

LEDs make the future bright for

Auckland's street lighting



Client: Auckland Transport.

EMANZ Member: Opus International Consultants.

Challenge: To reduce electricity and maintenance costs for the Auckland street lighting network.

Solution: Opus carried out an in-depth study of the street lighting network for Auckland Transport. A business case was built using the results of the study. The Board approved the retrofit programme which will result in significant cost-savings, both in terms of energy and reduced maintenance costs, by changing its network to LED technology.

In brief: Opus carried out a study for Auckland Transport which established that replacing the existing lights with LED technology would save millions in operating costs. Work began at the end of April 2015 on the first stage of the project, which will see 40,000 low-powered 70 watt high pressure sodium (HPS) lights in residential streets replaced with LED lights. The Opus study established that the stage one project would achieve payback in year eight and achieve a net saving of \$36 million over the next 20 years. Once stage one is complete, stage two will begin, replacing higher wattage HPS lights on main feeder and arterial roads. The upgrade also includes the installation of a telemanagement system which will ensure better control of lighting levels and improved customer service.

The project

Electricity charges currently account for 50 per cent of total operating costs for Auckland's street lighting network. David Dick - Team Leader Street Lighting, Auckland Transport - said the organisation first began investigating LED technology three years ago.

"It made sense to target the electricity costs, because that was where we could make the most savings. LED technology was starting to mature and the costs of low wattage LED luminaires (40 watts and below) suitable for residential streets, was coming down rapidly. Also, it is much easier to change lights in residential areas as less traffic management is required, so we decided to build our business case on replacing these residential area lights as the first stage. We estimated this could lower our energy use by 60%," said David.

The solution

Auckland Transport engaged Opus to carry out an in-depth study to estimate the cost of retrofitting LED luminaires in place of the existing high pressure sodium luminaires and to calculate the future savings in energy use. This study established that changing forty thousand 70 watt HPS luminaires would cost \$23M with a simple payback in year eight, a Net Present Value (NPV) of \$14.1M, and a Benefit Cost Ratio (BCR) of 2.1. These were calculated within the total cost of the project.

Auckland Transport worked with Auckland University of Technology to investigate the advantages of installing a telemanagement system to control and monitor the lighting network. This work over a period of a year established further reduction in energy use by up to 18%. This is achieved by better adjusting lighting levels during the night and the maximum luminaire output to match the roading category. Further savings are achieved through monitoring the luminaires and reporting faults. This lowers customer calls through the call centre and regular network patrols. The telemanagement system also measures the energy use of each light, which will allow a more flexible contract to purchase energy in the future. Auckland Transport is working with the Electricity Authority to gain acceptance of the telemanagement system as an energy meter.

The next stage is to install sensors in the street to measure foot and vehicle traffic, so lighting levels can be better adjusted for the traffic conditions.

Another operational saving is on maintenance. Existing luminaires get a clean every four to five years when the lamp is changed. LED luminaires will require cleaning over their expected 25 year life, and Auckland Transport is about to begin a piece of work to establish cleaning frequencies across

the region. It is likely there will be up to three cleaning zones across Auckland to recognise the coastal areas, heavy use roads and rural areas.

"We spent a lot of time building our case for the board," said David. "The Opus report was a big part of it, along with our research which had established the opportunity to upgrade the network in a way that would bring significant savings on energy, maintenance and administration, and result in better management of the network and improved customer service. Through installing LED lighting and a telemanagement system, we now expect to save 65-80 per cent of our current energy use."

There was considerable outside interest in purchasing the street light network which resulted in a rigorous study being carried out looking at the various ownership/contract models.

"Once we presented our case, the Board accepted that retaining ownership and funding the retrofit was the best long term option for the ratepayers and Auckland Transport," said David. The Board approved the two-stage project in October 2014.

"The Energy Efficiency and Conservation Authority (EECA) has also been a very good advocate in highlighting these benefits to the government. The New Zealand Transport Agency (NZTA) subsidises street lighting in New Zealand and is now subsidising LED retrofits," said David.

Throughout the process, the cost of low wattage LED lights had fallen significantly to less than \$400 per unit. There are 40,000 low wattage lights in the network and the target is to get the first 3,000 lights changed to LED by the end of June 2015 and a further 8,000 - 9,000 by the end of June 2016.

"By the time we have completed stage one (replacing the low wattage luminaires on 'P category' pedestrian-dominated residential streets) in four to five years' time, the cost of the higher wattage lights for stage two (covering the 'V category' vehicle-dominated arterial and feeder roads) will have decreased significantly," said David.

The company

Opus International Consultants is a global company with its base here in New Zealand, where it is the largest integrated consultancy firm employing skilled engineers, architects, planners and other professional and technical staff. With Design Centres based in Auckland/Hamilton and Christchurch providing support to a Regional Network comprising 18 offices, Opus has a strong focus on local Government. The Street Lighting team, centred in Auckland, has played an integral role in the momentum for change to LED road lighting now emergent within Local Authorities across New Zealand.

"Another advantage for us is that this is one of the biggest lighting projects in the southern hemisphere. We will be buying between 8,000 and 10,000 lights each year, which means we can purchase them at very competitive prices.

"Auckland Transport is happy to discuss the project with other councils, and we would be happy for councils to piggyback on our orders so that the LED lights and reduced prices are also available to other local authorities."

David Dick, Team Leader Street Lighting, Auckland Transport.



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