FINAL REPORT: CEEP 1015

Kingston Arts Precinct Energy Efficiency Improvement Program

Author: Craig Halley, Capital Projects Officer

This activity received funding from the Australian Government.

November 2014
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EXECUTIVE SUMMARY

This document presents a summary of the Kingston Arts Precinct Energy Efficiency Improvement Program which received $375,000 from the Australian Government in November 2012 to implement and promote effective measures to improve energy efficiency at the Kingston City Hall and Kingston Arts Centre.

Kingston City Council in partnership with the Australian Government has upgraded the existing HVAC (Heating, Ventilation and Air Conditioning) system servicing the Kingston City Hall, and delivered energy efficiency initiatives including double glazing of the front fascia and a comprehensive lighting upgrade across both the City Hall and Arts Centre located on the corner of the Nepean Highway and South Road in Moorabbin.

The Project activities have achieved considerable energy efficiency gains at the City Hall and the Arts Centre. The City Hall is now a more energy efficient building and a combination of the improvements to the facility has resulted in a significant rise in bookings. Increased usage of the building has contributed to a rise in energy consumption by more than 35% than the original baseline consumption however this is mitigated by the improved amenity of the facility. As upgrades have only been completed for a short period of time, there is limited energy consumption data to make an accurate prediction of energy efficiency improvements however predicted savings will be significant at around 44.55 MJ/M2/annum. The Art Building has achieved an energy efficiency gain of 97.05 MJ/m2/annum with greatly improved comfort levels for staff and visitors.

This extensive energy efficiency upgrade and refurbishment is an outstanding example of integrating new and old where leading technologies required to reduce global emissions can be achieved whilst maintaining the heritage and cultural significance of the buildings, fittings and fixtures. The targets for the project were certainly met and major issues such as the power upgrade were overcome. Opportunities were provided for local contractors and suppliers throughout the project which helped stimulate economic activity in the Kingston area.

Disclaimer: 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.
PROJECT OBJECTIVES

The Project was undertaken between December 2012 and July 2014. A key objective of the Project was to provide an example of how energy efficiency can be introduced into an iconic 1960’s City Hall building.

More specifically, the project aimed to reduce energy costs and environmental impact of the building, to enhance security of energy supply, to reduce CO2 emissions by at least 30% and to increase public awareness and understanding of climate change issues and actions through demonstration value provided by the project.

Key components of the project were:

- undertake an initial baseline energy consumption audit;
- identification of activities appropriate to reducing energy consumption at the Arts Precinct, together with forecast energy savings of each activity;
- implementation - retrofitting the identified activities including lighting, double glazed Windows and HVAC;
- promotion of the ‘Energy Efficiency’ benefits of the project;
- promote Project activities through a range of communications mediums;
- to gage the success of the Project against the anticipated benefits.
PROJECT ENERGY EFFICIENCY ACTIVITIES

The Kingston City Council signed a Community Energy Efficiency Program (CEEP) funding agreement with the Australian Government in 2012 to upgrade the existing HVAC (Heating, Ventilation and Air Conditioning) systems servicing the Kingston City Hall, and other energy efficiency initiatives including double glazing of the front fascia and a comprehensive lighting upgrade across both the City Hall and Arts Centre located on the corner of the Nepean Highway and South Road in Moorabbin.

The Kingston City Council commissioned local consultant Peter Brodribb of Expert Group to provide specialist independent technical advice and assessments on the most effective energy efficient initiatives and technologies to be deployed across the site. His recommendations were drafted up by mechanical services engineers WSP Group, and installed by Conte Mechanical and Electrical.

A mix of best in class energy efficiency equipment was installed including a PowerPax high efficiency Chiller, Air handling unit, a building management system with CO2 sensors as well as new double glazed thermal windows, and upgrades to energy efficient LED lighting throughout the Arts Precinct.

The previous HVAC equipment included a forty year old Carrier chiller which had reached the end of its serviceable life. The previous belt driven air handling unit (i.e for air supply) and heating/cooling coils were of a similar vintage to the Chiller and were not energy efficient. The new PowerPax Chiller is expected to deliver a 60% improvement in cooling efficiency over the previous chiller.

In implementing this project, it required careful planning and preparation. The HVAC required a conceptual then detailed design. An options appraisal was required to ascertain the best equipment selection. This process of concept to detailed design worked well because it ensured a well-considered project that delivered maximum energy efficiency.

One on-site issue worth noting was an oversight on behalf of the electrical consultant relating to insufficient power available to run the equipment at full capacity. This has subsequently been addressed as a cost variation and sufficient power now exists to feed the system.

The learning’s from the project were various. Energy efficient lighting technologies, glazing and HVAC equipment were all brought together to provide a total transformation to the Arts Precinct, setting a fine example for the community.
PROJECT DEMONSTRATION & COMMUNICATION ACTIVITIES

The Kingston City Council targeted the entire community with its energy efficiency measures. The City Hall was built in 1962 and designed by prominent Melbourne architectural firm Bates Smart McCutcheon. The Hall houses the Wurlitzer theatre organ which is on the Victorian Heritage Register and is listed by the National Trust. The hall is used for many local events: ranging from annual school concerts and speech nights through to political rallies, football club events, dances, Christmas parties and organ concerts.

The focus of the communication activities was to ensure the message of energy efficiency was transferred to the community. Kingston City Council is committed to providing a leadership role with environmental concerns and this project provided an excellent platform to relay the key environmental messages.

Specifically, communication activities included an article in the Moorabbin Kingston Leader newspaper titled “Town Hall Gets Green Upgrade” and another in the June/July edition of the Kingston Your City – a quarterly newspaper from Council to the community. The project and its benefits were also mentioned and discussed during the Council Radio Hour on 88.3 Southern FM in June.

Media Coverage examples:

MOORABBIN

Town hall gets green update

UPGRADES that are environmentally friendly completed at Kingston City Hall will result in energy savings of up to 90 per cent.

The energy-efficient upgrades to lighting, heating and ventilation were done thanks to a $375,000 grant from the Federal Government’s Community Energy Efficiency Program.

Kingston Council used the grant to replace the 40-year-old heating and cooling system, and replaced old windows and doors.
OUTCOMES AND BENEFITS OF THE PROJECT

The main purpose of the project was to demonstrate and encourage the adoption of improved energy management practices within councils, organisations and the broader community.

This project has been an outstanding example of collaboration between local and Federal levels of Government achieving significant energy saving for the community. Energy efficient lighting upgrades delivered the council saving of 97.05 MJ/m²/annum energy efficiency gain for the Arts Building. The HVAC, lighting and double glazing has not achieved the estimated energy efficiency improvements to date due to a 35% increase in usage and insufficient time to gather data. It is anticipated that a saving of 44.55MJ/m²/annum will be achieved for City Hall.

The community will benefit from the revitalised Arts and Cultural Centre that includes a historic Grand Hall, Banquet Room and function rooms available for hire, a new stylish lounge that mimics features of the 1928 heritage Wuriltzer theatre organ housed in the Grand Hall, art studios that provide creative spaces for local talent and a comfortable and authentic theaterette.

The new heating and cooling system comprised the following benefits:

- Replacing a forty year old chiller with a belt driven air handling unit with a 450 kilowatt capacity Smardt-Powerpax chiller, supplied by an Australian manufacturer that uses cutting edge compressor technology to deliver the highest possible efficiency levels of up to three times more efficient than the old one. The old air handling unit was replaced with a modern variable speed air supply system with heat recovery and economising technology to optimise the use of natural ventilation and energy recover from ambient air.

- This new HVAC system also allowed the decommissioning of a very old inefficient air extraction system no longer required due to non smoking laws that simply wasted energy by exhausting conditioned air into the car park.

- All of this technology is controlled by a Alerton Building management system with CO₂ sensors to assess the number of occupants in the conditioned space, and therefore minimise the amount of fresh air to satisfy the ventilation standards, and optimise the operation and co-ordination of equipment to condition spaces in time for events.

- The combined energy savings of the new heating and cooling system will increase as the hours of use increase with greater attendance.

To assist the heating and cooling system the front facia of the City Hall has been upgraded with Miglas’ best available solar control and low emissivity double glazed (5 cooling stars, and 6½ heating stars) windows and doors that combine the advantages of both timber windows and aluminium windows to create a low maintenance, energy efficient and thermally stable window and door system. This energy saving initiative not only inhibits the harsh western sun or solar heat gain from penetrating the building and its occupants in summer, it also provides a high level of thermal insulation to prevent heat losses during the winter.
A comprehensive lighting upgrade of around 600 lamps and fittings was also undertaken across the sites, which required trial and error, and paying close attention to the technical standards to ensure lighting levels were maintained. Some of the highlights include:

- More than 250 old T8 fluorescent tubes used throughout the site for general lighting were upgraded to LED tubes delivering savings of around 50% which was as per the original target.
- Around 170 high energy consuming halogen down lights that typically consume 60W including transformers were replaced with 15W and 9W LED down lights.
- Special attention was taken with antique pendants and wall sconces to maintain the original style of the building, were upgraded from 150W linear halogen lights to efficient LED lights, and 20W energy saver lamps.
- The car park lighting was upgraded from metal halide lights to LEDs with two circuits controlled by a photo electric switch so they switch on to meet the minimum lighting requirements when it cannot be achieved with natural lighting.
- Similarly the decorative pendants in the grand hall were maintained and the fluorescent tubes retrofitted with LED tubes.
- Linear halogen down lights at the City Hall entrance were replaced with 25W LED down lights providing a 65% saving.
- Metal halide floodlights have at the front of the building were upgraded to LED flood lights delivering savings of around 40% which contributed to excellent energy reductions.
- Decorative mirror lighting comprising hundreds of incandescent lamps in the artists dressing room have been replaced with LED strip lighting.
- 205W dimmable halolux lamps in pendent fittings the theaterette were replaced with 20W dimmable energy saver globes achieve a massive 90% reduction and similar lighting levels.

This extensive energy efficiency upgrade and refurbishment is an outstanding example of integrating new and old where leading technologies required to reduce global emissions can be achieved whilst maintaining the heritage and cultural significance of the buildings, fittings and fixtures. The targets for the project were certainly met and major issues such as the power upgrade were overcome.

Despite the communication activities outlined in the above section, the outcomes of the communication activities are more difficult to quantify than the energy efficiency outcomes as there is always some uncertainty as to the level of engagement in the community despite best efforts to cover a range of promotional methods.

Opportunities were provided for local contractors and suppliers throughout the project which helped stimulate economic activity in the Kingston area. For example, the electrical contractors, the builder responsible for the windows installation as well as numerous sub-contractors were all provided employment opportunities as a result of this project.
# Project Energy Efficiency Improvement Summary

<table>
<thead>
<tr>
<th>Site 1</th>
<th>Kingston City Hall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location (address)</td>
<td>979-985 Nepean Highway, Moorabbin. VIC 3189</td>
</tr>
<tr>
<td>Type of building, facility or site</td>
<td>Hall</td>
</tr>
<tr>
<td>Activity Type and Measure</td>
<td>Upgrade of HVAC system, double glazing and Light Fittings</td>
</tr>
<tr>
<td>Energy Efficiency Estimate Method</td>
<td>Detailed Level 2 Energy Audit undertaken in accordance with AS/NZ 3598</td>
</tr>
<tr>
<td>Baseline Energy Usage</td>
<td>236,655 kWh per annum (35% increase from supplementary EEIT at 175,300kWh per annum)</td>
</tr>
<tr>
<td>Baseline Energy Efficiency</td>
<td>112.64 MJ/m²/annum</td>
</tr>
<tr>
<td>Energy Efficiency Improvement</td>
<td>44.55 MJ/m²/annum</td>
</tr>
<tr>
<td>Reporting Data (Measuring Energy Efficiency and Additional Data)</td>
<td>A total area of 7563 m² and 200 occupants. 85 per cent average operational occupancy level. Daily hours of operation: 8am to 5pm. Building construction date 1965. The City Hall has seen an increase in usage of more than 35% due to refurbishments and energy efficiency upgrades. There is insufficient data to accurately reflect the impact of the increase in usage and savings from the upgrades. It is estimated that the actual savings will be significantly higher at around 167.40 MJ/m²/annum</td>
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<tr>
<td>Cost of Activity</td>
<td>$1,197,531.35 (HVAC, lighting, glazing at Hall)</td>
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<tr>
<td>Estimated Cost Savings</td>
<td>$12,621 per annum based on 24c per kWh</td>
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<th>Site 2</th>
<th>Kingston Arts Centre</th>
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<tbody>
<tr>
<td>Location (address)</td>
<td>979-985 Nepean Highway, Moorabbin. VIC 3189</td>
</tr>
<tr>
<td>Type of building, facility or site</td>
<td>Arts Centre</td>
</tr>
<tr>
<td>Activity Type and Measure</td>
<td>Upgrade of Light Fittings</td>
</tr>
<tr>
<td>Energy Efficiency Estimate Method</td>
<td>Detailed Level 2 Energy Audit undertaken in accordance with AS/NZ 3598</td>
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<tr>
<td>Baseline Energy Usage</td>
<td>102,900 kWh per annum</td>
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<tr>
<td>Baseline Energy Efficiency</td>
<td>185.22 MJ/m²/annum</td>
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<tr>
<td>Energy Efficiency Improvement</td>
<td>97.05 MJ/m²/annum</td>
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<tr>
<td>Reporting Data (Measuring Energy Efficiency and Additional Data)</td>
<td>A total area of 2000 m² and 50 occupants. 85 per cent average operational occupancy level. Daily hours of operation: 8am to 5pm. Building construction date 1975</td>
</tr>
<tr>
<td>Cost of Activity</td>
<td>$100,000</td>
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<tr>
<td>Estimated Cost Savings</td>
<td>$9,878 per annum based on 24c per kWh</td>
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BUDGET

The CEEP 1015 Project Activity was undertaken within a revised budget of $1,297,531.35.

The Grant received from the Australian Government was $375,000.

The Kingston City Council contribution was $922,531.35.

A full list of project expenditure is provided in Appendix 1.

The project went over budget as a result of underestimated costs with regards the Double Glazed Windows and the HVAC project. Following public tender it was discovered that there was a funding shortfall which Council subsequently agreed to fund in order for the project to be delivered.

PROJECT OPERATION, MECHANISM AND PROCESSES

The CEEP 1015 project was managed internally by Kingston City Council staff. The Project Manager was Craig Halley, Capital Projects Officer who reported to a Steering Group made up of 6 important Council stakeholders, including the Sponsor and the end Client, all of whom have some decision making authority.

The Project Manager was responsible for managing the total implementation of the project from business plan to project design and documentation through to completion of construction against the agreed time, cost and quality parameters. The Project Manager coordinated between the Project Steering Group, operator, user groups, reference groups, the cost consultant, other client consultants and the design team.

Should Kingston City Council be in a position to complete a similar project like this again, the same governance structure would be implemented. The multi-faceted nature of this project was certainly challenging, and because of the scale of project, the venue had to be closed down for three months resulting in a loss of revenue for the City Hall. The consultant input was valuable and targeted so that key outputs were delivered from each. There were only minor finishing issues such as a minor noise complaint from the more powerful HVAC system, which was overcome by replacing the vents that the air pushes through.
CONCLUSION

The CEEP 1015 project was a great success. The Project was implemented according to plan and although the budget was revised, it achieved its intended objective, to increase energy efficiency.

The Project activities resulted in the forecast energy efficiency gains at the City Hall being met. The City Hall is now a considerably more energy efficient building (97.05 MJ/m²/annum energy efficiency gain for Arts Building & 44.55 MJ/m²/annum for City Hall) with greatly improved comfort levels for staff and visitors.

The Project has improved awareness amongst staff, and all associated with usage of the City Hall, of the considerable environmental and financial benefits of undertaking a carefully planned energy efficiency upgrade. The Project has also demonstrated that the unique features of the Heritage façade do not need to be compromised when making upgrades for energy efficiency.

The benefits of the total project will continue to be realized indefinitely for Kingston City Council, and also more broadly as the foundation has been laid for ongoing promotion of energy efficiency in older/heritage buildings. The City Hall provides a fine example of what can be achieved.
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 Kingston City Council.
♦ 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: 6/8/2014

Name: John Nevins

Position: Chief Executive Officer Organisation: Kingston City Council

Witness Signature: Date: 6/8/2014

Name: Craig Halley

Position: Capital Projects Officer Organisation: Kingston City Council

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

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.