

Customers



Above: recently installed hybrid systems

Project FREEDOM brings together the electricity and gas network operators. Registered jointly between Western Power Distribution (WPD) and Wales & West Utilities (WWU) the project aims to provide both organisations with data which can make a meaningful contribution to long-term network planning and system operation from using a hybrid heating solution. The project will deliver a network level demonstration of domestic demand response using hybrid heating solutions, combining gas boiler and air-source heat pump technology, which can be used as flexible loads in domestic properties.

Project FREEDOM runs from October 2016 to April 2018, and will use 75 domestic households in the County Borough of Bridgend, South Wales, for the trial. We are deploying three hybrid heating systems i.e. Samsung, Daikin and MasterTherm. Wales and West Housing Association (WWHA) were allocated 40 MasterTherm heat pumps and the other 35 households, mainly private, were allocated Daikin and Samsung heat pumps. To date, 74 out of the 75 households have had the heat pumps installed, with the only remaining one being a MasterTherm to be retrofitted to an existing boiler. The installation is likely to be completed in the first week of November. For the installed units, the hybrid heating controls have been deployed, regularly used and operating well. Early control strategies have been implemented with the aid of City University. We continue to develop the wireframes/graphical interactions on energy consumption, demand response and budgeting. We are also focused on customer engagement to ensure that all tenants and homeowners are educated about the FREEDOM Project, including the scheduled hybrid heat pump experiments that are due to commence over winter. Pre-trial surveys are being completed and the data is being gathered.

The survey can be viewed here: <https://www.surveymonkey.co.uk/r/MPS2ZCL>

LV Connect and Manage began in April 2016 and will be complete by March 2019. The main aim of the project is to develop LV Active Network Management (ANM) solution, which will allow the connection more Low Carbon Technologies (LCTs) in customers' homes by reducing the impact of additional demand to the electricity network.

WPD is recruiting 50 households in West Bridgford, Nottingham for the Electric Vehicle (EV) smart charger trial and 50 customers in Furzton, Milton Keynes for the battery storage trial. These two areas were chosen due to the existing high penetration of LCT technologies in the local network and provides a good representation of challenges that we will face due to growing uptake of EV, solar generation and other LCTs.

A customer engagement video and project website; www.wpdconnectandmanage.co.uk, have been produced to increase customer numbers. Recruitment of customers reached 33 out of 50 for the battery inverter trials and 25 out of 50 for the charge point trials (58 out of 100 for the overall project). A £25 incentive refer-a-friend scheme was introduced to attract more participants.

Eighteen EV charge point installations in customer's homes are now complete. Results from the post-installation satisfaction survey show 100% of people are happy or very happy with their equipment. Two of the battery storage installations have been completed in Milton Keynes with more scheduled for November.



Above: recently installed battery storage system

Assets

The **OpenLV project** is inviting the submission of ideas for how data from local electricity networks could be used to develop new apps. Such data has never been available before, and is soon to be opened up by the OpenLV project.

OpenLV, led by project partners EA Technology, is trialling an open software platform in electricity substations that can monitor substation performance and electricity demand, as well as other important power quality measurements such as voltage and temperatures.

The OpenLV project team is looking for ideas for new apps that can utilise such Low Voltage (LV) network data to provide benefits to Distribution Network Operators (DNO), community groups, industry, academia and, of course, customers.

The value of third party apps providing useful data has been demonstrated previously by Transport for London (TfL), where they allowed commercial organisations to develop apps to assist people with travelling across the capital. There are now hundreds of apps built on the back of TfL's data, which reach millions of London transport users and deliver tens of millions in monetised time savings to its core customer base, all for relatively low investment.

Organisations or individuals with ideas for apps that could be developed as part of the OpenLV project should complete a survey to register their interest at: www.openlv.net/about/the-project/for-business-and-academia. To watch a short video that explains the OpenLV project visit: www.openlv.net/resources



Network Equilibrium, WPD's largest network innovation project aims to release significant network capacity through intelligent voltage and power flow control on both the 33kV and 11kV networks. The project started in March 2015, is based in the South West of England and the project's current focus is the technical delivery of two key methods, System Voltage Optimisation (SVO) and the Flexible Power Link (FPL).

SVO is a centralised voltage control system that will optimise the network voltages in through the management of the voltage control settings at 16 existing substations. It will achieve this by utilising a new real-time modelling system, Siemens' Spectrum Power 5 technology, which receives real-time network data, such as voltage, current and system status, from our Network Management System (NMS) and then calculate and transmit the optimised voltage control settings to the substations' voltage regulating relays via the NMS. The full and integrated system has now undergone Factory Acceptance Testing (FAT) at Siemens' laboratory in Nuremberg, Germany. Following the successful laboratory based testing our NMS system has been updated to enable the successful integration of the new system. System Integration Testing (SIT) has now successfully been completed; whereby a large number of scripted end-to-end tests enacting what would happen on the live system were undertaken in WPD's controlled environment. The next steps of the project are to carry out testing with the system on the live network, monitoring the system and provide an industry wide report; this is scheduled for April 2018.

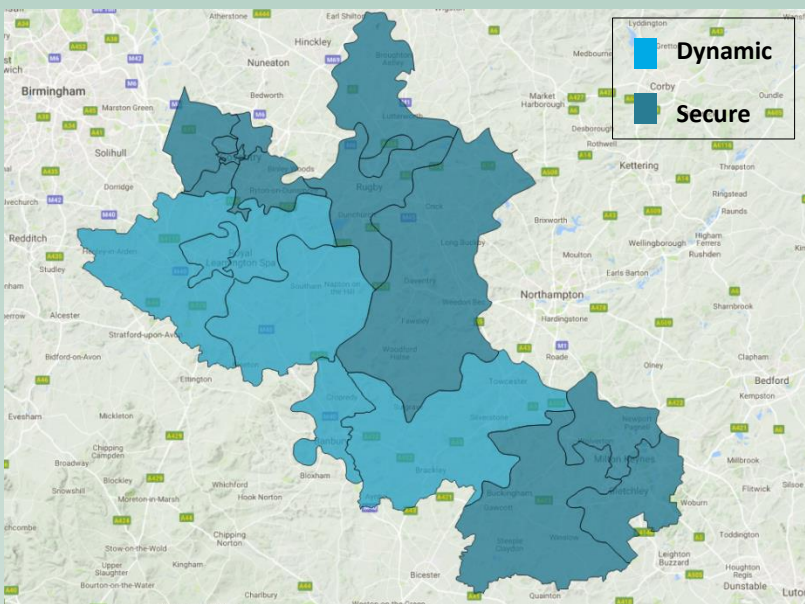
The **FPL** is an AC to DC to AC converter technology, based on previous learning from HVDC interconnector schemes, which, in this instance, will enable the connection of two previously isolated 33kV networks. The FPL will enable the control of real power through the system as well as independently controlling reactive power at each side to enable accurate voltage control to also be considered. The aim of the power and voltage control is to more easily facilitate the connection of generation and load on networks, without the need for significant reinforcement. As with the SVO the FPL has undergone specific design and built criteria; this has focussed on ensuring that the technology is designed specifically for the inclusion in to the 33kV network in the South West region at Exebridge substation. The design work was completed in April 2017 and the build process was recently completed which has enabled testing of the individual elements to be undertaken. As the FPL operates at 3.25kV, a transformer is required, which is specifically designed to remove harmonics generated by the power electronics within the FPL. This was successfully tested at the manufacturing facility in Croatia in October and the FPL converter (*pictured right*) was tested in August. Following the completion of testing the complete device is scheduled to be installed at Exebridge substation during November, with commissioning and installation planned for the early part of 2018.



Operations

WPD has now finished the review of **project Entire**. Discussions with Ofgem highlighted that they did not think models where the DNO acts as a commercial operator were in the long term interests of customer. As such the stacked service has been removed from our Flexible Power offering. This will allow us to focus on the effective delivery of the Constraint Management Zones (CMZ) service. Revenue stacking remains a priority to make DNO led Demand side Response (DSR) viable, as such the CMZ services have been designed to fit into wider market schemes as simply as possible.

We have also taken the opportunity to redesign and expand the CMZ offering. We are now offering three DSR services to address different operational requirements on the Distribution Network. The services are called **Secure**, **Dynamic** and **Restore** and will be tested in 14 CMZ in the East Midlands between April 2018 and March 2019. These zones are highlighted below:



Secure and **Dynamic** are main response services and operate to reduce predictable stresses on the distribution network. Each zone will operate *either* a Secure *or* a Dynamic service (as highlighted on the map). Both services are used to manage known conditions of increased risk on the network. The advance notice is intended to assist participants in assessing their ability to declare capacity whilst minimising conflicts with any other DSR programmes.

The **Restore** service is an additional service and would only be activated in the event of rare faults occurring on the network. The service would help manage an incident and expedite the process of reinstating normal operations. Restore will be available across all the zones and is optional.

The CMZ services are available to half hourly metered customers in the target area who can increase generation output or reduce demand within 15 minutes of being called and can hold the response for at least 2 hours.

Please register your interest in the CMZ products by completing the site engagement form on the website:

www.flexiblepower.co.uk/FlexiblePower/media/Documents/FP-Site-Engagement.docx by **17.00** on **15/12/2017**.

The Common Information Model (CIM) project

aims to combine data from our key systems including our asset database, graphical user interface and network management system. Once combined, the benefits of having data in the CIM format, which is an international standard for describing distribution networks and related energy data, will be explored. This will include importing our network models into new software, using the format for interfacing and sharing the data with stakeholders.

CGI have been working to combine WPD data for 11kV, 33kV and 132kV networks for the South West region and have been able to cross reference network assets between the systems and compare information. This is not as simple as it sounds as the different systems don't contain all the same assets and don't always have the same asset IDs to enable records to be cross referenced. Building on work carried out for the FALCON project in Milton Keynes, CGI have developed algorithms and inference rules to help match assets together. The asset matching is now sufficiently advanced so that some potential data errors can be highlighted. For example where a site is shown as having one transformer in one system but two in another, or where the switchgear is shown as a pole mounted recloser in one system but as a pole mounted switch in another.

These potential errors have been fed back to system owners, who can also access data about the contents of fields. This allows other errors to be spotted such as where misspelled variants of valid options are present, or how many times a field has a null value.

Given that data provision has been identified as a potential barrier to smart grid capability, being able to understand the potential scale and nature of data issues is a valuable step.

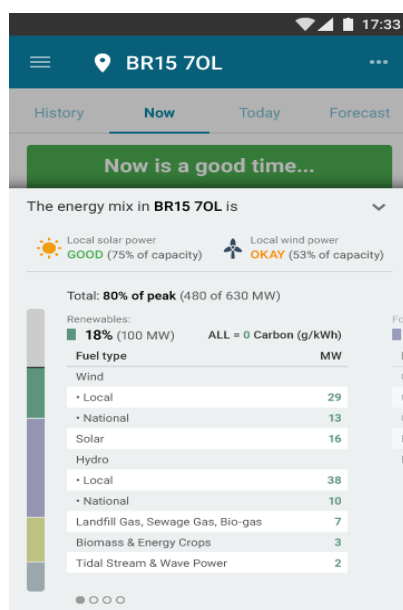
New Projects

The Carbon Tracing Project is a joint venture with the Carbon Trust which seeks to investigate the extent to which customers are interested in how their energy is made up. With solar and wind generation continuing to expand, there is now real meaning in relating how much these renewables, as well as other energy sources, are contributing to their energy mix.

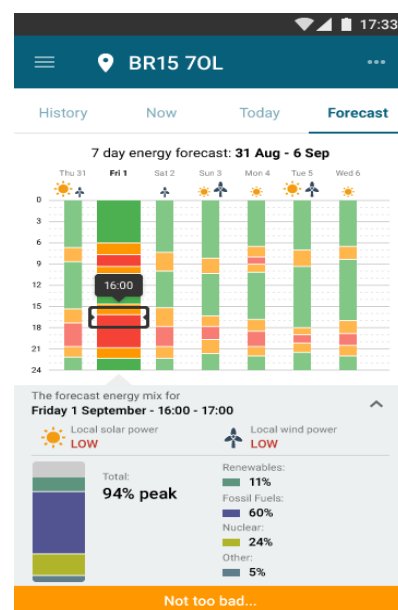
The project will provide a mobile app and shadow website to allow customers with an interest in knowing more about their electricity to investigate the different types of energy supplied to them. The data behind the app is taken from a number of sources both internal to WPD and from real-time external data feeds. The data feeds include the Balancing Mechanism Reporting Service (BMRS), which is provided by Elexon and gives the national energy mix and weather feed. The weather data is used to scale back the attached declared capacity for generators affected by prevailing environmental conditions such as cloud cover, wind speed and precipitation and when taken along with season and time of day information yields a current value for local generation by type and in total at the Bulk Supply Point (BSP) level. Current demand at the BSP is taken from characteristic normalised load curves and known peak demand values. All of WPD is covered and the user can look at a current (*Now*) screen, a *Today* screen and seven-day *Forecast* and *History*.

The project will report carbon intensity as well as energy mix with a variety of breakdowns available. Through educating and informing customers and also by offering them the chance to declare their own intention to shift energy consumption on the basis of the information provided to them within the app, we also seek to determine the extent to which behaviour can be influenced by green criteria.

The app and website are currently in the early stages of testing and initial reviews with a trial user group are just being completed. We hope to deploy the app for customer download in early 2018.



App NOW Screen Mock-up Showing Current Energy Mix and Call to Action



App 7 Day Forecast Mock-up Screen

2018 NIA Call for 3rd Party Proposals

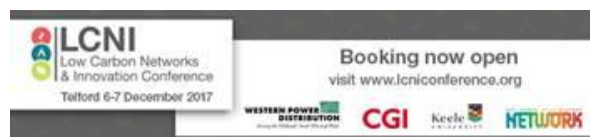
We have for the last three years run an open and competitive call for third party led Network Innovation Competition (NIC) project and will, in January 2018, run a Network Innovation Allowance (NIA) third party call for projects. The call will focus on the three pillars of our innovation delivery programme, Assets, Customers and Operations. NIA projects are able to focus on solutions from one to eight on the Technology Readiness Level (TRL) scale, which we're hoping can provide a wide and varied range of projects from feasibility, systems and technology trials.

More information will be provided in January 2018 and the call will be released through our innovation website, ENA's Collaboration Portal and UVDB Achilles.

Find out more

Website: www.westernpowerinnovation.co.uk
Email: wpdinnovation@westernpower.co.uk
Telephone: 01332 827446

Western Power Distribution will be disseminating learning from our innovation portfolio and exhibiting at the 2017 LCNI Conference:



Visit www.lcniconference.org to register