FINAL REPORT
NGSC Community Energy Efficiency Program
(Project Number: CEEP 2123)
‘Stawell Leisure Complex Solar Water and LED Lighting Upgrade”

May 2015

Australian Government
Department of Industry and Science
This activity received funding from the Australian Government
NGSC – Stawell Leisure Complex CEEP Project Plan 2013

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Executive Summary

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.

In December 2013, Northern Grampians Shire Council entered into a funding agreement with the Australian Government’s Community Energy Efficiency Program (CEED) to upgrade out-dated and inefficient pool hot water and lighting technologies at the Stawell Leisure Complex (SLC).

Prior to the project, indoor pool water (and the pool hall air) was heated solely with a gas boiler.

The installation of a solar pool hot water system and variable speed drive (VSD) on the filtration pump was intended to increase energy efficiency and reduce both emissions and operating costs.

Likewise, the installation of 29 x 200W Highbay LED lighting in replacement of 450W metal halide lights in the centre’s basketball court and cricket pitch, together with the replacement of 420 x 36W T9 fluorescent tubes with the same quantity of T9 20W Light Emitting Diode (LED) lamps, was intended to reduce energy consumption and save on annual maintenance costs.

Installation of the pool solar hot water was completed in February 2014 and went into immediate service. Installation of the VSD unit took place in May 2014.

The changeover of the lights took place between May 2014 and October 2014.

Intended data monitoring included the use of existing sub-meters on internal electric circuits, examination of billing and consumption data, Planet Footprint reporting and, later, and interval data from the distributor.

The use of interval data (mains power) became necessary after discovery that the sub-metering was not connected properly, compromising data collection and making it unusable. This, together with the fact that the Stawell Leisure Complex was not a sterile or dedicated project area by its very nature, meant that data collection and analysis was a significant challenge.

Project staff have had to look at others ways to interpret information.

A summary of the savings from the installation of the solar hot water system is that gas consumption has decreased by somewhere between 10.18% and 30.48% from an intended saving of 32.4%. The lower result reflects unexpectedly high gas usage at the complex over the winter period. There was a seasonal influence on gross consumption figures.

A summary of the savings from electricity consumption as a result of the variable speed drive installation on the pool filtration pumps and the LED lighting upgrade.
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indicates savings conservatively estimated in the region of 29.7% for lighting and 18.2% for the filtration pump.

Overall gross electricity consumption at the complex has decreased by between 6.54% and 11.64% over the monitoring period which compares with a figure of 12.5% from the original estimates pre-project.

The LED lighting was intended to contribute a 49% saving in lighting costs. However, with the failure of sub-metering monitoring, it is estimated that this saving is about 29.7% but with significant other factors contributing to this result – including increased usage post-project and inaccuracies in estimating pre-project consumption.

Estimated energy savings as a result of the project are:  (MJ/yr from the pool solar and MJ/yr from the lighting upgrade and VSD installation)

Ongoing, longer term monitoring of both gas and electricity consumption is needed to better measure savings.

From an on-ground perspective, the project has been a great success with all the proposed works completed. It is also achieving energy and cost savings for Council, although these appear to less than originally anticipated.

From a financial perspective, projects funds have been expended largely in the way originally budgeted with variations in budget lines explained. All projects funds have been expended, with the acquittal budget showing an under-contribution by council from the original budget of $1,557.75 (see Attachment B).

The major learning has been around the data collection and methodology – including the need for start-up and regular quality/verification checks of systems, and the need for back-up systems that can be used both as a contingency and to confirm data integrity.

Despite the issues with data collection, the project has demonstrated Council’s preparedness to show leadership and action in energy efficiency, and to manage community assets in a responsible and sustainable manner.

The project has been well-received by the community through media releases and Council newsletters. Feedback from users at the Stawell Leisure Complex has been extremely positive.

The project has been consistent with both Northern Grampians Shire Council’s Council Plan 2013-18, Council’s Sustainable Living Strategy, and the 2012 Business Plan and Services Review of the complex.
It is also consistent with the objectives of the Australian Government’s Community Energy Efficiency Program (CEEP) by delivering a range of energy efficiencies that will help move Australia towards a clean energy future.
**Project Objectives**

The Stawell Leisure Complex is a local government owned and operated community sport and recreation facility and one of the major providers of leisure activities within the Stawell Region.

In December 2013, Northern Grampians Shire Council entered into a funding agreement with the Australian Government’s Community Energy Efficiency Program (CEEDP) to upgrade out-dated and inefficient pool hot water and lighting technologies at the Stawell Leisure Complex (SLC).

The complex is a local community sport and recreation facility and one of the major providers of leisure activities within the Stawell Region. Apart from servicing the general public, the complex hosts many regular programs run by various community groups and organisations including schools, disability support organisations and senior groups.

Prior to the project, indoor pool water (and the pool hall air) was heated solely with a gas boiler.

The installation of a solar pool hot water system and variable speed drive (VSD) on the filtration pump was intended to increase energy efficiency and reduce both emissions and operating costs.

Likewise, the installation of 29 x 200W Highbay LED lighting in replacement of 450 W metal halide lights in the centre’s basketball court and cricket pitch, together with the replacement of 420 x 36W T9 fluorescent tubes with the same quantity of T9 20W Light Emitting Diode (LED) lamps, was intended to reduce energy consumption and save on annual maintenance costs.

**Project Energy Efficiency Activities**

Installation of the pool solar hot water was completed in February 2014 and went into immediate service. Installation of the VSD unit took place in May 2014.

The changeover of the lights took place over two installation periods – the first in May 2014, and the second in October 2014. This was due in part to scheduling work around seasonal bookings at the complex, supply of lights, and the availability of staff and contractors.

All installation work was carried out by contractors and went forward with minimal problems. Site safety and risk was monitored by Northern Grampians Shire Council project staff.

Contactors also had responsibility for removal of waste using best practice management as detailed in their corporate waste management plans.

Data monitoring to measure changes in consumption was intended as a big part of this project and included using sub-meters on internal electric circuits, examination of
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billing and consumption data, Planet Footprint reporting and, later, interval data from the distributor.

The use of interval data became necessary after two incidents.

The first, reported at Milestone 4 was a problem with the data being collected from Carbon Real Time. In early April, when project staff went to access the daily and weekly data to collate it, it was discovered that the equipment at the Stawell Leisure Complex had stopped transmitting data to the portal – so that while files were being forwarded to project staff and saved, when they were opened there was no data. Project staff checked the equipment which looked to operating properly and then contacted Carbon Realtime who suggested that we ask the local contractor who installed the equipment to have a look. He did and could see there was no data being recorded but could not establish why. Northern Grampian Shire IT staff were called in who believed that it may have something to do with a firewall update they did in early February. They also were not able to resolve the issue and referred back to Carbon Realtime. Eventually Carbon Realtime corrected an SQL issue – but not before a significant gap in data occurred.

Then, once data started being received again, it became apparent that the problem was far more serious as it was revealed that the sub-metering had not been set up correctly and that, despite how they were named, the wrong circuits were being monitored - meaning that all pre-project data on the circuits was unusable.

These errors have compromised the capacity of project staff to relate benefits directly to project interventions. This capacity has been further compromised by the fact that the project site is not a sterile environment and is subject to highly variable usage patterns, continual and ongoing maintenance works or repairs, and other capital works such as the recommissioning of the spa, replacement of the boiler, new spotlights over the outdoor pool area, filtration equipment upgrade and irrigation (grounds) equipment upgrade – all of which affect consumption data.

The recommissioning of the spa which was completed in October 2014 has resulted in a significant increase in gas and electricity usage that did not occur pre-project.

With different staff working independently of the project on their own priorities, it has not been possible to monitor and measure all variables. Project staff have had to look at others ways to interpret information.

These are discussed below

**Project Demonstration and Communication Activities**

Despite the issues with data collection, the project has demonstrated Council’s preparedness to show leadership and action in energy efficiency, and to manage community assets in a responsible and sustainable manner.
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Council has promoted the project through two media releases that appeared in local and regional papers, on its website and through its community newsletters. Project staff have communicated benefits and progress of the project through Northern Grampians Shire Council’s management structure to Council.

The most significant communication, however, has been through word-of-mouth and feedback from clients and staff at the Stawell Leisure Complex which show that local residents believe the project has definitely enhanced the complex and that they are fully supportive of Council’s efforts to save both energy and money.

The project has been consistent with both Northern Grampians Shire Council’s Council Plan 2013-18 (i.e., improving the social and economic viability of the Shire) and Council’s Sustainable Living Strategy, and the 2012 Business Plan and Services Review of the complex.

It is also consistent with the objectives of the Australian Government’s Community Energy Efficiency Program (CEEP) by delivering a range of energy efficiencies that will help move Australia towards a clean energy future.

Project Outcomes and Benefits

Looking at the gas consumption data, the intended savings pre-project were of the order of 32.4% - that is a reduction of 515,585 MJ/yr from a baseline usage of 1,591,312 MJ/yr.

During the twelve month periods from April 2013 to February 2014 (pre-project installation) and from April 2014 to February 2015, the project achieved savings of 10.18% - from 1,925,983 MJ/yr to 1,729,927.78.

However, over the warmer months (more sunlight) from September to February, the savings rose to 30.48%, indicating the obvious fact that the solar panels are much more effective in summer.

Looking at the usage graphs, there was higher consumption of gas over the winter period post-project which begs the question that there was a significant seasonal variation (i.e extended and more intense cold periods over winter) which increased demand in 2014-15.

The gas boiler at the Stawell Leisure Centre was also replaced in March 2015 after routine maintenance, dating back to an initial inspection in October 2014, revealed unacceptable levels of CO2 being produced - indicating that there was inefficient combustion of the gas which would have led to increasingly higher usage of gas over a period of time, potentially coinciding at least in part with the project period.

In short, while there has been a significant reduction in reduction in gas usage following the project, the deteriorating condition of the old boiler will have masked some of the benefits. This will need to be monitored over a longer timeframe than
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has currently elapsed to better measure the benefits of the solar installation in reducing consumption.

Also, the newly installed gas boiler is likely to be far more efficient than the old one, which means that quantifying savings over the long term will need to acknowledge that upgrade as a factor too.

There have been reductions in electricity consumption following the project but these have also been clouded by other factors.

Intended savings from the installation of the VSD were 4,380 kWh/yr, 700kWh/yr from the pump upgrade, and 20,110 kWh/yr from the lighting upgrades - for a total of 25,190 kWh/yr (90,684MJ/yr). This was over a baseline of 89,119kWh/yr for these items.

However, as the project couldn’t measure the savings on each of these items individually, the reduction has been calculated in relation to total electricity consumption at the site (conservatively valued at 202,700kWh/yr – Planet Footprint).

On this basis, expected savings against gross consumption was just under 12.5%.

Comparison of the period 1/7/13 to 1/3/14 with the same period 1/7/14 to 1/3/15 shows a saving of 6.54% - but this also includes a period when the changeover was still in progress. Figures from the period after installation was complete (November to March 2013/14 and 2014/15) shows a percentage saving of 11.64%.

Ongoing, longer term monitoring is again needed.

The lighting upgrade was where major savings were to be achieved – 20,110kWh/yr over a baseline of 40,939 kWh/yr, or approximately 49%. Not having pre-project data on lighting-only usage, a variance method has been used to calculate the savings been achieved.

Interval data was used to calculate average peak demand on lights at hourly intervals over a minimum of 224 days (both pre and post project) between 6pm and midnight when the complex had closed for the day. This was intended to reduce the errors caused by variations in the time of sunset and use of lights – i.e. peak demand in winter might have been earlier than in summer.

Comparison (see attached variance sheets) indicated that pre-project there was a variance of 2.5092792 kWh in gross consumption when the majority of lights (excluding security lights) were switched off. Post-project, that drop decreased to 1.804551 – a change of 2.793496kW or 27.9% attributable to the energy usage of the lights.

Current monitoring of the lighting circuit indicates that that drop is generally consistent with what is happening when the lights are switched off today. Obviously, there can be significant variation on a day-to-day basis.
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27.9% is considerably less than the intended 49% and the difference has been attributed to a number of factors, including

- Average peak demands will be less than actual peaks so the calculation of the variance is conservative
- Better lighting now has made the centre more attractive to users and seems to have had the effect of increasing patronage and extending use, thereby increasing consumption and decreasing savings. Unfortunately, the project is unable to provide statistical evidence of this increased patronage and is relying on anecdotal evidence from complex staff. Casual usage at the centre is not well-recorded.
- As part of the upgrade process and working with the contractors, it became apparent that a significant percentage of the fluorescent tubes were not functioning properly. When covers were removed, some battens had a tube missing. Some sections were used infrequently or quickly turned off because some tubes in the series flashed or flickered and were irritating to patrons. Overall, this had a ‘de-lamping’ effect on consumption that was not properly taken into account during the baseline assessments. While baseline consumption data provided by the distributor, Powercor, and retailer, AGL, was accurate, the changeover wasn’t one for one and so this is now distorting comparison of current data with pre-project data – i.e. there are more operational lights now.

With feedback from clients and staff complimenting the improved lighting, there may be an opportunity for discreet and targeted de-lamping to reduce consumption even further. In addition, it has become apparent through the project that lights are commonly left on inadvertently or carelessly in some sections (e.g. basketball court, squash courts) after use. There is an opportunity here through increased signage, better communication with clients, and staff awareness and education to reduce the incidence of this occurring. The issue has already been raised with staff.

From an on-ground perspective, the project has been a great success with all the proposed works completed. It is also achieving energy and cost savings for Council, although these appear to less than originally anticipated.

The major learning has been around the data collection and methodology – including the need for start-up and regular quality/verification checks of systems, and the need for back-up systems that can be used both as a contingency and to confirm data integrity.

In regard to electricity, project staff believed they had a suitable methodology with three platforms that would support each other – consumption and billing information; Planet Footprint reports, and the Carbon Realtime sub-metering data.

A mis-founded confidence in technology led to three fateful assumptions, i.e.,
that after checking the first few data files, all subsequent data files being downloaded contained data and could be saved for later analysis without necessarily being opened first. Files were being checked periodically but not every day, or every week. When it was discovered in April 2014 that some files had been emailed without any data, it took another two weeks or so to rectify the cause and resume data receipt.

that the data being downloaded (but not immediately analysed) was relevant and had integrity. Once the above situation had been rectified, project staff started analysing the data to identify any emerging trends or impacts that could be related to the project. The collected figures and graphs did not make any sense and a concern rose that there was a problem with the sub-metering. An electrical contractor was sent to investigate which circuits the sub-meters were wired to, confirming that there was indeed an issue.

these sub-meters were installed prior to the project as part of another regional project being run by Central Victorian Greenhouse Alliance (CVGA). Data collection by subscription to carbon Realtime continued unabated from one project to the next and as the previous project had been successfully acquitted by CVGA, project staff had made the assumption that the meters were correctly reading what the web dashboard said they were reading.

This has meant that the only information on usage relate to mains inputs and not individual circuits. Having to rely solely on gross consumption data has limited the project’s ability to measure and compare pre- and post-project power usage on the lights and VSD unit.

**Demonstration and Communication Outcomes**

While there was no formal evaluation of the energy efficiency activities on the community, there has been very clear support and approval for the project which is supported by anecdotal evidence from Stawell Leisure Centre Staff relating feedback from users.

The complex receives visitations of over 51,000 people per year from a population base of only 8,000. It includes individuals and groups of all ages and abilities. This means that there is an incredibly high exposure of the complex to the community.

The new lighting is very obvious and noticeable, while the solar pool hot water installations were widely publicised. Northern Grampians Shire Council installed a similar unit for the outdoor pool at the same time as part of a separate capital works project. This would have made the installation much more obvious with more comfortable water temperatures available outside for longer. This in turn has increased peoples awareness of the indoor upgrade as well.

Staff have been very active in promoting and discussing the upgrades. They have reported an apparent increase in both the number of people using the venue and the length of time they spend there.
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Councillors have been kept well informed about the project and it has been one of the 'good news' items they have been able to take back to ratepayers. Two separate media pieces – one covering the start of project, and a second highlighting the expected savings from the project – involved Councillors and included an acknowledgement of the funding provided by the Australian Government. These appeared in the local and regional media. The second media is attached.

With the exception of the solar hot water installation, all other contractors, suppliers and tradespersons used on the project were local businesses.

The project has encouraged Council to consider other projects to increase energy efficiency or lower consumption at other sites – including acting on installing solar photovoltaic panels on a number of its buildings.

While there is no evidence that people have rushed out to buy LED's, the project has made people aware of the benefits and potential savings from solar and LED technology.

The project has been especially valuable in municipality such as Northern Grampians Shire where faces increasing unsustainable pressures on its budget to maintain and improve assets and facilities for its community.

Northern Grampians Shire is a small, rural Shire with a low socio,economic profile and a Social Economic Index for Areas (SEIFA) which, at 917, is significantly below both the overall and regional averages and at the bottom scale of the index.

The Central Highlands Regional Strategic plan notes the region is the 4th most disadvantaged in Victoria. Key priorities include an increasing emphasis on liveability, health and well-being.

The range of activities on offer, its affordability and nearness makes the complex an attractive and important community asset. However, costs to maintain the facility are ever-increasing and the Northern Grampians Shire Council is under constant pressure to find efficiencies and savings.

This project has helped toward that end by providing a real opportunity to achieve savings in both dollars and resource use – which in turn will lead to better provision of services and improved facilities.

**Budget**

Spreadsheets detailing project income and expenditure are included in Attachment B.

From a financial perspective, projects funds have been expended largely in the way originally budgeted with only minor variations in budget lines.

All projects funds have been expended.
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Project Operation, mechanisms and processes
The project was managed internally by Northern Grampians Shire Council’s Infrastructure and Environment Department. Department staff include qualified engineers and asset managers.

The Building and Assets Projects Officer had prime responsibility for the implementation of the project. This included coordination and delivery of the project; providing liaison and facilitating information exchange with and between any parties having responsibility to the project; monitoring and recording of energy use and savings at the complex, and reporting to in-line managers and for preparing reports to the Commonwealth required under the deed.

Communication was the responsibility of Northern Grampians Shire Council’s Marketing and Communication Officer, in consultation with project staff. The Mayor and Shire’s Manager of Emergency Services and Environment were the spokespeople for all media contact.

Supply and installation of upgrades was governed by Northern Grampians Shire Council’s Procurement policy and procedures which focuses on best value practice and ensures transparency and fairness, and which confirmed the qualifications and accreditation of suppliers, contractors and tradespeople.

Installation was carried out by the contractors, who also had responsibility for proper disposal of the waste from the project.

Data monitoring and collection, as well as analysis and reporting was supported by Northern Grampians Shire Council’s Sustainable Living Project Officer.

Council has the ongoing responsibility for maintenance of the assets post-project as part of Council’s asset management program.

There were no significant issues in completing the installation/upgrade activities.

While there was interaction with the community and efforts by staff to promote and communicate the project, the recording and evidence for these activities was poor with a heavy reliance on anecdotal evidence being provided by complex staff, or ratepayers speaking with local Councillors.

As reported above, the most significant problems arose over monitoring and data collection. If we were to repeat a similar project, much more development and testing of the monitoring mechanisms would be undertaken.

The learnings from the project are included in the conclusion below.

Conclusion
In conclusion, from Northern Grampians Shire Council’s perspective, the project has been mostly successful.
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It has resulted in savings, reduced emissions, an improved community centre, and encouraged additional investment in other capital works at the centre including the installation of the outdoor solar pool hot water system.

Was it cost effective??

This would include:

- getting expert advice on proven methodologies
- use of purpose-built systems and equipment/meters that allow discrete isolation and monitoring of project components
- rigorous start-up and regular quality/verification checks of systems
- use of back-up systems that are used both as a contingency and to confirm data integrity.
- Better systems for collecting and recording evidence of community impact
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Declaration

DECLARATION

The Authorised Officer of the organisation makes the following declarations:

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

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

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

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

Authorised Officer Signature: [Signature] Date: 17-06-2015

Name: Justine Linley

Position: Chief Executive Officer

Organisation: Northern Grampians Shire Council

Witness Signature: [Signature] Date: 17-06-2015

Name: John Kindred

Position: Building Projects Officer

Organisation: Northern Grampians Shire Council

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

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.
**Attachment A**

**Project Energy Efficiency Improvement Template**

<table>
<thead>
<tr>
<th>PROJECT TITLE</th>
<th>Stawell Leisure Complex Solar Water and LED Lighting Upgrade</th>
<th>PROJECT ID</th>
<th>CEEP 2123</th>
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<td></td>
<td><strong>DATE</strong></td>
<td>May 15 2015</td>
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<tr>
<td>Northern Grampians Shire Council</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PO Box 580 Stawell VIC 3380</td>
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**Building, Facility or Site 1**

<table>
<thead>
<tr>
<th>Name of Building, Facility or Site 1</th>
<th>Stawell Leisure Complex – Pool Water Heating</th>
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</thead>
<tbody>
<tr>
<td>Location (address)</td>
<td>Houston St, Stawell, Victoria 3380</td>
</tr>
<tr>
<td>Type of building, facility or site</td>
<td>Pool and Sporting Complex</td>
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</tbody>
</table>

**Activity Type and Measure**

Installation of pool solar hot water system to replace gas-fired boiler

**Energy Efficiency Estimate Method**

NOTE: Text in purple throughout this table is excerpt from original Baseline Report. Text in black is current information.

Baseline gas usage (1,591,312 MJ) has been calculated from 67% of Northern Grampians Shire total billing data for gas at the Stawell Leisure Complex from. Modelling provided by Sunbather Pool Technologies indicates waterheating uses 67% of the energy produced by the gas boiler, with the balance space heating.

Assuming an efficiency of 80% for the current 5.5 Kw filtration system pump, power usage will be 4.4 Kw at 1440 rpm. Running 24 hrs a day, 365 days a year, this equates to another 138,758 MJ/yr.

Energy efficiency for the final report was still measured as MJ/yr but the calculation was based on 2013-14 financial year consumption figures and July 2014 to May 2015 figures taken from Planet footprint reports. Also, as no pump upgrade took place as originally intended, this figure has been removed.
The VSD consumption figures are for electricity and, as consumption can’t be measured individually for the VSD, these figures have been included below in the electricity calculations for lighting which use gross electricity consumption to measure efficiency. Consequently, the VSD figures have also not been included in the baseline energy usage.

Energy efficiency method for the pool hot water system is a simple comparison between the periods April 2013 to February 2104 (pre-project) and April 2014 to February 2015 (post project) using billing and consumption data recorded by both the retailer (AGL) and Planet Footprint.

These were 1,925,983.49 Mj and 1,729,927.78Mj respectively, or a reduction of 196,056 Mj (10.18% less consumption in 2014-15 period than 2013-14 period)

This period included winter readings which were higher than the same period last year indicating potential for seasonal influence.

Taking these periods out and using six monthly figures from September 2013 to February 2104, and from September 2014 to February 2015 resulted in a drop from 1,080,932 to 750,952.8 Mj. This decrease of 330,079 Mj represents a 30.54% saving.

<table>
<thead>
<tr>
<th>Baseline Energy Usage</th>
<th>Original 1,730,070 MJ/yr</th>
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<tbody>
<tr>
<td></td>
<td>Less Pump and VSD this will be adjusted to 1,591,312 MJ/yr</td>
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<tr>
<td></td>
<td>However, using the 2013/14 figures this has been adjusted to 1,925,983.49MJ for period between April 2013 and February 2014.</td>
</tr>
<tr>
<td></td>
<td>Or 1,082,946MJ for six months between September 2013 and February 2014</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Baseline Energy Efficiency</th>
<th>Original 1,730.070/122 = 14,181 MJ/yr/m3</th>
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<tbody>
<tr>
<td></td>
<td>Baseline energy efficiency was calculated by dividing baseline energy use by the volume of the pool (122 cubic metres).</td>
</tr>
<tr>
<td></td>
<td>14,181 MJ/yr/m3 = 38.85205 MJ/yr/m3</td>
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</table>
Using the Spring/Summer figures, this means using a revised baseline energy efficiency of $(1,082,946/122)/181 \text{ days} = 49.04203 \text{ MJ/dy/m}^3$

Using the longer period which includes the winter anomaly but reflects the reduced efficiency of the panels in winter

Baseline energy efficiency
$= (1,925983.49/122)/304 \text{ days} = 51.9301 \text{ MJ/dy/m}^3$

The equivalent energy efficiency measure for the Spring/Summer figures for 2014/15 are $(750,852.8/122)/181 = 34.00293 \text{ MJ/dy/m}^3$

This is an improvement of 15.0391 MJ/dy/m3 or 30.67% Annually: $5,489 \text{ MJ/yr/m}^3$

The equivalent energy efficiency measure for April to February (304 days) the figures for 2014/15 are $(1,729,927.78/122)/304 = 46.64387 \text{ MJ/dy/m}^3$

This is an improvement of 5.28623 MJ/dy/m3 or 10.18% Annually: $1,929 \text{ MJ/yr/m}^3$

See Attachments as listed in Appendix C

$25,040$ (including shared costs with LED replacement – e.g. project admin, communication etc.)

Actual costs:

Solar Hot Water + 50% project balance generic project costs  

$= $13,500 + $10,750 = $24,250$

Estimated cost savings $5,502/yr
Billing data (attachment E12) shows that the average cost per MJ of gas from October 2011-12, not including supply charges, was $0.0087/MJ. This figure multiplied by the projected savings of 32.4% of baseline energy usage gives a cost saving of 515,585 MJ x $0.0087 = $4,486/year

Billing data shows the average cost for electricity from October 2011-12, not including supply charges, was $0.214/KwH.
With a 1 Kw reduction in power through the use of the VSD when in operation (estimated at 12 hours a day for 365 days a year) at a conservative $0.2/Kw, the cost saving is 1 x 12hrs x 365 days x $0.2Kw = $876/year. Likewise, with regard to the upgraded filter pump, a 1.8% efficiency gain on 4.4 Kw operating power is 0.08Kw. This translates to an annual cost saving of 0.08Kw x 24hrs x 365 days x $0.2/Kw = $140/year. Total savings for the pool = $5,502 per year.

Revised Estimated Cost savings

Average gas price $ 0.0087/MJ

Savings = Reduction in consumption x cost

Spring Summer figures

5,489 MJ/yr/m3 x 122m3 x $0.0087 = $5,826/year

Longer period

1,929 MJ/yr/m3 x 122m3 x $0.087 = $2,047/year

It is still too early to properly quantify the savings and a longer period of monitoring and comparison with historical consumption data is required.

<table>
<thead>
<tr>
<th>Building, Facility or Site 2</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Name of Building, Facility or Site</th>
<th>Stawell Leisure Complex – Pool Water Heating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location (address)</td>
<td>Houston St, Stawell, Victoria 3380</td>
</tr>
<tr>
<td>Type of building, facility or site</td>
<td>Pool and Sporting Complex</td>
</tr>
<tr>
<td>Activity Type and Measure</td>
<td>Replacement of 24 x 450 W Metal Halide lamps with 200 W High Bay LEDs.</td>
</tr>
<tr>
<td></td>
<td>Replace 412 T9 Cool/Daylight 6500k 36W fluorescent tubes and 4 x 400W metal halide lights with 420 x 20W T9 LED tubes and 210 new battens.</td>
</tr>
<tr>
<td></td>
<td>Instal VSD unit on filtration pump</td>
</tr>
</tbody>
</table>

*Note: these three have been put together because of the sub-metering difficulties which have not made it
**Energy Efficiency Estimate Method**

<table>
<thead>
<tr>
<th>Possible to measure them separately and we have relied on gross electricity consumption data.</th>
</tr>
</thead>
</table>

| Basketball and Cricket Pitch: |
| Baseline energy use on the basketball court has been calculated on 16 x 450 watt metal halide lights running an average of 4 hrs a day for 320 days of the year = 9,216KWh = 33,178 MJ. |

Baseline energy use for the cricket/Soccer pitch has been calculated similarly but for 8 lights = 16,589 MJ. Usage has been estimated from the Stawell Leisure Complex business and Service Review and from staff input.

Prior to the project an energy efficiency assessment will be conducted to inform monitoring and evaluation.

**General Changeover of Lights:**
Refer Attachment - General Purpose LED Changeover Saving Table
Table shows that the changeover will cost $36,862 but will save over 6630 kWh (23,870J) of energy per annum at a cost saving to Council of $2,326.20.

Middendorp Electrical has supplied a quote for the supply of tubes and battens with a unit price of $48.75 and $42.32 respectively.

Skinners Electrical contractors have estimated the cost of removing the old lights and fittings, and the installation of new battens and LED tubes, at $7,500.

This includes a disposal cost through CMA Ecocycle of $504 - 7 boxes (60 tubes/box) @ $72/box (ex GST).

**VSD Unit:**
VSD savings based on reduction from 1440 rpm to 1300 rpm and a saving of approximately 1Kw (3.6 MJ) on an assumed efficiency of 80% on the 5.5 Kw motor. With this reduction applying 12 hours a day for 365 days, this translates to an additional saving of 15,768 MJ/yr (4,380kWh/yr)

In the absence of sub-metering and because of an inability for monitoring of lights to be project exclusive due to the nature of the site and other activities imposing uncontrollable variables on usage, it was decided the best way to calculate efficiency was to look at the step-down of power when the lights were turned off at the
NGSC – Stawell Leisure Complex CEEP Project Plan 2013

<table>
<thead>
<tr>
<th>Baseline Energy Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basketball Court – 33,178 MJ/yr</td>
</tr>
<tr>
<td>Indoor Cricket and Soccer – 16,589 MJ/yr</td>
</tr>
<tr>
<td>Total – 49,767 MJ/yr</td>
</tr>
<tr>
<td>General Changeover 97,615 MJ/yr (from attached lighting variation table)</td>
</tr>
<tr>
<td>Filtration pump without VSD = 48,180 kWh/yr = 173,448 MJ/yr</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Baseline Energy Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both sites (Basketball and Cricket) are used intermittently, and so baseline energy efficiency was calculated by dividing the baseline energy use by the area of each space (704 m² and 600 m² respectively) by the average hours of use per year (1280 hrs).</td>
</tr>
<tr>
<td>Basketball = 33,178 / (1,280 x 704) = 0.0368 MJ/m²/hr</td>
</tr>
<tr>
<td>Cricket/Soccer = 16,589 / (1,280 x 600) = 0.0216 MJ/m²/hr</td>
</tr>
<tr>
<td>Total = 0.0584 MJ/m²/hr</td>
</tr>
<tr>
<td>General Light changeover = 46.48 MJ/yr/m² (energy usage/area)</td>
</tr>
<tr>
<td>VSD = 173,448 MJ/yr / 122 m³ (pool volume) = 1,421.7 MJ/yr/m³</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Energy Efficiency Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n.b. Lights illuminate an area greater than the actual size of the basketball court (25m x 15m) or indoor cricket/soccer enclosure (30 m x 15m)).</td>
</tr>
<tr>
<td>Energy efficiency improvement was calculated by subtracting the projected energy use of the LED lights from the current baseline energy use of the metal halides. This was then divided by both the estimated hours of operation per year and floor area.</td>
</tr>
<tr>
<td>LED energy use - Basketball = 16 lights x 200 watts x 1280hrs = 4,096 kWh = 14,746 MJ</td>
</tr>
<tr>
<td>Improvement = Baseline energy (33,178 MJ - 14,746) / (1,280 x 704) = 0.0205 MJ/m²/hr</td>
</tr>
<tr>
<td>LED energy use - Cricket = 8 lights x 200 watts x 1280</td>
</tr>
</tbody>
</table>
hrs = 2048 kWh = 7,378 MJ
Improvement = Baseline energy (16,589 MJ - 7,378)/(1,280 x 704) = 0.012 MJ/m2/hr

Total improvement = 0.0325 MJ/m2/hr

General Light Changeover:
44,749 MJ/Yr (Estimated usage pre-project - estimated usage post-project - see attached lighting variation table)

VSD:
Assumption is as per specifications where VSD fitted pump will use 157,680 MJ/yr (1 kW reduction for 12 hours x 365 days x 3.6 conversion to MJ from baseline usage)
Efficiency Improvement = (Pump Baseline Energy Use - VSD fitted Pump Use)/122 m3 = (173,448 - 157,680)/122 = 129.24 MJ/yr/m3

With the monitoring adaptations we have had to apply measuring gross consumption though the revised energy efficiency needs to be expressed also in gross terms – that is total expected savings per year per complex, i.e.

(33,178 - 14,746) + (16,585 - 7,378) + (173,448 - 157,680)
= 43,407 MJ/yr/complex
= 12,057.5 kWh/yr/complex

Over the gross expected consumption for these items (223,211), this is approximately 19.47% reduction in consumption – for these items, not gross consumption.

It is not possible to accurately ascertain the true reduction due the reported failure of sub-metering and the unmeasurable influence of other factors such as highly variable and apparently increasing usage at the centre; inaccuracies in the counting the number of operable lights pre-project; the commissioning of the spa; upgrades to the outdoor irrigation and other maintenance works.

As reported, an attempt was made to use step down consumption data to measure the apparent savings from the lighting upgrade. Based on the attached spreadsheets and lighting graph, these indicate that is a measurable saving of at least 27.9% being achieved.
### Reporting Data (Measuring Energy Efficiency and Additional Data)

- **Basketball and Cricket Courts:**
  - Combined area 1304 m²
  - Average hours of use per year = 1280 hrs

- **General Light Changeover:**
  - Total area approximately 2100 m²
  - Hours of operation are moot because the LEDs will operate the same length of time as the fluorescents

- **VSD** – estimate from specifications

See also supporting attachments as listed in Appendix C

### Cost of Activity

- **Basketball Court** – $15,836
- **Indoor Cricket and Soccer** – $11,343
- **Total** – $27,179
  - (including shared costs with LED replacement – e.g. project admin, communication etc.)

- **Cost of General Light C/over:** $51,212 (from attached lighting variation table)

- Original did not include VSD which was included in pool solar hot water calculations

- **Total original budget:** $78,391

- **Actual expenditure** (see attached budget sheets):
  - Lighting upgrade and VSD installation (including electrical connections, etc.) + shared generic project costs = $77,623.25

*Note: this figure together with the $24,250 for the pool solar hot water comes to $101,873.25 as per the attached budget spreadsheet.*

### Estimated Cost Savings

- **Basketball:**
  - Cost savings for the lights are based on both energy savings and lower maintenance costs for LED.
  - Energy savings = 16 lights x 250 watts x 1,280 hrs/yr = 5,120 Kwh
  - Energy cost savings = 5,120 Kwh x $0.2 = $1,024 per year
  - Maintenance savings based on estimate of $1,735 per annum for 24 lights provided by Middendorp Electrics.
  - Savings on 16 lights is $1,155.
  - Cost savings = $2,179.
Cricket/Soccer:
Calculated as above.
Energy savings 2,560 kw or cost savings of $512
Maintenance saving (balance from $1735) = $580
Cost savings = $1092

General Light C/over: $2,486 per annum (from attached lighting variation table)

The expected savings from the VSD were originally expected to be the savings in kWh x the rate = 4,380 x $0.2 = $876

This would give a total cost savings of $6,633

For the reasons specified above in the section on 'baseline energy improvement' is not possible to accurately specify what the actual cost savings are as a result of the project.

While there are undoubtedly savings (conservatively estimated in the region of 29.7% for lighting and 18.2% for the filtration pump, and between 6.54% and 11.64% of gross consumption), there are too many other variables impacting on the project and long term monitoring is required to be confident of the level of saving being achieved by Northern Grampians Shire.
Financial Declaration

DECLARATION

The Authorised Officer of the organisation makes the following declarations:

- Grant funds (CEEP funding and Other Contributions) were spent in accordance with the Funding Agreement;
- Any unspent funds will be used within the next reporting period;
- If an asset has been created/acquired that these comply with the requirements for Assets set out in the Funding Agreement; and
- At the time of providing this report, Northern Grampians Shire Council has sufficient funds to cover any debts at the end of financial year.

Authorised Officer Signature: [Signature]
Date: 17-06-2015

Name: Justine Linley
Position: Chief Executive Officer
Organisation: Northern Grampians Shire Council

Witness Signature: [Signature]
Date: 17-06-2015

Name: Jay Petty
Position: Finance Coordinator
Organisation: Northern Grampians Shire Council
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Attachment C - List of Separate Attachments

1) VCCCH00145 2013-14 Data and Variance Spreadsheet
2) VCCCH00145 2014-15 Data and Variance Spreadsheet
3) Lighting variation Spreadsheet
4) Gas and Electricity Consumption Data
5) SLC Mains Light Graph
6) Media Release - Energy efficiency program slashing costs at Stawell Leisure Complex
Page Removed for Publication
Page Removed for Publication
<table>
<thead>
<tr>
<th>Location</th>
<th>Type</th>
<th>Usage (hrs/wk)</th>
<th>Number</th>
<th>Wattage</th>
<th>Total Wattage</th>
<th>Annual KwH</th>
<th>Replacement Type</th>
<th>Number</th>
<th>Wattage</th>
<th>Total Wattage</th>
<th>Annual KwH</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indoor Swimming Area</td>
<td>400 W Metal Halide</td>
<td>520</td>
<td>4</td>
<td>400</td>
<td>1600</td>
<td>800</td>
<td>LED Tubes</td>
<td>8</td>
<td>20</td>
<td>160</td>
<td>83.2</td>
<td>748.8</td>
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<tr>
<td>Indoor Swimming Area</td>
<td>36 W T9 Fluorescent</td>
<td>3068</td>
<td>36</td>
<td>36</td>
<td>1296</td>
<td>3976.128</td>
<td>T9 LED Tubes</td>
<td>36</td>
<td>20</td>
<td>720</td>
<td>2208.96</td>
<td>1787.168</td>
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<td>Foyer</td>
<td>36 W T9 Fluorescent</td>
<td>3068</td>
<td>48</td>
<td>36</td>
<td>1728</td>
<td>5301.64</td>
<td>T9 LED Tubes</td>
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<td>20</td>
<td>960</td>
<td>2945.28</td>
<td>2356.224</td>
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<tr>
<td>Changeerooms (Mens)</td>
<td>36 W T9 Fluorescent</td>
<td>3068</td>
<td>24</td>
<td>36</td>
<td>864</td>
<td>2650.752</td>
<td>T9 LED Tubes</td>
<td>24</td>
<td>20</td>
<td>480</td>
<td>1472.64</td>
<td>1178.112</td>
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<tr>
<td>Changeerooms (Mens)</td>
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<td>3068</td>
<td>24</td>
<td>36</td>
<td>864</td>
<td>2650.752</td>
<td>T9 LED Tubes</td>
<td>24</td>
<td>20</td>
<td>480</td>
<td>1472.64</td>
<td>1178.112</td>
</tr>
<tr>
<td>Hallway (between courts)</td>
<td>36 W T9 Fluorescent</td>
<td>3068</td>
<td>40</td>
<td>36</td>
<td>1440</td>
<td>4147.92</td>
<td>T9 LED Tubes</td>
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<td>20</td>
<td>800</td>
<td>2454.4</td>
<td>1983.52</td>
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<td>Closets</td>
<td>36 W T9 Fluorescent</td>
<td>3068</td>
<td>64</td>
<td>36</td>
<td>2304</td>
<td>1843.2</td>
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<td>1024</td>
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<td>Utility mezzanine</td>
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<td>1440</td>
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<td>800</td>
<td>640</td>
<td>512</td>
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<td>Tabletennis/Playgroup area</td>
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<td>1200</td>
<td>80</td>
<td>36</td>
<td>2880</td>
<td>3686.4</td>
<td>T9 LED Tubes</td>
<td>80</td>
<td>20</td>
<td>1600</td>
<td>2048</td>
<td>1638.4</td>
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<tr>
<td>Storage Hallway (below stand)</td>
<td>36 W T9 Fluorescent</td>
<td>100</td>
<td>24</td>
<td>36</td>
<td>864</td>
<td>86.4</td>
<td>T9 LED Tubes</td>
<td>24</td>
<td>20</td>
<td>480</td>
<td>48</td>
<td>38.4</td>
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<td>Rock Climbing Wall area</td>
<td>36 W T9 Fluorescent</td>
<td>400</td>
<td>24</td>
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<td>864</td>
<td>345.6</td>
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<td>20</td>
<td>480</td>
<td>192</td>
<td>153.6</td>
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<tr>
<td>Side entrance to courts</td>
<td>36 W T9 Fluorescent</td>
<td>600</td>
<td>8</td>
<td>36</td>
<td>288</td>
<td>172.8</td>
<td>T9 LED Tubes</td>
<td>8</td>
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<td>160</td>
<td>96</td>
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<td>Squash Courts x 4</td>
<td>36 W T9 Fluorescent</td>
<td>800</td>
<td>85</td>
<td>36</td>
<td>2888</td>
<td>1728</td>
<td>T9 LED Tubes</td>
<td>85</td>
<td>20</td>
<td>1600</td>
<td>1024</td>
<td>819.2</td>
</tr>
</tbody>
</table>

| Cost of LED @ $139.82 ea      | $29,362       | Annual estimated energy saving (KwH) | 13430 |
| Estimated cost of installation (Skinners) | $7,500 | Annual estimated energy saving (Mj) | $44749 |
| $109,102  | Annual cost saving $0.2/KwH | $2,488 |

Skinner WW and KF P/L
Electrical Contractors
23 King Street, Stawell VIC 3380
(03) 5358 5324
## Monthly Electricity Consumption

<table>
<thead>
<tr>
<th></th>
<th>Consumption kWh 1/7/13 to 1/3/14</th>
<th>Consumption kWh 1/7/14 to 1/3/15</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>11895.63</td>
<td>11680.12</td>
</tr>
<tr>
<td>August</td>
<td>12434.13</td>
<td>11667.88</td>
</tr>
<tr>
<td>September</td>
<td>11486.84</td>
<td>13419.32</td>
</tr>
<tr>
<td>October</td>
<td>13874.74</td>
<td>15349.83</td>
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<tr>
<td>November</td>
<td>21115.64</td>
<td>19169.64</td>
</tr>
<tr>
<td>December</td>
<td>23123.97</td>
<td>20384.77</td>
</tr>
<tr>
<td>January</td>
<td>23038.86</td>
<td>20203.14</td>
</tr>
<tr>
<td>February</td>
<td>20843.27</td>
<td>18194.48</td>
</tr>
<tr>
<td>March</td>
<td>22958.58</td>
<td>20194.4</td>
</tr>
</tbody>
</table>

- **July**: 11895.63 kWh to 11680.12 kWh, **-215.51 kWh**
- **August**: 12434.13 kWh to 11667.88 kWh, **-766.25 kWh**
- **September**: 11486.84 kWh to 13419.32 kWh, **1932.48 kWh**
- **October**: 13874.74 kWh to 15349.83 kWh, **1475.09 kWh**
- **November**: 21115.64 kWh to 19169.64 kWh, **-1946 kWh**
- **December**: 23123.97 kWh to 20384.77 kWh, **-2739.2 kWh**
- **January**: 23038.86 kWh to 20203.14 kWh, **-2835.72 kWh**
- **February**: 20843.27 kWh to 18194.48 kWh, **-2648.79 kWh**
- **March**: 22958.58 kWh to 20194.4 kWh, **-2764.18 kWh**

**Percentage Saving**

- **July**: 6.54%
- **November**: 11.64%
### Monthly Gas Consumption

<table>
<thead>
<tr>
<th>Month</th>
<th>2013-14 Consumption MJ</th>
<th>2014-15 Consumption MJ</th>
<th>Percentage Saving</th>
</tr>
</thead>
<tbody>
<tr>
<td>May/June</td>
<td>386132.19</td>
<td>427234.78</td>
<td>10.18%</td>
</tr>
<tr>
<td>July/Aug</td>
<td>458919.14</td>
<td>551840.19</td>
<td></td>
</tr>
<tr>
<td>Sept/Oct</td>
<td>442201.14</td>
<td>358530.43</td>
<td>-26270.7</td>
</tr>
<tr>
<td>Nov/Dec</td>
<td>370021.73</td>
<td>216118.87</td>
<td>-153903.84</td>
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<tr>
<td>Jan/Feb</td>
<td>268709.29</td>
<td>175203.51</td>
<td>-93505.8</td>
</tr>
</tbody>
</table>

**Total Consumption**

- 2013-14: 1925983.49 MJ
- 2014-15: 1729927.78 MJ

**Percentage Saving**

- 10.18%

---

### Comparison of Consumption

<table>
<thead>
<tr>
<th>Month</th>
<th>2013-14 Consumption MJ</th>
<th>2014-15 Consumption MJ</th>
<th>Percentage Saving</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
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**Total Consumption**

- 2013-14: 1925983.49 MJ
- 2014-15: 1729927.78 MJ

**Percentage Saving**

- 10.18%
June 2, 2014

MEDIA RELEASE

Energy efficiency program slashing costs at Stawell Leisure Complex

Northern Grampians Shire Council is set to save almost $11,000 a year thanks to a new initiative cutting operating costs at the Stawell Leisure Complex.

Funding provided through the Australian Government’s Community Energy Efficiency Program (CEEP) has allowed Council to install a new solar heating system and LED lighting to minimise gas and electricity consumption at the facility.

The solar heating system has been operational since February and reduces the use of the pool’s gas boiler.

Mayor Cr Kevin Erwin said LED lights were now being installed throughout the Leisure Complex, including the basketball stadium and indoor cricket area.

“This project is part of Council’s commitment to energy efficiency and sustainable living,” he said.

“The Stawell Leisure Complex is more than 25 years old and much of its technologies are out-dated or inefficient.

“The funding we have received under CEEP enables us to reduce the energy used at the facility and save on annual maintenance costs.”

Savings from the solar hot water system for the pool are expected to be in excess of $5,000 per year, while the lighting changeover will cut annual costs by $5,750.

Cr Erwin said local contractor WW & KF Skinner was completing the electrical work with lights supplied by Stawell’s Middendorp Electrics.

“The new lights are much brighter than the old ones and have made a huge difference, especially in the basketball stadium,” he said.

“Being able to improve the facility, reduce energy consumption and cut costs is a win-win situation and will ensure the long-term sustainability of the Stawell Leisure Complex for the community.”

PHOTO: Northern Grampians Shire Mayor Cr Kevin Erwin, Marc Collins (Middendorp Electrics), Cameron Potter, Mathew Skinner (WW & KF Skinner), Northern Grampians Shire Council Building Projects Officer John Kindred and Leisure and Recreation Coordinator Marc Brilliant with the new basketball stadium lights.

Media enquiries to Jessie Newton
Marketing and Communications Officer
Phone: (03) 5358 0517
Email: jessie.newton@ngshire.vic.gov.au