Smart LED streetlighting project

Overview

The Smart LED Street Lighting project is the largest major road smart lighting upgrade in NSW. The project used internet of things (IoT) functionality and programming, evidenced-based GIS data sets, lighting designs and scenario modelling to secure triple bottom line benefits.

It has achieved a 74% energy reduction, while incorporating vehicles, pedestrians, and wildlife requirements. Over 3,000 streetlights are transitioning to smart LED lighting technology, with adaptive light programming for wildlife and dimming functionality between 11pm and 4am.

Background

Council's 2014/15 corporate emissions baseline identified 50% of emissions are generated from streetlighting, an asset owned by Distribution Network Service Providers (DNSPs).

The population of Parramatta is projected to double (from 2016 to 2041). There are fourteen growth precincts where the lighting of new footpaths, transport internodes and traffic need to be considered.

The Smart LED Street Lighting project aimed to deliver emissions savings, while improving wildlife, pedestrian and driver safety, and accommodating population growth.

Biodiversity corridors with adjacent streets or active transport links results in significant light spills into sensitive nocturnal wildlife habitats. Street lights controlled by smart IoT technology can reduce the impacts through trimming light spill and intelligent lighting which can respond instantly to changes in conditions.

The project was funded through the federal Department of Infrastructure, Transport, Regional Development, Communications and the Arts, Local Roads and Community Infrastructure (LRCI) Program.

Implementation

Council partnered with Endeavour Energy (DNSP) and Ironbark Sustainability (street lighting experts) to design and implement the pilot project. Agreements were drawn up with contract clauses for smart IoT, data management, data access, smart tariffs, and e-waste diversion.

Council established a cross-organisational stakeholder group of traffic control, road safety, asset management, transport planning, urban design, economic development, public health, sustainability and bushland teams. Ironbark Sustainability facilitated workshops to journey Council's delivery of street lighting from the 'on/off' business as usual approach to embracing the IoT suite of functionality.

Environmental and social GIS data sets were incorporated into the lighting design, including data on bushland reserves, threatened ecological communities, traffic, pedestrians, transport internodes, crime, safety and accidents.

Three nocturnal lighting design indicator species were chosen: the endangered nocturnal species of Grey-Headed Flying-Fox (resident populations) and Bogong Moth (migration route impacted by Sydney's light pollution) and Willy Wagtail (nocturnal song vocalisations during breeding).

A range of scenarios were modelled using light programming rules on constant lighting output, trimming, dimming, wildlife, pedestrian crossings, road and footpath gradients, corners and intersections, and accident hot spots.

The project engaged 40,000 individuals through a joint communications campaign with Endeavour Energy that included website, media releases, social media campaigns, short film, FAQs and customer service briefing.

Outcomes

Council has already installed and programmed 2,000 streetlights, saving of $451,000. Emissions were reduced by 1,830 TCO2-e, equivalent to three years of emissions generated by Council's next largest electricity consumer.

The remaining 1,384 streetlights will be finalised by the end of 2022, after delays due to supply chain issues casued by COVID-19.

The business case modelling projects an overall saving of 36,594 TCO2-e over the 20-year asset lifespan, with $7.2 million operation and maintenance savings.

The smart capabilities of the remote IoT control are mitigating against the light spill into habitat caused by traditional lights, benefiting native endangered species which nest, breed and feed in Parramatta, including the Grey-Headed Flying-Fox, Bogong Moth and Willy Wagtail.

The light programming can be adjusted to incorporate future data sets once they become available, including live traffic feed, cloud cover and moon cycles.

Current major road lighting infrastructure includes capacitators, ignitors, surge arrestors and choke boxes which when removed would traditionally be sent to landfill. The project established an e-waste diversion process, which has diverted over 600kg of metal and 20kg of cable from landfill.

Key Learnings

The use of smart IoT functionality and programming, evidenced-based GIS data sets, lighting designs and scenario modelling were pivotal for the project's success. The ability to continually expand, trial and adjust the lighting functionality will generate greater emissions savings and environmental benefits into the future.

Smart technology allowed for more intelligent and intuitive lighting programming, reducing energy and carbon emissions. By taking vehicular traffic density, pedestrian traffic and other active transport modes into account when designing smart lighting scenarios, lights could be dimmed during times with fewer road users.

Endeavour Energy plan to use this project as the 'gold standard' for all councils to follow. A product package was developed which can be adapted and scaled to other local governments, DNSPs and lighting managers.

The process, challenges and learnings have been documented, including issues ranging from data security protocols, waste diversion & e-waste recycling processes, procurement logistics, streamlining asset and software relationships, lighting design and compliance methodologies.
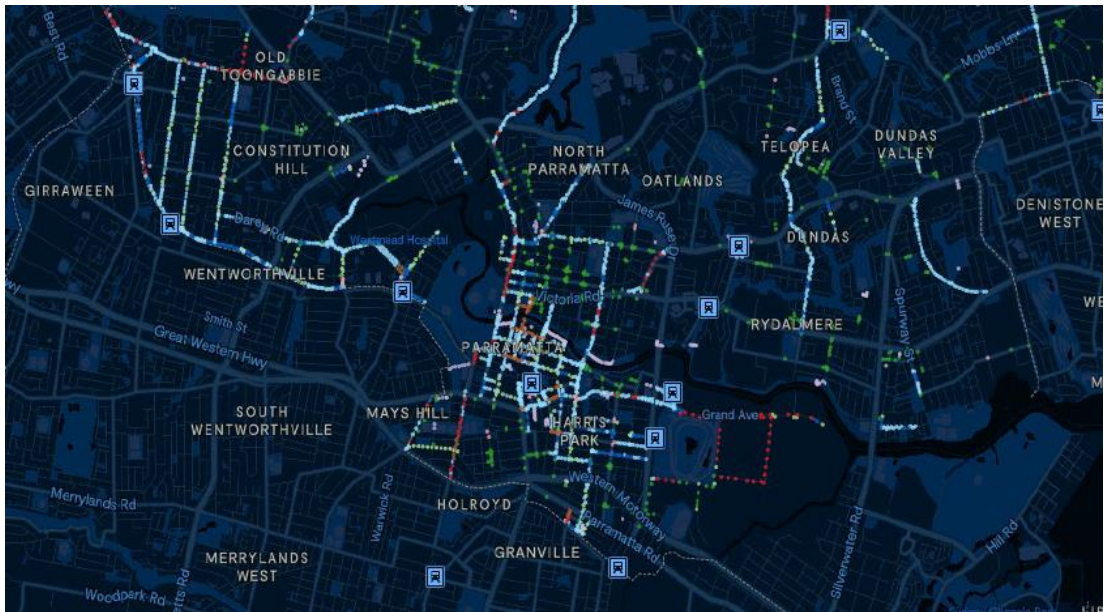
GIS tool showing lighting classifications and compliance with Australian Lighting Standards

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This project was the 2022 winner of the Towards Net Zero Emissions Award at the LGNSW Excellence in the Environment Awards