UK Power Networks

Dynamism of Distributed Generation Requires a Flexible, Robust and Long-Term Model

BACKGROUND

UK Power Networks has implemented an innovative approach to offer real-time control of its power grid and to enable additional generation to connect without the need for expensive upgrades.

THE CHALLENGE

Faced with rising demand for distributed generation (DG) connections, UK Power Networks was looking for a solution to help it manage the impact of large solar and wind plants within its East of England service territory. The distribution network operator selected Itron to deliver a standards-based RF network relay interface to integrate distributed generation in a cost-effective manner.

The Flexible Plug and Play (FPP) project is supported by regulator Ofgem's Low Carbon Network Fund, its ongoing commitment to making Britain's electricity grid smarter. The FPP project demonstrates how to leverage innovative technological solutions to cost-effectively use DG to alleviate distribution network constraints. In addition, this project proves the ability to leverage an RF mesh network to implement IEC-61850 and DNP communications, while meeting the stringent requirements for high availability, low latency, and effective failover.

UK Power Networks' aim in selecting Itron as a communications partner was to find an effective, long-term approach that could be used for the generation of connections to come forward in the future. Utilities and cities around the world rely on Itron's critical infrastructure platform to connect their intelligent devices. Itron's standards-based networking platform has seamlessly connected an array of smart grid and smart city applications to provide the most reliable connectivity for more than 21 million devices on five continents. And, in the process, Itron has solved one of the market's toughest engineering challenges – building and operating massive-scale machine-to-machine networks that securely connect these millions of devices in varying climate conditions and topographically diverse environments.

The £9.7 million FPP project was delivered on-schedule and finalized in December 2014, with Itron successfully deploying a network across a vast, rural area of 700 km2 between Peterborough and the towns of March and Wisbech in Cambridgeshire.

CUSTOMER

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OUTCOMES

- **87%** reduction in connection costs for DERs
- **27** weeks: average time saved on connection requests
- **17%** increase in acceptance rate of connection requests

TECHNOLOGY

- The Itron Gen4 network provides last mile communication from DERs to the system head-end
- Active Network Management system for real-time DER management

THE INNOVATION

Communications Infrastructure Ensures Grid Reliability Across A Rural Service Territory

In order to provide more cost-effective connections, UK Power Networks was interested in maximizing the existing electricity network capacity through smart technologies. UK Power Networks selected Itron as a communications partner for the FPP trial, along with Cable&Wireless Worldwide (now Vodafone) and Fundamentals. The project leveraged Itron's IPv6-based smart grid communications network platform, software and services to deploy an Internet-like, high-speed telecommunications platform to enable novel control and monitoring smart technologies.

Features for Itron's IPv6-based smart grid, along with those used for the UK Power Networks FPP project, include:

- Multi-hop networking to extend the reach of a critical infrastructure network
- Easy installation on existing assets with standards-based network interfaces
- Interoperability with smart grid applications, such as advanced metering infrastructure (AMI), demand response (DR), outage/restoration management, distribution automation (DA), and smart street lights
- Highly flexible deployment options

At the core of the FPP project, a joint solution from Itron and an additional UK Power Networks FPP partner, Smarter Grid Solutions, helped connect an array of distribution equipment across a deployment of intermittent wind and solar resources in the FPP trial area, enabling UK Power Networks to proactively manage renewable energy sources and grid devices. Smarter Grid Solutions' Active Network Management technology monitors the electricity grid using data provided by the Itron IPv6, standards-based network. The system autonomously calculates the available capacity of the grid and issues real-time control instructions to participating Distributed Energy Resources (DERs). For the first time in the industry, the deployment also successfully demonstrated the use of the IEC 61850 protocol across a radio mesh field area network.

Site Surveys Ensured Optimized Network Performance

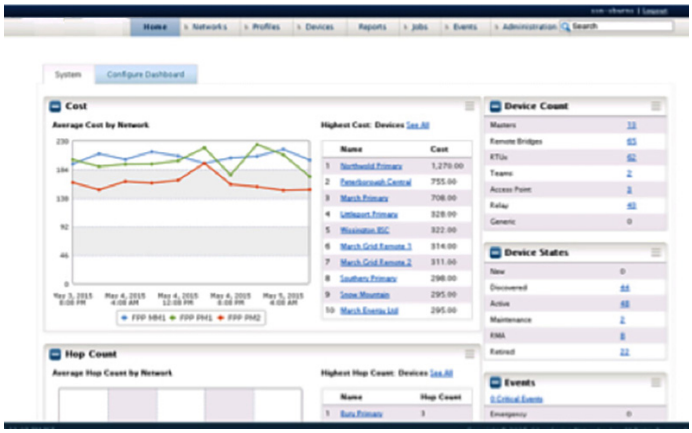
UK Power Networks chose to deploy the project in the vast, rural area due to large increase of renewable generation connection requests and its favourable characteristics for distributed generation.

VALUE DELIVERED

Connecting Distributed Sources Complete

The FPP implementation and testing period began in January 2012 and was successfully completed in 2014. UK Power Networks reported in June 2014 that "there were as many connection requests made in the first half of 2014 as in the whole of 2013, and a higher acceptance rate is being achieved than typically seen with traditional DG connection offers."

Monitoring the Network to Ensure Low Latency and High Reliability



For the first time in the industry, the deployment successfully demonstrated the use of the IEC 61850 protocol across a radio mesh field area network.

Communicating Nodes on the Itron Network

Itron completed deployment of the network in December 2014 across 700 km2 in East England, between Peterborough and the towns of March and Wisbech in Cambridgeshire.

The FPP project has also continued to engage and recruit customers for its duration. According to UK Power Networks, as of November 21, 2014, "15 flexible connection offers have been accepted by customers to be connected on the distribution network. These fifteen accepted customers represent a total of 54.4 MW across wind, PV and Anaerobic Digestion generators connecting at different voltage levels on the distribution network (33kV, 11kV and LV)." The project has also delivered significant connection cost savings in excess of £20 million to those customers.

The technical diversity of the connections enabled by partners including Itron will continue to provide UK Power Networks' teams with extensive experience and rich knowledge that is invaluable beyond the length of the project. UK Power Networks now has the option to leverage this existing platform to develop new tools for generators of renewables in the future, while also proving out a new model to other distributors to remain relevant and leverage a multi-application for various solutions in the future.

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