

Western Power Distribution Chooses Cisco for Low-Carbon Study

Building a pilot communications infrastructure to support 11kV grid reinforcement monitoring.

EXECUTIVE SUMMARY
<p>Western Power Distribution (WPD)</p> <ul style="list-style-type: none"> • Energy • United Kingdom
<p>BUSINESS CHALLENGE</p> <ul style="list-style-type: none"> • Design and build private network pilot to monitor grid to support modernization studies • Meet all security policies and requirements • Create blueprint for future grid intervention techniques
<p>NETWORK SOLUTION</p> <ul style="list-style-type: none"> • Design and deploy IP network using IEEE 802.16 WiGRID access and backhaul technologies • Built on Cisco Connected Grid CGR2010 and CGS2520 routers and Airspan AirSynergy base stations for integrated wireless backhaul and WiGRID access
<p>BUSINESS RESULTS</p> <ul style="list-style-type: none"> • Pilot communications network across 200+ substations for study purposes • Understanding of applicability and costs of conventional 11-kV grid reinforcement techniques • New communications network blueprint for WPD



PRODUCT LIST
<ul style="list-style-type: none"> • Cisco 2010 Connected Grid Router (CGR2010) • Cisco 2520 Connected Grid Switch (CGS2520) • Cisco 1240 Connected Grid Router (CGR1240)

Around the world, governments are cooperating with industry to find new ways of implementing an updated electric grid infrastructure. One such initiative is the Flexible Approaches to Low Carbon Networks (FALCON), a government-funded study project in the United Kingdom that has the goal of improving industry’s understanding of infrastructure needs in a low-carbon future.

U.K. utility regulator Ofgem has estimated that £32 billion of new grid investment will be required within the next 10 years, twice the rate of investment over the previous two decades. Western Power Distribution (WPD) undertook a study to see how the cost of reinforcing its 11-kV grid can be reduced based on smarter investment that draws on innovative intervention techniques that can replace or supplement conventional methods.

WPD is one of six electricity distribution network operators in the United Kingdom, responsible for the Midlands, South Wales, and the South West. Its grid is one of the largest and most diverse in the country, covering densely populated residential neighborhoods and widely dispersed rural communities, consisting of 216,000 kilometers of overhead lines and underground cables and 184,000 substations. WPD delivers electricity to more than 7.7 million customers over a 55,300 square kilometer service area.



Business Challenge

The WPD study examined the use of four technical and two commercial intervention techniques, and combinations thereof, which are designed to address:

- Dynamic asset rating
- Automated load transfer
- Meshed grids
- Energy storage
- Distributed generation
- Demand-side management

However, to successfully carry out such studies as this, WPD needed to gather detailed, real-time information from the grid over time. WPD worked with the Cisco Connected Grid team to develop a wireless communications network pilot that gathers grid information based on a Cisco IP-based WiGRID network. WiGRID is an IEEE 802.16 system profile developed by the WiMAX Forum to meet the requirements of utility companies. WiGRID features optimize the standard's WiMAX equipment for a range of field area networking applications.

The project's goal is to create a communications solution to serve as a blueprint for WPD and for other utilities as they test the same intervention techniques.

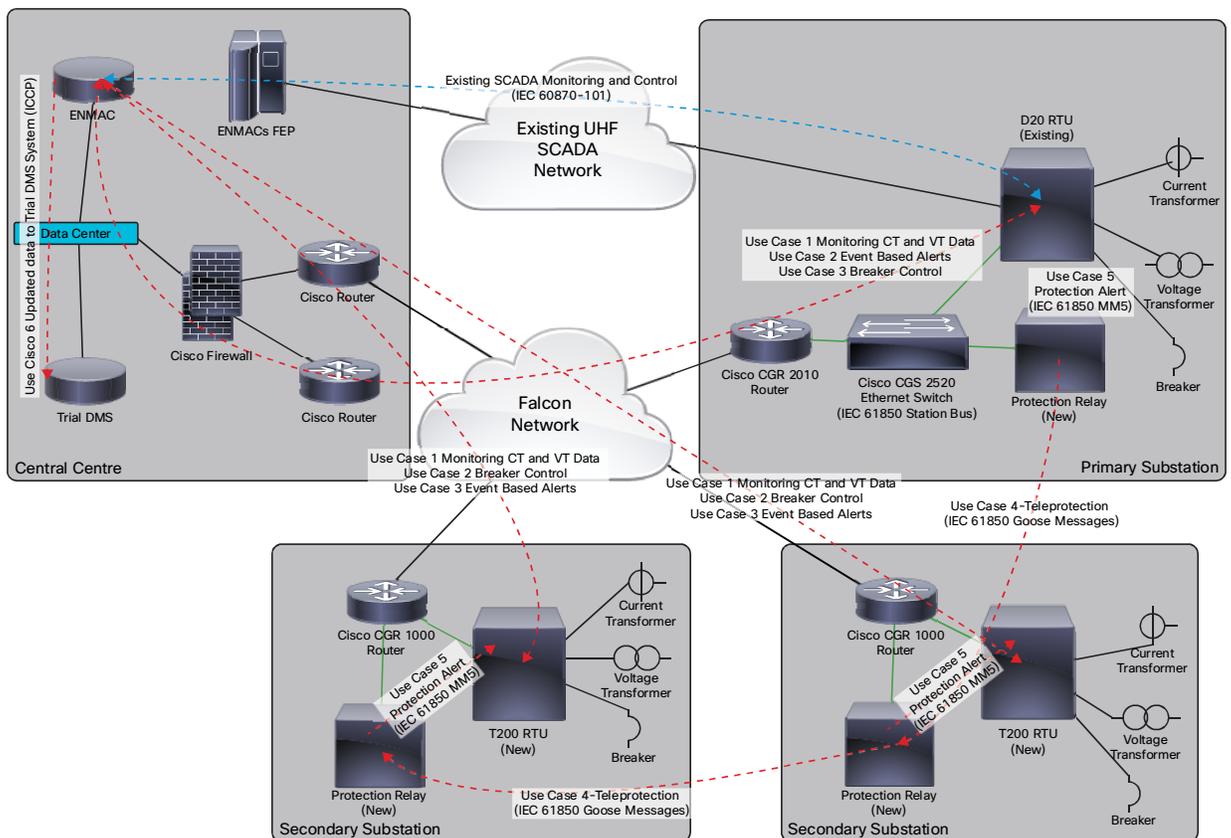
"Being able to develop a robust telecommunications network is a critical element in our strategy, especially given the forecasted uptake in low-carbon technologies such as electric cars, heat pumps, and solar panels. We are pleased to be working alongside Cisco to develop the Falcon communications solution, and we are hoping it will help other utilities to develop their own smarter grids."

—Roger Hey, Future Networks Manager, Western Power Distribution

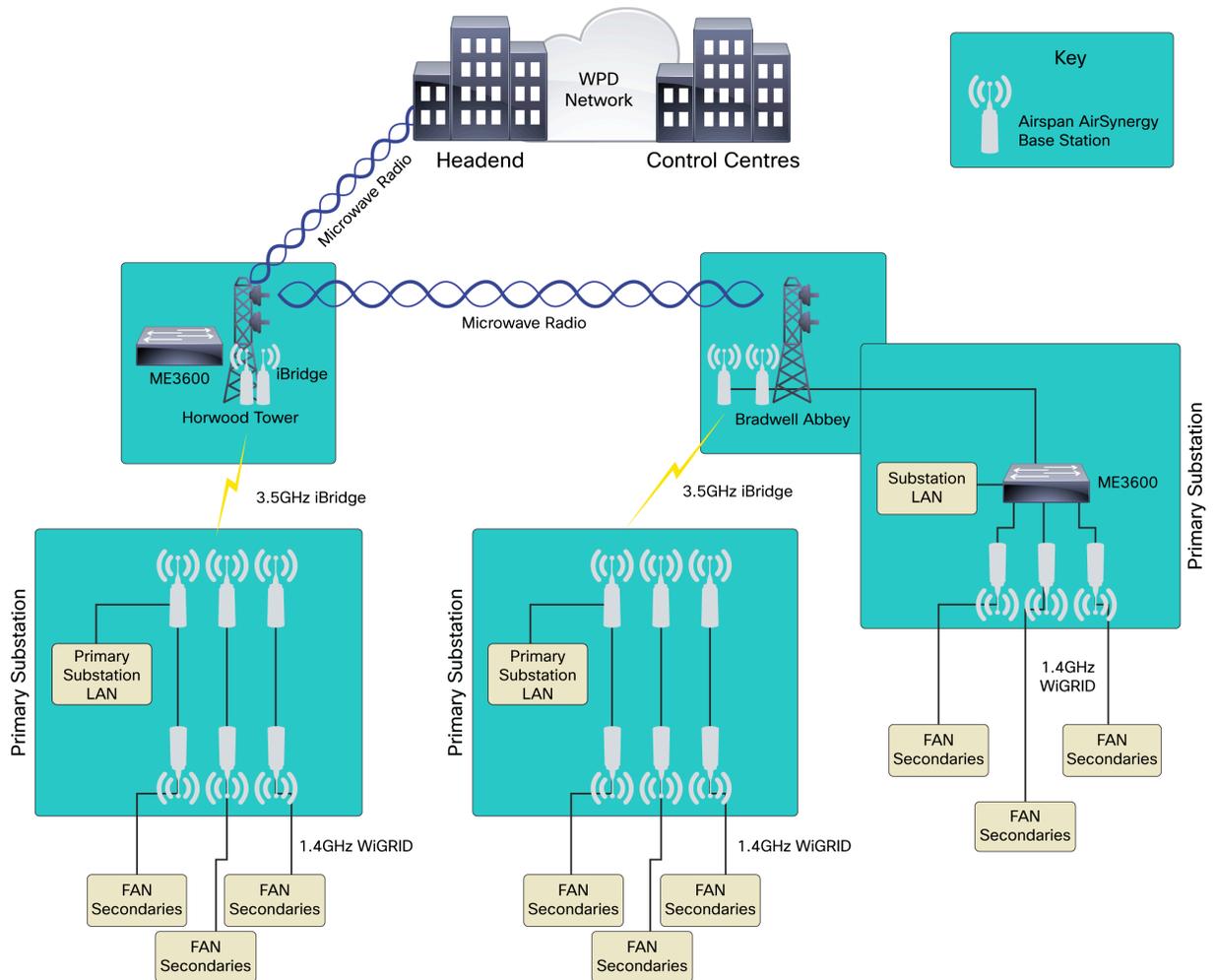
Communications Network Pilot

The pilot communications network, located in and around the town of Milton Keynes, was designed to generate improved load-forecasting information to inform the reinforcement analysis, on the hitherto unmonitored but essential 11-kV electricity network (see Figure 1). Managers for the project set the goals of:

- Providing a better understanding of the applicability and costs associated with alternatives to conventional 11-kV reinforcement techniques
- Helping enable tuning of the common set of evaluation criteria
- Supporting the addition of new criteria (e.g., grid utilization percentages)
- Providing better asset information, allowing a greater focus on minimizing total lifetime cost
- Supporting investment decisions made in longer timeframes
- Helping operators base investment decisions on a broader range of criteria, including managing uncertainty, helping ensure deliverability, and minimizing risk



This private communications infrastructure pilot securely interconnects newly deployed assets at one control center, nine primary substations, and 200 distribution substations. The communications network transports both monitoring and control traffic for the intervention techniques. It is based on the IPv4 standard and related technologies, and the primary and distribution substations utilize an Ethernet-based station bus.



Within the primary substations, a Cisco 2010 Connected Grid Router (CGR2010) is deployed to provide WAN routing and firewalling. This is connected to an Airspan AirSynergy node to provide combined wireless backhaul and WiGRID access. A Cisco Connected Grid Switch (CGS2520) is connected to the CGR2010 and provides the IEC61850 station bus, which connects the substation's remote terminal units (RTUs) and intelligent electronic devices (IEDs). Multiple Airspan Airsynergy devices provide Pico cell coverage from the primary substation to the secondary low-voltage substations.

Within each secondary substation, a Cisco CGR1240 router is deployed with a 1.4 Ghz WiGRID module. This device provides Ethernet connectivity within the substation and uses the WiGRID network to backhaul the traffic. Existing communications to the substations are based on WPD's existing UHF radio network. As the new monitoring and control functions are deployed over the WiGRID communications network, it is anticipated that all traffic will be gradually migrated from the UHF infrastructure.



Results

The key objectives of the Cisco communications network solution for WPD included:

- Designing and deploying an IP-based communications infrastructure using IEEE 802.16e WiGRID access and backhaul technologies
- Helping ensure adherence to WPD's security policy for design and implementation
- Learning and disseminating all information and findings related to the technologies deployed so far.
- Creating a blueprint for WPD and for other utilities in the United Kingdom as they test the same intervention techniques

To learn more about this program and specific results, please contact your Cisco representative.



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