



NORTHERN LIGHTS

Final Report
by
Regional Development Australia
Northern Inland
(CEEP 2053)

enlightening the community

This activity received funding
from the Australian Government



Australian Government
**Department of Industry,
Innovation and Science**

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Executive Summary

The Northern Lights project successfully replaced 4,566 old technology-high energy use (50-100 watt) street lights with the latest LED technology averaging 23.5 Watts per light.

Old mercury vapour, high pressure sodium, compact fluorescent (CFL), incandescent and low pressure sodium lights were replaced with two types of LEDs across seven council areas in the Northern Inland Region of NSW.

This resulted in an estimated total annual energy saving of 1,096 MWh and cost savings to the councils in terms of reduced energy and light maintenance in excess of \$400,000 pa. Street light bills for January 2016, the first full month of operation already show an average energy saving of 35% and an actual total energy saving across the councils of 84.5 MWh.

This reduction in energy use will also decrease greenhouse gas emissions by 942 tonnes of CO_{2e} per year.

The project significantly brought forward the installation of LED street lights in NSW, particularly in the major proportion of the state which is covered by Essential Energy – the government corporate agency responsible for most street light upgrades and maintenance in NSW (in terms of the geographic area).

Our Energy Efficiency Education Officers developed a range of internet-based and physical display material used at over 75 community events and forums, targeting low socio-economic groups. These proved most helpful in explaining simple energy cost saving options to households, and also some businesses.

The success of this communication approach was revealed by the following feedback:

1. The large number of people who made the comment that the letter-box drop brochures and displays had now convinced them to switch to LED lighting at home, as well as conduct other energy saving activities.
2. The smaller number of technically-minded people/electricians who produced calculators at our energy calculator display to check the figures – and concluded they were correct.

We hope the project will pave the way for the broader uptake of LED lighting across the state, and nationally in the near future.

This project is a good example of precisely what RDAs were set up for – to bring together all tiers of government in collaborative projects for the benefit of regional Australia. It will have spill-over effects to local businesses, providing them with concrete examples of how they can reduce energy costs and improve competitiveness – a key factor in promoting regional economic development.

Project Objectives

The Northern Lights Project sought to achieve three main objectives:

1. Improve the energy efficiency of street lighting in the seven local government areas covered by the project;
2. Work with state-based street light providers to more rapidly adopt the latest street lighting technology; and
3. Use both the highly visible aspect of new LED street lights and the services of dedicated Energy Efficiency Education Officers (EEEOs) to demonstrate and communicate to businesses and households in the Northern Inland region the financial and environmental benefits of adopting energy efficiency activities. This included more than just lighting. The objective was to provide a broad overview of the array of actions community members could take to improve their energy efficiency.

The project objectives support the following CEEP objectives:

- Support a range of local councils and community organisations to increase the energy efficiency of lighting; particularly where this would benefit low socio-economic and other disadvantaged communities or support energy efficiency in regional and rural councils;
- Demonstrate and encourage the adoption of improved energy management practices within councils, organisations and the broader community;
- Better services and improved amenity of community facilities;
- Minimising energy consumption and costs;
- Building the knowledge and capacity of the energy services and construction industry;
- Supporting competitive Australian energy efficiency technology and equipment manufacturers; and
- Contributing to the national effort to reduce greenhouse gas emissions.



Two key objectives:

1. Upgrade street lights to LED technology
2. Assist local households and businesses to improve their energy efficiency

Project Energy Efficiency Activities

Energy efficiency activities were related to the installation of new LED street lighting across seven council areas, and the community work of the EEOs. The project represented the first major rollout of LED street lights in regional NSW. Table 1 shows the number of new LED lights installed. These replaced old, less energy efficient lights including:

- Mercury vapour 50W;
- Mercury vapour 80W;
- Fluorescent 20W, 40W and 80W;
- Incandescent 100W

Table 1. LED Street Light Upgrades

Council Area	Number of lights upgraded to LED
Armidale Dumaresq	1,828
Walcha Shire	254
Tenterfield Shire	452
Glen Innes Severn	555
Inverell Shire	786
Gwydir Shire	381
Guyra Shire	310
TOTAL	4,566

The technologies used at each site in similar proportions were the following two types of LED streetlights:

- General Electric P4/P5 Evolve 25W



- Gerard Lighting Street LED 22W



These technologies were chosen by Essential Energy (EE) who conducted a public tender to source supplies of LED street lights specifically for the project. Two different types were chosen as Essential Energy was using the project as a trial of the LED street lighting technology. The choice largely came down to companies who could meet the tender specifications and delivery timeframes, though cost considerations were also involved.

Implementation involved installing a similar number of each light type in all seven participating local government areas. Typically, a town was divided in two on a geographical basis, with one half receiving the General Electric product, the other half the Gerard Lighting product.

The largest issue the project faced was convincing EE to install LEDs rather than compact fluorescents (CFL). At project commencement, there was no Australian standard for LED street lighting, and EE had already planned to conduct their three yearly upgrades using CFLs. However, our project lighting consultant suggested that LEDs would be a superior option. After negotiation with EE and Networks NSW, and a timely decision by other network providers that the International Standard could be adopted, it was agreed to use LEDs.

Installation timeframes were a source of concern, with EE pushing back the install schedule four times, however impressing upon them the need to meet the CEEP project timelines else councils may lose the funding saw the installs largely completed ahead of the Project Plan schedule. In fact, once they commenced, the installs progressed much faster than anticipated. In part this was because EE made our project area a priority and diverted contractors from other areas of the state.

Some on-site specific problems arose during installation:

1. The LEDs would not bolt directly onto some existing metal arms attached to the street light poles, necessitating the design and manufacture of a special metal collar to solve the problem. Local manufacturers of this collar charged \$40 each which was a significant unbudgeted cost-impot. However EE were able to source them from China for \$10 each and covered the cost themselves (no CEEP budget impact).
2. Some lights required additional glare-guards to eliminate unwanted light into houses. This was very uncommon however, and councils would cover this additional cost (i.e. no CEEP budget impact).
3. Some lights required anti-vandal cages for protection. Again this was very uncommon, and councils would cover this additional cost (i.e. no CEEP budget impact).
4. Very late in the project (Feb 2016) we were informed by Essential Energy that some street lights could not be retrofitted with LEDs as they were decorative lights, and some sites could not be accessed by the contractors. At the time of reporting, just 70 lights fell into this category and are awaiting fitting.

The other anticipated problem was complaints from residents about the brighter light output from LEDs. This was largely eliminated via a brochure letterbox drop in all seven council areas which informed residents that new LED street lights would be installed, highlighting their benefits (lower council energy costs, safer lighting) and having images of old and new lighting street scenes taken from an Ausgrid LED trial in Sydney.

Project Demonstration and Communication Activities

The mainstay of the demonstration and communication activities revolved around the employment of an Energy Efficiency Education Officer (EEEEO), and the development of portable energy efficiency displays and a dedicated website and energy use calculator (see <http://www.northernlightsproject.com.au/>).

Two brochures and a Powerpoint display were also developed for residents and businesses. The brochures were delivered into the letterboxes of every resident across the seven local government areas (26,493 x2 brochure deliveries). The Powerpoint display was used by the EEEEO for presentations to suitable audiences, and it also ran on the Ipad display along with the project videos at community functions.

The EEEEO specifically targeted lower-socioeconomic groups by holding displays at Aboriginal events, council foyers, town libraries, council hubs, market days, employment agencies, Salvation Army functions, Rotary Clubs, Mensheds, Town Shows and in aged care facilities. Permission could not be granted to hold displays at Centrelink Offices or doctors surgeries.

All of these were conducted throughout the life of the project and extended beyond the energy savings produced by the street lights to include all the main electrical appliances found in households. Because we have a cold winter climate in the region, and an increasingly hot summer climate, heating and cooling issues were also included in communication activities. However, the new street lights are a highly visible reminder of the energy efficiency message and strongly compliment the EEEEO work.

The displays we constructed will continue to play a role beyond the life of the project as we will loan them to the Uralla ZNET project (see <http://z-net.org.au/>) and will be used by their project coordinator to continue extending the energy efficiency message to communities in our region.

Outcomes and Benefits of the Project

1. Energy Efficiency Outcomes

The project exceeded planned outcomes and targets in terms of energy savings (estimated by Planet Footprint 1,096 MWh per annum saved as opposed to 930 MWh planned – an additional energy saving of 18%), even though the final number of lights installed was slightly below target due to site access issues (4,566 installed versus 4,744 planned).

An actual comparison of council street light bills for the month of January 2015 (before upgrades) with the month of January 2016 (after upgrades) reveals an energy saving of 84.5MWh, an average saving of 35% (Figure 1).

Figure 1. Actual Energy Savings for the Month of January from Street5 Light Upgrades

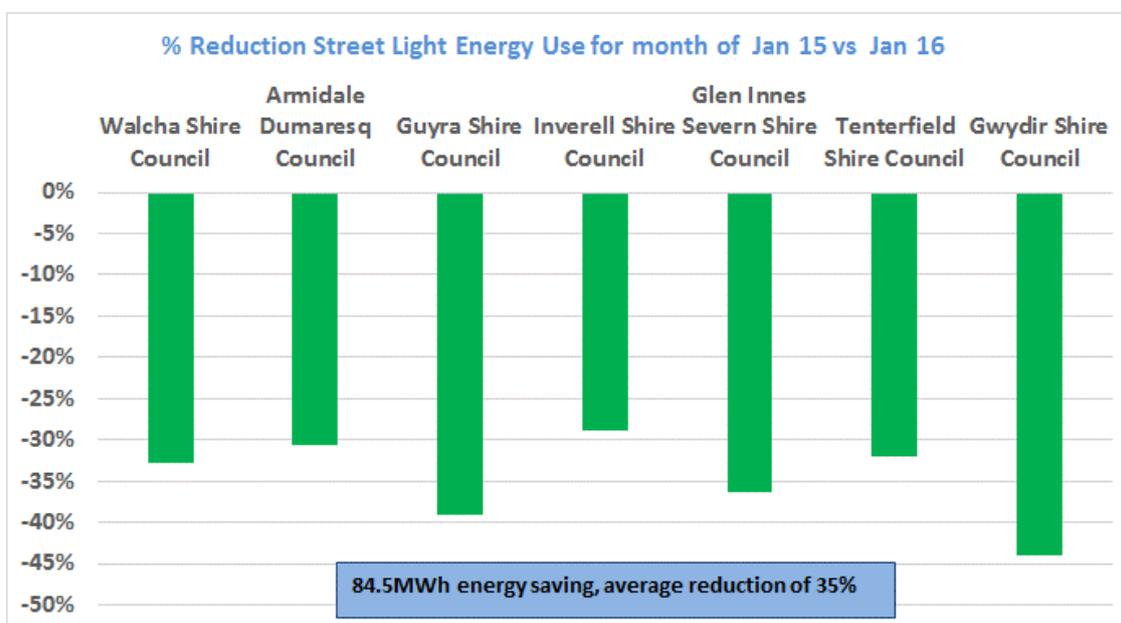


Figure 2. The New LED Streetlights Launched in Armidale with State and Federal Politicians, the Mayor of Armidale and the RDANI Project Team



David Thompson (RDANI), Adam Marshall (State MP), Barnaby Joyce (Federal MP), Laurie Bishop (Mayor), Nathan Axelsson (RDANI)

Figure 3. Commencement of LED Installations by Essential Energy Contractors



EE also offered to upgrade CFLs (initially it was just to be mercury vapours) which resulted in a larger energy saving than initially estimated.

Originally, cost savings for the seven councils were estimated at \$295,100 on the basis of reduced energy costs and lower maintenance charges (this estimate was provided by EE at the project application stage). Actual savings are calculated at \$400,286. These are significantly higher due to the upgrading of CFLs, and a greater reduction in the SLUOS charge (down to \$42 per LED – equivalent to CFLs) than initially provided by EE. This revised SLUOS charge is currently interim in nature as it requires approval by the Australian Energy Regulator – it could fall further or increase.

Figure 4. Light Distribution from one of the New LEDs



The savings and payback periods for each council are calculated as shown in Table 2. These are based on the actual final net cost (after CEEP funding) to each council (which increased significantly from the original project plan due to the switch from CFLs to LEDs. Councils covered this additional cost).

Table 2. Council Payback Periods

Council Area	Saving in energy & maintenance (\$/pa)	Payback period (years) with energy and SLUOS savings
Armidale Dumaresq	206,062	1.5
Walcha Shire	22,492	1.8
Guyra Shire	17,232	1.5
Inverell Shire	53,385	1.9
Glen Innes Severn	41,806	1.8
Tenterfield Shire	34,146	2.2
Gwydir Shire	25,163	1.7

The average **payback period is 3 years**, based on energy use savings alone.

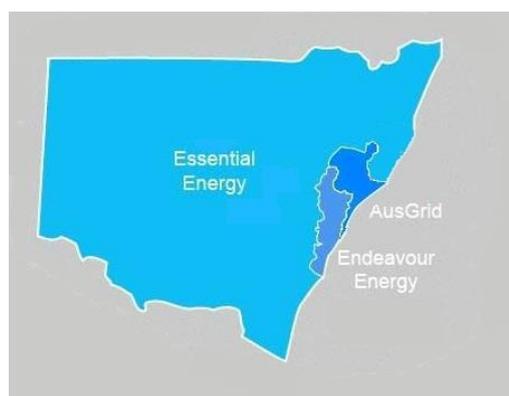
If SLUOS (maintenance charge) savings are added, the average **payback period falls to 1.8 years**

Project energy efficiency improvements by site are detailed in Attachment A.

The project definitely resulted in the capital expenditure on new LED street lighting being brought forward. Negotiations with the responsible NSW state government agencies (Essential Energy and Networks NSW) resulted in LEDs being installed rather than less energy efficient (and possibly less reliable according to Ausgrid trials in Sydney) CFLs. Given EE conduct bulk lamp replacements every 3 years, capital expenditure was brought forward by at least 3 years.

Moreover, this bring-forward effect will likely extend to the remainder of the EE coverage area (which is most of regional & rural NSW – see Figure 5) as following the EE LED tender process for our project, Networks NSW went to tender for LED suppliers for the remainder of the state. The project in our area will inform and assist the broader regional NSW rollout.

Figure 5. The Essential Energy Area of Responsibility



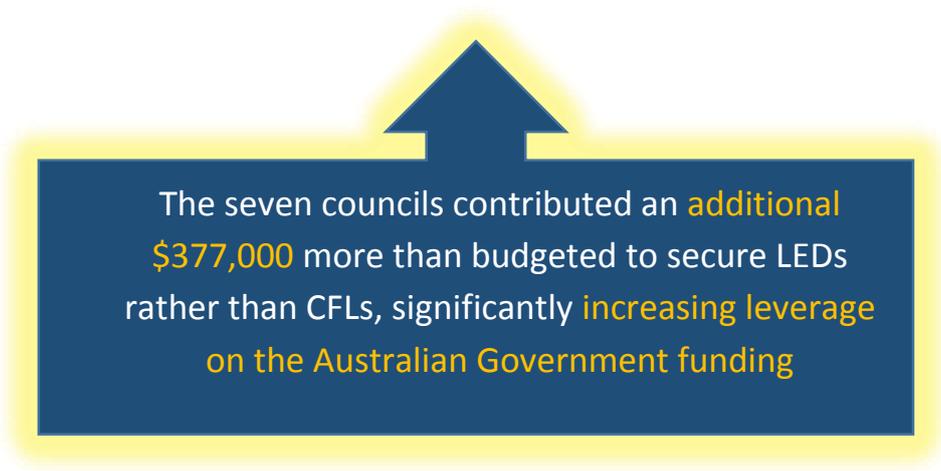
As well as reduced energy costs, EE network access charges, government levies and the renewable energy charge (collectively known as NUOS charges) are also reduced since these are based on the kWhs used – so as the kWhs fall with LEDs, the cost of NUOS also falls.

Similarly the maintenance costs for the street light (which are charged by EE and known as the SLUOS charge) also reduce. EE street light maintenance charges (SLUOS) are complicated as there are over 100 different tariffs depending on the type of lamp, the type of light pole used and the ownership of the lamp and pole, ranging from \$31 to \$433 per annum.

SLUOS charges are set by the Australian Energy Regulator (AER) and as yet have not been set for LED street light luminaires. While this is being determined, for this project EE have set the LED SLUOS charge as the same as for a CFL luminaire. This represents a considerable cost saving (e.g. the LED SLUOS for this project has been set at \$42/pa while for a similar mercury vapour lamp, the charge would be around \$62/pa). If this price difference is maintained with the AER pricing decision, the additional cost savings to some councils may even exceed that of the energy cost savings (depending on the mix of lamps, poles, ownership and maintenance characteristics of their street lights). For example, data supplied by EE indicated the following SLUOS savings (Table 3).

In all cases, the capital cost of the LEDs was much greater than initially quoted for CFLs (see Table 4) and the CEEP funding request was based on the much lower CFL cost. Regardless, all seven councils agreed to opt for LEDs (EE gave them the option of LEDs or CFLs) based on the energy cost data savings calculated and supplied to them by RDANI.

Consequently the applicant (the seven councils) paid an additional \$377,028 for using LEDs instead of CFLs. This significantly increases the Departments leverage in the project such that the CEEP funding request falls from 63% to 45%.



The seven councils contributed an **additional \$377,000** more than budgeted to secure LEDs rather than CFLs, significantly **increasing leverage on the Australian Government funding**

Table 3. SLUOS Savings

Council Area	Saving (\$)
Armidale Dumaresq	145,285*
Walcha Shire	8,037
Tenterfield Shire	12,046
Glen Innes Severn	14,201
Inverell Shire	16,504
Gwydir Shire	7,256
Guyra Shire	3,204
TOTAL	206,533

* Armidale has very high savings as it has a large number of lights on high SLUOS tariffs

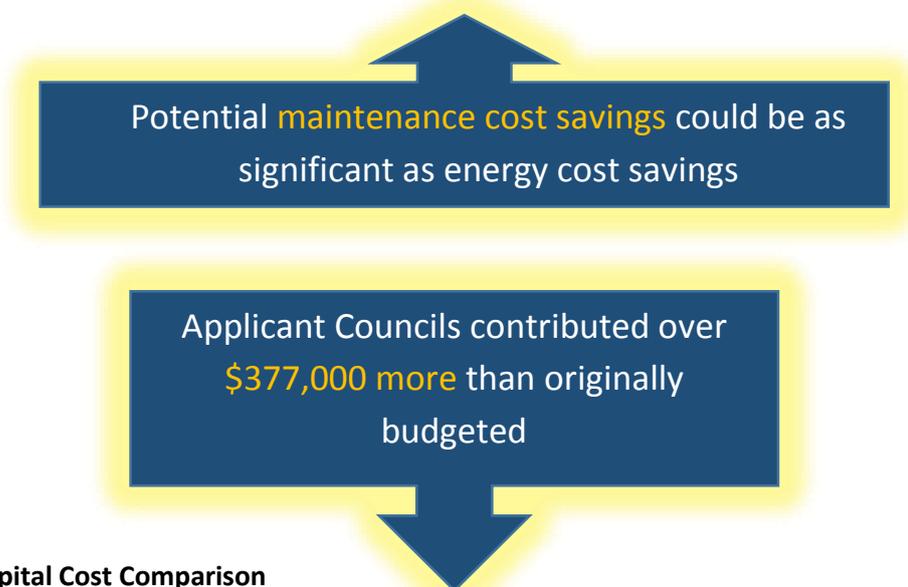


Table 4. LED vs CFL Capital Cost Comparison

Council Area	LED cost (\$)	CFL cost (\$)
Armidale Dumaresq	449,229	271,351
Walcha Shire	53,078	26,712
Tenterfield Shire	114,920	79,337
Glen Innes Severn	113,668	76,489
Inverell Shire	147,969	88,631
Gwydir Shire	64,095	41,391
Guyra Shire	33,549	15,568
TOTAL	976,508	599,480

2. Demonstration and Communication Outcomes

The education component of the project also met the project objectives with over 75 community visits/displays/presentations conducted by the EEEOs over a 20 month period. Many of these were two day events (e.g. in council foyers or at shows) – see Figure 6.

The development of several interactive displays, a website and an on-line energy calculator also proved to be a valuable addition to the EEEO activities which attracted community members to the display area. School-children were particularly engaged with the energy use calculator while adults tended to be more interested in the lighting display (see Figures 6-9)

Three Northern Lights Project displays (Figure 8 & 9) include a stand and Ipad to run the website/videos, an interactive household energy cost calculator and a lighting information and comparison display. All these have been utilised and well received by the public and have been invaluable in bringing to them the message of energy efficiency.

As noted above, these displays will continue to be useful after the end of this project, being used by the Uralla ZNET project.

Figure 6. Northern Lights EEEO and Displays in Action in Armidale, Uralla and Glen Innes



The Energy Efficiency Education Officers conducted **over 75 community visits** using the energy efficiency displays

Figure 7. Screenshot of Northern Light Website



Figure 8. The Lighting Display



Figure 9. EEEO Peter Stanley with All Project Displays at the Armidale Energy Efficiency Expo



The new LED street lights are a highly visible component of the project which demonstrate to residents that their local councils were serious about improving energy efficiency, and a trigger for them to think in a similar manner. The ancillary benefit to the community is an improved quality of lighting and as noted above, the project team in Armidale received some favourable comments about the new lighting, particularly from a security aspect.

Although no formal evaluations were taken of the impact on the community, over 52,000 brochures were mailed out to more than 26,000 households in the seven council areas. Additional brochures were handed out at EEEO displays and left in display racks at council foyers and other facilities.

As a result there was only one real complaint about extra light shining through windows (and in fact, these were about LED street lights previously installed by the council in the main street, not those installed under the Northern Lights Project – however the brochure drop probably led the resident to think otherwise).

There were enquiries about the potential upward light spill into the night sky from an astronomy perspective. However, the improved downward direction of the LEDs actually meant that this issue was lessened.

A more amusing enquiry was about the blue PE cells (which detect light levels, and thus when the lights should go on and off) on the underside of the lights. Previous street lights had the PE cell on top where they were largely invisible from the ground. When they became highly visible on the underside of the light, there were concerns they were cameras being used by council to monitor resident activities. This concern was rapidly dispelled!

Finally, other residents stated that they preferred the extra security the improved light levels afforded their homes and vehicles. Table 5 shows the results of light output monitoring conducted by EE in Armidale before and after the new LEDs were installed. They indicate dramatic changes in street lighting levels. C1 to C6 represent increasing distances from the light pole.

Table 5. Changes in Illuminance

Illuminance – Change over time



Site/Product		Original Luminaire (CFL42W/MV50W)	LED – 0 Months	% Change from previous
Pole 4186 - Galloway St - GE P4-P5 LED	C1	1.53	6.70	77%
	C2	0.57	3.60	84%
	C3	0.18	2.36	92%
	C4	0.04	0.14	71%
	C5	0.01	0.38	97%
	C6	0.01	0.25	96%
Pole 4183 - Galloway St - GE P4-P5 LED	C1	7.31	8.44	13%
	C2	2.20	3.16	30%
	C3	0.41	1.27	68%
	C4	0.12	0.25	52%
	C5	0.17	0.34	50%
	C6	0.24	0.36	33%
Pole 1618 - Canamble St - Gerard StreetLED	C1	1.75	10.59	83%
	C2	0.91	5.11	82%
	C3	0.23	0.86	73%
	C4	0.00	0.08	100%
	C5	0.00	0.08	100%
	C6	0.01	0.08	88%
Pole 1618 - Canamble St - Gerard StreetLED	C1	1.55	10.19	85%
	C2	0.42	3.47	88%
	C3	0.12	0.72	83%

Initial measurements in Armidale showed
significant improvements in street lighting levels

The only objective not met was the desire for the EEOs to hold some displays in schools, Centrelink buildings and doctor’s surgeries. In all cases, permission could not be obtained to set up displays in these locations. Some of the displays on council foyers were poorly attended, however this was remedied in part by moving to alternative community locations such as libraries, community halls and council hubs.

Project Operation, Mechanisms and Processes

Theoretically, the project was managed by a steering committee consisting of RDANI staff, council representatives, Essential Energy representatives and an Australian Government staff member. This committee met three times during the course of the project.

In practice, the project was managed by the RDANI Senior Project Officer and Executive Officer and two key Essential Energy Staff – the Program / Project Manager for the Bulk Street Light / Luminaire Program and the Manager Community Relations – Northern Region.

RDANI ran the day to day operations of the project including financial management and liaising with councils and EE, while EE were responsible for the on-ground installation, testing of the new lights and dealing with the installation contractors and LED tender/supply process.

Eventually, this arrangement worked well though for much of the project RDANI had concerns over EE delays in the commencement of LED installations and several revisions of the installation schedule.

RDANI became the ‘honest broker’ intermediary between the seven councils and EE (there was some operational tension between these agencies, largely around the EE cost of street light maintenance for councils), and consequently RDANI conducted much of the financial analysis of payback periods etc. to convince councils to make the additional capital investment in LEDs. In the past, this information has been supplied for EE, but for this project they did not conduct such analysis.

Toward the end of the project, many councils in the region were dealing with the NSW ‘Fit for the Future’ process and the possibility of forced amalgamations, so street light upgrades were not high on their priority list. Consequently, many were somewhat dis-engaged with the process and allowed RDANI to make most of the running. In general however, the management mechanism worked well having RDANI as the lead agency.

In terms of internal resourcing, we underestimated the amount of work required for project reporting and assembling the materials for the EEEO displays and events. Consequently the RDANI Senior Project Officer was required to assist in the EEEO role. The organisation is now most certainly better equipped to undertake future projects in the energy efficiency/renewable energy space. Our understanding of the technical aspects, project reporting and Australian Government program reporting requirements has improved significantly.

Key external sources for completing the project were utilised – including a lighting consultant with good knowledge of LED lighting and LED street light suppliers who were able to explain the regulatory to-ing and fro-ing occurring with the LED street light Australian Standard. Also, having contacts within the NSW Government (OEH) who could promote the project at the highest levels was beneficial.

The key project management difficulties were:

1. Convincing EE to use the LED technology in an environment of regulatory uncertainty (i.e. no Australian Standard for LED street lights). This was overcome by negotiating with Networks NSW and impressing upon them the expert opinion that LEDs were a superior choice to CFLs. Public lighting providers were simultaneously receiving pressure from commercial LED suppliers to make the switch.

2. Being locked into an Australian Government funding deadline, but where project completion was entirely dependent upon a NSW State Government agency (EE), who mid-way through the project made the decision to go with LEDs instead of CFLs. This created a large amount of project risk. It was managed by impressing upon EE the need to meet the project deadlines else risk losing the funding, and by the judicious use of the local MP and contacts within the NSW OEH who had direct links to the NSW Energy Minister. At one stage we considered using private lighting providers rather than EE, however the tight timeframes involved were problematic.
3. Our initial lack of understanding of the technology and street lighting space. RDANI climbed a steep learning curve in this area.
4. Keeping councils engaged with the education/demonstration side of the project. Having a very personable and motivated EEO helped manage this issue.

The key lessons our organisation has taken away from this project are:

1. When you are told by a government agency a new technology can't be introduced in the timeframe required, be persistent and find people within the organisation who can make it happen.
2. Local government (the largest provider of public street lighting) often have little knowledge of this space, or the costs/potential cost savings.
3. Preparing the community for a highly visible change such as LED street lights well before it happens helps immensely with acceptance.
4. Many low-socio economic (and other) households have large potential for reducing their energy use and costs, but lack the information to implement.
5. Expect a rapid turnover of staff in both state and Commonwealth government agencies – you may often be dealing with new people for your project.

Conclusion

This was a successful, but somewhat risky project due to uncertainty over being able to install the LED technology on time. The fall-back position of using CFLs would have resulted in a less desirable outcome.

Ultimately, the project became a flagship test for LED street lighting in regional NSW, resulting in over 4,560 old-style lights being upgraded, energy savings of 1,096 MWh pa, and cost savings to the seven councils of over \$400,000 pa.

The capacity of Regional Development Australia organisations to operate in this space would be variable, as it requires rapidly coming to terms with new technologies, negotiating with all three tiers of government including government corporate entities, liaising with private firms and having the financial and technical analytical skills to estimate energy savings and financial performance outcomes.

Recruiting Education Officers with the skills and demeanour to interact well with community members and businesses, and design and oversee the production of display material was critical. Local knowledge was a great advantage in this regard and resulted in significant cost-savings in building the physical displays. At the end of the project, these displays will continue to educate the community as they are being loaned to the Uralla ZNET Project (see here - <http://z-net.org.au/>) for use at their functions.

These type of collaborative projects between regional development organisations and councils are most beneficial to councils who often lack the resources to give such projects their full attention. Moreover, this project represents exactly what RDAs were set up for – to bring together all tiers of government in collaborative projects for the benefit of regional Australia.

While this project had a focus on local government technology upgrades, there will be spill-over effects for regional businesses in teaching them how to further cut their energy costs and improve business competitiveness.

Declaration

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 Regional Development Australia Northern Inland (name of organisation)
- I declare that the information provided in this Final Report is true and accurate.
- I understand, and acknowledge that giving false or misleading information in this Final Report is an offence under the *Criminal Code Act 1995*.
- I understand that final payment will only be made in accordance with the Funding Agreement including on satisfactory completion of Milestones.

Authorised Officer Signature:  Date: 30/3/16

Name: Nathan Axelsson

Position: Executive Officer Organisation: RDA Northern Inland

Witness Signature:  Date: 30/3/16

Name: David Thompson

Position: Senior Project Officer Organisation: RDA Northern Inland

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 and Cost Benefit Data

Site 1	
Name of building, facility or Site 1	Walcha Street Lights
Location (address)	Walcha NSW
Type of building, facility or site	Street lights
Activity type and measure	Upgrade of street lights to energy efficient lights
Energy Efficiency Estimate Method	As used by Planet Footprint reporting service
Baseline Energy Usage ¹	151 MWh
Baseline Energy Efficiency ²	151 MWh
Energy Efficiency Improvement	51 MWh (35%)
Reporting Data (Measuring Energy Efficiency and Additional Data)	235 street lights to be upgraded, 4,342 hours of operation per year, 2,883 residents
Cost of Activity	\$59,158
Estimated Cost Savings	\$22,492 pa

Site 2	
Name of building, facility or Site 1	Armidale Dumaresq Street Lights
Location (address)	Armidale NSW
Type of building, facility or site	Street lights
Activity type and measure	Upgrade of street lights to energy efficient lights
Energy Efficiency Estimate Method	As used by Planet Footprint reporting service
Baseline Energy Usage	1,199 MWh
Baseline Energy Efficiency	1,199 MWh
Energy Efficiency Improvement	366 MWh (31%)
Reporting Data (Measuring Energy Efficiency and Additional Data)	1,721 street lights to be upgraded, 4,342 hours of operation per year, 23,215 residents
Cost of Activity	\$454,679
Estimated Cost Savings	\$206,062 pa

Site 3	
Name of building, facility or Site 1	Guyra Street Lights
Location (address)	Guyra NSW
Type of building, facility or site	Street lights
Activity type and measure	Upgrade of street lights to energy efficient lights
Energy Efficiency Estimate Method	As used by Planet Footprint reporting service
Baseline Energy Usage	202 MWh

¹ These were the baselines reported in Essential Energy data at the start of the project which differ slightly from those estimated from later inventories by Planet Footprint

² Improvements based on later inventories supplied by Essential Energy to Planet Footprint, hence % reductions do not match original baseline figures

Baseline Energy Efficiency	202 MWh
Energy Efficiency Improvement	81 MWh (31%)
Reporting Data (Measuring Energy Efficiency and Additional Data)	288 street lights to be upgraded, 4,342 hours of operation per year, 3,093 residents
Cost of Activity	\$38,999
Estimated Cost Savings	\$17,232 pa

Site 4

Name of building, facility or Site 1	Inverell Street Lights
Location (address)	Inverell NSW
Type of building, facility or site	Street lights
Activity type and measure	Upgrade of street lights to energy efficient lights
Energy Efficiency Estimate Method	As used by Planet Footprint reporting service
Baseline Energy Usage	751 MWh
Baseline Energy Efficiency	751 MWh
Energy Efficiency Improvement	216 MWh (29%)
Reporting Data (Measuring Energy Efficiency and Additional Data)	898 street lights to be upgraded, 4,342 hours of operation per year, 11,399 residents
Cost of Activity	\$153,419
Estimated Cost Savings	\$53,385 pa

Site 5

Name of building, facility or Site 1	Glen Innes Severn Street Lights
Location (address)	Glen Innes NSW
Type of building, facility or site	Street lights
Activity type and measure	Upgrade of street lights to energy efficient lights
Energy Efficiency Estimate Method	As used by Planet Footprint reporting service
Baseline Energy Usage	523 MWh
Baseline Energy Efficiency	523 MWh
Energy Efficiency Improvement	156 MWh (30%)
Reporting Data (Measuring Energy Efficiency and Additional Data)	576 street lights to be upgraded, 4,342 hours of operation per year, 8,315 residents
Cost of Activity	\$119,118
Estimated Cost Savings	\$41,806 pa

Site 6

Name of building, facility or Site 1	Tenterfield Street Lights
Location (address)	Tenterfield NSW
Type of building, facility or site	Street lights
Activity type and measure	Upgrade of street lights to energy efficient lights
Energy Efficiency Estimate Method	As used by Planet Footprint reporting service
Baseline Energy Usage	470 MWh
Baseline Energy Efficiency	470 MWh

Energy Efficiency Improvement	132 MWh (28%)
Reporting Data (Measuring Energy Efficiency and Additional Data)	638 street lights to be upgraded, 4,342 hours of operation per year, 5,865 residents
Cost of Activity	\$119,740
Estimated Cost Savings	\$34,146 pa

Site 7

Name of building, facility or Site 1	Gwydir Street Lights
Location (address)	Warialda and Bingara NSW
Type of building, facility or site	Street lights
Activity type and measure	Upgrade of street lights to energy efficient lights
Energy Efficiency Estimate Method	As used by Planet Footprint reporting service
Baseline Energy Usage	265 MWh
Baseline Energy Efficiency	265 MWh
Energy Efficiency Improvement	92 MWh (39%)
Reporting Data (Measuring Energy Efficiency and Additional Data)	388 street lights to be upgraded, 4,342 hours of operation per year, 3,570 residents
Cost of Activity	\$69,545
Estimated Cost Savings	\$25,163 pa

Report for **Northern Lights Project** Regional Development Australia Northern Inland

Participant Councils

- Armidale Dumaresq Council
- Glen Innes Severn Council
- Guyra Shire Council
- Gwydir Shire Council
- Inverell Shire Council
- Tenterfield Shire Council
- Walcha Council

Prepared By **Planet Footprint**



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Summary

Seven councils in the Northern Inland region are beneficiaries of new energy efficient street lighting under the Northern Lights project coordinated by Regional Development Australia Northern Inland (RDANI). The project received \$576,000 in funding from the Commonwealth Government and councils are contributing over \$300,000 toward the capital cost of the new lights.

The councils involved are:

- Armidale Dumaresq Council
- Glen Innes Severn Council
- Guyra Shire Council
- Gwydir Shire Council
- Inverell Shire Council
- Tenterfield Shire Council
- Walcha Council

Installation of LED lights commenced in August 2015 and LED replacements in the majority of the above areas were completed by the end of December, 2015.

4500 predominantly Mercury Vapour and Fluorescent street lights were replaced with the latest LED technology, saving over 1,096 MW hours of energy.

Method

Data for this analysis was sourced by two methods and a working dataset was generated from the two sources.

1. Planet Footprint obtains Street Lighting inventories from member councils as the standard method of reporting consumption by Council street lighting assets. Planet Footprint maintains a database of these inventories and can, where sufficient history has been obtained, report on changes to consumption over time.
2. Essential Energy provided a project dataset stating how many luminaires of each technology and wattage had been replaced in each council area.

Planet Footprint updated pre-retrofit inventories with retrofit statistics to generate the post retrofit datasets. Planet Footprint has extrapolated future consumption for this report from the relative change experienced by each council. This is expected to be a conservative methodology as some luminaires are still to be replaced, and total installed load will continue to fall in 2016.

Planet Footprint's calculation methodology includes an allowance for the length of night at each latitude. The average length of night varies slightly across the project area, and slight variations to kWh calculations may be apparent.

Keys:

The Luminaire technologies are referred to by the following three letter codes:

FLU	Fluorescent and Compact Fluorescent
HPS	High Pressure Sodium - predominantly used in category V (vehicular) applications
INC	Incandescent
LED	Light Emitting Diode
LPS	Low Pressure Sodium
MHR	Metal Halide - reactive control gear - very high quality white light
MVA	Mercury Vapour

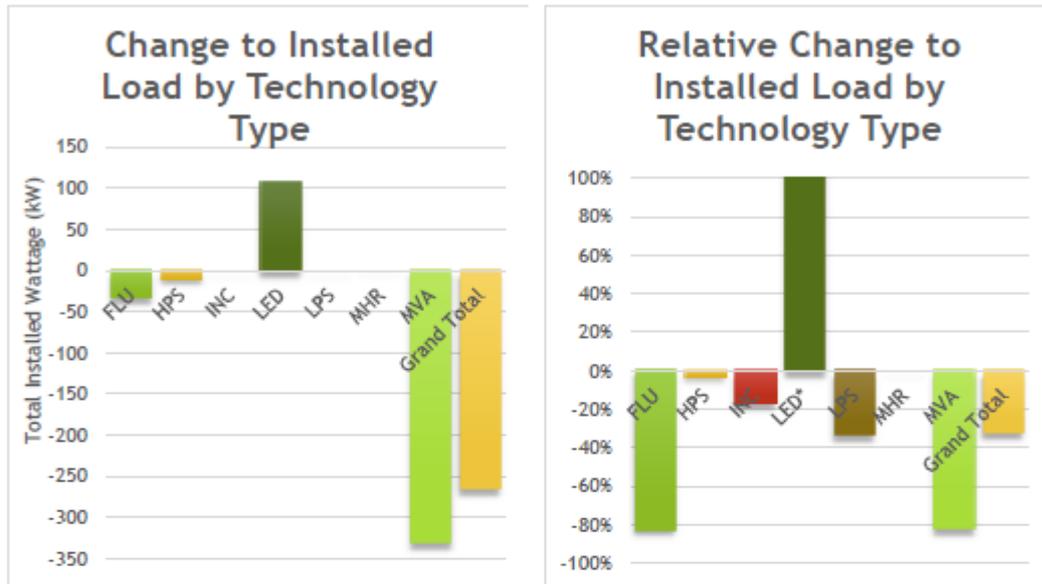
The Seven Councils are referred to by the following three letter codes

ARM	Armidale Dumaresq Council
GLN	Glen Innes Severn Council
GUY	Guyra Shire Council
GWY	Gwydir Shire Council
INV	Inverell Shire Council
TTF	Tenterfield Shire Council
WCH	Walcha Shire Council

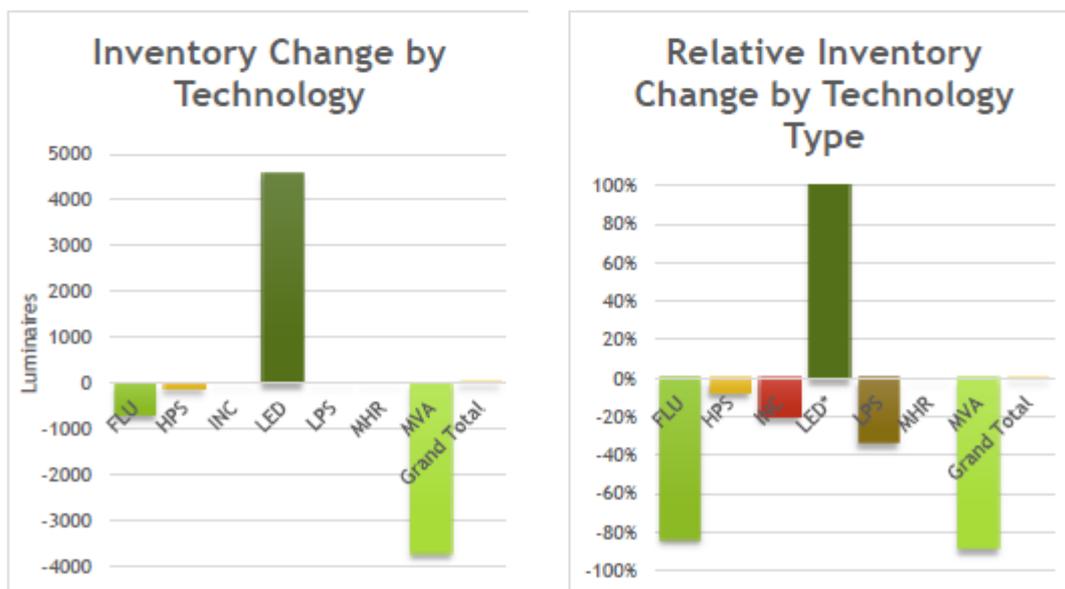
Results

Combined Project Results

The Northern Lights Project has, at the time of assessment, reduced the total wattage of installed street lighting luminaires from 822 kW to 557 kW across the project area.

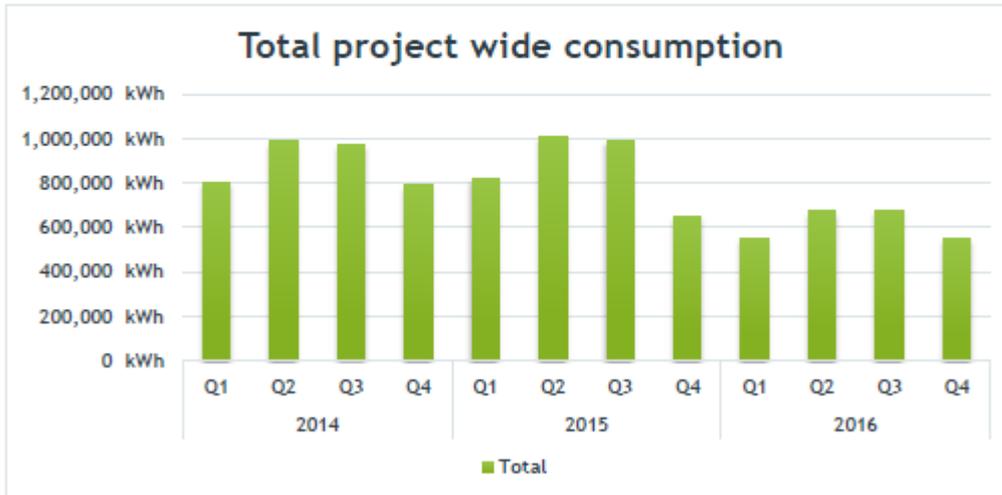


* *Relative Change to LED: The calculation returned a 'Divide by Zero' result. Value is arbitrarily set to 100%.*



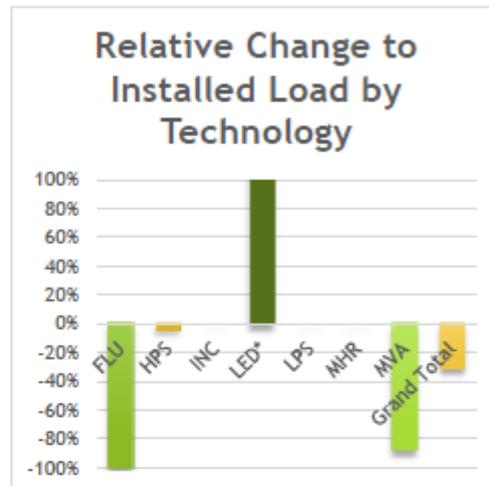
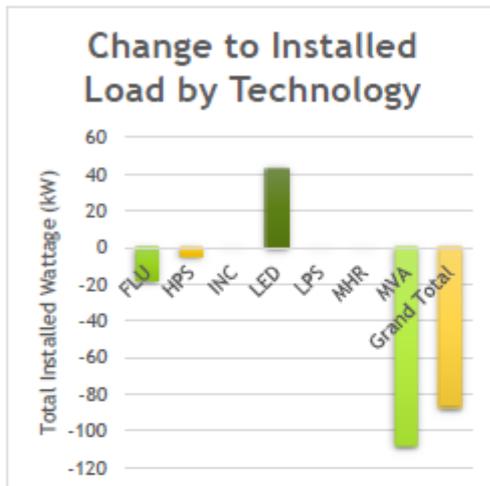
A total of 4500 LED luminaires were installed during the retrofit, with the total inventory increasing by 50 luminaires during this time.

This change has resulted in a calculated saving of 1,096 MWh per annum. This equates to a 31% reduction in the energy consumed by street lighting luminaires in the project area.

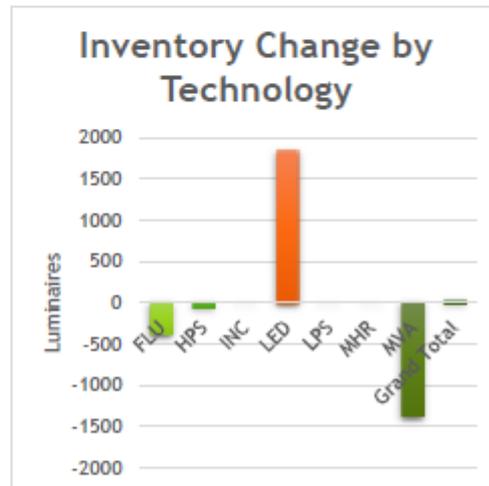
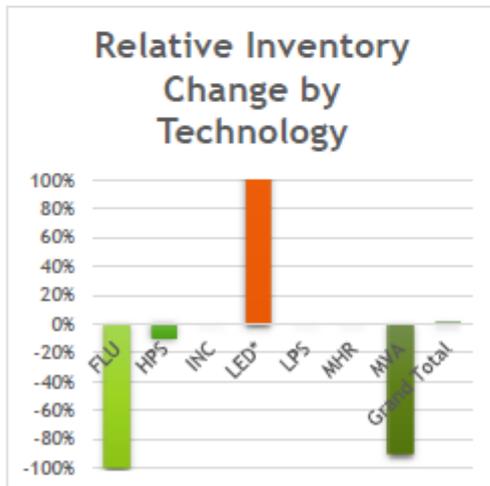


Individual Council results
Armidale Dumaresq Council

The Northern Lights Project has, at the time of assessment, reduced the total wattage of installed street lighting luminaires from 279 kW to 192 kW across the Armidale Dumaresq project area.

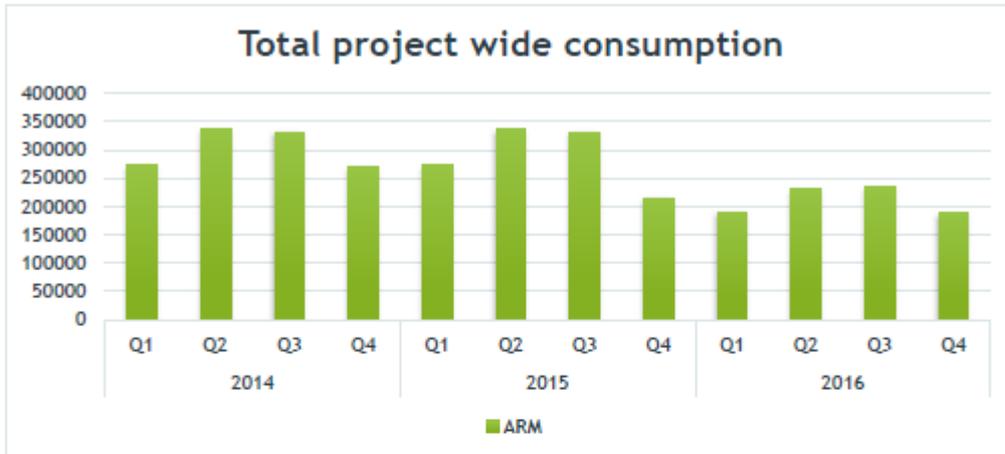


* Relative Change to LED: The calculation returned a 'Divide by Zero' result. Value is arbitrarily set to 100%.



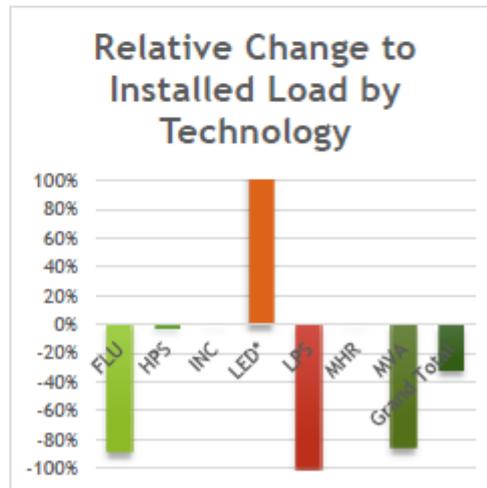
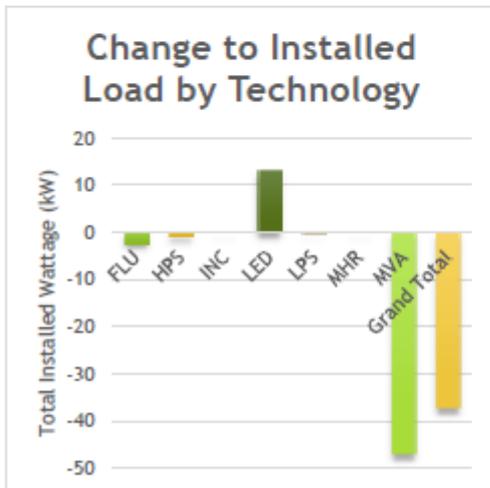
A total of 1828 LED luminaires were installed during the retrofit, with the total inventory increasing by 28 luminaires during this time.

This change has resulted in a calculated saving of 366 MWh per annum. This equates to a 31% reduction in the energy consumed by street lighting luminaires in the Armidale Dumaresq project area.

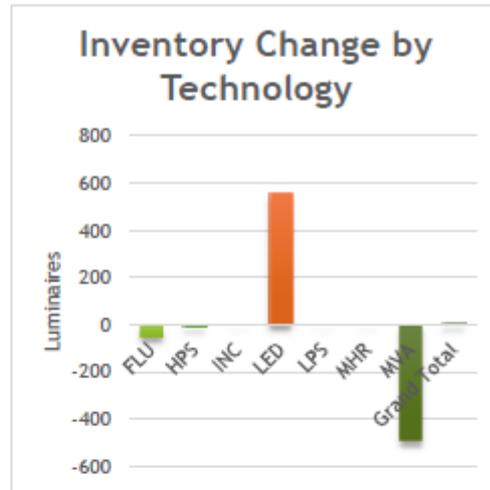
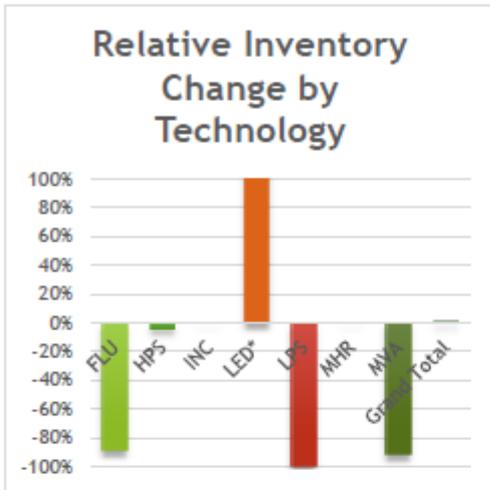


Glen Innes Severn Council

The Northern Lights Project has, at the time of assessment, reduced the total wattage of installed street lighting luminaires from 118 kW to 81 kW across the Glen Innes Severn project area.

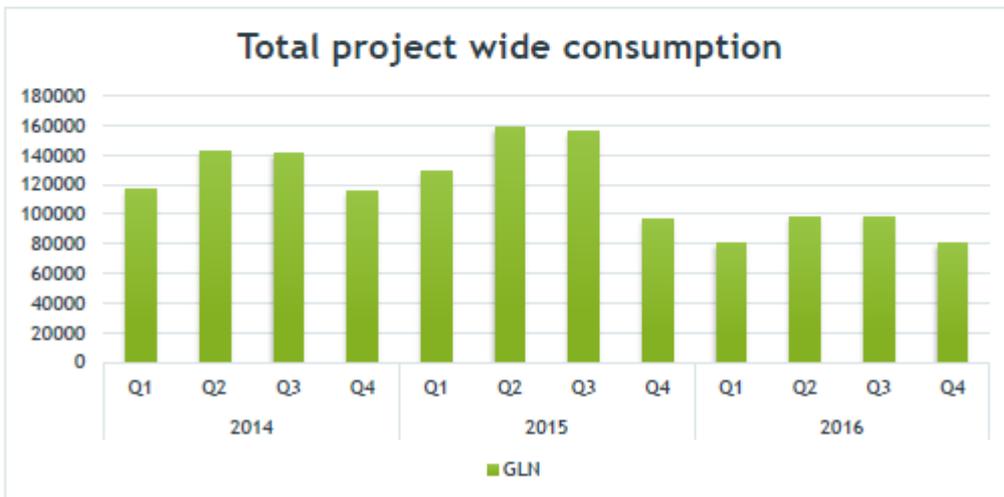


* Relative Change to LED: The calculation returned a 'Divide by Zero' result. Value is arbitrarily set to 100%.



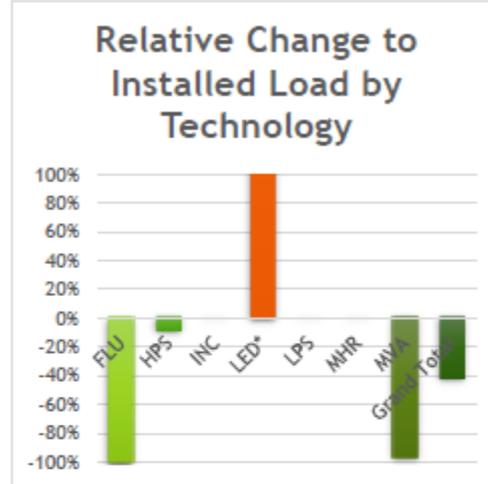
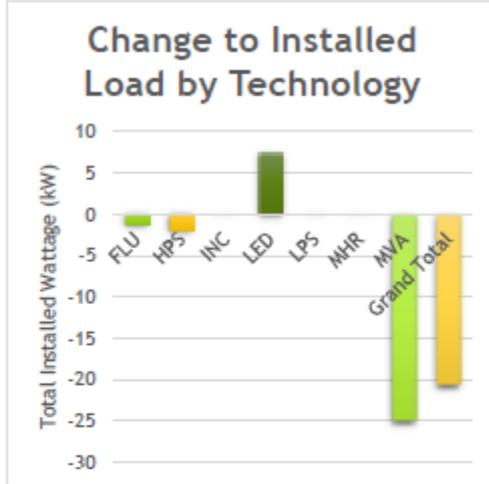
A total of 555 LED luminaires were installed during the retrofit, with the total inventory increasing by 7 luminaires during this time.

This change has resulted in a calculated saving of 156 MWh per annum. This equates to a 30% reduction in the energy consumed by street lighting luminaires in the Glen Innes Severn project area.

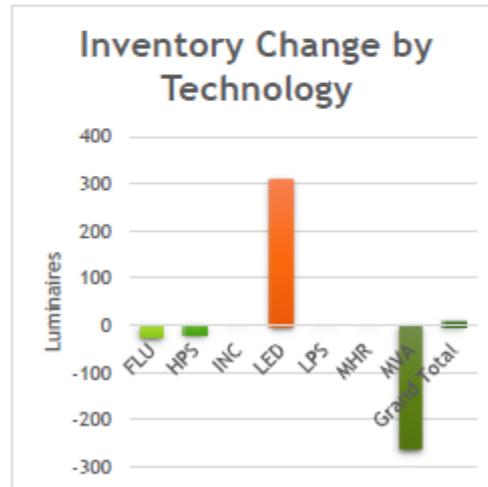
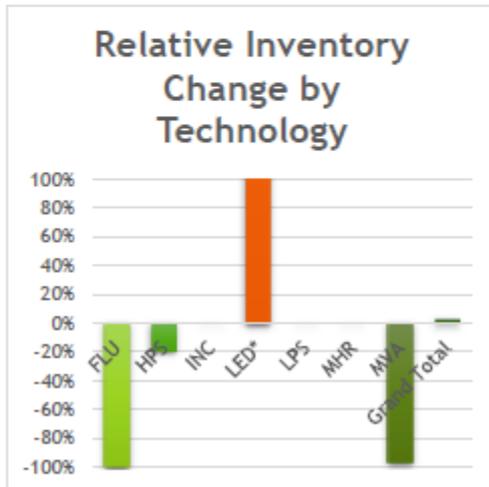


Guyra Shire Council

The Northern Lights Project has, at the time of assessment, reduced the total wattage of installed street lighting luminaires from 50 kW to 29 kW across the Guyra project area.

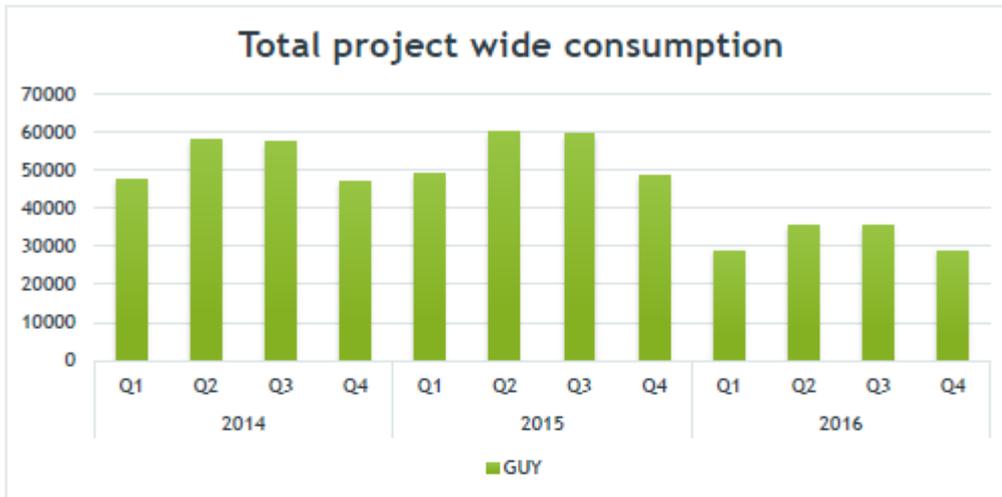


* Relative Change to LED: The calculation returned a 'Divide by Zero' result. Value is arbitrarily set to 100%.



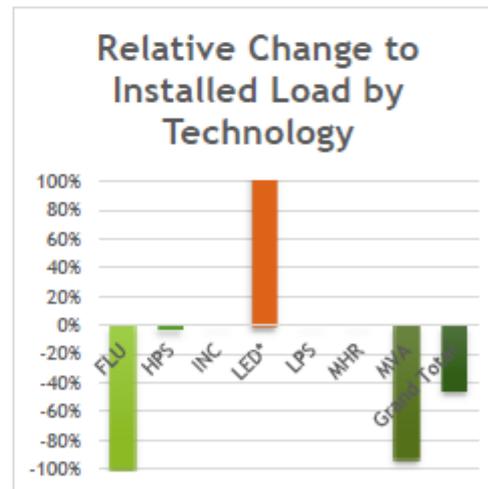
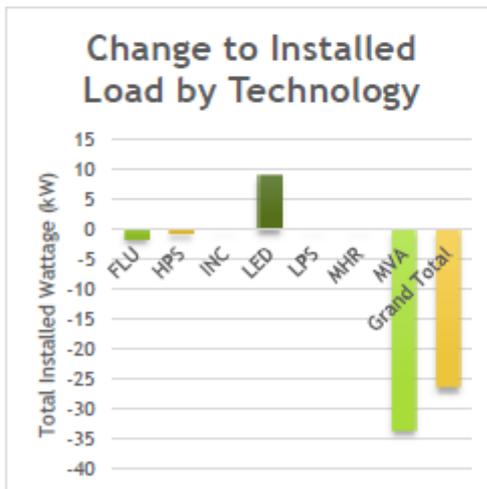
A total of 310 LED luminaires were installed during the retrofit, with the total inventory increasing by 8 luminaires during this time.

This change has resulted in a calculated saving of 81 MWh per annum. This equates to a 31% reduction in the energy consumed by street lighting luminaires in the Guyra project area.

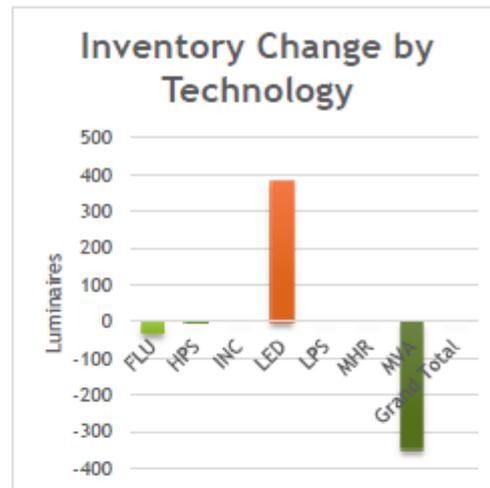
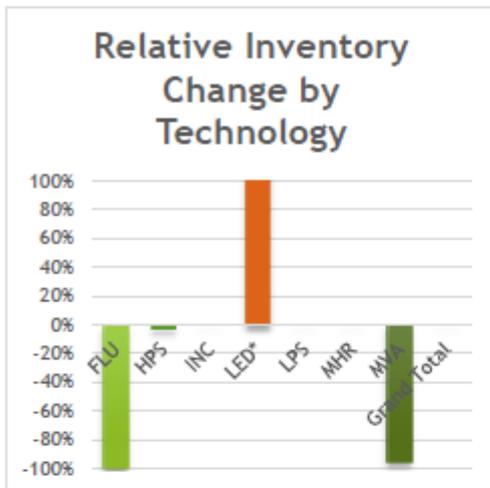


Gwydir Shire Council

The Northern Lights Project has, at the time of assessment, reduced the total wattage of installed street lighting luminaires from 59 kW to 33 kW across the Gwydir project area.

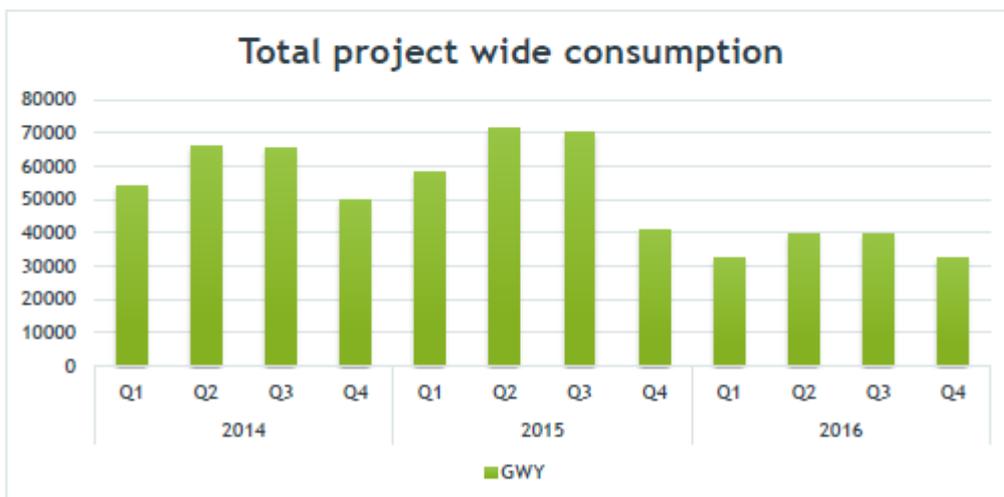


* Relative Change to LED: The calculation returned a 'Divide by Zero' result. Value is arbitrarily set to 100%.



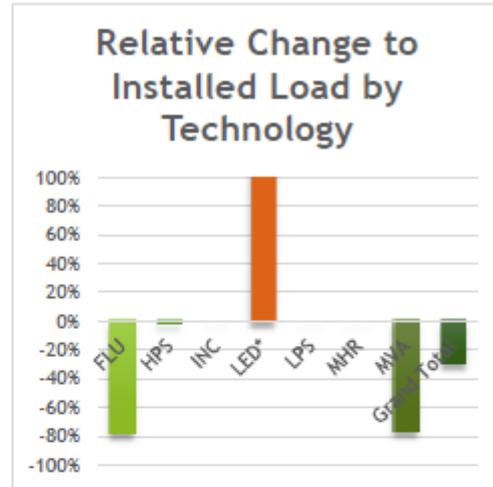
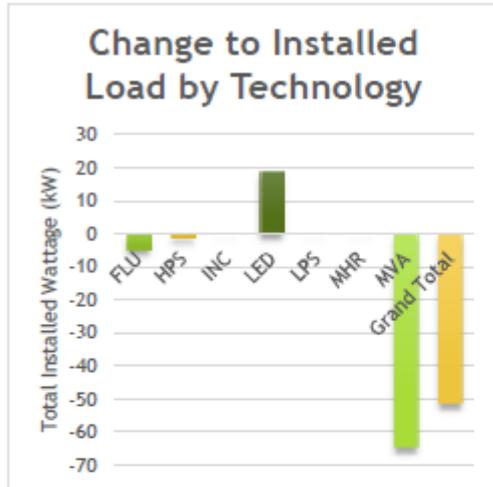
A total of 381 LED luminaires were installed during the retrofit, with the total inventory increasing by 0 luminaires during this time.

This change has resulted in a calculated saving of 92 MWh per annum. This equates to a 39% reduction in the energy consumed by street lighting luminaires in the Gwydir project area.

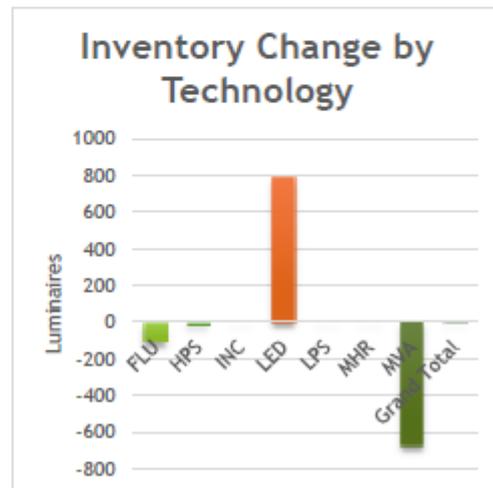
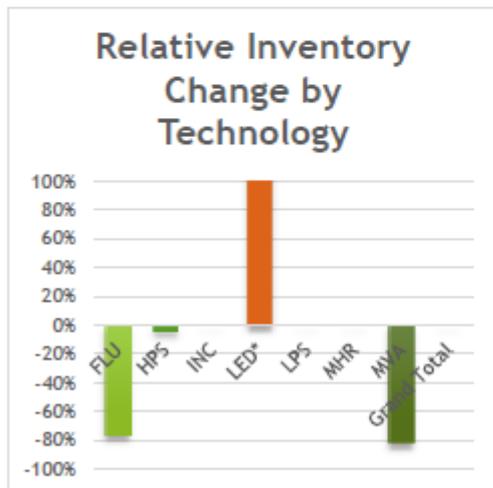


Inverell Shire Council

The Northern Lights Project has, at the time of assessment, reduced the total wattage of installed street lighting luminaires from 175 kW to 123 kW across the Inverell project area.

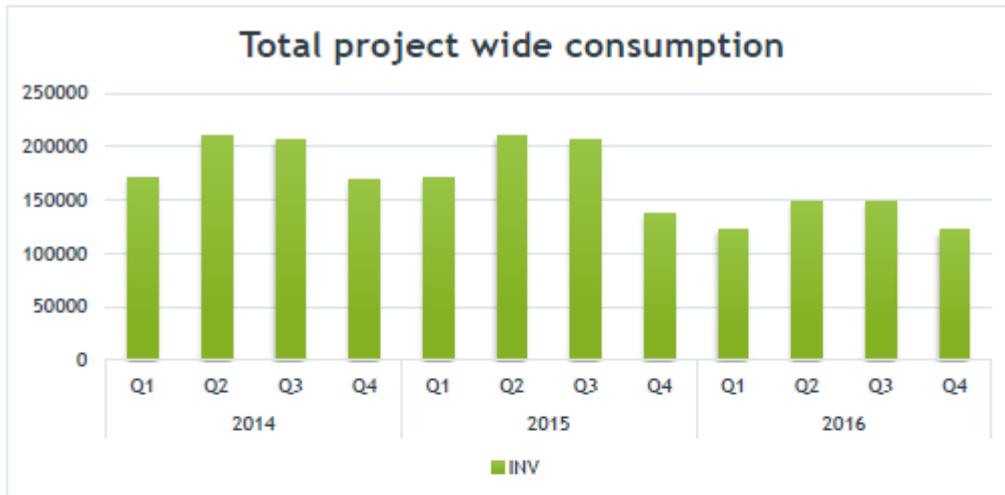


* Relative Change to LED: The calculation returned a 'Divide by Zero' result. Value is arbitrarily set to 100%.



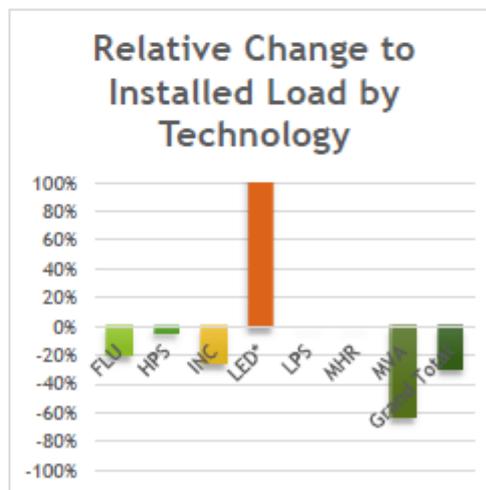
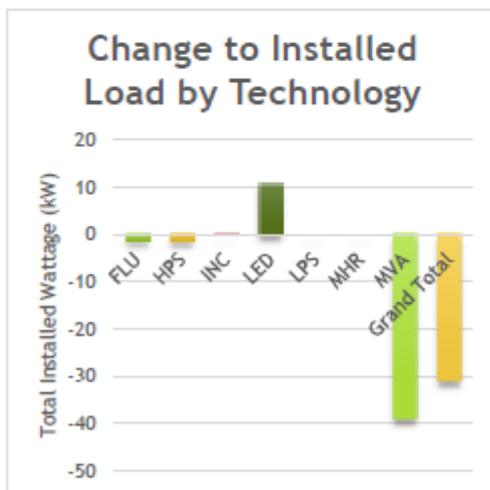
A total of 786 LED luminaires were installed during the retrofit, with the total inventory increasing by 2 luminaires during this time.

This change has resulted in a calculated saving of 216 MWh per annum. This equates to a 29% reduction in the energy consumed by street lighting luminaires in the Inverell project area.

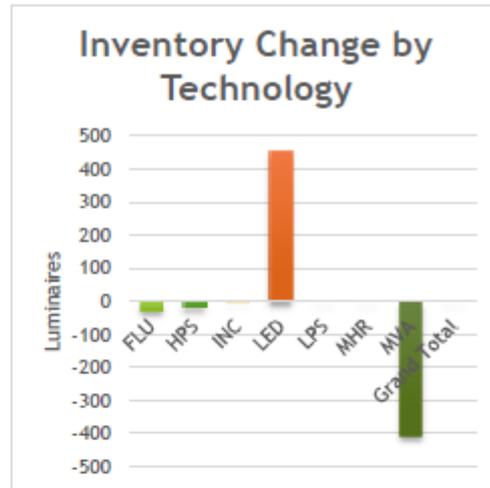
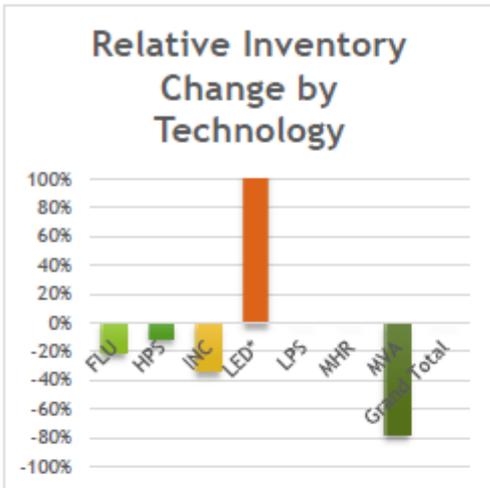


Tenterfield Shire Council

The Northern Lights Project has, at the time of assessment, reduced the total wattage of installed street lighting luminaires from 107 kW to 76 kW across the Tenterfield project area.

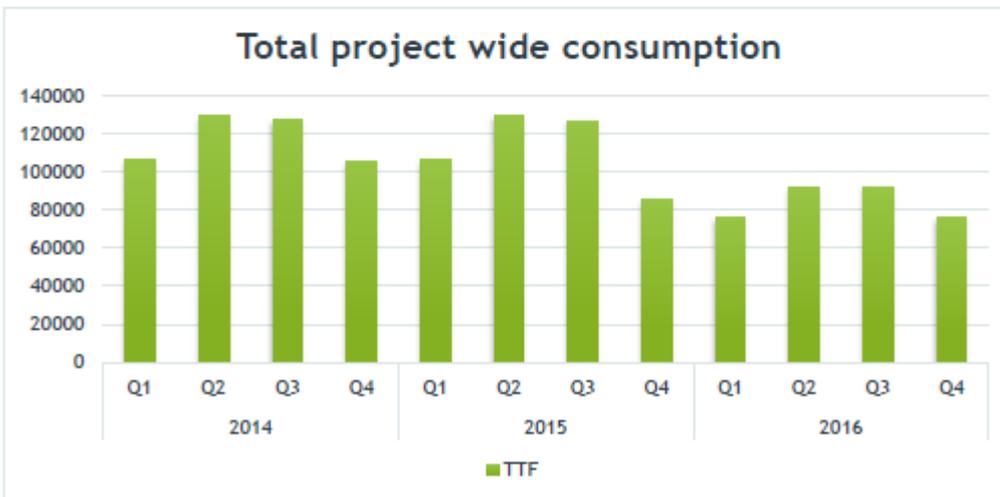


* Relative Change to LED: The calculation returned a 'Divide by Zero' result. Value is arbitrarily set to 100%.



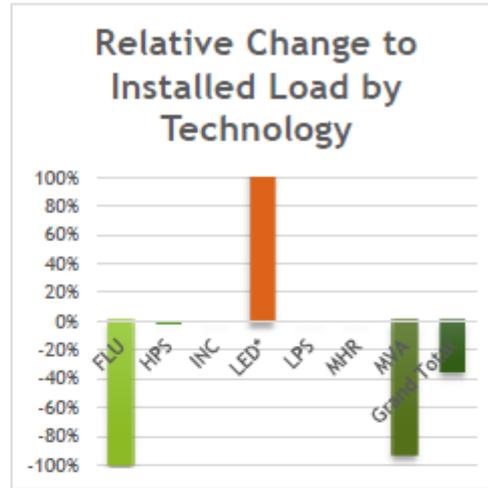
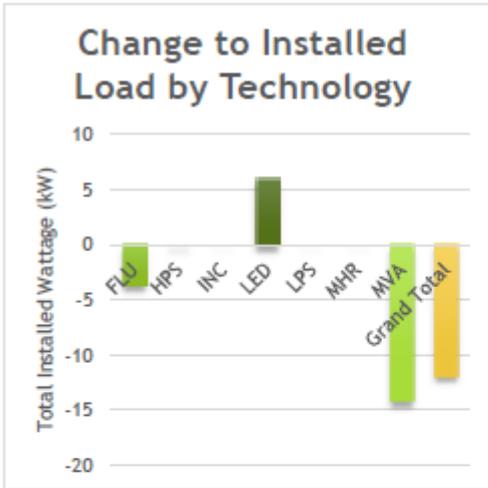
A total of 452 LED luminaires were installed during the retrofit, with the total inventory increasing by 2 luminaires during this time.

This change has resulted in a calculated saving of 132 MWh per annum. This equates to a 28% reduction in the energy consumed by street lighting luminaires in the Tenterfield project area.

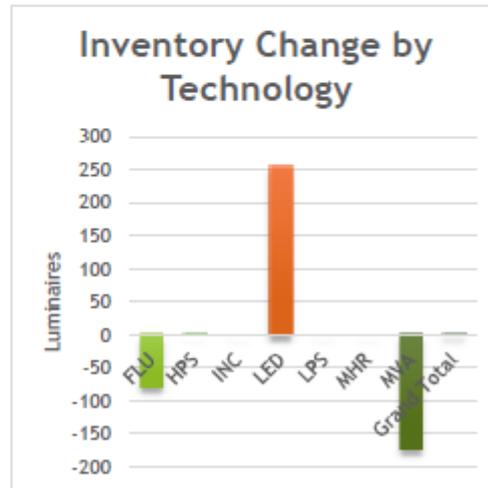
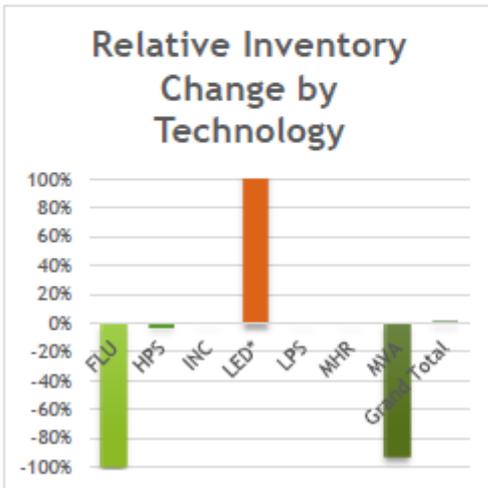


Walcha Council

The Northern Lights Project has, at the time of assessment, reduced the total wattage of installed street lighting luminaires from 34 kW to 22 kW across the Walcha project area.

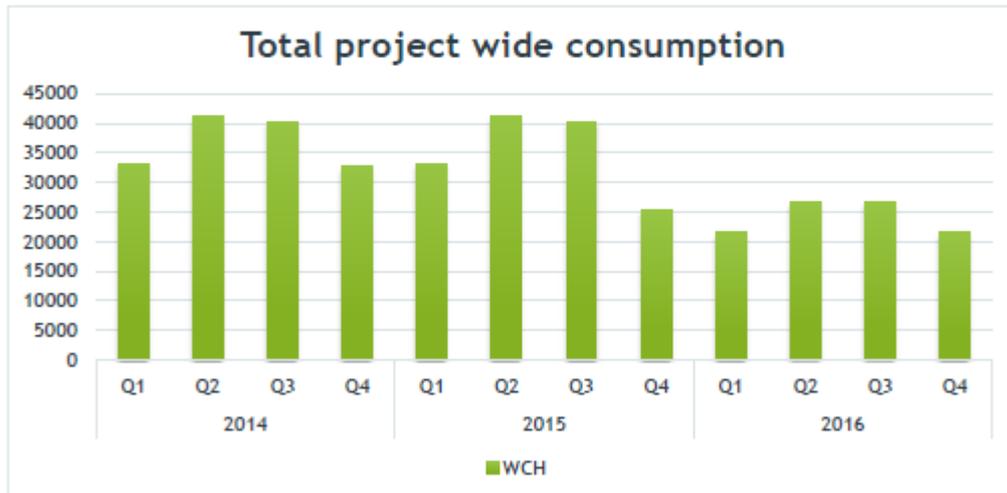


* Relative Change to LED: The calculation returned a 'Divide by Zero' result. Value is arbitrarily set to 100%.



A total of 254 LED luminaires were installed during the retrofit, with the total inventory increasing by 50 luminaires during this time.

This change has resulted in a calculated saving of 51 MWh per annum. This equates to a 35% reduction in the energy consumed by street lighting luminaires in the Walcha project area.



Data

		kWh Electricity						
Cal Year & Q		ARM	GLN	GUY	GWY	INV	TTF	WCH
2014	Q1	273239	116420	47366	53927	171499	106511	33175
	Q2	336843	142643	58273	66175	210197	129811	41052
	Q3	331388	140442	57446	65154	206947	127896	40369
	Q4	269265	114873	46795	50000	169208	105212	32667
2015	Q1	273239	129053	49087	58098	171499	106511	33175
	Q2	336843	158122	60371	71204	210197	129811	41052
	Q3	331388	155683	59411	70103	206947	127098	40369
	Q4	215521	96279	48397	40947	137233	85221	25309
2016	Q1	190271	80899	28933	32224	122359	76228	21504
	Q2	231909	98001	35585	39493	148275	91852	26610
	Q3	233235.4	98561.19	35584.52	39493.12	149121.9	92377.69	26609.93
	Q4	189195	80441.79	28933.39	32223.91	121668	75796.66	21504.06

Pre Upgrade Installed Load (kW)										
Tech	Inv. Code	Installed Load	ARM	GISC	GUY	GWY	INV	TTF	WCH	Total
MVA	MVA0010	65	50.895	0.455	0	0	0	0.13	4.94	56.42
MVA	MVA0020	95.8	68.018	49.4328	25.866	34.8712	77.0232	46.2714	10.4422	311.9248
MVA	MVA0190	270	4.86	0.81	0	0.54	2.16	5.13	0	13.5
MVA	MVA0220	430	0.43	3.87	0	0.43	5.16	10.32	0	20.21
HPS	HPS0010	60	0.12	0	0	0	0.12	0	0	0.24
HPS	HPS0020	86	7.912	3.87	1.376	0	2.924	2.666	0.172	18.92
HPS	HPS0090	173	14.359	2.076	1.903	1.903	2.422	1.038	0	23.701
HPS	HPS0100	245	0	0.98	0	0	0	0	0	0.98
HPS	HPS0110	273	94.458	45.045	18.018	19.11	73.71	26.754	14.742	291.837
HPS	HPS0140	350	0	0	0	0	0	1.05	0	1.05
HPS	HPS0170	440	10.12	0.88	1.76	0.88	4.4	5.72	0	23.76
HPS	HPS0250	1064	0	1.064	0	0	0	0	0	1.064
LPS	LPS0040	120	0	0.12	0	0	0	0.24	0	0.36
MHR	MHR0010	81.5	0.5705	0	0	0	0	0	0	0.5705
MHR	MRHxxx	191	5.539	0	0	0	0	0	0	5.539
MHR	MHR0070	425	3.825	0	0	0	0.425	0.85	0	5.1
MHR	MRH0100	1040	0	7.28	0	0	0	0	0	7.28
FLU	FLU0050	29	0	0	0	0.087	0.348	0.029	0	0.464
FLU	FLU0130	50	0.05	1	0	0	1.8	4.45	0	7.3
FLU	FLU0140	100	0	0	0	0	0	0.6	0	0.6
FLU	FLO0060	50	0	0	0	0.05	0	0	0	0.05
FLU	FLU0220	81	0	0	0	0	0.162	0	0	0.162
FLU	FLU0350	46.4	17.6784	1.5776	1.1136	1.2528	3.7584	1.3456	3.6192	30.3456
INC	INC0050	100	0	0	0	0	0.2	0.2	0	0.4
INC	INC0090	200	0	0	0	0	0	0.2	0	0.2
LED	LED18	22	0	0	0	0	0	0	0	0
LED	LED25	25	0	0	0	0	0	0	0	0

Post Upgrade Installed Load (kW)										
Tech	Inv. Code	Load	ARM	GISC	GUY	GWY	INV	TTF	WCH	Total
MVA	MVA0010	65	2.275	0.065	0	0	0	0	0.13	2.47
MVA	MVA0020	95.8	8.622	3.0656	0.958	1.5328	12.6456	7.4724	1.0538	35.3502
MVA	MVA0190	270	4.86	0.81	0	0.54	2.16	5.13	0	13.5
MVA	MVA0220	430	0.43	3.87	0	0.43	5.16	10.32	0	20.21
HPS	HPS0010	60	0	0	0	0	0.12	0	0	0.12
HPS	HPS0020	86	3.784	3.096	0	0	1.892	1.29	0.086	10.148
HPS	HPS0090	173	14.359	2.076	1.73	1.903	2.422	1.038	0	23.528
HPS	HPS0100	245	0	0.98	0	0	0	0	0	0.98
HPS	HPS0110	273	94.458	45.045	17.745	18.564	73.71	26.754	14.742	291.018
HPS	HPS0140	350	0	0	0	0	0	1.05	0	1.05
HPS	HPS0170	440	10.12	0.88	1.76	0.88	4.4	5.72	0	23.76
HPS	HPS0250	1064	0	1.064	0	0	0	0	0	1.064
LPS	LPS0040	120	0	0	0	0	0	0.24	0	0.24
MHR	MHR0010	81.5	0.5705	0	0	0	0	0	0	0.5705
MHR	MRHxxx	191	5.539	0	0	0	0	0	0	5.539
MHR	MHR0070	425	3.825	0	0	0	0.425	0.85	0	5.1
MHR	MRH0100	1040	0	7.28	0	0	0	0	0	7.28
FLU	FLU0050	29	0	0	0	0	0.348	0.029	0	0.377
FLU	FLU0130	50	0	0.3	0	0	0.8	4.45	0	5.55
FLU	FLU0140	100	0	0	0	0	0	0.5	0	0.5
FLU	FLO0060	50	0	0	0	0	0	0	0	0
FLU	FLU0220	81	0	0	0	0	0.162	0	0	0.162
FLU	FLU0350	46.4	0	0	0	0	0.0464	0.1856	0	0.232
INC	INC0050	100	0	0	0	0	0.2	0.1	0	0.3
INC	INC0090	200	0	0	0	0	0	0.2	0	0.2
LED	LED18	22	18.854	7.48	3.3	4.268	6.93	4.202	2.816	47.85
LED	LED25	25	24.275	5.375	4	4.675	11.775	6.525	3.15	59.775