

KEYNOTE ADDRESS

**CENTRAL NSW COUNCIL'S
NEXUS BETWEEN WATER AND ENERGY PROGRAM**



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CENTRAL NSW COUNCIL'S NEXUS BETWEEN WATER AND ENERGY PROGRAM

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EXECUTIVE SUMMARY

In 2014, fourteen Councils in the Central NSW region embarked on a major program of works to increase energy efficiency at their water and waste water pump stations by reducing the pump load at thirty sites across the region through the relining of sewer pipes and repair of leakages and manholes in areas subject to infiltration.

Council's sewer and water systems baseline energy usage is currently operating below optimal efficiency. The level of efficiency is causing the sewer pumps, treatment plants and water pumps/filtration plants to be consuming excess energy. The state of the infrastructure has a direct correlation to the amount of energy required to operate. Subsequently infiltration to sewer systems and leakage from water systems has caused council's baseline energy usage at the 30 sites to be higher than it should be.

Informed by a significant amount of audit work including smoke testing, CCTV and active leak detection, the Centroc Water Utilities Alliance's, (CWUA) *Nexus Between Water and Energy Program* both grows the understanding of the nexus between water and energy from baseline usage while remediating the problem in selected lower socio-economic communities.

The Program aims to deliver substantial energy savings while introducing advice and measures for member Councils to embed ongoing activity in reducing greenhouse gas emissions.

The pumping of water requires a lot of electricity and has a significant impact on Council's budgets. Efforts to improve efficiencies and reduce costs will benefit communities by ensuring Council's rates for these essential services are kept to a minimum

Given the recognition of the CWUA and its work, there is significant potential for further roll out of similar programming in Local Water Utilities (LWUs) in regional NSW, especially those adopting a similar structure as the CWUA.

This activity has received funding from the Australian Government.

The Centroc Water Utilities Alliance

The Central NSW Regional Organisation of Council's (Centroc) Water Utilities Alliance (CWUA) is a voluntary collaborative Alliance between sixteen Councils in the Central NSW region including the Local Government Areas of Bathurst, Blayney, Boorowa, Cabonne, Cowra, Forbes, Lachlan, Lithgow, Mid-Western, Oberon, Orange, Parkes, Upper Lachlan, Weddin, Young and Central Tablelands Water. It represents a population of around 243,000 and covers an area of more than 72,500 square kilometres.

As the water and sewer suppliers to communities in the Central NSW region, Central NSW Councils have sought to address the challenges associated with the size of their organisations, capacity to deliver services and affordability by adopting an Alliance model.

In the context of Local Government and Water Utilities Reform, the CWUA have been strong advocates for the collaborative Alliance initiatives of Local Government owned and managed water utilities serving as the model for appropriate governance and management of the water sector, not only in NSW but elsewhere in Australia, facilitating effective joint planning, resource sharing and most importantly the efficient and cost effective delivery of quality drinking water in regional areas. The Alliance continues to provide demonstrable cost savings and efficiencies through:

- Collaborative approach to best practice
- Sharing resources, knowledge and ideas
- Collaborative procurement
- Training and mentoring programming.¹

The Nexus between Energy and Water Program

Centroc has been active in the energy efficiency space for some time with the Nexus between Water and Energy Program building on previous project work. The Program has been specifically designed to not only deliver energy efficiency programming in Central NSW, but to share this advice across all members of Centroc, their communities and with other LWUs in regional NSW. Prior work undertaken by Centroc has received national and international attention.²

In the context of climate change adaptation and mitigation, Centroc has identified work in renewables and energy efficiency as being a priority³. Members have developed a growing understanding of their electricity usage through a regional approach using the E21 program identifying energy consumption with high level advice on its management. This work informed the activities for programming undertaken through a project titled the Learning and Sharing Energy Efficiency Program (LASEEP) which also received funding from the Australian Government.

As a result of the Communication Strategy activities for LASEEP, the CWUA was inspired to undertake a collaborative project which is a good strategic fit with both member and regional Demand Management Plans.

Centroc members have a growing understanding and capability in energy efficiency. Of note is the recent completion of a regional Distributed Energy Plan and the development of an Energy Technology Evaluation Model, which has informed the data requirements for this program. Having said that, Centroc members are at varying stages of project readiness for introducing energy efficiency programming across the region and by taking a regional approach, it is anticipated that a greater understanding of possible programming, auditing and strategies going forward for funding and communication will be achieved.

On current estimates there will be at least 15% savings on energy regionally on assets upgraded or retrofitted through the *Nexus between Water and Energy Program*. It should be noted that effort has been undertaken to deliver a broad range of works that lend themselves to further roll out in the region.

There is a significant and growing body of strategic work that supports the need for this program for example the CSIRO suggests the following:

¹ The CWUA Business Plan 2014-2016

² See as examples the Productivity Commission report into Water Utilities and an audio visual presentation on the Water and Energy Nexus at Singapore International Water Week, the largest conference in the Asia Pacific for water professionals. The 'Water of the Worlds – the Water Energy Nexus', presented at the Water Dome, focussed on the importance of managing both of these finite natural resources in a long term sustainable and integrated manner, and highlighted innovative and industry leading approaches from around Asia Pacific.

³ See for example "Options Paper for a Regional Resilience Strategy, Report from the Centroc Summit (2010), the Carbon + strategies and advice from the Centroc Summit 2012, the Space to Be on the Centroc website <http://centroc.com.au>

- Ensure water source planning processes and decision-making continue to assess the costs and benefits of water efficiency programs versus developing new sources.
- Maintain investment in energy and water efficiency programs, for both utility operations and customer end-use. The adoption of more energy intensive water sources can be partially offset through greater efficiency throughout the urban water system.
- Systemic understanding is necessary in evaluating potential water conservation programs to reduce urban systems energy. This is because some water conservation measures can lead to increased GHG emissions. For example, when fuel loads are shifted from natural gas to electricity, such as when installing water efficient clothes washers which have cold water only connections with internal water heating units.⁴

1.0 PROGRAM OBJECTIVES

Targeting lower socio economic communities in Central NSW and building on existing strategic work and activities undertaken in the region, the objectives of the *Nexus between Water and Energy program* are to:

1. Increase the energy efficiency of Council water and sewer assets across 14 councils by an average of at least 15%;
2. Install a variety of energy efficiency products across the region to demonstrate the effectiveness of a variety of technologies to our members, communities and beyond our borders;
3. Build on work undertaken in the region in revolving energy savings funds;
4. Build capacity in the region and be implementation ready for further programming in the nexus between water and energy; and
5. Promote energy efficiency to CWUA member Councils and communities through communication of program activities and outcomes through traditional and on-line media.

2.0 PROGRAM ACTIVITIES

This project aims to embed ongoing activity in the region in energy efficiency through:

- Trailing different programming in member Councils;
- Providing a high level of reporting to key stakeholders;
- Sharing information that is measured and reliable;
- Ensuring sustainable funding through revolving cost savings fund; and
- Using the media and internet to promote the program and further share information.

2.1 Audit

Given this project identifies the nexus between water and energy, a significant amount of audit work was undertaken by member Councils in the following areas to inform the program of works:

- Smoke testing for sewer inflow from private residences;
- Flow monitoring to measure storm infiltration into sewage treatment plants;
- CCTV work in water and sewer; and
- Metering for water loss.

Smoke testing and CCTV work has been completed at approximately 3900 properties across the region and informs the program of works including sewer pipe relining,

⁴Energy use on the provision and consumption of urban water in Australia: an update, May 2012
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leakages and manhole repairs in areas subject to infiltration that will impact on the overall energy efficiency of the 30 sites identified. Smoke testing and CCTV work has been committed 100% by members towards the program.

2.2 On and in ground works

On and in ground works aimed at reducing infiltration and leakage have been undertaken across the region. These are as follows:

- Sewer infiltration remediation (pipe relining) at 11 Councils;
- Manhole repair program in Forbes;
- Audit of water loss at Water treatment plant in Boorowa;
- Installation of variable speed drives at the Water Filtration Plant in Orange
- Water loss management program at Parkes and Lithgow including reticulation repairs.

2.3 *Centroc Nexus between Water and Energy Water Loss Management Program and Toolkit*

In addition to the above a significant part of the project is the development of *The Centroc Nexus between Water and Energy Water Loss Management Program and Toolkit*.

The Water Loss Management Program is a pilot project being undertaken in Parkes and Lithgow for the monitoring, assessment, location and repair of economically feasible leakage and water losses throughout the entire water network. The objective is to develop a Water Loss Management Toolkit and Plan tailored to the Central NSW region identifying programming that targets reduction in energy use as the priority in water loss management. A key feature of this initiative is the trialling of the Centroc Mentoring program (just completed) in a water utilities setting where Parkes Shire Council, who are well into this type of work will develop the program in a mentoring relationship with Lithgow as mentee who are at the beginning of this journey. Further details are provided in a separate presentation and paper to the WIOA Conference.

2.4 Development of Revolving Cost Savings Funds

To encourage embedment of energy efficiency programming in member Councils it is an objective of the *Nexus between Water and Energy Program* to have all member Councils informed and instituting revolving cost savings funds which secure the cost savings from energy efficiency programming for future works.

2.5 Sharing of information

To increase awareness and capability to adopt energy efficiency practices throughout member Councils and their communities, the program of works has been designed with a view to information sharing:

- within Council;
- between Councils;
- between Regional Organisations such as Regional Organisations of Councils and Water Utilities' Alliances;
- with key agencies within the region;
- with the broader community; and

- with industry.

The structure of the project, including teams from all levels of Council operations, will foster the sharing of information in and between Councils. Quality reporting and the use of media releases, social media and community engagement collateral including rates notice inserts, posters and newsletters will build on this.

3.0 PROGRAM MONITORING AND EVALUATION

A Project Energy Efficiency Baseline and Improvement report has been developed as part of the monitoring and evaluation of the program. The methodology used to measure energy efficiency improvements and the variables that could impact on individual sites has been the subject of a literature review in the early stages of the program development.

3.1 Baseline Energy Usage

The Baseline energy efficiency has been calculated on each of the 30 sites by assessing the current inflow of sewer/water to each site. Industry suggests that the amount of wet weather inflow to the pumps and treatment plants is the best way to assess baseline energy usage at those sites and will have a direct correlation to the current state of each council's reticulation.

If the sewer pipes are cracked or are allowing infiltration from the surface through storm/flood events or from domestic illegal flow then the work required by the pumps and treatment plants will be unnecessarily large. If the infiltration is inhibited then the inflow will reduce thereby reducing the energy consumed by the pump/treatment plant.

In some cases the infiltration is constant and the pipes are below the water table level and are so damaged that even in a dry weather period there is a large amount of infiltration. For example, at Forbes Council calculations show that there will only be a 2% improvement in efficiency against storm events. If the pipes are fixed, a greater improvement is anticipated due to the reduction of continuous infiltration where the average energy saved for the totality of the project is at least 15%.

3.2 Projected Energy Efficiency Improvement

The projected energy efficiency improvement of each site is calculated using the average dry weather inflow as the best case scenario and comparing that to the baseline energy efficiency. The difference between the current inflow rates and the average dry weather flow is accounted for by infiltration. Industry suggests that works undertaken as part of this project will reduce the amount of infiltration by 50%.

In relation to the sites that are having work done to their water infrastructure, the projected energy efficiency improvement is calculated by comparing the total plant output from the water treatment plant and water pumps to the amount of water that is being sold to the community. The expected difference between these figures, or loss factor, is 20%. Therefore the projected energy efficiency improvement is calculated on the difference between what the current loss factors is and the allowable figure of 20%.

These calculations do not measure the energy efficiency improvement on all areas of the service as lower socio-economic areas have been targeted, thereby providing opportunity

to increase the energy efficiency at the end of the project in the evaluation stage when recommendations for future rollout will be made.

3.3 Tools for Calculating Baseline Energy Usage and Energy Efficiency Measures

The baseline energy usage for each site proposed to be upgraded has been calculated with consumption data retrieved from e21 which takes information directly from its electricity bill and is then checked against independently downloaded consumption information and compared to the council's electricity contract to ensure correct data.

The projected energy efficiency improvement of each sewer site is calculated as detailed in the table below.

Table 1: *Energy efficiency Improvement at Each Sewer Site*

Baseline energy usage (MJ) (kwh*3.6)	Baseline energy efficiency (ML/annum)	Projected energy efficiency improvements (ML/annum)	Energy Efficiency Improvement (MJ)
3.6 times the amount of kwh at each activity site over 1 year gets it into megajoules	Inflow into the relevant Sewage Treatment Plant – data taken from each site.	<i>New inflow to each Sewage Treatment Plant</i> – (post the works suggested in the grant) was calculated using the average dry weather flow to each site as the 'best case scenario'. The current inflow rates (baseline energy efficiency) was compared to the average dry weather flow and the difference is deemed to be from infiltration into the system.	Projected energy efficiency improvement times the MJ/KL of water pumped**

** MJ/KL of water pumped = (Baseline energy divided by the baseline energy efficiency) divided by 1000

The methodology detailed is currently being trialled and modified in measuring the energy efficiency improvements and will be improved through consultation with industry specialists.

Anecdotal evidence to date suggests that there has been a considerable reduction in infiltration from the on-ground works including manhole repairs in Forbes which it is anticipated will translate into energy efficiencies at the pump station.

Similarly preliminary findings on the installation of variable speed drives on three pump motors at the Orange City Council Filtration Plant show a 33% energy saving translating to cost savings of \$17,522 pa.

While it is anticipated that results will be variable across the region, the *Nexus between Water and Energy program* will most certainly have achieved its objective of fostering an increased capacity and understanding of possible programming, auditing and strategies going forward to improve energy efficiency across the Central NSW region.