Australia approved the request to waive the tax liability for the project.

The waiving of the tax liability resulted in additional funds being available to be used to install additional lights for the project. It was decided by SoL and DOI to install additional 249 new technology LED lights to the town of Hopetoun in the Shire of Ravensthorpe.

The Shire of Ravensthorpe committed to perform all communications required to showcase the new LED street lights in line with the other shires communications plan. These items include the printing of posters, brochures, a face to face meeting with the local Chamber of Commerce and Industry and social media updates on the City website.

Shire of Laverton Activities
The town of Laverton lies at the heart of the area known as the Shire of Laverton. A total of 91 U2 lights and 74 U4 lights were installed within the Shire of Laverton.

During the hotter months (November through February), as the streetlight installations in the GVROC shires entered the final stages, Horizon Powers installation crews were deployed to fire zones. Numerous bushfires during Western Australia’s fire season, 2015/16 meant Horizon Power electrical contractors were deployed to emergency areas to repair damaged infrastructure. This delayed deployment of crews to the towns of Laverton, Leonora and Menzies as these were the last on the GVROC list to be completed.

Post implementation of the streetlights in Laverton was met mostly with positive feedback with one Shire representative admitting there had been no complaints from the community which was seen as a positive message.

As with any project, early planning and communications with stakeholders sets up the project for success. When dealing with such a large organisation as Horizon Power the project team learnt that ensuring a single regional representative appointed to the project was critical. Early in the project the communication between the GVROC and Horizon Power was very slow. Once a single point of contact from Horizon Power, based in the Esperance region, was appointed, the speed of progress accelerated greatly. This representative was able to clearly communicate to the project team and able to keep the team up to date on critical activities. For any future projects the team would ensure a representative from the utility was appointed from a senior management level able to make decisions critical to the projects progress.

**Shire of Menzies Activities**

The town of Menzies also lies at the heart of the area known as the Shire of Menzies. A total of 28 U2 lights and 20 U4 lights were installed within the shire. The town is small in comparison to other shires within the GVROC so the installation process was completed by the installation crew on the way to Laverton. The delays, as previously explained in Project Activities prevented the Menzies lights from being installed on time. Numerous schedule changes effected the installation but did little to effect the final installation. The feedback provided, as discussed in the Project Demonstration and Communications Activities, by the shire and the community of Menzies was excellent. No issues were experienced which contributed to the successful installation.
Shire of Dundas Activities

The town of Norseman is situated in an area known as the Shire of Dundas. A total of 147 U2 lights and 119 U4 lights were installed within the town. The lighting retrofit in Norseman was completed early in the installation schedule, so suffered none of the delays caused by regional fires.

The feedback provided, as discussed in the Project Demonstration and Communications Activities, by the shire and the community of Norseman was excellent. No issues were experienced which contributed to the successful installation.

Shire of Ravensthorpe Activities

The town of Hopetoun is situated in an area known as the Shire of Ravensthorpe. A total of 247 U2 lights and 8 U4 lights were installed within the town. As soon as the additional funding was approved by the DOI, the GVROC implemented the additional light orders in time for installation to begin. The lighting retrofit in Norseman was completed early in the installation schedule, so suffered none of the delays caused by regional fires.

The feedback provided, as discussed in the Project Demonstration and Communications Activities, by the shire and the community of Norseman was excellent. No issues were experienced which contributed to the successful installation.
4 PROJECT DEMONSTRATION AND COMMUNICATIONS ACTIVITIES

To communicate the energy efficiency activities of the project and their effectiveness, it was decided the SoL’s communication strategy should be premised on regular and sustained engagement with the local community and visitors to the area who would benefit from or be impacted by the energy efficiency upgrade. Consequently, the project implemented a communications and engagement program which included an awareness campaign delivered by the GVROC during and after the project completion.

The target message of the project was to demonstrate and encourage the adoption of improved energy management practices within the Councils and the broader community. The community was informed of the project and its energy efficiency benefits via physical media distributed throughout the site and directly to users.

Through approved communications activities, as outlined in the communications plan, the local council, specifically, the local community were kept informed of the project’s progress.

The following groups were targeted for communications regarding the project:

- **Primary stakeholders who have a direct interest in project outcomes such as:**
  - Councillors and Shire CEOs
  - Key community groups directly affected by a project

- **Secondary stakeholders with a general interest in the project:**
  - Council and Shire staff
  - People who live and work in the broader Shire area
  - Community groups in the area

- **Tertiary stakeholders who had some interest in the project:**
  - Local Government agencies and organisations
  - Non-government agencies and organisations
  - Local media

*Figure 5: Target groups and stakeholders*

These groups all received different, targeted communications and engagement throughout the life of the project and were instrumental in shaping the design and delivery of project communications.
Communications activities took place throughout the life of the project. At project commencement, the communications consultant met with the GVROC Sponsor, each of the Shire CEOs, key community stakeholders and the Project Manager to agree the requirement for communications activities for the entire project.

The communications consultant identified:

- The expectations of Shire CEOs and key stakeholders regarding project communications, their expectations and outcomes of the communications and engagement activities
- Their perceptions of the key benefits of the project and how these benefits should be made visible to the community – key messages
- The impact of the project on local communities, potential issues and community resistance, and associated strategies for addressing concerns
- How the project communications can best support the timing and rollout of the project
- The extent to which Shire’s CEOs and others wanted to participate in communications activities
- Feedback mechanisms for assessing the success of communications.

This overarching project communications plan was then used as the basis for the individual Shire’s specific communications plans.

The stages of communications activities undertaken at each Shire are illustrated as follows:
Stage 1 - Shire, community and stakeholder consultation

At the start of each Shire’s street light retrofit program, a Communications Plan was developed for the Shire. The Plan was developed in consultation with each Shire CEO, nominated Shire personnel, and selected community groups including local indigenous representatives to ensure all stakeholders could provide input to, and help shape, the proposed rollout of activities.

The communications consultant utilised the local community representatives who had direct access to people, who understood local issues and sensitivities, and who would sustain community support. This included working directly with, for example, the Menzies Aboriginal Community Group. Their role was vital in helping to engender widespread support and in ensuring that communications addressed the specific information needs of the local community. They helped explain local issues and community expectations about the project which helped to shape the plan for communications and engagement activities. Additionally, this engagement clarified the extent to which they wished to get involved in the design and delivery of communications activities. Topics which were explored included:

- How best to leverage existing community assets, knowledge and resources
• The most effective communications methods to engage with the community
• Ways to identify potential “hard to reach” stakeholders and barriers to accessing community some groups, so as to maximise opportunities to engage with those community members
• Access to schools and other venues, other logistical considerations
• Potential threats, such as individuals or organisations that may have concerns about the project or other issues that may hinder the success of communications activities.

As a result of this early, broad consultation, the communications team was able to form lasting relationships with senior community leaders. This ensured that their needs and wishes were taken into account in project decision-making and the style of communications which was provided.

Local Research

While developing each Shire’s Communications Plan, the communications consultant developed a thorough understanding of the local community. This included research into the local history, demographics, socio-economic issues, and specific community concerns.

Approval and sign off

The final Communications Plans were each reviewed by the Project Manager and approved by the Department of Industry, Innovation and Science. In total, six Communications Plans were developed during the project.

Stage 2 - Implement the Communications Plan

Communications activities were timed to integrate with Horizon Power’s project installation schedule. This ensured that the community understood what was happening in their towns and knew about the project and its’ benefits. This approach maximised community interest and enthusiasm for the installation of the lights, whilst raising awareness of the importance of energy efficiency.

Pre start meetings

The communications approach originally aimed to hold pre-start meetings with each Shire approximately 1 month prior to the commencement of lights in their area. However, the installation in some Shires progressed more quickly than planned which meant that the lead time for informing Shires was, in a few cases, less than 2 weeks’ advance notice. This did not have a significant impact
on the communications activities, as these were quickly ramped up to coincide with the installations. All Shires responded positively to the quick rollout and were happy to help in accommodating the communication consultant’s presentations to the Shire, Councillors, community groups and local schools. A single prestart meeting was conducted with the Shire of Menzies, Dundas and Ravensthorpe.

![Communications channels](image)

**Figure 7: Communications channels**

**Communications channels**

After engaging with community leaders and local Government Shire CEOs to agree the best approach to engaging with the local community, the communications campaign was rolled out using a variety of channels to maximise access to project information. The projects Communication team from Mango Group presented to each group, although none of the presenters were indigenous the presenters received excellent feedback from all sectors of the community including indigenous members who provided positive feedback to the communications team.

For example, in some poorer and more remote Aboriginal communities, access to the internet was difficult. In these areas, face-to-face presentations were successful in explaining the project, building trust, and providing opportunities for questions.

Conversely high penetration, low cost communications channels, social media and online outlets provided the opportunity to engage with the Goldfield’s busy, mobile and younger communities. In bigger centres (e.g. Norseman), social media was a great communication accelerator and Shire website updates were highly effective in reaching larger groups.
Face to Face communications

All Shires were provided with face-to-face briefings for their staff, Shire Councillors and other community representatives. The Shire of Laverton did not see this as being necessary and preferred to rely on printed materials (letter drops, posters and banners) for informing the community. These briefings included demonstrations of the LED U2 light, along with an outline of project activities and the benefits of the project to the community. A total of 3 workshops were completed for the Shire of Menzies, Dundas and Ravensthorpe over the period of the Project. Each workshop consisted of approximately 4-5 representatives.

Face-to-face briefings and presentations were highly successful in gaining support, getting feedback about the LED lights, and for identifying any local issues which needed attention e.g. In Esperance a Shire Councillor raised the issue of public safety concerns in a poorer socio-economic suburb and requested that the area be prioritised for the installation of lights. As a result, this suburb was the first to receive new LED lights and feedback from the local Nulsen Progress Association has been very positive.

The project also established kiosks in shopping malls to explain more about the project and large numbers of the community expressed significant interest. This provided direct access to a wide range of the community, who commented positively on the new street lights. Many residents noted that the LED street lights had improved the brightness of streets without “spilling” light into homes.
School Presentations

Schools were an important area for raising awareness about energy efficiency. Children, from the ages of 4 to 18, were provided with presentations about why energy efficiency is critical and how to achieve energy savings in their schools and homes. A series of interactive roadshows were conducted which included hands-on demonstrations of energy consumption by various household devices and globes. Children were also provided with the opportunity to handle a U2 LED residential street light. The following schools received presentations:

<table>
<thead>
<tr>
<th>School</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Menzies</td>
<td>Menzies remote school</td>
</tr>
<tr>
<td>Hopetoun</td>
<td>Hopetoun Primary School (2 sessions for different age groups)</td>
</tr>
<tr>
<td>Norseman</td>
<td>Norseman District High School</td>
</tr>
</tbody>
</table>

Children’s interactive experience of the lights created significant advocacy. Anecdotal feedback from school teachers and staff has been that children have taken the message about energy efficiency home, and have been instrumental in influencing their families to install LEDs in their homes.

Posters, letter drops, banners, newsletters and other hard copy materials

Eye catching information was provided in a variety of formats including newsletters, letter drops, large A5 stand-up banners, posters and presentation slides. These were mainly hung in local council buildings and facilities or taken into schools and displayed during presentations. Leaflets were left with the school and wherever posters were hung a pile of brochures was also displayed and encouraged to be taken home. The ‘goodie bags’ were handed out at the school presentations and
Consisted of booklets containing information on energy efficiency, stickers and small toys which highlighted energy efficiency.

Figure 10: Examples of banner, letter drop and local newspaper article

The following hardcopy promotional materials have been delivered:

<table>
<thead>
<tr>
<th>Location</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Menzies</td>
<td>A5 stand-up banner&lt;br&gt;Presentation slides for Shire briefing&lt;br&gt;Presentation slides for Menzies Aboriginal Community Group&lt;br&gt;Local school presentation&lt;br&gt;‘Menzies Matters’ newspaper articles (2)&lt;br&gt;Shire website articles (2)</td>
</tr>
<tr>
<td>Dundas - Norseman</td>
<td>A5 stand-up banner&lt;br&gt;Presentation slides for Shire briefing&lt;br&gt;Presentation slides for school&lt;br&gt;‘Norseman Today’ newspaper article (1)&lt;br&gt;Shire website articles (2)</td>
</tr>
<tr>
<td>Laverton</td>
<td>Posters (10)&lt;br&gt;Brochures, handouts and flyers (100)&lt;br&gt;Shire website articles (2)</td>
</tr>
<tr>
<td>Hopetoun</td>
<td>Posters (10)&lt;br&gt;Presentation slides for Shire briefing&lt;br&gt;Presentation slides for school&lt;br&gt;Shire website articles (2)</td>
</tr>
</tbody>
</table>

Figure 11: Promotional materials for each Shire
Social media

The project provided website articles for each Shire providing updates about the project and its’ benefits. These articles provided an opportunity for the community to contribute feedback and ask questions via Facebook and Twitter (where available), or directly to the project’s communications consultant. This facility was also used to garner feedback from the community via a Survey Monkey survey, after installations were completed.

Media and photo shoots

Local and regional media were kept informed of the project progress with regular Press releases, setting up local radio interviews with community leaders and Shire CEOs, and photo opportunities at key milestones. Use of these channels enabled far reaching communications to widespread communities.

![Cartoon used in newspaper articles](image)
The following community media organisations were engaged:

Kalgoorlie Miner

Norseman Today Community Newspaper Group

Photo shoots with local Shire CEOs and Horizon Power’s project staff provided a vivid account of the progress which was being made.

Figure 13: Photo shoots used in newspaper articles
Stage 3 - Review communications activities

At the commencement of the project, Horizon Power’s implementation plan was to roll out the lights in a sequential program with installations being completed in one Shire, prior to initiation of the next Shire’s implementation. The communications approach was designed to undertake a review of the effectiveness of communications at each Shire, with input from the community and Shire staff, so that the “lessons learned” could be taken into the next phase of communication activities at the next Shire.

However, the rollout program progressed more quickly than planned, with implementations of both U2 and U4 lights occurring in a number of Shires simultaneously. This meant that many of the post-implementation communication reviews with Shires and the community were conducted within close succession of each other and did not necessarily inform the communications activities conducted in other Shires.

Feedback has been obtained through:

- Verbal interviews with Shire CEOs, Shire Presidents, and 1-on-1 meetings with project stakeholders and community representatives
- An online survey monkey for all communities
- A hard copy survey provided to Shires and Information Centres, along with reply paid envelopes, requesting community feedback.
5 OUTCOMES AND BENEFITS OF THE PROJECT

5.1 LED lighting technologies

The key outcomes and benefits of the project were identified as:

- Energy efficiency improvement of 723,204 MJ per annum
- Reduction in electricity costs to participating Shires enabling reinvestment of savings in further energy efficiency or renewable energy opportunities
- Decreased annual maintenance costs to participating Shires and Utility
- Increase in perceived light levels and coverage assisting in a reduction in anti-social behaviour
- Greater community awareness of energy efficient technology

The original application for funding for the project forecast energy efficiency improvement of 375,211 MJ per annum from a baseline for Laverton, Menzies and Dundas of 1,017,488 MJ per annum, this would have resulted in a 37% reduction in energy use. As the scope of the project developed the Shire of Ravensthorpe was added to the project and the total number of lights across the now 4 municipalities changed from 506 to 735. This increased predicted energy efficiency improvement from 375,211 MJ to 723,204 MJ per annum. An overall reduction in energy use of 56% per annum. Further information can be seen in Appendix 1 - Project Energy Efficiency Improvement Report

Energy efficiencies were calculated by comparing the baseline energy consumption of the existing street lights with the energy consumption of the new LED technology. Baseline energy consumption has been identified using existing utility invoices and a streetlight audit undertaken by Horizon Power. As the street lights were not individually metered the energy cost savings were calculated based on electricity tariffs set by the utility before and after the project completion.

The payback on project funding for this project is sub-optimal, as Horizon Power tariffs for the new LED lights were set very close to the existing tariffs for lights with much higher electricity consumption and maintenance costs. This was an extremely disappointing outcome for the GVROC, as maintenance and replacement costs borne by Horizon Power are expected to be significantly
lower with the new LED streetlights. Electricity consumption is also much lower, as the wattages of the new LED lights are considerably lower than pre-existing lights, but this has not resulted in a significantly lower tariff. Horizon Power initially indicated the tariffs for the new LED streetlights would be 28.62c/light/day for U2 lights and 45.96c/light/day for U4 lights. The eventual tariffs were considerably higher; 30.22c/light/day for U2 lights and 54.42c/light/day for U4 lights. These tariffs are not significantly lower than pre-existing tariffs and therefore the financial savings to the Shires has been reduced. It appears that Horizon Power have taken this opportunity to set new tariffs to increase revenue, as Horizon Power are realising large savings in maintenance and replacement as well as a reduction in electricity supplied to the lights, however these savings have not been passed on to the Shires through proportionately reduced tariffs.

The annual financial saving for Shires of Laverton, Menzies, Dundas and Ravensthorpe of $34,551 gives a payback period on project funds of $1,075,911 of approximately 31 years. This means the project does not meet the basic criteria for a project’s financial viability of a payback period of 10 years or less.

Any financial savings that are accrued as a result of the reduction in energy use will allow GVROC to materially assist in providing and enhancing the services provided to the local community. In particular, the revenue has been highlighted as being directed into providing more energy efficient projects.

In its current state, where maximisation of the efficiency is possible, the benefits to participating Shires are $34,551 per year in reduced electricity consumption costs alone. The overall maintenance savings are still only estimated as the useful life of LED lights vary from 50,000 hours up to 100,000 hours. This is significantly longer than any of the redundant street light technology. Due to the remoteness of their location, the replacement and vandalism costs of the redundant lights make up approximately 49% of the overall operational expenditure required to maintain the road lighting network in the region. The project has been able to significantly reduce this percentage based on the expected life span of the new technology due to the robust materials and design.

Use of a robust light fitting with a longer useful life expectancy has provided an additional benefit to communities with high levels of anti-social behaviour. Prior to the project commencing the communities suffered from street light vandalism with lights being broken by thrown projectiles. This
caused light outages throughout the towns. The feedback from the local community has indicated that there is a perceived benefit of increased light level which has translated into a feeling of safety. For example – “I think the community have a few reasons why they are so positive. One, the LEDs are bright – and so they feel more secure. Two, the lights are “green” inasmuch as they use less energy and three, the lights reduce maintenance costs which may mean reduces costs for the Shire of Menzies.”. The comments from Laverton have also been positive with comments such as - “All positive – haven’t heard one bad thing. No one has expressed any concerns. I have heard some say “it is great” and “much brighter”. All positive feedback”. The benefit of the robust light is that the lights are much more difficult to break and even if one LED lights module is broken it does not mean the remaining LED modules in the fitting is prevented from working. This is an excellent result which will continue to benefit the community over time by reducing the maintenance required on individual poles and ensure light levels are maintained for longer periods.

5.2 Demonstration and Communication Outcomes

The local community in each shire was surveyed to evaluate the impact of the lighting upgrade on the community with an overwhelmingly positive response of 90% of those who have provided feedback indicating that they believed the new LED street lights had improved visibility. Other positive feedback cites the following factors as benefitting the community:

- Reduced crime, improved public safety from improved lighting
- Safer roadways due to increased visibility of hazards
- Improvements in environmental management from reduced power consumption.

There was some uncertainty as to the extent to which the LED lights would save on energy and maintenance costs, as most had limited access to this type of information, but many expressed optimism that this would eventuate in the future.

As per Figure 12, the Shires received significant circulation of the communications materials. It is difficult to confirm how much of the community has been reached in the demonstration and communications activities in particular how many website article hits were received.
The feedback on the project from the community was excellent and comprehensive. A total of 23 responses were received from Laverton, Menzies, Dundas and Ravensthorpe. The most significant results are summarised as follows:

- 100% of respondents believe the lights improve energy efficiency
- 90% respondents believe that the new LED street lights have improved visibility
- 90% believe the lights improve safety, generate more light and will result in cost savings
- 85% believe the lights makes the area look more attractive

When asked “How would you characterise the overall quality or appearance of the new LED lighting?” more than 90% of respondents indicated that it was “better” or “much better” than previously.

Other comments have indicated:

> We have found the lighting to be very good and encourage all communities to embrace it. From what we have witnessed throughout the town, we have now upgraded our household lighting to LED.

> They are a great idea and should be rolled all over the country saving money and improving the environment.

It would be difficult to confirm if the project has in fact contributed to the broader uptake of energy efficiency activities in the community, but because it is the first of its kind in the region, there is an increase in interest in the technology. Due to the communications activities through the local shire of Esperance, the Shire of Waroona made contact with the communications consultant regarding the LED technology and Enigin was able to provide full costings and roll out plans for the Shire of Waroona. The Shire is very interested in taking on its own streetlight retrofit project, as a way of contributing to CO2 reductions and energy costs to the Shire.

It is unclear if there have been any improved energy management practices in the community arising from the demonstration of the project and its benefits. However, one of the respondents to the community survey commented, “The feedback from the school was good too. The kids took the message home about LED lights and I have heard that parents are now putting LEDs into their...
homes! *The cost savings stack up*. This alone indicates the level of interest in this type of energy efficient equipment and its potential uptake as a result of the Council undertaking the project.

The project provided some excellent **opportunities for local industry** as the majority of the contractors were locally based contractors. The majority of the equipment in the project was sourced from either the east coast or overseas due to cost and lack of locally sourced materials. However, the contractors who worked on the project were from the Goldfields-Esperance region ensuring the money was spent locally and was injected back into the local community as much as possible. Although maintenance has been reduced by the use of the new technology there will still be occasional light failures during the useful life of the fitting which will require local labour to replace.

The robust street lighting and improved lighting coverage has been deemed a critical asset in remote communities and this project has given a sense of safety and of a reduction in anti-social behaviour in particular areas frequented by ‘at risk youth’. By showcasing the success of the CEEP lighting project shires like Esperance will demonstrate key benefits when improving conditions for the local community. An example being the redesign of the local skate park. Projects like these have been viewed as critical to the ‘at risk youth’ identified who get real value from contributing / learning from projects seen to have a visible and material value to the community. In this way the LED retrofit project has been used to demonstrate the broader / longer-term value to them as individuals and the community by building a “sense of worth”.

*“Certainly, public sentiment towards the Shire, is positive – people like shop keepers have seen an improvement in the lighting and in the overall appearance of the main road and have commented “it all looks much better”. The whole project has been well received”.*

**Pascoe Durtanovich, CHIEF EXECUTIVE OFFICER, Shire of Menzies**
6 BUDGET

The Shire of Laverton, Menzies, Dundas and Ravensthorpe project was achieved within the budget specified for the project.

Project budget: $1,075,911

The Horizon Power and Western Power gifted asset tax policies were an unexpected project cost, which were unable to be funded by CEEP. This matter was taken to the WA Department of Treasury, where an exemption was granted for project components in Horizon Power towns.

The nature of the LED technology did not create any budgetary issues as the procurement and installation was provided by Horizon Power. The GVROC shires involved did not cause any particular issues to the project.

<table>
<thead>
<tr>
<th>Category:</th>
<th>Expenditure Item:</th>
<th>Budgeted Costs:</th>
<th>Actual Costs:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Administration</td>
<td>Project Office and Contract Administration Services</td>
<td>$ 18,700</td>
<td>$ 23,228.72</td>
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<td>Ongoing Project Management</td>
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<td>Design &amp; Develop</td>
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<td>Delivery</td>
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<tr>
<td>LED Streetlight Retrofit - Dundas</td>
<td>LED Procurement - Manufacture</td>
<td>$ 105,750</td>
<td>$ 113,597.59</td>
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<tr>
<td></td>
<td>LED Procurement - Delivery</td>
<td>$ 105,750</td>
<td>$ 113,597.59</td>
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<td></td>
<td>LED Installation Testing and Commissioning - Dundas</td>
<td>$ 82,950</td>
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<td>LED Procurement – Manufacture</td>
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<tr>
<td></td>
<td>LED Procurement – Delivery</td>
<td>$ 48,339</td>
<td>$ 64,357.57</td>
</tr>
<tr>
<td></td>
<td>LED Installation Testing and Commissioning - Dundas</td>
<td>$ 157,500</td>
<td>$ 64,357.57</td>
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<tr>
<td>LED Streetlight Retrofit - Menzies</td>
<td>LED Procurement - Manufacture</td>
<td>$ 16,500</td>
<td>$ 20,732.64</td>
</tr>
<tr>
<td></td>
<td>LED Procurement - Delivery</td>
<td>$ 16,500</td>
<td>$ 20,732.64</td>
</tr>
<tr>
<td></td>
<td>LED Installation Testing and Commissioning - Dundas</td>
<td>$ 52,500</td>
<td>$ 20,732.64</td>
</tr>
<tr>
<td>LED Streetlight Retrofit - Ravensthorpe</td>
<td>LED Procurement - Manufacture</td>
<td>$ 95,250</td>
<td>$ 116,189.17</td>
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<tr>
<td></td>
<td>LED Procurement - Delivery</td>
<td>$ 95,250</td>
<td>$ 116,189.17</td>
</tr>
<tr>
<td></td>
<td>LED Installation Testing and Commissioning - Ravensthorpe</td>
<td>$ 114,582</td>
<td>$ 116,189.17</td>
</tr>
<tr>
<td>Energy Audit</td>
<td>Pre-application</td>
<td>$ 9,000</td>
<td>$ 5,500</td>
</tr>
<tr>
<td></td>
<td>Post implementation</td>
<td>$ 9,000</td>
<td>$ 0</td>
</tr>
</tbody>
</table>
Total (ex. GST): $1,075,911
GST: $107,591.10
Total (incl. GST): $1,183,502.10

Further information can be seen in Appendix 2 - Financial Report.

### 6.1 Effect of Budgetary Changes on Project Outcomes

The project achieved the number of lighting installations outlined for Laverton, Menzies, Dundas and Ravensthorpe. The financial savings generated by the Shire of Laverton, Shire of Menzies, Shire of Dundas and Shire of Ravensthorpe retrofits have not been as much as was initially envisaged, due to higher than expected LED streetlight tariffs created by Horizon Power. Initial projected savings were $205,770/year for the Shires of Laverton, Menzies, Dundas and Ravensthorpe, but after Horizon Power LED streetlight tariffs were released, the projected savings are now $34,551/year. This was a highly disappointing outcome, as the eventual tariffs were much higher than what was initially indicated by Horizon Power. SoL believes that the bulk of the savings for reduced operation and maintenance costs were realised by Horizon Power.
7 PROJECT OPERATION, MECHANISMS AND PROCESSES

Project Management

The project was managed on behalf of SoE by the Goldfields Voluntary Regional Organisation of Councils (GVROC). The project was managed through a team of stakeholders, internal to the GVROC appointed and acting on behalf of the Shires as the leveraged funding provided by the WA Department of Regional Development was awarded to GVROC to complete the project. The Project Sponsor was Don Burnett and the Project Owner was Ryan Wilson the Sustainability Officer City of Kalgoorlie-Boulder, while the SoL contact was Steven Deckert, CEO. The Project Manager was Paul Malcolm, an External Project Manager from Enigin Western Australia who are a specialist Energy Efficiency consultancy firm. Enigin was responsible for all reporting requirements including completion of the project plan, milestone reports and final reports as well as providing technical support throughout the project.

A communications consultant Lisa Cunningham from Mango Leadership managed the communications rollout in each shire. There were also internal project team members assigned to the project as needed.

Ryan Wilson was the primary point of contact for the Department of Industry, Innovation and Science as well as for Horizon Power and he relayed information to GVROC when required. Ryan Wilson managed all project finances and procurement processes including engaging Enigin and Mango Leadership, Ryan Wilson also assisted Mango Leadership with communications activities in participating Shires.

This management structure was effective and ensured the project management responsibilities were not overly burdensome for the City of Kalgoorlie-Boulder. The City of Kalgoorlie-Boulder would likely choose to implement this management structure in the future.

The City of Kalgoorlie-Boulder was the only local government within GVROC with the resources to effectively manage a project of the scale of this project, hence leading to CKB taking on project management responsibilities. For projects which involve numerous smaller regional councils without a larger council included, it would be challenging to effectively manage such a project.

After managing this project, the lessons learned from the process have been invaluable to take into future similar projects. The management was primarily undertaken by one individual however, so if
they were to leave the organisation it would significantly reduce the benefit gained from undertaking the current project. It is believed that there were no additional external resources required to assist in completing the project as the resources outlined were sufficient.

Managing Horizon Power on this project proved problematic at times, as they were in control of the procurement and installation of lights, as well as setting the new LED tariffs for the lights. As such, it felt at times that SoL and the GVROC did not have as much control over project timelines and outcomes as would have been ideal. The stakeholder relationship improved when Horizon Power delegated the lead for this project away from headquarters in Perth to the Esperance Regional Manager. Response times reduced and seeming overall commitment to the success of the project and to meeting project deadlines increased immediately.

Having more control over the procurement of the lights and the movement of installation teams would have provided greater understanding of the project and in particular a greater sense of control over installation dates. This would have flowed through to a greater cohesion with the communications team who felt rushed to respond to HP installation schedule changes. Undertaking these aspects would have added a layer of technical complexity that would have required substantial additional technical support however. As such, from a project management perspective, the nature of the working relationship with Horizon Power, once the lead was delegated to the regional office is preferable over taking responsibility for procurement and installation of lights - despite issues around higher than expected tariffs and project delays.

The project suffered significant delays prior to the project beginning especially with the HP approval of the new technology LED light and the auditing of the existing lights to be retrofitted. A greater control over this dependency would also have been beneficial to the project. Unfortunately, as the light were owned by HP this would not have been possible so became an unavoidable delay.

As the retrofit locations were so geographically isolated, sending work crews to remote locations took a significant amount of time. Planning each installation crew’s movements, usually needed to coincide with other works being undertaken in the same area. This added time and costs to the overall project budget.

The Shire of Laverton believes the experience gained by undertaking this CEEP project means and GVROC are better equipped to undertake future similar projects of this size and scale. Ryan Wilson, Steven Deckert the SoL CEO and other internal managerial staff have witnessed first-hand an
implementation of a new technology, and are now aware of the requirements and processes for the planning, implementation and reporting of such a project.
8 CONCLUSION

With funding provided by the Clean Energy Efficiency Program (CEEP), the Shire of Laverton’s streetlight retrofit project was able to achieve an annual energy efficiency improvement which calculated a financial saving for the shires of $34,551 per annum. These savings have been identified by the CEO of Laverton as being optimally used for reinvestment in further energy efficiency or renewable energy opportunities, although there has been no council resolution to this effect at this stage.

The Shire of Laverton has had mixed results from the CEEP funded project. The success of the LED upgrade was tarnished by the minimal reduction in savings passed on to the shires by the utility. While the new technology was able to achieve an energy efficiency improvement of 723,204 MJ per annum and reduce maintenance costs to the shires the overall tariff reductions were minimal.

Through a comprehensive communications program, the project has been able to showcase the successes of the project to the local community through various printed and electronic media. In particular, the various presentations to special interest groups has further showcased the projects technology and project benefits. There has been interest in the project from other local councils who see the benefits the LED technology can offer on their own shires. This highlights the success of the project and the success of the communications plan implemented by the CEEP project.

The GVROC is committed to a continued roll out of LED lighting technology to additional sites and will fully investigate the proposed timelines based on experience gained through the completion of this project. The need for a detailed analysis of the required timeline has been a key lesson learnt from the outcomes of this project. While the GVROC performed due diligence and conducted extensive background research into the technology, there were a number of complexities with regards to tax liabilities and electricity utility supply chain issues which were unforeseeable. Any future GVROC projects of this nature would undergo rigorous risk analysis, planning and management to sufficiently ensure the appropriate timeframes were allowed before commencement.

The GVROC now has a greater understanding of LED technology, and in particular understands the procurement and delivery aspects of an energy efficiency project. The GVROC has had excellent results by being an early-adopter of new energy efficient street light technology, and will continue to investigate options that will see improvements to energy efficiency for all GVROC sites in the future.
9 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
   City of Kalgoorlie - Boulder .......................................................... (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

☑️ 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: 6/5/16

Name: John Walker ...................................................................................

Position: Chief Executive Officer Organisation: City of Kalgoorlie - Boulder

Witness Signature: .................................................................................... Date: 6/5/16

Name: Andy Wilson ...................................................................................

Position: Sustainability Officer Organisation: City of Kalgoorlie - Boulder

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.

Information contained in the Final Report may be disclosed by the Department for purposes such as promoting the program and reporting
on its operation and policy development. This information may also be used in answering questions in Parliament and its committees. In
addition, the selected project information will be made publicly available. Public announcements may include the name of the grant
recipient and of any project partners; title and description of the project and its outcomes; and amount of funding awarded.
APPENDIX 1 – Project Energy Efficiency Improvement Report

See attachment “GVROC - Energy Audits.pdf”
<table>
<thead>
<tr>
<th>Building, Facility or Site 1</th>
<th>Street Lights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Building, Facility or Site 1</td>
<td>Street Lights</td>
</tr>
<tr>
<td>Location (address)</td>
<td>Street lights throughout the municipality of Shire of Laverton, Shire of Dundas, Shire of Menzies and Shire of Ravensthorpe</td>
</tr>
<tr>
<td>Type of building, facility or site</td>
<td>Street lights</td>
</tr>
<tr>
<td>Activity Type and Measure</td>
<td>Street lighting replacement</td>
</tr>
</tbody>
</table>
| Energy Efficiency Estimate Method | The total number of lights for each shire and current energy usage is as follows. 

Dundas has a total of 293 lights which are made up of 83 (80W), 63 (125W), 112 (150W), 35 (250W) with a baseline energy use of 579,099MJ. 

Laverton has a total of 163 lights with 48(80W), 42 (125W), 25 (150W), 48 (250W) with a baseline energy use of 359,037MJ. 

Menzies has a total of 50 lights with 28(80W), 2 (125W), 20 (150W), 0 (250W) with a baseline energy use of 79,352MJ. 

In total, the lights to be replaced are: 
- 83 x 250W High Pressure Sodium Lights 
- 157 x 150W Mercury Vapour Lights 
- 107 x 125W Lights 
- 159 x 80W Lights 

To calculate baseline energy use the calculation is: 
\[ \text{Number of Lights} \times \text{Wattage} \times 365 \text{ (days/year)} \times 11.94 \text{ (hours operational per day based on the regulations cited above)} / 1000 \text{ (to get to kWh)} \]

These figures are incorrect, but reflect the initial estimate included in the initial energy efficiency baseline report.

The correct figures are as follows:

<table>
<thead>
<tr>
<th>There are:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline Energy Efficiency</strong></td>
<td><strong>Baseline Energy Usage</strong></td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>The types and numbers of lights to be replaced are stated above.</td>
<td>Baseline energy use is 1,017,488 MJ per annum</td>
</tr>
<tr>
<td>Dundas has 23.5km of lighting across class 4 roads with efficiency of 8,611.35 MJ/km, while Laverton has 13km of lighting across class 4 roads with efficiency of 11,866 MJ/km.</td>
<td>This figure is incorrect, but reflects the initial estimate included in the initial energy efficiency baseline report. The correct baseline is 1,285,394 MJ per annum</td>
</tr>
<tr>
<td>Menzies has 4km of lighting across class 4 roads with efficiency of 4,589 MJ/km.</td>
<td>The types and numbers of lights to be replaced are stated above.</td>
</tr>
<tr>
<td>Hence, the consolidated data for the two shires is:</td>
<td>Dundas has 23.5km of lighting across class 4 roads with efficiency of 8,611.35 MJ/km, while Laverton has 13km of lighting across class 4 roads with efficiency of 11,866 MJ/km.</td>
</tr>
<tr>
<td>- Length of roads that are P category: 40.5km</td>
<td>Menzies has 4km of lighting across class 4 roads with efficiency of 4,589 MJ/km.</td>
</tr>
<tr>
<td>- Number of P lights: 506</td>
<td>Hence, the consolidated data for the two shires is:</td>
</tr>
<tr>
<td>- Energy consumption: 1,017,488 MJ/year</td>
<td>- Length of roads that are P category: 40.5km</td>
</tr>
<tr>
<td>- Energy consumption per kilometre of road: 9,259 MJ/km/year</td>
<td>- Number of P lights: 506</td>
</tr>
<tr>
<td>- Energy consumption per kilometre of road: 25 MJ/km/day</td>
<td>- Energy consumption: 1,017,488 MJ/year</td>
</tr>
</tbody>
</table>

*These figures are incorrect, but reflect the initial estimate included in the initial energy efficiency baseline report.*

*The discrepancy is discussed in the final report.*

*The correct figures are as follows:*  

**KMs of roads that are P category:** 16.929 km  
**Number of P lights:** 519  
**Energy consumption:** 707,234 MJ  
**Energy consumption per KM of road per year:** 41,777
Energy Efficiency Improvement

The power consumption of each light and its corresponding replacement is outlined below for the Shires of Laverton, Menzies and Dundas.
- 250W HID replaced by 132W LED
- 150W HID replaced by 132W LED
- 125W HID replaced by 66W LED
- 80W HID replaced by 25W LED

To calculate new energy use the calculation is:

\[
\text{Number of Lights} \times \text{Wattage} \times 365 \text{ (days/year)} \times 11.94 \text{ (hours operational per day based on the regulations cited above)} / 1000 \text{ (to get to kWh)}
\]

The LED retrofit will achieve a 9,269.06MJ/km (37%) energy efficiency improvement. This specific project will save 104,225.39kWh (375,211MJ).

These figures are incorrect, but reflect the initial estimate included in the initial energy efficiency baseline report.

The discrepancy is discussed in the final report.

The correct figures are as follows:

The new lights will be 25W and 120W LEDs
- 519 x 25W U2 LEDs
- 216 x 120W U4 LEDs

To calculate new energy use the calculation is:

\[
\text{Number of Lights} \times \text{Wattage} \times 365 \text{ (days/year)} \times 11 \text{ (hours operational per day based on Horizon Power information)} / 1000 \text{ (to get to kWh)}
\]

The new energy use is 562,190 MJ per year.
This project will save 723,204 MJ per year, which amounts to a saving of 56% relative to the existing lights.

**Assumptions**
In calculating the energy usage and efficiency and associated benefits, a number of assumptions have been made supported by Horizon Power.
- The lifespan of the Mercury Vapour lights currently installed is 6 years.
- The lifespan of the High Pressure Sodium lights currently installed is 3.74 years.
- The lifespan of the LED lights to be installed in 22.5 years.
- The LED lights being installed cannot be vandalised due to the nature of their construction.
- The MV / HPS lights being replaced can be vandalised, and are replaced by the asset manager at their cost as necessary.
- Councils have a total of 40.5km of P-Category roads which are specific to this project.
- Average hours of operation of lights per day: 11 hours

This project offers a significant value proposition driven by the considerable energy saving potential and longevity / robustness of the LED lights. The total cost of the project is $1,075,910 which is broken down as follows:

The project site cost to the Shire of Dundas is $398,568.
The project site cost to the Shire of Laverton is $415,153.
The project site cost to the Shire of Menzies is $125,489.
This return on investment / simple payback period of the project is 4.56 years.

The following off site activities will be undertaken with support from CEEP funding:
- Energy audits or assessments: $18,000
- Educational activities and raising community awareness: $100,000
- Project management or administration: $18,700

*These figures are incorrect, but reflect the initial estimate included in the initial energy efficiency baseline report.*

*The discrepancy is discussed in the final report.*

*The correct figures are as follows:*

$950,132 excluding communications and project management. ($1,075,911 inclusive)

The total cost savings can be summarised as follows:
- $118,622 savings in Dundas
- $68,151 savings in Laverton
$18,996 savings in Menzies

A total annual cost saving of $205,770 of the project saves in the order of $4.1M across the life of the LED lights, with these savings shared by the Shires and Horizon Power. This does not include any increases in cost to service / tariff over this period.

These figures are incorrect, but reflect the initial estimate included in the initial energy efficiency baseline report.

The correct figures are as follows:

New Horizon Power tariffs:
25W - 30.22c/light/day
120W – 54.42c/light/day

Savings based on new Horizon Power tariffs are as follows:

<table>
<thead>
<tr>
<th>Location</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laverton</td>
<td>$7,076/year</td>
</tr>
<tr>
<td>Norseman</td>
<td>$10,922/year</td>
</tr>
<tr>
<td>Menzies</td>
<td>$1,240/year</td>
</tr>
<tr>
<td>Hopetoun</td>
<td>$15,313/year</td>
</tr>
</tbody>
</table>

**Total Savings:** $34,551/year

The discrepancy in savings indicated above is due to an increase in the new LED tariffs from those initially indicated by Horizon Power. The discrepancy is discussed further in the final report.