BENEFITS FROM RENEWABLE-POWERED STREET LIGHTING

SYDNEY, AUSTRALIA

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Along with renewables, energy efficiency has a key role

The International Renewable Energy Agency (IRENA) and ICLEI (Local Governments for Sustainability) first documented the case of Sydney, Australia, in 2012 as a local government that had chosen energy-conscious options for public lighting (IRENA and ICLEI, 2012). This study offers a further analysis, noting the emission reductions and cost savings that the city has realised more recently, particularly by combining energy efficiency with the increasing use of renewable power generation.

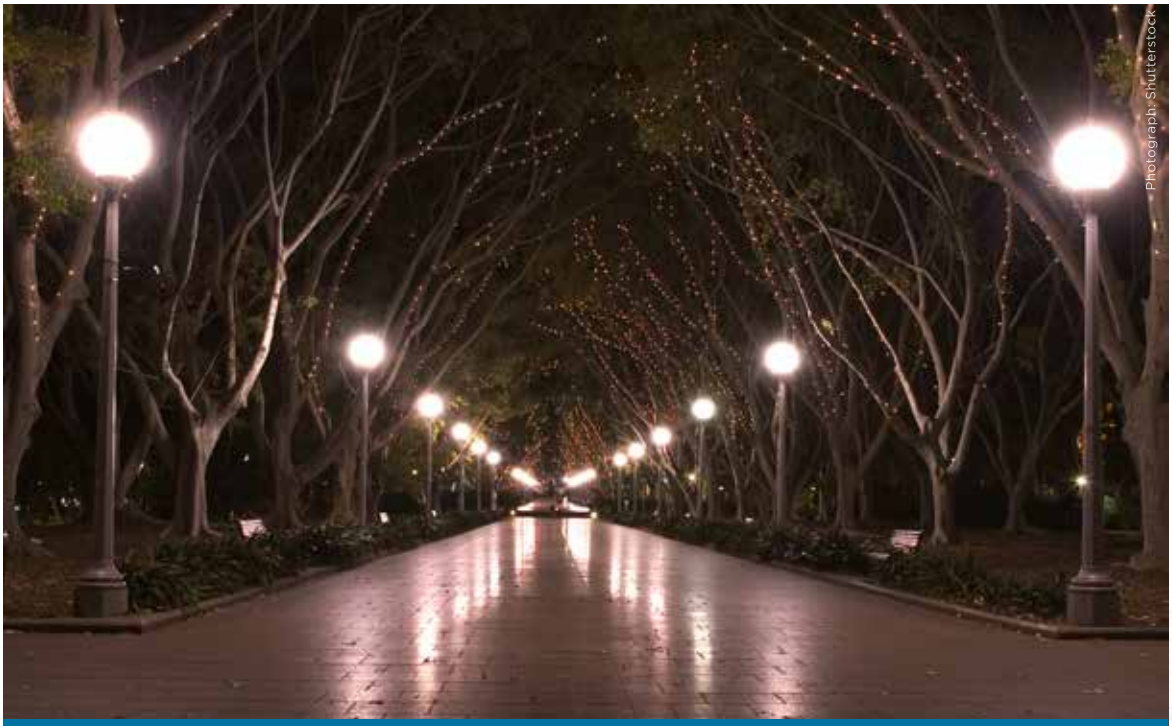
Sydney aims to draw half of its electricity from renewables by 2030

The three-year project – which began in 2012 with the objective of reducing the city's carbon footprint – saw a total of 6 604 (or over 75%) of publicly-owned lights replaced by December 2015. This resulted in a 48% reduction in energy use, a 47% reduction in CO_2 emissions and total savings of AUD 800 000 (over USD 600 000)[1] for the municipality (City of Sydney, 2015a).

In addition to renewables, energy efficiency plays an important part in forming a sustainable urban energy system. In conjunction with the city's Energy Efficiency Master Plan, renewable energy has been used to decarbonise local energy supply, while tri-generation using natural gas is being used to hedge against intermittent shortfalls in variable renewable power.

The challenge of sustainable streetlighting

Public lighting, including street lighting, is among the core services a local government can either provide directly or influence. Public lighting plays a pivotal role in urban energy consumption. Energy efficiency measures – such as the replacement of incandescent lights with light-emitting diodes (LEDs) – reduce energy demand and avoid associated greenhouse gas (GHG) emissions. They also offer financial savings from lower electricity use. The City of Sydney has committed to meeting 50% of electricity needs from all municipal operations with renewable energy by 2021 and by 2030 aims to source 50% of electricity from renewables within city boundaries. In pursuit of these targets, the municipality plans to install solar photovoltaic (PV) panels on council-owned sites and purchase off-site renewable energy through the GreenPower Scheme (City of Sydney, 2018).



Public lighting is among the core services a local government can either provide or influence

1 The exchange rate used throughout this report is 1 AUD = 0.75291 USD, based on a yearly average for 2015, generated at: www.oanda.com/currency/average.

LED street lighting forms part of the Sustainable Sydney 2030 strategy

Actions taken

The local government's operations achieved carbon neutrality in 2006–2007. However, meeting its target to reduce 2006-level emissions by 70% implies that the city must reduce its annual emissions (excluding offsets) to below 15 892 tCO_2e by 2030 (City of Sydney, 2016). Public lighting is responsible for a third of the City of Sydney's yearly electricity requirements and 30% of its municipal GHG emissions (EEC, 2015).

Sydney is the first Australian city to introduce energy-efficient LED streetlights and park lights. It experimented with various energy efficient lighting options through several pilot projects. Then, over the course of a three-year period from 2012 to 2015, Sydney successfully replaced 6 604 conventional lights, representing over 75% of publicly owned streetlighting.

Results to date

These energy efficiency measures resulted in reductions of energy use from public streetlighting by 48% between 2012 and 2016.

Each year, the city saves almost AUD 800 000 (over USD 600 000) in electricity bills and AUD 932 000 (over USD 700 000) in maintenance costs. Energy savings of 2.8 million kilowatt hours (kWh) per year (Global Lighting Association, 2014b) have exceeded the target by 8% and will reduce total GHG emissions by 2 861 tonnes annually (City of Sydney, 2016).

The three-year LED lighting replacement project cost AUD 7 million and was a joint venture between the City of Sydney, General Electric Lighting as the supplier of technology and UGL Limited as the installation partner (City of Sydney, 2015a). The city approved the project with a carbon abatement contract of AUD 17 (USD 12.80) per tonne, and the project is expected to be completely paid off within ten years (City of Sydney, 2016).

The public's response to LED lighting has been very positive: in a survey carried out by the city authorities following one of the initial pilot projects, more than 90% of respondents found the LED lighting to be appealing, with 75% specifically mentioning improved visibility (EEC, 2015). The LED program was also recognized for leadership and innovation at the 2014 Institute of Public Works Engineering Australasia (NSW) annual awards (City of Sydney, 2015a).

Streetlighting in the context of wider energy efficiency goals

LED street lighting forms part of a series of environmental master plans and strategies that the city has developed to guide the implementation of Sustainable Sydney 2030. One of these plans is the Energy Efficiency Master Plan (EEMP) adopted in 2015. It considers the policy framework, technologies and actions needed to further reduce energy consumption and lower GHG emissions. The energy efficiency measures detailed in the EEMP focus on upgrades to lighting, current building stock and hot water infrastructures. They would cost approximately AUD 396 million to implement and generate savings of AUD 604 million (USD 455 million), resulting in a cumulative net benefit of AUD 208 million (USD 156 million) by 2030. This translates into savings of AUD 1.50 for every dollar invested in energy efficiency (City of Sydney, 2015b).

Increasing the share of renewables and deploying energy trigeneration

In 2013, nearly 90% of electricity consumed within city limits was generated from coal; the remaining 10% came from renewable sources. In its updated strategy, Sustainable Sydney 2030, the city plans to increase the renewable energy share to 50% by 2030 and to cover the remainder with the help of trigeneration – a technology that employs natural and recycled gas to generate electricity, heating and cooling. To reach its renewable energy goal, the City of Sydney is planning to install enough solar PV on municipality-owned properties to meet 15% of its electricity needs. It also seeks to procure additional renewable electricity through the GreenPower Scheme. As of 2018, the total installed capacity of solar PV in council sites, including office buildings, civic halls, libraries and other public spaces, had reached 800 kW and was expected to double by the end of the year (City of Sydney, 2018).

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As recently as 2013, nearly 90% of the city's power came from coal

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