ENERGY EFFICIENT UPGRADE OF KHANCOBAN WATER SUPPLY PUMPING STATIONS
CEEP2084

Final Report
December 2014

"This Activity received Funding from the Australian Government as part of the Community Energy Efficiency Program."
FOREWORD

This final report for the Energy Efficient Upgrade of Khancoban’s water Supply Pumping Stations is prepared to fulfil the requirement of Australian Government, Department of Industry’s Funding Agreement requirement. The report presents the detail of project activities from concept to completion.

This is a very successful project, in terms of resources utilization, management and benefits to community. It has made possible the Council to deliver its water supply services using less energy and also help to reduce the costs associated with running the pumps.

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Issue Date: 10 December 2014
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Executive Summary

1.1. Background

Tumbarumba Shire Council is situated on the western side of the Snowy Mountains in New South Wales.

Khancoban pump station pumps water from the Khancoban Creek to the 1.5 ML main reservoir of the Khancoban Town’s water supply. The pump station was constructed in 1988 and provided with two pumps to operate as duty and 100% standby. Pumps operate at a fixed speed with approximately 30L/s water flow rate.

The pumping system was not operating at optimal energy efficiency due to various reasons such as oversized pumps, the age of pumps and motors, operating the pumps during peak power demand times, etc. Start and stop of the pumps was also carried out manually by monitoring the reservoir level.

Tumbarumba Shire Council was successful in obtaining $51,400 in grant funding under Round Two of the Australian Government’s Community Energy Efficiency Program (CEEP) towards replacing two old pumps with energy productive systems and upgrade of the Operation Control System at Khancoban Creek Pumps. This was matched by $51,400 of Council’s own funds.

The upgrades increase energy efficiency and decrease running costs. The new pump is coupled with a high efficiency motor, with pump duty point to match with the required operating range. A smart metering management system was also installed allowing for pump start and stop times to be programmed by an operator on the Human Machine Interface (HMI) on the pump unit. This pre-set timing facility will allow the pumps to run only during off-peak power tariff times. Council will save a total of $10,000 each year in electricity costs, while also becoming more water efficient. The total cost of the project was $152,218.00 (GST exclusive). Tumbarumba estimates that the payback period for the Project will be 15.2 years. The commissioning was successfully completed on 30th May 2014.

Council engaged NSW Public Works to prepare a suitable strategy and technical specification to upgrade the pumping arrangement using appropriately sized pumps to suit flow rates and by providing other facilities such as smart metering to operate pumps during off-peak times when power tariffs are lower. NSW Public works also provided advice to Council in evaluation of quotations and project management.

Quotations were called and the contract for the supply, installation and commissioning of the Khancoban Pumping System was awarded to QMAX Pumping System in April 2014.

There was a delay to appoint subcontractor/award the work but regardless of this, the project was successfully completed within the time frame and within the allocated budget.

Pump Start and Stop time are based on pre-set times (adjustable by the operator) selected by the operator on the HMI (Human Machine Interface, touch Screen) on the pump unit. This pre-set timing facility will allow the pumps to run only during off-peak power tariff times. The ON and OFF times will be 10:00PM to 7.00AM Monday to Friday and 10:00PM Friday to 7AM Monday. The pump system is incorporated with the necessary alarm system to ensure the continuous pump operation. The estimated cost savings per year for the project is $10,000 each year in electricity bills.

"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."
1.2. Project Objective

The main objectives of the project were to;

i. Decrease the operational cost of the town water supply for the Khancoban Township.

This was achieved by installing new efficient pump including new electrical switchboard fitted with associated electrical services and HMI (Human Machine Interface, touch Screen) control. The new pumping system replaced the old large capacity pump at Khancoban Water Pump Station.

ii. Optimise the energy usage.

The new facility is able to operate the pumps during off-peak power tariff times. Pump Start and Stop time will be based on pre-set times (adjustable by the operator) selected by the operator on the HMI (Human Machine Interface, touch Screen) on the pump unit. This pre-set timing facility will allow the pumps to run only during off-peak power tariff times. The ON and OFF times will be 11PM to 7.00AM Monday to Friday and 10PM Friday to 7AM Monday.

In summary, upon completion of the project, both of these important objectives had been satisfied.

2. Project Energy Efficiency Activities

Water for Khancoban Town is sourced from the nearby creek. The pumping system consists of a pump station at the creek, a 1.5 ML town reservoir and a rising main running from the pump station to the reservoir.

The town reservoir is located on the top of the hill and the water to the town is supplied by gravity from this reservoir. Chlorine is added at the rising main just after the pump station for disinfection.

The old pumping arrangement can be considered to be inefficient due to the following:

- Pumps were oversized compared to the requirement.
- Operational wear and tear of both pumps and motors reduced the actual pumping performance.
- The existing pumps and motors were manufactured in the 1970’s (installed in 1988).
- Curves for the existing pumps suggested that they were not operating at their best efficiency point to suit the system head and flow characteristics.
- Operation of the pumps during high power tariff times. There were no facilities to direct the pumps to operate during off-peak power tariff times.
- Starting and stopping of the pumps was manually controlled by the operator by observing the reservoir level. This arrangement also required extensive operator involvement.

2.1 Project operation, mechanisms and processes.

The Australian Government Grant provided an opportunity for Council to upgrade its old pumping system with the efficient pumping system. Tumbarumba Shire Council has been successful in obtaining funding from the Australian Government to upgrade the pumps used for Khancoban’s drinking water supply.
Council engaged NSW Public Works to prepare a suitable strategy and technical specification to upgrade the pumping arrangement using appropriately sized pumps to suit flow rates and by providing other facilities such as smart metering to operate pumps during off-peak times when power tariffs are lower. NSW Public works also provided advice to Council in evaluation of quotations and project management.

The proposed augmentation was intended to upgrade the river pumping system to deliver the revised flow rate of raw water to the Khancoban balance tank, via the existing rising main.

The following upgrading work was purposed to minimise the power usage of the pumping system and to improve the operation performance:

- Replace the existing pump motors with new energy efficient, MEPS compliant motors. Improvements in product development and manufacturing of current equipment provide enhanced performance and efficiency in both pumps and motors compared to old equipment designs.
- Replace the pumps with new higher efficiency pumps. This will also overcome the loss of performance due to wear & tear of the existing pumps.
- Analyse the system characteristics and select new pumps to operate at or near the point of maximum efficiency.
- Provide a Smart Metering Management system to operate the pumps outside the periods of very high demand in the power supply system.
- Install pump control facilities for automatic pump start and stop based on reservoir levels, with interlocks so that pumps primarily operate during off-peak power tariff times. Pump would still be possible to operate during times of higher tariffs, to allow for emergency or unusually high-demand scenarios.

The average town demand for water is approximately 350kL. The off peak power tariff applies during 10pm to 7am. A pump which has approximately 11 L/s design flow can achieve the 350kL demand during the 9hrs period from 10pm to 7am. However, it was proposed to set the design capacity of the pump to approximately 17L/s to allow the pump to provide sufficient flow during town’s higher demand times. As the town reservoir has a higher capacity of 1500kL compared to the town demand, the above operating philosophy has been applied to the new system.

During peak day demand (PDD) times where approximately 950kL daily water demand is required, the pumps have to be operated approximately 15 hrs which includes a few peak hour power tariff times. As the number of days where the PDD exists is limited to only a few days a year, this will have a minimal effect on the total power usage.

3. Contract for the supply, installation and commissioning of the Khancoban Pumps

Quotations were called and the contract for the supply, installation and commissioning of the Khancoban Creek Pump works was awarded to QMAX Pumping System in 14 April 2014. The Contract Sum was $134,018.00 (excl GST).

The final commissioning of the project was completed on 30th May 2014.
4. Budget

The Contract sum was $134,018 and the final cost was approx. $152,000. The reason for the increased in cost is due to installation of reservoir control system and radio link and alarm SMS sender Unit at Khancoban Storage tank. The pump start and stop time is set on water level in the tank and power off peak hours. Without the assistance of the Australian Government, the project could not have succeeded. The Australian Government provided $51,400.00. The remaining funds for the project were provided by Tumbarumba Shire Council.

The project has been successfully completed at an all up final cost including initial investigations and Council management costs of $152,218.00 (excluding GST). The project was managed by Tumbarumba Shire Council. All of the Milestones set in the Funding Agreement by the Australian Government were satisfied.

5. Project Management

Council provided its own project and construction management services, and sought expert advice, as required. Also advice from the NSW Department of Finance and Services (Public Works) staff greatly assisted in the project.

The Department of Industry has been very helpful and has provided guidance to Council staff to manage and successfully complete this project.

The Contractor, QMAX Pumping System are commended for excellent project management. Their staff worked very closely with Council Management staff on the project ensuring quality workmanship and timely completion of milestones.

Council’s own Water Committee played a very effective role providing direction and guidance during the project period.

Tumbarumba Council employed a Project Officer to manage the Project who communicated with the department via emails, mail and telephone during the project period. The department provided support and guidance to Council’s staff management team to complete the milestone reports on time. Council informed the Department that they were unable to meet the expected completion date of the Fourth Milestone and a extension to the due date was approved. This has proven to be a very successful, well managed project, completed within the time and budget without any compromise in quality, regulatory, environmental or safety requirements.

6. Project Demonstration and Communication Activities

The project’s activities and progress was discussed in the Council’s Water Committee meeting during the project period.

The benefits of the Project were communicated to external stakeholders through updates to Councils website, local advertising including media releases and an article published in Tumbarumba Shire Council’s community newsletter.

Council estimates that the website received 50 hits during the project period. The advertisements and media releases were also a cost effective way of demonstrating the energy efficiency benefits of the Project. An article was published on page 3 of the TUMBARUMBA TIMES newspaper which has a
readership of around 4,500. Similarly, an article was published Tumbarumba’s Shire Councils community newsletter which has a readership of approximately 3,000.

### Khancoban water supply upgrade

Tumbarumba council expects to this month complete an energy efficiency upgrade at the Khancoban Water Supply. The council was recently successful in obtaining Community Energy Efficiency Program Funding to upgrade drinking water pumps.

The council received $51,400 towards the project, to replace two old pumps with energy productive systems as well as an upgrade of the Operation Control System at Khancoban Creek. The money is being matched by $51,400 of Council's own funds. The pumps will not only help to deliver services using less energy, but they will also help to reduce the costs associated with running the pumps.

In conjunction with the efficient pumps and motors, an improved control system to regulate the runtime for off peak operation will be installed. The council estimates it will save about $10,000 each year in electricity costs, while also becoming more water efficient. By utilising advances in pumping technology, the council also hopes to demonstrate to landholders that replacing ageing pumping equipment with new energy efficient technology can actually save money in the long term, over and above the initial cost outlay.

The council expects the pumps will be commissioned this month.

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Article in the TUMBARUMBA TIMES: Wednesday, May 21, 2014

The contribution by the Australian Government towards this project has been greatly appreciated by the community of Tumbarumba. This contribution has been stated to the community of Khancoban in local press items reporting progress on the project, on Council's web sites and in the Community newsletter.

### 7. Outcomes and benefits of the Project

Khancoban pump station pumps water from the Khancoban Creek to the 1.5 ML main reservoir of the Khancoban Town’s water supply. The pump station was constructed in 1988 and provided with two pumps to operate as duty and 100% standby. The pumping system was not operating at optimal energy efficiency due to various reasons such as oversized pumps, the age of pumps and motors, operating the pumps during peak power demand times, etc.

The upgrades increase energy efficiency and decrease running costs. The new pump is coupled with a high efficiency motor, with pump duty point to match with the required operating range. A smart metering management system was also installed allowing for pump start and stop times to be programmed by an operator on the Human Machine Interface (HMI) on the pump unit. This pre-set timing facility will allow the pumps to run only during off-peak power tariff times. Council will save approximately $10,000 each year in electricity costs, while also becoming more water efficient. The total cost of the project was $152,218.00 (GST exclusive). Tumbarumba estimates that the payback period for the Project will be 15.2 years.

#### 7.1 New Pumping System

The following work has been carried out under this project at Khancoban pumping station;

- Supply, installation, testing and commissioning of two of Javelin JV64-4 Vertical In line Multistage Centrifugal pumps, selected for a duty point of 17.3l/s @ 79m. Standard Vertical Multistage pumps Specifications.
- Supply, installation, testing and commissioning one new DN200 Resilient seated Gate valves, four new DN100 Resilient seated gate valves and two new DN100 Resilient seated Swing Check valves with limit switches.
• Supply, installation, testing and commissioning of new DN100 Stainless Steel pipework to connect to existing suction pipes wall flanges and discharge pipe wall flange as shown in the specification. Includes Galvanised bolts, pipe supports and all gaskets.
• Supply, installation, testing and commissioning of Pressure gauges and valves.
• Design, Manufacture, install and commission new Pump Station Control Panel, including:
  i. Front access, powder-coated steel enclosure, Form 1, wall mounted
  ii. Ventilation fans, grilles and thermostat
  iii. Aluminium gland plate
  iv. Main Isolator with panel handle
  v. Surge diverters and phase fail protection
  vi. Circuit breakers for surge diverters, pumps and control
  vii. NHP soft starters, contactors and thermal overloads for 2 x 22kW pumps
  viii. Emergency stop switch
  ix. Omron PLC control, Ethernet comms
  x. Weintek 7" colour touch screen HMI, programmed to spec
  xi. 3G router with SMS alarms capability
  xii. Inputs for flow switches and level sensor
  xiii. Electrical connection of pumps, limit switches and level sensors to switchboard including conduits
  xiv. RCD-protected GPO for laptop connection
  xv. CAD circuit and connection diagrams
• Supply and install one Creek level sensing transducer
• Supply and install one Reservoir level sensing transducer and three back up floats
• Design, Manufacture, install and commission new Reservoir Control Panel, including:
  i. Front access, powder-coated steel enclosure, Form 1, wall/frame mounted
  ii. Solar panel, regulator and battery system for power supply
  iii. Main isolator with panel knob
  iv. Circuit breakers for control and spares
  v. Radio link to pump station
  vi. CAD circuit and connection diagrams
• Supply and install One DN 200 Euromag Flow meter, including display unit in switchboard.
• Pump Start and Stop time are based on pre-set times (adjustable by the operator) selected by the operator on the HMI (Human Machine Interface, touch Screen) on the pump unit. This pre-set timing facility will allow the pumps to run only during off-peak power tariff times. The ON and OFF times will be 10:00PM to 7.00AM Monday to Friday and 10:00PM Friday to 7AM Monday.

• The Creek Pump Station has a pressure transmitter fitted on the suction line to facilitate loss of suction lift. In addition, the electromagnetic flow meters will provide signals to the SCAs (Switchboard Control Assemblies) for no-flow protection for the pumps.

The pump system is incorporated with the necessary alarm system to ensure the continuous pump operation. Alarms alert operational staff to abnormal conditions that may result in performance outside the specified requirements, danger to pump, failure of equipment and system faults.

8. Environment

There were very minimal environmental impacts of construction and operational activities. However, all practical efforts were undertaken to minimise the noise emission, air/dust pollution, and the priority was to protect the environment from any unanticipated consequences during the construction and commissioning activities.
9. Project Energy Efficiency Improvement

Khancoban pump station pumps water from the Khancoban Creek to the 1.5 ML main reservoir of the Khancoban Town’s water supply. Creek Pumps are generally operated to back up the Khancoban Creek gravity feed line. As the upgrade work just recently completed and pumps are not operating at the moment, an estimate of the likely energy usage based on past average usages is provided in the following table:

Table A: Energy Efficiency Baseline and Improvement

<table>
<thead>
<tr>
<th>Building, facility or site Category Type</th>
<th>Measuring Energy Efficiency Data</th>
<th>Additional Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Pumping-Khancoban Creek Pumping Station</td>
<td>$0.05/kL</td>
<td>• 5899.93kL of water pumped for the period 16/07/2014 to 15/08/2014</td>
</tr>
</tbody>
</table>

Table B: Project Energy Efficiency Improvement

<table>
<thead>
<tr>
<th>PROJECT TITLE</th>
<th>Energy Efficient Upgrade of Khancoban Water Supply Pumping Stations-CEEP2</th>
<th>PROJECT ID</th>
<th>CEEP2084</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUNDING RECIPIENT</td>
<td>Tumbarumba Shire Council</td>
<td>DATE</td>
<td>02/08/2013</td>
</tr>
</tbody>
</table>

Building Facility or Site 1

Name of Building Facility or Site 1 | Khancoban Creek Pump Station
Location (Address) | Alpine Way, Khancoban 2642
Type of Building, Facility or Site | Khancoban Creek Water Pump Station
Activity Type and Measure | Upgrade of Pumping System
Energy Efficiency Estimate Method | Based on the actual water pumped for the period 16/07/2014 to 15/08/2014 & pump’s run time
Base Line Energy Usage | 1986.60 kWh (1740.26 kWh off peak & 246.34kWh peak)
Baseline Energy Efficiency | 0.33kWh/kL
Energy Efficiency Improvement | Reduction 0.32kWh/kL
Reporting Data (Measuring Energy Efficiency and Additional Data) | Daily hours of operation: off peak hour tariff from 10:00pm to 7:00 am
Cost of Activity | $152,218.00 (GST exclusive)
Estimated Cost Savings | $10,000.00/year
The total cost of the project was $152,218.00 (GST exclusive). The estimated cost savings per year for the project is $10,000. Tumbarumba estimates that the payback period for the Project will be 15.2 years.

10. Conclusion

The Contract sum was $134,018 and the final cost was approx. $152,000. The reason for the increased in cost is due to installation of reservoir control system and radio link and alarm SMS sender Unit at Khancoban Storage tank. There was a delay to appoint subcontractor/award the work but regardless of this, the project was successfully completed within the time frame and within the allocated budget.

Council’s own Water Committee played a very effective role providing direction and guidance during the project period. The department provided support and guidance to Council’s staff management team to complete the milestone reports on time.

The operation of new pumping system has opened the opportunity to pump the available raw water from Khancoban Creek to 1.5ML Khancoban Storage Tank in an efficient way by optimising the energy usage or by running pumps during off-peak power demand time. By replacing the pumps, Council will save approximately $10,000 each year in electricity costs.

The financial assistance for the Energy Efficient Upgrade of Khancoban’s Water Supply Pumping System by the Australian Government towards this project has been greatly appreciated by Tumbarumba Shire Council and the community of Khancoban.

11. Snapshot of Activities

![Old Pumping System](image-url)
New Electrical Switch Board and Touch Screen Control System (HMI) Unit

New Control Valve and Flow Meter
Installation of Reservoir Control System and Radio link and alarm SMS sender Unit

12. Declaration
DECLARATION

The Authorised Officer of the organisation makes the following declarations:

1. I declare that I am authorised to submit this Final Report (including any attachments) on behalf of Tumbarumba Shire Council.
2. I declare that the information provided in this Final Report is true and accurate.
3. I understand, and acknowledge that giving false or misleading information in this Final Report is an offence under the Criminal Code Act 1995.
4. 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: 29/1/2014

Name: .................................................................

Position: ................................................................. Organisation: Tumbarumba Shire Council

Witness Signature: ........................................ Date: 29/1/2014

Name: .................................................................

Position: ................................................................. Organisation: Tumbarumba 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.