Unlocking the potential of energy efficiency within local governments

LED Streetlight retrofit project - Final Report
Shires of Esperance and Leonora (CEEP 2130)

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

This report summarises the outcomes of the “LED Streetlight retrofit in the Shires of Esperance and Leonora” project (the Project), delivered by the Shire of Esperance (SoE) with co-funding from the Australian Government through the Community Energy Efficiency Program (CEEP). The project was managed on behalf of SoE 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 Esperance and Leonora. The Shire aimed to do this by replacing 2,281 existing street lights with energy efficient LED (Light Emitting Diode) lamps. This number was revised downward as per the variation submitted and approved to the Department of Industry, Innovation and Science due to Horizon Power overestimating the number of lights present in the Shire of Esperance. The total number of lights ultimately installed in the Shire of Esperance was 1,693 which were revised down from the initial estimate of 2,008. The number of lights ultimately installed in the Shire of Leonora was 278, which was a slight increase on the 273 initially estimated.

Within the Shire of Esperance lights were installed in the towns of Salmon Gums, Grass Patch, Condingup and Gibson in addition to the town of Esperance, while in the Shire of Leonora lights were only installed in the town of Leonora.

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 Esperance (SoE)** – This activity was implemented in Esperance, a regional city in the Goldfields-Esperance region of Western Australia, about 400 kilometers south of the city of Kalgoorlie-Boulder and about 720 kilometers east-southeast of Perth. This activity involved the replacement of 1693 existing streetlights.

**Shire of Leonora (SoL)** – This activity was implemented in Leonora a town also in the Goldfields-Esperance region of Western Australia. Leonora is situated 240kms north of the city of Kalgoorlie-Boulder and involved replacing 278 street lights.

The project’ objectives were in line with the broader CEEP objective to increase and promote energy efficiency while reducing greenhouse gas emissions of community street lighting. SoE’s 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 consumption would be reduced from 4,546,519 MJ per annum to 2,792,859 MJ per annum achieving a saving of 1,753,660 MJ per annum. As the scope of the project developed the total number of lights across the 2 municipalities changed from 2,200 to 1,971. This was a result of Horizon Power grossly overestimating the number of streetlights in Esperance. Their initial estimate was that Esperance had 2,008 streetlights, which was later found to be 1,693, a reduction of 315 lights. However, this did not reduce the overall improvement in energy efficiency, as the predicted energy efficiency improvement rose from 1,753,660 MJ to 1,778,548 MJ per annum, which corresponded to an overall reduction in energy use of 55%. The correct baseline energy usage for Esperance and Leonora is 3,261,096 MJ per annum and this has now been reduced to 1,482,548, which gives the aforementioned reduction in energy use of 1,778,548 MJ per annum. This is much higher than the initially predicted 38% energy reduction due to lower wattage lights being used. Initially 66W lights were scheduled to replace all 125W and 80W mercury vapour lights, but these were instead replaced with 25W lights.

Total financial savings realised from reduced streetlight tariffs for Shires of Esperance and Leonora are $87,279 per year, with Shire of Esperance expected to save $77,118 per year and Shire of Leonora expected to save $10,161 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 (by combining installation contracts with the energy provider) 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 on the basis of this project. Sixteen lights were installed on the 17th April 2016 on the main street in Kalgoorlie with a further 20 lights scheduled for installation in June 2016. This will help brighten the main street to reduce crime while reducing electricity consumption by 36% on the previous streetlights.

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 Esperance and Leonora (the Shires) streetlights. The project was awarded funding through the CEEP program because of the alignment between the Shire’s 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 SoE’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 towns and reduce operational costs while promoting and showcasing the project benefits.

A significant objective of both the SoE 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.

SoE’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 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 SoE 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 shire of Esperance and Leonora 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 5 features the installers removing the redundant fittings and replacing with the new LED fitting. The removed lights have been disposed of in local landfill facilities in each town.

Figure 4 – Horizon Power installation crew midway through the streetlight retrofit in the main street of Esperance. Image courtesy of Tim Slater of the Esperance Observer.

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 Australia.

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 the SoE and the Shire of Laverton through the related project CEEP2202 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 the SoE and the Shire of Laverton in full. The tax of 13.9% would have derailed the project with an impost of close to $800,000 for both CEEP 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, 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. As the streetlights with the GVROC area had all been accounted it was agreed by the Shire and DOI to install additional 400 new technology LED lights to an area in the city of Kalgoorlie. However, installing LED into Kalgoorlie meant Horizon Power was no longer the electrical network utility. Western Power (WP) was approached to approve the retrofit of new LED technology. WP to date had no approved LED technology but were willing to make an exemption and
approve an LED luminaire as produced by their preferred supplier Sylvania. Unfortunately, as a new utility was then ‘gifting’ assets to the city of Kalgoorlie the Minister of Energy needed to approve the exemption of the gifted assets tax again. Unfortunately, the delay and eventual rejection of the request to the Minister meant the additional funds could no longer be used for additional LED streetlights on the WP network.

At the approval of the Department, the City of Kalgoorlie-Boulder proceeded to procure an additional 20 LED streetlights for installation into the main street of Kalgoorlie. This was deemed possible as the City of Kalgoorlie-Boulder separately meters these lights and was therefore exempt from a gifted assets tax. The installation was to take place by the City of Kalgoorlie-Boulder. However, due to further delays, they will be installed at a future date and outside of the scope of the project. The unused funds have been returned to the Department (as outlined in section 6 – Budgetary Changes).

The City of Kalgoorlie-Boulder has committed to perform all communications required to showcase the new LED street lights in the main street of Kalgoorlie. 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 Esperance Activities**

The town of Esperance lies at the heart of the area known as the Shire of Esperance. The surrounding suburbs of Nulsen, Bandy Creek, Pink Lake, Monjinup, Sinclair, West Beach, Chadwick, Castletown and Windabout all received streetlight upgrades. A total of 1,279 U2 lights and 464 U4 lights were installed within the Shire of Esperance. This also included installations in the towns of Salmon Gums, Grass Patch, Gibson and Condingup.

During the hotter months (November through February), as the streetlight installation in Esperance 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.

Post implementation of the streetlights was met mostly with positive feedback however a local resident of Esperance, who lived at the corner of a major intersection, had significant concerns about the newly installed U4 lights. The bright light from the larger U4s was spilling into the resident’s bedroom. These concerns were raised with the project communications consultant. The resident’s
concerns were conveyed to Horizon Power’s project manager. While the lights were the correct size and luminosity for the intersection, after considerable discussion with Main Roads (who owned the lights and made the decision to install larger U4s at the intersection), a decision was taken to replace the U4s with lower luminosity lights (U2). This was a positive outcome for all residents living close to the intersection, whilst also meeting the standards for lighting requirements at an intersection.

Similar a local Councillor for Nulsen (suburb in Esperance) raised the issue of poor street lighting and public safety concerns amongst the community in the area, with the communications consultant. It was requested that the project team prioritise the suburb for installation of the new lights so as to improve lighting and safety in the area. The communications consultant discussed these requirements with Horizon Power’s project manager and it was agreed that the suburb would be prioritised as the first suburb for installations. The Chairperson of the Nulsen Progress Association was very pleased with the outcome, and the members of the Association played an active, articulate role in subsequently promoting community goodwill towards the project.

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 Leonora Activities

The town of Leonora also lies at the heart of the area known as the Shire of Leonora. A total of 106 U2 lights and 105 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 Leonora 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 Leonora 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 SoE’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:

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:
Figure 6: Stages of communications activities at each Shire

**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 Esperance Nulsen Community Progress Association. 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 Esperance.

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. Esperance), 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 Leonora 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 Esperance and Leonora 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.

Figure 8: Briefing for Esperance CEO and Councillors, with demonstration of LED light

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>Esperance</th>
<th>Esperance Primary School</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Esperance Senior High School</td>
</tr>
<tr>
<td></td>
<td>Castletown Primary School</td>
</tr>
<tr>
<td></td>
<td>Nulsen Primary School</td>
</tr>
<tr>
<td></td>
<td>Wongutha CAPS (Christian Aboriginal Parent-directed School)</td>
</tr>
<tr>
<td></td>
<td>Esperance Anglican Community High School</td>
</tr>
<tr>
<td></td>
<td>Our Lady Star of the Sea Catholic Primary</td>
</tr>
<tr>
<td></td>
<td>Esperance Christian Primary 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 where ever 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>
</table>
| Esperance | A4 high gloss Posters (10)  
Brochures, handouts and flyers (300)  
Presentation slides for Shire briefing  
Presentation slides for 8 schools  
Children’s “goodie bags” with toys and booklet information about energy efficiency  
‘Esperance Express’ newspaper articles (3)  
“Esperance Observer’ newspaper articles (3)  
Shire website articles and FAQs (5) |
<p>| Leonora | Posters (10) |</p>
<table>
<thead>
<tr>
<th>Location</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Brochures, handouts and flyers (200)</td>
</tr>
<tr>
<td></td>
<td>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. Interviews, provided by Horizon Power’s implementation team and the Esperance Shire CEO were also provided on regional ABC radio.

*Figure 12: Cartoon used in newspaper articles*
The following community media organisations were engaged:

Kalgoorlie Miner  Esperance Observer

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 1,778,548 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

At the outset of the CEEP project it was estimated that energy consumption would be reduced from 4,546,519MJ per annum to 2,792,859 MJ per annum achieving a saving of 1,753,660 MJ per annum. As the scope of the project developed the total number of lights across the 2 municipalities changed from 2,200 to 1,971. This was a result of Horizon Power grossly overestimating the number of streetlights in Esperance. Their initial estimate was that Esperance had 2,008 streetlights, which was later found to be 1,693, a reduction of 315 lights. However, this did not reduce the overall improvement in energy efficiency, as the predicted energy efficiency improvement rose from 1,753,660 MJ to 1,778,548 MJ per annum, which corresponded to an overall reduction in energy use of 55%. This is much higher than the initially predicted 38% energy reduction due to lower wattage lights being used. Initially 66W lights were scheduled to replace all 125W and 80W mercury vapour lights, but these were instead replaced with 25W lights.

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 Shires, 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 Esperance and Leonora of $87,279 gives a payback period on project funds of $2,738,890 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. As the Shire of Esperance does not have access to Horizon Power’s financial modelling, it is unclear what the financial benefits to Horizon Power are, but it is clear they will be substantial due to a relatively high tariff with much lower electricity demand and largely reduced maintenance costs due to the long operational life of the LEDs.

Any financial savings that are accrued as a result of the streetlight tariffs will allow the Shires 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 financial benefits to the Shires is $87,279 per year in reduced electricity consumption costs alone. The overall maintenance savings are still only estimated as the useful life of LED lights varies 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 – “Definitely better in Nulsen (Esperance) – so much brighter. It’s good for public safety – I can walk around at night without feeling too scared. This will be good in winter when it gets dark so early, especially good for people who park their cars outside at night. Definitely a phenomenal improvement”. The comments from Leonora have also been positive with comments such as - “Leonora really love it. It’s really brightened the place up. People have said to me they feel more secure”. 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 28 responses were received from both Esperance and Lenora. The most significant results are summarised as follows:

- 100% of respondents believe the lights improve energy efficiency
- 97% respondents believe that the new LED street lights have improved visibility
- 97% believe the lights improve safety, generate more light and will result in cost savings
- 95% 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 in to 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”.

“The community have responded positively to the LED street lights. I haven’t heard of any concerns amongst community groups. Many have commented on how bright it is now “Leonora really love it. It’s really brightened the place up. People have said to me they feel more secure”.

Jim Epis, CHIEF EXECUTIVE OFFICER, Shire of Leonora
6 BUDGET

The Shire of Esperance and Leonora project was achieved within the budget specified for the project and under the original proposed budget, due to a reduction in scope.

The budget changed significantly with the removal of the City of Kalgoorlie-Boulder lighting installations. The total change is as follows:

Initial budget:  $3,138,289 with the Department’s contribution:  $1,569,145

Amended budget:  $2,738,890

Difference:  $399,400

Of this, $199,700? was reduced from CEEP funding, and $199,700 was reduced from leveraged funding.

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. As discussed previously, Kalgoorlie-Boulder was removed from the project due to the WA Department of Treasury indicating that they were not willing to make the Kalgoorlie-Boulder component of the project exempt from Western Power’s gifted asset tax.

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

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### 6.1 Effect of Budgetary Changes on Project Outcomes

The project achieved the number of lighting installations outlined for Esperance and Leonora while Kalgoorlie-Boulder lighting installations were not undertaken. The project budget was adjusted accordingly and relative to overall lighting installations, the project achieved the value for money initially envisaged.

However, the financial savings generated by the Shire of Esperance and Shire of Leonora 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 $794,869/year for the Shires of Esperance and Leonora, but after Horizon Power LED streetlight tariffs were released, the projected savings are now $87,279/year. This was a highly disappointing outcome, as the eventual tariffs were much higher than what was initially indicated by Horizon Power. SoE 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) as the leveraged funding provided by the WA Department of Regional Development was awarded to GVROC to complete the project. The project was managed through a team of stakeholders, internal to the GVROC, appointed and acting on behalf of the Shires. The Project Sponsor was Don Burnett and the Project Owner was Ryan Wilson the Sustainability Officer City of Kalgoorlie-Boulder, the SoE’s representative was Matthew Scott 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
was perceived at times that the Shire of Esperance 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
lights 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 Esperance believe the experience gained by undertaking this CEEP project means it and
GVROC are better equipped to undertake future similar projects of this size and scale. Ryan Wilson,
SoE CEO Matthew Scott 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 Shires of Esperance’s streetlight retrofit project was able to achieve an annual energy efficiency improvement which calculated a financial saving for the shires of $87,279 per annum. These savings have been identified by the CEO of Esperance 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 Esperance 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 1,778,548 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 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: 26/2/16

Name: John Walker

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

Witness Signature: ................................................................. Date: 26/2/16

Name: Ryan 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.
10 APPENDIX 1 – Project Energy Efficiency Improvement Report

See attachment “GVROC - Energy Audits.pdf”
**Project Energy Efficiency Improvement Report**

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#### Energy Efficiency Estimate Method

The total number of lights for each shire and current energy usage is as follows:

Esperance has a total of 2008 lights which are made up of 750 (80W), 470 (125W), 381 (150W), 407 (250W) with energy consumption of 4,013,153.1 MJ and baseline energy use of 1,114,764 kW/hr.

Leonora has a total of 273 lights with 81 (80W), 63 (125W), 102 (150W), 27 (250W) with energy consumption of 526,197.87 MJ and baseline energy use of 148,158 kW/hr.

In total, the lights to be replaced are:
- 434 x 250W High Pressure Sodium Lights
- 483 x 150W Mercury Vapour Lights
- 533 x 125W Lights
- 831 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:

There are:
- 117 x 42W Compact Fluorescent Lights
- 42 x 50W Mercury Vapour Lights
- 876 x 80W Mercury Vapour Lights
| Baseline Energy Usage | 375 x 125W Mercury Vapour Lights  
386 x 150W High Pressure Sodium Lights  
175 x 250W High Pressure Sodium Lights  
To calculate baseline energy use the calculation is:  
Number of Lights x Wattage x 365 (days/year) x 11 (average hours operational per day based on Horizon Power information) / 1000 (to get to kWh).  
The discrepancy is discussed in the final report. |
| Baseline Energy Usage | Baseline energy use 4,546,519 MJ per annum  
This figure is incorrect, but reflects the initial estimate included in the initial energy efficiency baseline report.  
The correct baseline is 3,261,096 MJ per annum  
The discrepancy is discussed in the final report. |
| Baseline Energy Efficiency | Esperance has 160.6 km of lighting across class 3 roads with efficiency of 24,982MJ/km, while Leonora has 21.8km of lighting across class 4 roads with efficiency of 24,093MJ/km. Hence, the consolidated data for the two shires is:  
- Length of roads that are P category: 182.5km  
- Number of P lights: 2,281  
- Energy consumption: 4,546,519MJ/year  
- Energy consumption per kilometre of road: 24,876MJ/km/year  
- Energy consumption per kilometre of road: 68MJ/km/day  
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: 58.938 km  
Number of P lights: 1,410  
Energy consumption: 1,791,850 MJ  
Energy consumption per KM of road per year: 30,402 MJ/KM/Year  
Energy consumption per KM of road per day : 83.3 MJ/KM/Day  
KMs of roads that are V category: 22.76 km  
Number of V lights: 561  
Energy consumption: 1,469,246 MJ  
Energy consumption per KM of road per year: 64,554 MJ/KM/Year |
### Energy Consumption

- **Energy consumption per KM of road per day:** 176.9 MJ/KM/Day
- **Average energy consumption per KM of road per year:** 40,123 MJ/KM/Year \(((1410/1971)\times30402)+((561/1971)\times64554)\)

### Energy Efficiency Improvement

The power consumption of each light and its corresponding replacement is outlined below for the Shires of Esperance and Leonora.
- 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:

\[
\text{Number of Lights} \times \text{Wattage} \times 365 \times 11.94 \div 1000
\]

(to get to kWh)

The LED retrofit will achieve a 9,610.15 MJ/km (38%) energy efficiency improvement. This specific project will save 487,127.91kWh (1,753,660MJ).

*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
  - 1,410 x 25W U2 LEDs
  - 561 x 120W U4 LEDs

To calculate new energy use the calculation is:

\[
\text{Number of Lights} \times \text{Wattage} \times 365 \times 11 \div 1000
\]

(to get to kWh)

The new energy use is 1,482,548 MJ per year. This is vastly lower than the 2,792,859 projected in the original energy efficiency baseline report. This is discussed in the final report.

This project will save 1,778,548 MJ per year, which amounts to a saving of 55% relative to the existing lights.

### Reporting Data (Measuring Energy Efficiency and Additional Data)
<table>
<thead>
<tr>
<th>Cost of Activity</th>
<th>$2,602,193 excluding communications and project management. ($2,738,890 inclusive)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The total cost savings can be summarised as follows:</td>
</tr>
<tr>
<td></td>
<td>$698,327 savings in Esperance</td>
</tr>
<tr>
<td></td>
<td>$96,542 savings in Leonora</td>
</tr>
<tr>
<td></td>
<td>A total annual cost saving of $794,869 of the project saves in</td>
</tr>
<tr>
<td></td>
<td>the order of $16M across the life of the LED lights, with these</td>
</tr>
<tr>
<td></td>
<td>savings shared by the Shires and Horizon Power. This does</td>
</tr>
<tr>
<td></td>
<td>not include any increases in cost to service / tariff over this</td>
</tr>
<tr>
<td></td>
<td>period.</td>
</tr>
<tr>
<td></td>
<td>These figures are incorrect, but reflect the initial estimate</td>
</tr>
<tr>
<td></td>
<td>included in the initial energy efficiency baseline report.</td>
</tr>
<tr>
<td></td>
<td>Tariffs have been finalised for LED streetlights and are as follows:</td>
</tr>
<tr>
<td></td>
<td>25W U2: 30.22c/light/day</td>
</tr>
<tr>
<td></td>
<td>120W U4: 54.42c/light/day</td>
</tr>
<tr>
<td></td>
<td>Savings based on these new tariffs are as follows:</td>
</tr>
<tr>
<td></td>
<td>Esperance Savings: $77,118/year</td>
</tr>
<tr>
<td></td>
<td>Leonora Savings: $10,161/year</td>
</tr>
<tr>
<td></td>
<td><strong>Total Savings:</strong> $87,279/year</td>
</tr>
<tr>
<td></td>
<td>The discrepancy in savings indicated above is due to an increase</td>
</tr>
<tr>
<td></td>
<td>in the new LED tariffs from those initially indicated by Horizon</td>
</tr>
<tr>
<td></td>
<td>Power. The discrepancy is discussed further in the final report.</td>
</tr>
</tbody>
</table>