BUSINESS CHALLENGE

New carbon emission targets are driving significant changes around how electricity is generated, transported and consumed in the United Kingdom. With the increase in small scale generation technology onto the network, Distribution Network Operators (DNOs) are met with great challenges to facilitate a future low carbon network.

As one of seven DNOs in the United Kingdom, Western Power Distribution (WPD) is at the heart of this changing dynamic. Responsible for delivering electricity to the Midlands, South Wales, and the South West, WPD is a critical DNO in the UK delivering electricity to more than 7.8 million customers over a 55,500 square kilometre service area.

To increase real-time visibility, WPD is installing Tollgrade’s LightHouse Smart Grid Sensors on their overhead electric lines.

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Ben Godfrey, Innovation and Low Carbon Networks Engineer at WPD
to monitor load at different points of their 11kV networks and create an energy model which provides a forecast for near real-time and future energy scenarios. The deployment is part of the Flexible Approaches to Low Carbon Optimised Networks (FALCON) project, a £16 million Ofgem funded program that aims to improve the industry’s understanding of infrastructure needs in a low-carbon environment. FALCON is focused on the Milton Keynes network to identify how DNOs could increase capacity without resorting to traditional reinforcement. Part of the project involves monitoring of overhead lines, to look at real time impacts of environmental conditions and load conditions, in order to identify additional capacity.

SOLUTION OVERVIEW

Tollgrade supplied its LightHouse platform to WPD as part of Project FALCON. Tollgrade’s LightHouse platform is made up of Medium Voltage (MV) Smart Grid Sensors for overhead lines that measure voltage, current and power (real, reactive and apparent) up to 69 kV. The LightHouse platform is unique because it combines highly accurate sensor technology with Predictive Grid® Analytics software that monitors overhead lines and assets to deliver real-time intelligence about how the grid is operating. This allows DNOs to react quickly by making decisions they couldn’t evaluate before they had access to this type of data. The end solution allows DNOs to run their grids more efficiently and reliably.

Tollgrade's LightHouse Medium Voltage (MV) Sensor products are easy to install on overhead lines. The sensors communicate data back to LightHouse Sensor Management System (SMS) software in configurable time intervals to provide near real-time alerts and trending data.

Tollgrade LightHouse Sensors offer many benefits over alternative solutions including:

- They are extremely lightweight (2.7 kg) and easy to install. Tollgrade holds the design patent for the way our sensors clamp onto the line so that DNOs need only use the hot-stick once. There is no need for the DNO to take an outage during installation.

- Sensors are inductively powered from the line; they require no batteries or solar panels and have a Mean Time Before Failure (MTBF) of 20 years. They are 100% maintenance-free and require no field calibration.

- Sensors operate in low current environments; there is no need to worry charging batteries or losing data.

- GSM sensors allow for easy installation of the DNO’s own Subscriber Identity Module (SIM) cards and require no pole mounted equipment. There is no need to take equipment apart, simply plug the SIM card into the sensor through the external port.

- Sensors are installed on the grid; not at a consumer’s house. There is no impact or action required by the consumer to get energy efficiency benefits.

- LightHouse inductively powered sensors offer the lowest Total Cost of Ownership (TCO) of any competitive platform.

With LightHouse, DNOs are more informed to make better network decisions. The Tollgrade LightHouse platform allows WPD to have the visibility to make these decisions and pass the benefits onto UK consumers.
HOW IT WORKS

Once Tollgrade LightHouse Sensors are placed on overhead lines, they immediately begin to monitor load capacity and report key data (e.g. load and fault current) to help tell WPD how their 11 kV networks and assets (e.g. transformers, overhead cables and switchgear) are operating. By knowing how the network is performing on a real time basis, WPD can push their network to run more efficiently and free up capacity rather than build out new infrastructure.

This data is also sent to WPD’s Scenario Investment Model (SIM) which gives WPD options for reinforcement of their grid over the next 5, 10 or 15 years when looking at network modelling. The data also helps WPD make the right decisions for the part of the network being monitored to help postpone, or even eliminate, reinforcing.

As part of Project FALCON, WPD is running trials in Milton Keynes and using Dynamic Asset Rating (DAR) to learn more about assets. Tollgrade LightHouse Sensors are playing a key role in these projects. By knowing simple monitoring data like wind speed, environmental conditions, wind direction, ambient temperature combined with LightHouse Sensor data, WPD can make decisions about the remaining capacity of their 11kV network. These decisions can have a direct and positive impact on consumers’ overall energy bills.

BUSINESS JUSTIFICATION

The whole purpose of monitoring is to be better informed about the distribution network. The more that is known about how the grid is actually performing with real sensor data, the more WPD can see if it is possible to postpone reinforcement efforts or perhaps better combine them with other techniques that can ultimately defer costly investment. As LightHouse Sensors alleviate the need to build new capacity with real-time monitoring, WPD can continue to work to keep consumer costs down.

“Our distribution network is the backbone of how we deliver electricity to homes and businesses. Leveraging proven technologies such as LightHouse allows us to improve our real-time visibility of the distribution grid for the first time,” said Ben Godfrey, Innovation and Low Carbon Networks Engineer at WPD. “We selected Tollgrade’s LightHouse platform because it provides us with better information for network planning, which will help us improve grid reliability and enable the transition to a low-carbon future.”

Ben Godfrey, Innovation and Low Carbon Networks Engineer at WPD