UK Power Networks
Delivering your electricity

Smart Urban Low Voltage Network

Funding mechanism:	LCNF Tier 1
Project budget:	£2.1 million
Status:	Live Start date: July 2012 End date: March 2015

Project concept/overview/challenge

UK Power Networks and TE Connectivity have been working in collaboration to develop a new solid-state switching technology for use on Low Voltage (LV) distribution networks. The devices developed retrofit to existing LV plant, and the system provides previously unavailable remote switching, visibility and reconfiguration of the LV network.

This project is carrying out a large-scale trial of the technology in two areas of the London LV network. Secondary substations have been equipped with circuit breakers and link boxes with switches or demand monitoring devices. The potential for helping network operators address the challenges faced with the transition to a low carbon economy will be investigated.

Stakeholder benefits

Network Planning at LV

- Improved modelling of the LV network utilising the extensive load monitoring data provided by the circuit breakers and link box switches.
- Optimal utilisation of existing LV plant, enabling better informed and targeted network reinforcements.

Control Room and Network Operations

- Enhanced operational management of the LV network provided by visibility of the real-time network running arrangement and load monitoring information.
- Ability to remotely reconfigure the LV network and introduce automated switching to create an automated, self-healing LV network.

- Optimised network configuration to reduce fuse operations due to overload conditions, and therefore enable more efficient use of faults field staff.
- Circuit breakers (CBs) and switches utilising arc-less switching technology will provide an improvement in the safety of operational staff working on the network.

Connections

- A more granular view of how the network is loaded will enable more informed decisions to be made regarding connection requests (potentially taking into account phase imbalance for single phase connections).
- An understanding of how active network management (ANM) of the LV network may facilitate the connection of additional and low-carbon loads.

What we are doing/deliverables

- Industrialisation of hardware and development of a link box load monitoring device to retrofit into older cast iron link boxes.
- Development of a three phase low voltage connectivity model in GE's PowerOn Fusion and integration of the low voltage hardware.
- Deployment of the technology and evaluation of the potential benefits which are expected to include reduced losses, increased capacity headroom, early visibility of emerging loading or power quality issues and improvement in quality of supply.
- Demonstrate ANM and remote reconfiguration of the LV network.

Progress

- Remote network reconfiguration and load transfer has been demonstrated on UKPNs LV network using prototype devices.
- Training has been delivered to commissioning engineers and operational staff.
- A fully interactive PowerOn Fusion LV control diagram has been developed for the trial area.
- The LV remote control and automation devices have been integrated with the LV control system, and operated remotely during testing.
- Following user acceptance testing in a controlled environment, live network testing has been carried out in the Ilford area of London and the results assessed.
- Further tests are now being undertaken to ensure that the system's hardware and software work effectively when installed onto the network.

Next steps

- Deployment of the system onto the network started in September 2014.
- Refresher training will be delivered to commissioning engineers and operational staff prior to deployment of the devices onto the network.
- Undertake detailed network modelling incorporating the load monitoring data provided by the system.
- Run several case studies based on network running arrangements optimised for specific investment drivers such as losses optimisation and increased capacity headroom.
- Implement network automation scripts and demonstrate automated switching.

Partners

GE

TE connectivity