



Demonstration Project Case Study

Project title: Replacement of legacy lights with Light Emitting Diodes (LEDs) in the NRW buildings estate

Description

Natural Resource Wales' building estate comprises offices, workshops, depots and visitor centres and uses around 3 million kWh of electricity annually. Energy audits indicate that lighting accounts for an average 30% of electricity use in NRW offices. LED lights can reduce electricity consumption, and therefore associated greenhouse gas emissions, by up to 70% (Carbon Trust, 2017). LED lighting has a long economic life span and requires significantly less maintenance than traditional tubes, therefore maintenance savings may be made of top of expected energy savings. The most common existing lighting across NRW assessed buildings were T8 fluorescent lamps. Other existing internal light fittings included T5 fluorescent tubes, 2D fluorescent lamps, halogen-based luminaires and a small number of compact fluorescent lamps. To reduce NRW's electricity related emissions and operating costs, the NRW Environmental Management System and Facilities teams secured Invest to Save funding from Welsh Government to install LED lighting in 13 buildings. Installations took place between June and December 2017 and will save an estimated 149,338 kWh of electricity annually.

Method

In 2016/17 the organisation's EMS team arranged for 15 NRW buildings to be assessed for energy saving opportunities by the Carbon Trust, through Welsh Government's (now closed) Resource Efficient Wales support service. This sub-set of 15 buildings was prioritised because they were considered to be secure in the long term as part of the NRW's on-going accommodation review.

For all assessed buildings, replacement of existing lights with LEDs was recommended as an energy and cost saving measure. The EMS and Facilities teams bid for the cost of these installation to the Welsh Government Invest to Save (I2S) Green Growth Fund. I2S supports energy efficiency projects in public service organisations through repayable, interest-free funding.

I2S funding was secured in 2016/17, with some of this funding carried over into 2017/18. An experienced contractor was sought through open tender, to further assess and confirm potential for LEDs, prior to supply and installation. The contract specification required installation of the most cost-effective solution at each site, whether this was replacement of, or retrofit of existing luminaires, or an alternative set up. Installations were considered to have minimal maintenance requirements, therefore no handover to NRW's building maintenance contractor was needed.

Tender for contractors through to appointment and installation of LEDs took from April to December 2017.

43.6 kW of LEDs installed across 13 sites

Expected electricity savings: 149,338 kWh / year

Emissions avoided: 67.5 tCO₂e / year

Total project cost: £108,300 excl. VAT

Established carbon saving opportunity

Staff involved

NRW Environmental Management System team
NRW Facilities and Technical Facilities staff

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Outcomes

Existing lights in 13 offices were replaced with LEDs. Installations took place between June and December 2017. Installation sizes, actual costs and estimated annual savings are given by office below:

Office	Total installation size (kW)	Installation cost (£) ¹	Predicted annual savings ²		
			Electricity (kWh)	Greenhouse gas emissions (tCO ₂ e)	Cost (£)
Llandovery	2.7	3,537	9,093	4.2	1,091
Resolven	2.3	4,509	7,648	2.9	920
Crosshands	4.0	7,436	13,200	6.2	1,579
Itton	1.1	1,532	4,782	2.2	558
Lampeter	0.8	1,196	2,259	1.0	230
Monmouth	3.9	5,550	12,794	5.9	1,841
Pye Corner	1.7	3,935	5,731	2.7	997
Gwydyr Uchaf	2.1	3,103	8,158	3.8	830
Cynrig hatchery	0.4	912	829	0.4	77
Clawdd Newydd	1.0	1,569	3,681	1.7	369
Haverfordwest	4.7	6,522	17,298	7.1	1,730
Welshpool	2.2	4,777	7,710	3.6	914
Bangor	16.9	63,724	56,154	26.0	6,738
Totals	43.6	108,300	149,338	67.5	17,874

¹Prices include all components and labour but exclude VAT.

²Predicted annual savings provided in building energy assessments carried out for NRW by the Carbon Trust, and scaled from predicted installation size to actual installation sizes.

The LEDs have an expected life of 20 years and cost and carbon savings will accrue over this period. The average payback period of the installed LED light fittings is estimated to be 5.1 years, over which the I2S fund will be reimbursed.

Installations at 2 offices were not progressed because the retention of these buildings is being re-evaluated under NRW's accommodation review.

Wider benefits

Alongside emissions savings, the LEDs will reduce NRW's annual operational costs and provide maintenance savings. LEDs reportedly reduce glare, flickering and eye strain compared to fluorescent lights, improving the work environment for staff.

As with all measures reducing demand for electricity, reduced fossil fuel combustion will provide air quality benefits contributing to the Wellbeing of Future Generations Act goal of a healthier Wales.

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Learning

LED installations in offices received a mixed reception from staff. Many felt that LEDs installed directly above their desks were too bright and subsequently complained about the lighting level. This generated a negative attitude toward the installations in some offices, with concerns raised about the lights leading to headaches. A number of pieces of learning have come from this:

- Early engagement with staff to inform them about the lighting change is essential. This should include positive communications around expected benefits such as reduced glare and flicker. The LEDs were better received at sites where staff were better informed of the changes.
- LEDs should be trialled before full installation to ensure the brightness and colour temperature of the light produced are suited to the installation environment.
- Determining the location and orientation of lights in large open plan offices was challenging given the need to ensure installations were sensitive to staff Display Screen Equipment and health requirements where possible. Providing a greater number of switches to give control over lights at the individual or office zone level will increase staff comfort and produce a more positive response to LEDs.
- LED lights were better received by staff in communal areas than above individual workstations.

The time required to plan a programme of LED installations should not be underestimated – we received funding in 2016/17 and spent it the following financial year. The ability to be flexible on installation times may increase the number of bids received for the work.

Evidence and information

Carbon Trust (2017) Lighting. Bright ideas for efficient illumination. <https://www.carbontrust.com/resources/guides/energy-efficiency/lighting/>

Carbon Trust (2012) How to implement LED lighting. CTL164.

https://www.carbontrust.com/media/31638/ctl164_how_to_implement_led_lighting.pdf

Photographs of LEDs installed in our Bangor office

