CASE STUDY

LIGHTING THE LIMERICK TUNNEL

TECHNOLOGY: LIGHTING ENERGY CONTROLLER

INVESTMENT: €77,000

ELECTRICITY BILL SAVINGS: €24,000 PER YEAR

PAYBACK PERIOD: 3.2 YEAR

meridiam
INVESTING FOR THE COMMUNITY

LIGHTING THE LIMERICK TUNNEL

Sound financial management of large infrastructure assets demands periodic review to find ways of reducing cost and adding value, which is exactly what has been done in Limerick in the Irish Republic. An innovative system of lighting control has been installed in the Limerick Tunnel and on its approach roads, after a process of analysis by DirectRoute supported additional investment in greater energy efficiency.

Meridiam helped to bring about construction of the Limerick Tunnel and it continues to maintain the safe and serviceable operation of this important asset, as a lead partner in DirectRoute. This is the special purpose vehicle that holds a 35 year concession to design, build, finance and operate the tunnel and its approach roads for the Irish government agency Transport Infrastructure Ireland (TII).

Meridiam's direct interest has led it to take an active role in ensuring the Limerick Tunnel is operated diligently and to make sure every effort is made to add value for the partners and investors of DirectRoute and TII.

Just a year after its opening, DirectRoute took a long hard look at the lighting of the tunnel and connecting roads. Electricity bills represent a large proportion of the cost of operating highway assets – particularly so in the case of a road tunnel. There are **1,560 lights in the Limerick Tunnel and 763 on its approach roads.** In 2011 it was costing DirectRoute around **€130,000 per year** to keep them all lit.

Meridiam was also aware that lighting technology had been developing rapidly, so it made sense to review the systems being used to light the Limerick Tunnel. Turning the lights off, or even down, was not an option. DirectRoute is responsible for maintaining light levels specified in its contract with TII and moreover, the aim was to add value. **The opportunity was there to investigate ways of lighting the tunnel to the same high standards, but more efficiently.**

A Cork-based consultant, Global Energy Management (GEM), supported DirectRoute's evaluations of different options.

The result was a proposal for a new proprietary system of **controlling the energy supplied to the lighting.**

According to GEM's figures, installation of Lighting Energy Controller devices (the system would require one LEC for each lighting circuit) could reduce the tunnel's annual energy cost and the carbon emissions associated with its lighting, by 15 to 20%.

However, it was important for Meridiam to carry out its own in-depth analysis of GEM's proposal. Installing the LEC system would require an **initial investment of approximately €77,000** and there is an element of risk attached to any new technology.

"The proposal from GEM certainly appeared attractive initially, but it was based on estimations of energy consumption. There are actually many different electricity tariffs associated with operation of the Limerick Tunnel and its approach roads," says Direct Route's General Manager, Declan Cahill.

"We also had to bear in mind the fact that our rates of energy consumption vary a great deal, with the seasons and the time of day for

example. We had to consider **how long the LEC technology would last** – how long it would be in place before it needed to be upgraded, so requiring investment again," Declan adds.

Performance and reliability were vital considerations as well. DirectRoute has a lot of different operational requirements it must adhere to, including a complex lighting specification. There are 12 different regimes of illuminance required in the tunnel alone, depending on the position within the tunnel, light levels outside and the direction of travel.

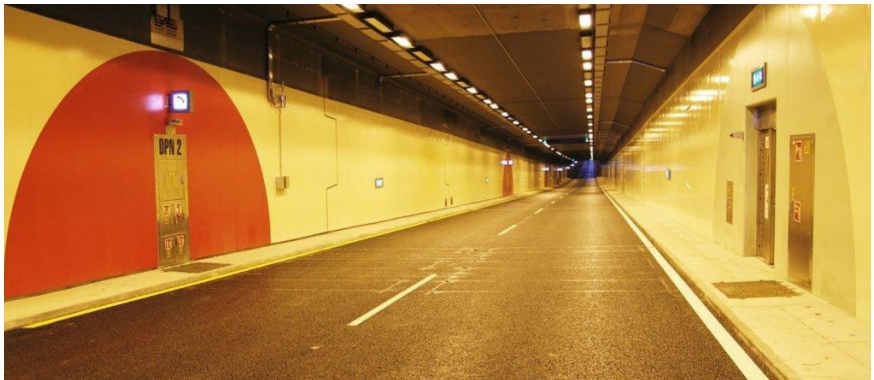
Would the LEC system present too much of a risk to DirectRoute's operating performance? All of these things had to be included in DirectRoute's assessment of the merits of installing the new technology.

"Ultimately we had the confidence to take on the risk, based on the analysis of the technology and the financial data," Declan says. "We could have reduced our exposure to risk by sharing the capital expenditure and the returns with GEM, but we felt we didn't need to. We had done a lot of analysis to support the decision."

The final reckoning has vindicated Meridiam's investment in the LEC system. Over the five year period from 2012 to 2016, **electricity savings have come out at 18%, representing a total saving of €120,000.** The payback period was three years and three months.

There is also an environmental benefit: the energy saved corresponds to the average electricity consumption of 35 Irish households[1].

[1]based on 2018 figures by the Commission for Regulation of Utilities, Ireland.



THE LIMERICK LIGHTING ENERGY CONTROLLER: HOW IT WORKS

The Lighting Energy Controller (LEC) system works by smoothing out the flow of electricity through road lighting power supply. Conventionally, voltage levels in an alternating current circuit will tend to fluctuate, registering peaks and troughs of power. Energy is wasted because the voltage has to be set high enough to account for the fluctuations, using a maximum capacity charge. By regulating and stabilizing the voltage supplied – with an array of special transformers controlled by a microprocessor – the LEC system reduces the waste and the amount of energy needed to light the Limerick Tunnel. ■

Direct Route is now getting ready for the next significant investment, in potentially switching all of the Limerick Tunnel lighting over to energy-efficient LED lamps in 2020. "We looked at this as an option for reducing cost and adding value back in 2012, but at the time the technology just wasn't as well developed. The risks were considered too high," says Declan.

"Now, however, the quality and reliability of LEDs have improved sufficiently to make them viable for road and tunnel lighting." The investment required to fit LEDs in the Limerick Tunnel is likely to be substantial, significantly higher than the cost of the LEC system, but DirectRoute's initial estimates suggest **potential energy savings of a further 50% year on year.** The payback period is expected to be longer, but LEDs have a lot more longevity – they're unlikely to need replacing for another 10 years or more.

Declan says: "The necessary analysis involved in this may seem relatively simple, but it's very important that we look at the detail before making decisions to invest. Lighting technology is not an exact science and the equipment may change; it may move on again. Investing in new, more energy efficient technology looks like good value for money. The principle is a good one, but we will continue to be diligent. We will review the market in-depth." ■

AN ASSET WORTH LOOKING AFTER

The Limerick Tunnel is a vital piece of infrastructure, providing a road crossing beneath the River Shannon. It was opened in 2010 as part of a new 10km dual carriageway built to connect the motorway network to the west of Limerick with roads to the east and south. The tunnel and road link have diverted a lot of traffic from the centre of Limerick City, so easing congestion in the city, while boosting economic development with completion of a strategic transport corridor across the region.

The tunnel itself is a 675m long immersed-tube structure. Reinforced concrete box sections were built on land, on the banks of the River Shannon, then floated out and sunk into place through a carefully controlled procedure. The €660m construction contract was carried out for concessionaire Direct Route by a joint venture between Strabag, John Sisk & Son, Lagan Holdings and Roadbridge Ltd.

DirectRoute's 35 year Public Private Partnership with the Irish government's Transport Infrastructure Ireland was signed in August 2006, with construction of the project getting underway in the autumn of that year. The partners within Direct Route are Meridiam (50%), Strabag (20%), Roadbridge (10%), Lagan (10%) and Sisk (10%). ■