

Green city, bright streets

Waitakere City Council, New Zealand's "greenest" city, picks up the street lighting torch and shows it to the country.
By Kevin Kevany.

Waitakere City, styles itself as New Zealand's "Eco City" and is unquestionably our greenest and most environmentally aware local authority. It is no surprise then that it has recently picked up the torch of advancing street lighting technologies – and opted to share it with anyone interested.

Bob Harvey, the city's long-serving mayor, recently was presented with a United Nations-endorsed award for environmental practice at the Eco City Summit in Washington. So it was totally appropriate that under the astute leadership of Michelle Dawson, Waitakere City Council's corporate sustainability manager, and Bryan King of Modus Lighting – leading advocates of improved urban lighting in New Zealand – suppliers, vendors, the Electricity Commission and other local authorities conducted a workshop with a show-and-tell climax at two greenfield sites in Waitakere City, which have had Philips CosmoPolis and Impact LED lights installed.

"Modus Lighting Ltd joined forces with the WCC at the Trusts Stadium, Henderson, Auckland to host a 'Street Lighting Technology Forum and Night Tour' as a means of

publicising and demonstrating the many new approaches now available," King notes.

"We believed there was a pressing need to assist council managers, throughout the country to navigate the bewildering range of design and technology options on offer."

He and Dawson originally floated an idea to bring a wide range of participants together to discuss and debate new street lighting options and to show real working demonstrations of the "fresh possibilities". More than 120 participants from all over New Zealand, comprising government officials, local government managers, lighting engineers, urban designers, developers and lighting suppliers attended.

The Electricity Commission sponsored the production of a DVD recording of the event to deliver the message of street lighting efficiency and performance improvement to a wider audience.

Contributor of greenhouse gases

"Street lighting contributes 28 percent of Waitakere City's corporate greenhouse gas emissions, making it one of the priority areas for action for Waitakere's 'Communities for Climate Change' Action

Plan," says Dawson, who has rapidly climbed to a position of being the leading council official, throughout the land, when it comes to sustainability, "greenness" and being environmentally aware.

As part of the background to and rationale for the forum, she recalls that when the Energy Efficiency and Conservation Authority (EECA) released the EECA Street Lighting Study in 2001, the Waitakere Council reviewed it and felt it was achieving best practice at the time.

"No other major developments in energy-efficient street lighting were implemented anywhere in New Zealand, until 2007, with the first installation of CosmoPolis lighting from Philips, in the newly-developed Sea Breeze Estate, Coromandel. The Council decided to learn more about the new CosmoPolis metal halide luminaries, complete with a 10 percent energy savings return, and review whether there was a business case for it to be applied to the Waitakere street lighting infrastructure."

The conclusion reached was that installing CosmoPolis technology in greenfield subdivisions had the highest viability.

"Replacing the city-wide network all at once with CosmoPolis technology was viable at that time – regardless of the level of hardware replaced," Dawson recalls.

Of course, the case for city-wide deployment begins to look more attractive, if the infrastructure upgrade is rolled out progressively, as part of a current maintenance programme, and potentially considerable non-economic benefits are also considered.

"With this in mind, greenfield and brownfield trials were recommended to progress the project, and the Code of Practice was to be reviewed to, in the first instance, require new subdivisions to install energy-efficient lighting. Similar research findings indicate, of course, it is always more cost-effective to install new technologies, whether they be CosmoPolis or Light Emitting Diodes (LED) street lights in greenfield or brownfield developments, due to the lower incremental cost, compared to retro-fitting existing street lighting infrastructure," Dawson says.

The WCC's first project was to install CosmoPolis luminaries at Corban Estate carpark. It then stipulated CosmoPolis luminaries as the

preferred product for a 479 street light, capital replacement programme.

Graeme Neale, business development manager, Philips Lighting in New Zealand, outlines the evolution of white light from the sodium powered lamps introduced in the 1930s “to beat the darkness”, through driver safety, pedestrian safety and on to driver comfort and “city livability”, at the turn of the last century. This marks the progression from artificial to “natural” daylight and the end of sodium as the only suitable method.

According to Neale, research had demonstrated – and most of Europe has accepted: voting with its feet to install their CosmoPolis lighting – white light is perceived to deliver greater brightness at low (road) lighting levels. It is also perceived to provide better safety and ambience, and leads to better orientation and quicker identification of people and surroundings.

Total cost of ownership

Philips’ approach to lighting is to calculate the total cost of ownership. It does this by taking into account not only the initial investment costs (luminaries, poles, lamps and cabling), but also maintenance

and energy costs, and the life of lamps – while also attaching values to improved security, safety and the prevention of accidents, better ambience through enhanced aesthetics, as well as the increasingly important CO2 reduction factor.

According to Dawson, her Council has continued to update its Code of Practice for street lighting and investigate advanced street lighting technologies. It has reviewed street lighting control systems and is trialling Light Emitting Diodes (LED) street lights from Impact LED, with approximately 45 percent energy savings per light.

“Sometimes new technology needs to be installed to allow engineers, policy makers, and other interested parties to view and evaluate the outcome in an actual setting, rather than just reading technical reports,” Dawson notes.

Modus Lighting’s King, widely-credited as a knowledgeable leader in the field, concurred and emphasised that the moment had finally come for the next generation of street lighting.

“Improving the efficiency and performance of energy using equipment is very high on the agenda of organisations

in both the public and private sectors. The pace of change of technology and design is rapid, and keeping in tune with developments is no simple matter.

“Nowhere is this more acute than in the area of street lighting, the public face of local government energy use and a sector which is usually the largest single component in a Council’s energy and emissions profile.

“After several decades of only minor evolutionary development this market area is now surging forward with a plethora of more efficient technologies streaming onto the market. New generation luminaires portrayed the advantages of precise light control optics to minimise ‘spill light’ and glare, as well as displaying much improved weather protection ratings,” he says.

Products incorporating the dictates of the European Union Eco Design Directive are very much part of this new wave, he believes.

“This is a new EU regulation that mandates stringent minimum acceptable energy performance for Energy Using Products (EUP’s), as well as sustainable design features, such as eliminating hazardous substances, using recycled materials and design for reuse/recycling at end of life,” says King.

Pioneering Neo LED lights

While CosmoPolis could be seen to be the de facto standard, a good deal of interest was shown in Impact LED’s pioneering Neo LED lights. Tim Hargreaves, a director of the company outlined the three years of research his company undertook with local authorities and vendors from all over the world to secure and then have New Zealand verification and rating from a fully-accredited independent testing laboratory – “the very best LED street lighting available anywhere”.

He points out LED technology has been around for 40 years, today being utilised in

most electrical products used in our daily lives, in our homes, work, cars, boats and – that must-have appliance – the mobile phone.

His company has an exclusive agreement with Hong Kong Stock Exchange listed, Neo Neon, which has factories throughout Asia and offices and distributors in Europe and America. Impact LED’s business development manager has been based in Hong Kong since 2006. His company has assigned its exclusive distribution agreement for the New Zealand market to Eco Friendly Light & Power Ltd, under the name of STEALTH LED Street Light Series to provide the sales and service support for mains powered and solar systems.

“When LEDs were first developed you could have any colour as long as it was red, red or red; and that is the way it stayed for many years. Today Boeing and Airbus install LED light technology in new aircraft, changing the colour at regular intervals in-flight to create light and mood changes, to mitigate the effects of jet-lag.

“And all the replay screens at the sports stadiums are LED too. The first white LEDs were not very bright, but in the last six years that has altered dramatically and we are now benefitting.

Roby Street in Te Atatu was the first of two streets to be illuminated by Waitakere City Council with their LED Street technology. The new lighting design (to meet the AS/NZS 1158 lighting standards) required the removal of four existing poles, luminaries (70 watt son-t, with a total wattage of 420) and the installation of nine new poles and 38 watt LED fittings at a height of eight meters with a total of 342 watts.

Hargreaves points out that had this project been on a one-for-one basis, using 70 watt son-t, plus control gear, the total savings by installing LED street lights instead of the 40-year-old existing lights, would have been 64 percent per luminaire, with total power



Bryan King (right) director of Modus Lighting and a co-convenor of the Waitakere street lighting workshop, and members of the Modus team.

savings of 603 watts.

The Stealth LED Street Light Series comes in a colour range of 2,000k through to 6,500k, with the nine small 38 watt (total power usage) LED fittings running a light colour of 6,500k, installed on the project. He says most people used to the yellow, dimmer luminance of existing street lights take a while to get accustomed to the brighter light.

"The LED street lights also have a longer life of up to 50,000 hours. They are rigid devices which are completely sealed and do not suffer the effects of wind, rain or dust, thereby reducing the long-term maintenance costs.

"They are encased in professionally styled, high-pressure die-cast aluminum alloy housing which is powder-coated, with a special material and process which promotes self-cleaning, as well as protection from the elements."

The LED high powered streetlights are also, dustproof and waterproof. They produce no ultra-violet emission, further enhancing their "green" qualities.

Wind a problem

"The biggest problem around the world – which New Zealand has a lot of – is wind and the damage it creates to luminaries through vibration. LED street lights do not suffer from this as they are a rigid device with no filaments.

"Additionally, the Stealth LED streetlights installed have zero up-light and no light pollution going into the homes of Roby Street," says Hargreaves.

Currently, the Impact LED product range has four street light fittings: 30, 60, 90 and 120-watt streetlights and a 75-watt tunnel light. Only the latter is not available with a solar or a mains-and-solar option.

"The range of products will continue to grow as we identify new opportunities in the New Zealand market.

"With direct connection

to 240volt AC power, the LED high-powered street light series embodies state-of-the-art high power LED technology. It produces 'green' energy and is an environmentally friendly product containing no mercury. The power consumption savings range between 45-65 percent."

All of the supporting hardware is made of high-grade stainless steel to prevent corrosion and provide secure fitting to new or existing poles.

Hargreaves is also keen to talk about "L-Bot" and "AST". L-Bot is an advanced optical reflector design and technique which shapes and directs the divergence of the axis of the LED to achieve the net effect of "lux boosting". It was developed to enhance the optical technique to boost the luminosity of the LED street light by a 50 percent plus factor, on average, and has a patent pending and a registered trade mark in favour of Neo Neon.

"With the conversion to lower voltages and the use of sophisticated electronics, we can now introduce intelligence into the luminaries and this is where AST comes into play. AST works by auto-switching; turning on the high power LED street lights when the luminance of sunlight is lower than 13 Lux and off again when the Lux factor is greater than 13."

AST is a standalone feature, operating from inside the luminaries and is not connected to the outside world, apart from the mains or solar power supply.

LED street lights connect to 240 volt supply in the street. At point of entry into the light head (luminaries) the voltage is reduced to 24 volts DC and is diverted to a PCB board, which then drives the LEDs and any other electronic devices.

"This is where LED street light technology starts to get sexy. The world started with gas-powered street lights and then moved to electricity powered street lights. They

have been dumb devices up until now.

"With the conversion to lower voltages and the use of sophisticated electronics we can now introduce intelligence into the luminaries and this is where AST really comes into play.

"The next step of AST allows us, as suppliers, to preset at our distribution facility, the time you require the LED street light to operate at full power and then after this to reduce the light output and the power consumed by half.

"This option is available on all our street light models and works along these lines. The sun sets at say 6.00pm and the LED street light turns on and runs at full power until 1.00am and then reduces the light and power output by 50 percent until the sun rises in the morning," says Hargreaves.

Diverse range of topics

In addition to the CosmoPolis and LED lighting focus, a diverse range of topics, including centralised dimming control systems, electricity metering, lighting education, innovative capital financing techniques and design consultant viewpoints on sustainable street lighting were actively aired at the workshop.

King noted there were also a number of impediments identified as hampering progress.

"Some of these were capital financing issues and the balancing of timing of investment outflows with cost reductions.

"Electricity tariff structures with high fixed/variable cost ratios are problematic and the current situation of an unmetered electricity supply regime does not encourage an 'invest to save culture'.

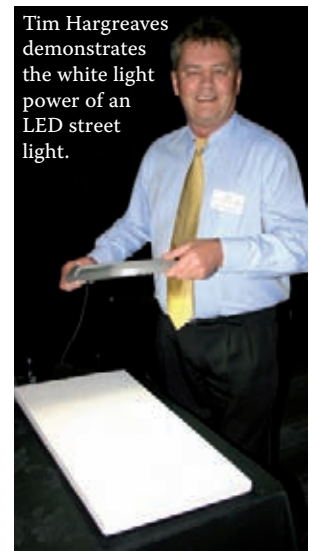
"Additionally, the nature of organisation and financial management within councils can lead to divided priorities and a failure to undertake holistic and whole-of-life appraisal of the cost/benefit of new technologies," he concludes.

A final thought from Waitakere's Dawson: "The landscape of street lighting is changing in New Zealand, with the emergence of advanced street lighting technologies being brought into the country from Europe and other countries. Councils like Waitakere, Hamilton, and South Waikato are making the time to research and trial these new advanced street lighting technologies to install more sustainable street lighting infrastructure for their communities that uses less energy.

"Winter 2008 has shown New Zealand that we need to keep improving the energy efficiency of our infrastructure," Dawson concludes.



Tim Hargreaves with an LED street light.



Tim Hargreaves demonstrates the white light power of an LED street light.