City of Armadale Champion Centre LED lighting and Insulation Retrofit Project Plan

Community Energy Efficiency Program (CEEP 2234)

This activity received funding from the Australian Government

Australian Government
Department of Industry
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1.0 Executive Summary
The Champion Centre Lighting and Insulation Retrofit project included an internal and external LED lighting retrofit and installation of ceiling insulation in key areas. This project has resulted in:

- Improved energy efficiency at the Centre
- Reduced greenhouse gas emissions and utility bills associated with the Centre
- Improved thermal comfort and lighting amenity at the Centre
- Improved security
- Greater community awareness of energy efficiency
- Increased corporate knowledge of energy efficient lighting technology
- Greater awareness of the benefits of LED and insulation retrofits

The project achieved expected energy savings and was delivered 1.4 percent under budget.

* Please Note: 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

2.0 Project Objectives
The objective of this project was to improve the energy efficiency and amenity of the Champion Centre. The Champion Centre (the Centre) provides a culturally appropriate setting for the provision of services and programs for Aboriginal and Torres Strait Islander people. Activities operated from the Centre are provided by agencies, non-profit organisations, Council staff and other community groups working in partnership with the City of Armadale.

This project met its objectives through an internal and external LED lighting retrofit which improved lighting quality and night time security while reducing building heat loads. The installation of ceiling insulation also contributed to increased thermal comfort and overall energy efficiency.

The energy efficiency improvements have been demonstrated through an independent energy audit conducted by Carbon Neutral and achievement of forecasted electricity savings.

3.0 Project Energy Efficiency Activities

3.1 Facility
The Champion Centre, located on Champion Drive Seville Grove, is owned and operated by the City of Armadale (the City) in partnership with a number of State agencies, NGOs and not for profit groups.

The Champion Centre is a brick and colour bond building that contains a main hall, crêche, kitchen, two meeting rooms, four offices, a storeroom and 45 bay car-park. A floor plan is shown below:
3.2 Technology

Insulation

The City installed R3.5 Sheep Wool ceiling insulation at the Champion Centre. Sheep's wool provides effective insulation and is a natural alternative to fibreglass. The natural fibre also reduces discomfort and Occupational Health and Safety risks for installers and to those accessing the roof spaces in the future. Using natural sheep's wool insulation also provides the following benefits:

A. It can absorb moisture and still be efficient as insulation
B. It has a longer lifespan than alternative insulations
C. It is safer to handle than alternative insulations
D. It can extinguish itself in the event of a fire
E. It has a very low rate of conductivity

The below photograph illustrates the areas insulated through this project.
**LED Lights**

An internal and external lighting retrofit was undertaken at the Champion Centre. A mixture of lighting technology was chosen by the City. The technology chosen is detailed in the table below:

<table>
<thead>
<tr>
<th>Image</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
</table>
| ![FX-T8-18W-T1200](image1.png) | 56 | FX-T8-18W-T1200:  
18W LED T8 Tube, 120 beam angle,  
1200x30mm, diffuser clear/frosted  
polycarbonate, CW5500-6000K |
| ![FX-T8-10W-T600](image2.png) | 2 | FX-T8-10W-T600:  
10W LED T8 Tube, 120 beam angle,  
600x30mm, diffuser clear/frosted  
polycarbonate, CW 5500-6000K |
| ![FX-LLP-45W-300X1200](image3.png) | 13 | FX-LLP-45W-300X1200:  
45W LED Light panel, size:  
300x1200x12mm, CRI 80, IP20, 120 beam angle, lamp life 30,000 hours,  
profile finish anodised aluminium  
silver, colour temperature range PW 5700-6000K |
| ![FX-LLP-26W-600X600](image4.png) | 15 | FX-LLP-26W-600X600:  
26W LED light panel, size  
600x600x12mm, CRI 80, IP20, 120 beam angle, lamp life 30,000 hours, profile  
finish anodised aluminium: silver, colour  
temperature range PW 5700-6000K |
| ![FX-C1-90W-FL](image5.png) | 1 | FX-C1-90W-FL:  
90W LED Flood Light, IP65, optional beam angles 10, 25, 40 & 60 degree,  
lamp life 30,000 hours, finish: high pressure die-cast aluminium |
| ![FX-A2-90W-ST](image6.png) | 8 | FX-A2-90W-ST:  
90W LED Stealth street light, adjustable light head, CRI 70, IP65, installation height 8-10m, lamp life 30,000 hours,  
finish: high pressure die-cast aluminium body with anti-corrosion treatment, |
3.3 Issues

The fittings and numbers of tubes being replaced at the Centre was rationalised from the original application. This is because through the project it was discovered that the original lighting installation in the northern most offices produced significantly more lighting output than was required. The number of ceiling mounted troffer lights installed was contrary to the required lighting pattern and had never been modified in the course of past fit outs.

In the course of the project the City had the contractor reinstate the lighting to the original ceiling pattern and remove those ceiling troffers that were no longer required.

Lumen test of passageways also concluded that lighting levels were excessive and it was concluded that the City could reduce the number of LED replacement tubes inside the troffer panels while still retaining compliant lighting levels.

Conversely the offices on the western end of the building were seriously under lamped and additional light fittings were installed into this area to ensure compliant lighting levels were achieved. These fixtures were installed following the completion of the new ceilings in September 2014.

To accommodate these modifications the City negotiated with the supplier and the order and installation of internal light fittings was adjusted to reflect site requirements. The changes from the original project plan were as follows:

- 13 less 18W LED T8 Tubes required (total installed 56)
- 5 less 45W LED Light panels required (total installed 13)
- 11 additional 26W LED Light panels required (total installed 15)

These amendments resulted in a 173 watt reduction in lighting electricity draw further increasing energy savings.

3.4 Discussion

The internal lighting retrofit produced significantly improved lighting quality and is considered to be superior to previous LED lighting upgrades the City has undertaken. The enhanced quality of internal lighting was achieved using a mix of lighting solutions. The installed fixtures have not only reduced the running cost of lighting but have also increased the lighting output, particularly in the office spaces. The effect of the installation has been to introduce a daylight feel to the building which enhances internal areas.

The strategy to introduce new LED specific light fittings as well as lamp replacements will be employed in any future LED retrofit projects.
4.0 Project Demonstration and Communications Activities

4.1 Signage
Two A1 sized signs have been produced and erected inside the Champion Centre (see attached). The signs communicate to patrons the changes that have been made at the Centre as well as tips on how to improve household energy efficiency.

4.2 Media
The attached media release was prepared by the City of Armadale and sent to the following local publications and community communication channels on 25 June 2014:

- Forestdale Rag
- Business News
- Heritage FM
- Carey College
- Valley Reporter
- Satterley Property Group
- Comment Newspaper
- Stockland
- Roleystone Courier

4.3 Flyers
A series of three A5 flyers were produced and made available at the Champion Centre, the Administration Building and the City's three libraries. The flyers include information about:

- Reducing heating and cooling costs
- Increasing the energy efficiency of household lighting
- Choosing ‘energy smart’ appliances

4.4 Workshop
An energy efficiency workshop was held on 17 September 2014 from 12:00-12:45pm. The workshop was scheduled to complement existing Centre programs and maximise attendance and it strategically followed a popular ‘Mum’s Cooking Class and Childcare Session’. The workshop was advertised in the local newspaper, on switchyourthinking.com and via the Switch your thinking! monthly e-newsletter.

The workshop provided attendees with practical tips on reducing electricity bills, increasing their home’s thermal performance and choosing energy smart appliances.

Participants also received a free energy efficiency showbag containing:

- Two rolls of draught exclusion tape
- Standby Energy Timer
- CFL globe
- Four minute shower timer
- Prompt items that highlight the most efficient running temperatures for air conditioning, winter heating, refrigerators and freezers
Seven people attended the workshop and 20 showbags were provided to Centre staff to distribute to participants and clients. An additional two people registered for the workshop but did not attend on the day.

5.0 Outcomes and benefits of the Project

Overall the project achieved its objectives. Operating costs and electricity use have been reduced at the Centre. In addition, the carbon saving arising from the lighting retrofit meets an objective of the City of Armadale’s Corporate Greenhouse Action Plan 2014/15 to 2019/20. This includes a specific action to implement LED lighting retrofits within City facilities. In completing the project, we have raised community awareness of energy efficiency and also enhanced awareness amongst city employees.

The project has also met the boarder objectives of the Community Energy Efficiency Program by:

- Improving energy efficiency and amenity at a facility that services a disadvantaged community
- Demonstrating improved energy management practices within Council and the broader community

5.1 Energy Savings

The City estimated that the internal and external LED lighting retrofit would result in annual electricity savings of 18,271 kWh. The baseline energy audit demonstrated a total electricity consumption of 44,200kWh for the 12 month period from April 2013 to March 2014. Therefore, prior to project commencement it was estimated that the retrofit would reduce energy consumption at the Champion Centre by 41 percent.

Carbon Neutral, the independent energy auditor engaged by the City to conduct the baseline and post installation energy audit, estimated an annual reduction of electricity use per square metre of 44.6 percent prior to installation.

The post installation energy audit, based on the best available billing data (12 August 2014 to 9 October 2014 extrapolated over 365 days), demonstrates savings of 42.4 percent when occupation rates are taken into account.

5.2 Other Benefits

It is expected that the lighting retrofit will initially reduce the maintenance costs as the whole building has been re-lamped reducing the requirement to have an electrician called out on an ad hoc basis as globes fail and fixtures reach the end of their life. However, this is somewhat offset by the high replacement costs of LED tubes compared to fluorescent lights when they do fail.

As indicated in section 3.4, the project has significantly improved the internal lighting in the Centre, benefiting all user groups including clients, staff and community groups. Lighting levels throughout the building are now more consistent and the daylight appearance provided by the LED lighting makes the facility appear warm and inviting. Meeting rooms and offices now have proper lighting levels reducing glare on screens and improving the functionality of each area.

Thermal comfort levels have also shown signs of significant improvement in the short time since installation, with office areas much warmer during the winter months. Consequently there is some certainty that the ceiling insulation will improve thermal comfort during summer months as well.
The new LED High Bay lighting installed in the hall should also increase summer comfort as the old light fittings generated a large amount of heat and the hall is not air conditioned.

The installation of a ceiling to the western offices was undertaken outside of the project by the City of Armadale using light fittings procured through the grant funding. The thermal comfort in this area has been significantly improved and has resulted in a reduction in air conditioning run times. The previous ceiling was the underside to the roof structure (metal tray roof with foil sisalation exposed to the occupants). This configuration was unsightly and required the air conditioner to run all year round. The improvement means the air conditioner in this area is now considerably oversized for the heat load and it is anticipated that it will cycle down from consistently operating at 100 percent of capacity. Staff working in this area have also reported improved acoustics.

Improvements to external lighting provide improved security to community groups who use the facilities after hours and for any staff working late. Efficiencies in lighting allow the lights to be on longer with no impact on cost.

5.1 Community Benefits

Physical Benefits

The project has significantly improved the internal lighting in the Centre benefiting all user groups including clients, staff and community groups. External lighting improvements have provided improved security to groups using the facilities after hours.

It is anticipated that the ceiling insulation and LED High Bay lighting, installed in the hall, will improve thermal comfort during summer months.

Community Benefits

The impacts of the mass marketing strategies employed throughout the project (editorial content, print advertising and flyer distribution) are not able to be evaluated. However, it is expected that 63,864 people in the south east metropolitan region have been exposed to the City’s promotional campaign.

The Energy Efficiency Workshop was promoted to the Centre’s user groups as well as the wider community through Switch your thinking! and the local community newspaper.

Staff from the following service providers associated with the Centre were personally invited to the workshop and were asked to encourage their clients to attend: Outcare, Health Department, Anglicare, Coolabaroo Neighbourhood Centre, Save the Children and Challenger.

Workshop participants were requested to complete a short survey. Five out of seven participants completed the survey revealing that:

- Three out of five participants are deeply concerned about their household’s power bill
- Only two out of five participants felt ‘somewhat’ in control of their household’s energy use and knew what they could do to reduce their consumption
- Four out of five participants reported that they intended to take action to reduce their household’s energy use in the next three months
- Four out of five participants reported that they had taken actions to reduce their household’s energy use in the last six months
- Participants ranked ‘confusion or a lack of information about what to do’ as the greatest barrier to reducing their household’s energy use, with ‘lack of financial incentives’ as a close
second. Interestingly a 'lack of scientific consensus on the facts about climate change' and 'lack of time/inconvenience of energy efficiency' was ranked an equal third over options such as 'lack of financial penalties', 'lack of international action' and 'lack of collective community action'.

- Four out of five participants reported increased knowledge of home energy efficiency after the workshop compared to their level of knowledge prior to the workshop.

- All participants rated the subject matter and level of detail covered in the workshop as well as the presenter and showbag as 'Good' or 'Very Good'.

- When asked to select the three most convenient ways to receive energy efficiency information, respondents selected the following:

<table>
<thead>
<tr>
<th>Information channel</th>
<th>Number of votes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community workshops</td>
<td>4</td>
</tr>
<tr>
<td>Information on my utility bills</td>
<td>3</td>
</tr>
<tr>
<td>When purchasing new appliances</td>
<td>2</td>
</tr>
<tr>
<td>When buying/building/renting a house</td>
<td>2</td>
</tr>
<tr>
<td>Online through a website or e-newsletter</td>
<td>2</td>
</tr>
<tr>
<td>Via SMS or text message</td>
<td>0</td>
</tr>
<tr>
<td>Advertising in local newspapers</td>
<td>0</td>
</tr>
<tr>
<td>At work or school</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
</tr>
</tbody>
</table>

6.0 Budget

A table below shows a detailed comparison of the project budget versus actual expenditure. Savings were realised in the supply cost of the LED light fitting as a result of the rationalisation discussed in section 3.3 Issues and a discount provided to the City as a result of being a member of the Western Australian Local Government Association. Savings were also made by recycling the removed fluorescent lights 'in-house' at the City's landfill and recycling facility as well as printing flyers and signage 'in house'.

Lighting installation costs were slightly higher than expected, which can be attributed to the time lapse between the quote being issued and works being completed. Overall the project budget was 1.4 percent under budget.
## Activity Budget CEEP City of Armadale WALGA City of Gosnells Actual

<table>
<thead>
<tr>
<th>Activity</th>
<th>Budget</th>
<th>CEEP</th>
<th>City of Armadale</th>
<th>WALGA</th>
<th>City of Gosnells</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>T8 replacement LED tubes supply</td>
<td>9,537</td>
<td>4,980</td>
<td>4,958</td>
<td>0</td>
<td>0</td>
<td>9,938</td>
</tr>
<tr>
<td>LED High Bay lights supply</td>
<td>7,960</td>
<td>3,980</td>
<td>3,980</td>
<td>0</td>
<td>0</td>
<td>7,960</td>
</tr>
<tr>
<td>LED car park lights supply</td>
<td>9,955</td>
<td>4,528</td>
<td>4,528</td>
<td>0</td>
<td>0</td>
<td>9,056</td>
</tr>
<tr>
<td>WALGA discount</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>539</td>
<td>0</td>
<td>539</td>
</tr>
<tr>
<td>Installing LED lights</td>
<td>8,349</td>
<td>4,378</td>
<td>4,378</td>
<td>0</td>
<td>0</td>
<td>8,756</td>
</tr>
<tr>
<td>Safe disposal of removed Luminaries</td>
<td>345</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Insulation supply and installation</td>
<td>3,935</td>
<td>1,968</td>
<td>1,968</td>
<td>0</td>
<td>0</td>
<td>3,936</td>
</tr>
<tr>
<td>Final energy audit</td>
<td>1,250</td>
<td>625</td>
<td>625</td>
<td>0</td>
<td>0</td>
<td>1,250</td>
</tr>
<tr>
<td>Project management</td>
<td>1,000</td>
<td>500</td>
<td>500</td>
<td>0</td>
<td>0</td>
<td>1,000</td>
</tr>
<tr>
<td>Production &amp; distribution of education materials</td>
<td>2,500</td>
<td>1,295</td>
<td>295</td>
<td>0</td>
<td>1,000</td>
<td>2,590</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>44,831</td>
<td>22,254</td>
<td>21,232</td>
<td>539</td>
<td>1,000</td>
<td>45,025</td>
</tr>
</tbody>
</table>

*The City of Armadale’s total co-contribution made to the project is $22,771 as it includes the co-contributions by WALGA and the City of Gosnells*

### 7.0 Project operation, mechanisms and processes

The project was managed internally within various departments at the City to ensure that knowledge developed was retained within the organisation and maximum value was achieved.

The City selected sub-contractors from a preferred supplier panel, managed by the Western Australian Local Government Association. Adequate internal resources were allocated to oversee the completion of the project in very tight timeframes and this has resulted in a lot being learned in a short space of time.

The project has prompted an open minded approach in the City to alternative technologies and the benefits they demonstrate in reducing electricity consumption and associated carbon benefits. For example, subsequent to project commencement, the City initiated a project to install a 30kW solar panel system on the roof of its Administration Centre.

A key lesson from the project was realising the value of using LED specific designed fittings over LED replacement tubes. This approach created a higher quality outcome and overcame many issues associated with older buildings.

A key challenge to implementing the project was the level of governance controls embedded within the grant acquittal process. Aside from that, the project has been implemented very smoothly and without fuss. A key outcome of the project has been the ability to assess alternative venues for their suitability for lighting retrofits.
8.0 Conclusion

The City found that retrofitting existing lighting installations to LEDs requires considerable analysis before the expected benefits can be achieved. Various activities and functions in the building require different degrees of lighting output and characteristics, which in some circumstances cannot be met by the new technology. While good results can be achieved in most situations, there are occasions when LED technology may not be the best solution.

There are occasions where existing fittings could be retrofitted and tube numbers reduced to deliver the same outcomes using T5 tubes. Similarly lighting patterns must be assessed to properly ensure that they direct the right amounts of light in the direction that it is required.

The City's project focused on LEDs; however it was found that there are also occasions where other solutions can deliver greater energy savings. For example in some situations refurbishment of existing fittings can allow more reflection of light to where it is needed and facilitate a reduction in the numbers of tubes. This provides a better outcome in areas where concentrated light is required.

All of our outcomes were focused on a maximum reduction in energy consumption, not only in a monetary sense, but also to comply with environmental values. These outcomes can be achieved through different strategies that should also be fully considered by external funding bodies and the City’s internal project assessment.
9.0 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 ARMADALE (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: 16/12/2014

Name: FELICITY BAXTEV

Position: ACTING EXECUTIVE DIRECTOR CORPORATE SERVICES

Organisation: CITY OF ARMADALE

Witness Signature: ........................................ Date: 16/12/14

Name: GLENN CAYRD

Position: COORDINATOR ACCOUNTING SERVICES

Organisation: CITY OF ARMADALE

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.
# Project Energy Efficiency Improvement Template

<table>
<thead>
<tr>
<th><strong>PROJECT TITLE</strong></th>
<th>Champion Centre LED lighting and Insulation Retrofit Project Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PROJECT ID</strong></td>
<td>CEEP 2234</td>
</tr>
<tr>
<td><strong>FUNDING RECIPIENT</strong></td>
<td>City of Armadale</td>
</tr>
<tr>
<td><strong>DATE</strong></td>
<td>31/10/2014</td>
</tr>
</tbody>
</table>

## Building, Facility or Site 1

<table>
<thead>
<tr>
<th><strong>Name of Building, Facility or Site 1</strong></th>
<th>Champion Centre</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location (address)</strong></td>
<td>76 Champion Drive, Seville Grove</td>
</tr>
<tr>
<td><strong>Type of building, facility or site</strong></td>
<td>Community Centre</td>
</tr>
<tr>
<td><strong>Activity Type and Measure</strong></td>
<td>Upgrade to ceiling insulation and LED Lighting Retrofit</td>
</tr>
<tr>
<td><strong>Energy Efficiency Estimate Method</strong></td>
<td>AS3598:2000 Energy Audits</td>
</tr>
<tr>
<td><strong>Baseline Energy Usage</strong></td>
<td>44,200 kWh per annum or 159,119 MJ per annum</td>
</tr>
<tr>
<td><strong>Baseline Energy Efficiency</strong></td>
<td>64.81 per m² per annum</td>
</tr>
<tr>
<td><strong>Energy Efficiency Improvement</strong></td>
<td>23.51 per m² per annum</td>
</tr>
</tbody>
</table>

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

- Energy consumption per square metre of floor area per annum = 64.8 MJ/m² p.a.
- Centre floor area equals 1,055 m²
- Hours of operation per year:
  - centre = 2500 hours; car parking = 4,015 hours
- Building construction date = 1982
- Typical operating pattern is based on occupancy from Monday - Friday 0830 - 1700 hours plus an additional 7.5 hours per week for community events
- Car park area = 1,400 m²
- Site is comprises of offices, a community centre/hall and a car park.
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Average daily hours of car park lighting use = 11 hours/night</td>
<td></td>
</tr>
<tr>
<td>Energy consumption per square metre of floor area per annum = 64.8 MJ p.a.</td>
<td></td>
</tr>
<tr>
<td><strong>Cost of Activity</strong></td>
<td><strong>$43,400</strong></td>
</tr>
<tr>
<td><strong>Estimated Cost Savings</strong></td>
<td><strong>$4,702</strong></td>
</tr>
</tbody>
</table>