

## Networks

WPD are currently involved in **Project Airstart** ([www.projectairstart.com](http://www.projectairstart.com)) as an end-user case study. Airstart is a collaborative research and development project developing key technologies to support routine small Unmanned Aerial Vehicle (UAV) operations Beyond Visual Line of Site (BVLOS).

Commercial small UAVs are becoming ubiquitous in our society, in applications from film-making to surveying. However, one issue is seriously limiting their wide scale use – the ability to safely and routinely operate and gather information outside of line of sight of the operator. Key activities of benefit to society, such as search and rescue or power utility linear asset inspection will only be realised if UAVs can safely operate over longer distances.

WPD are working closely with Blue Bear Systems Research who are pioneers of autonomy and unmanned systems. Blue Bear are focused on an element of the project which is looking at developing a real-time sensing and mapping solution to allow safe navigation relative to infrastructure rather than absolute positioning based purely on GPS. This capability will also be extended to develop new concepts of operation for enhanced user support for infrastructure inspection tasks, including assisted identification of faults / hazards and long term sensor exploitation.

WPD has provided an insight in to our existing inspection regime which Bluebear have used specify the UAVs and sensor setups to be used. The first real world trials on WPD assets are looking to take place at the end of August where Blue Bear will trial both a fixed wing and rotary UAV on both tower and pole overhead lines.



*A Blackstart fixed wing UAV which will be used in the project.*

WPD are leading a UK DNO collaborative project, **Improved Statistical Ratings for Distribution Overhead Lines.**

Distribution overhead line ratings are based on CEGB research work and assumptions from nearly 30 years ago. Recent work testing these assumptions have found some of them to be erroneous, with the result that existing distribution line ratings are now considered out of date. In addition, changing demands on networks are increasing the pressure to maximize overhead line capacity. Considering that existing ratings take no account of regional differences in climate, nor of any changes in climate that may have occurred over the last 30 years, this means that load-related decisions to replace or reinforce lines are currently based on inaccurate ratings.

Under this project, a test rig in Stoke on Trent will be operated continuously at a set current for 24 months, with conductor temperatures and weather conditions recorded at specified time intervals. At the end of the first 12 month period, an in depth analysis of the data collected will be undertaken. When the data collection activity has been completed, following intensive data analysis the OHRAT and OHTEMP tools (which calculate line ratings and temperatures respectively) will be updated. In addition a new tool will be developed, building on the algorithms developed for the OHRAT/OHTEMP update, to allow alternative weather data sets provided by the Met Office (or from other sources) to be analysed, enabling more comprehensive line rating assessments (regional or line specific) to be made. By using predicted weather datasets, assessments could even be made about future line ratings, taking climate change into account.

# Operations

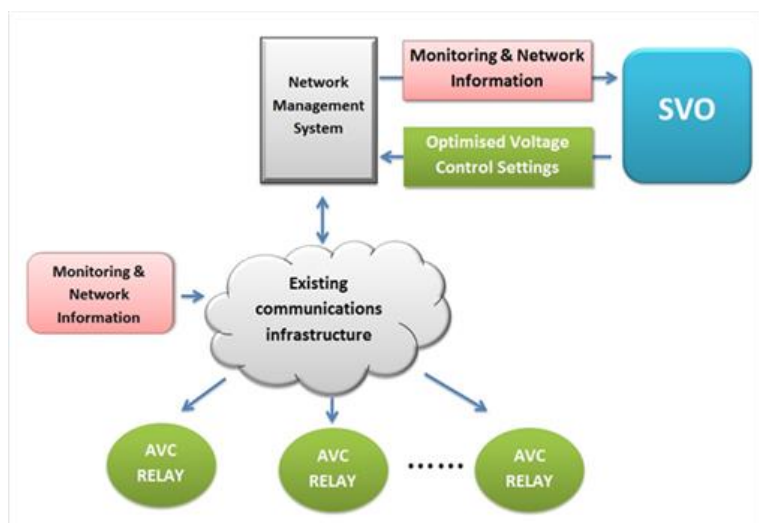
The **Common Information Model** Project is seeking to answer three questions:

1. What processes are required to take data from core systems, cleanse it and compile it to comply with the Common Information Model; IEC standard 61970/61968.
2. What is the value of having data in this format to third parties and does it justify the cost of producing it?
3. What benefits are there within the DNO of using this format for data, for example as the basis of creating interfaces between systems?

With the adoption of smart grids and the transition to Distribution System Operator (DSO) we will be using information about our network to support new planning tools and business processes. As well as supporting wider use of our network data for planning by third parties, we will be working more closely than ever to co-ordinate with third parties such as National Grid, electricity supply companies and providers of demand side response services.

This project will look at how we can create a CIM compliant network model by extracting data from a significant number of legacy systems, cleaning the data and linking it together. Having created the CIM model, this will then be shared with stakeholders including National Grid, software developers, universities and councils to determine the value of providing data in this format. This will help inform the industry of emerging stakeholder requirements and how we can best meet them. The project will commence in July and run until about September 2017, it will utilise network data for the whole of the South West and then share data for Cornwall with various third parties. We expect if this is successful to be able to then move to a business as usual project to roll this out across the whole business.

**System Voltage Optimisation (SVO)**, one of the three **Equilibrium Project** technologies, is an intelligent method of voltage control which aims to optimise the voltages in 11kV and 33kV networks to increase network capacity. The traditional voltage control philosophy of keeping the voltage as high as possible using static target voltage settings has been designed for demand dominated networks. Therefore, it is not suitable for modern electricity distribution networks and limits the amount of embedded generation that can be connected to the network.



*Illustration of the SVO Architecture*

SVO aims to solve this problem by assessing the state of the network in real time and dynamically adjusting the target voltage settings at 8 BSP and 8 Primary substations in Somerset & Devon. The SVO system will be connected to WPD's Network Management System, PowerOn, to receive network information and send the optimised voltage control settings to the network equipment. Siemens will be implementing SVO with their Spectrum Power 5 Technology. SVO is currently in the detailed design phase with a number of experts from within the business working with Siemens to finalise the system architecture.

**Equilibrium's Advanced Planning Tool (APT)** aims to enable better network and outage planning of distribution networks with increasing penetration of variable generation and demands. The APT, among others, will include the production of forecasted power flows using weather forecasts and the network analysis using typical demand and generation profiles while also enabling the planning of Equilibrium's technologies. The development of the tool by TNEI is under progress with the forecasting functionality, the typical profiles and the first version of the FPL and SVO plugins complete.

## New Projects

**CarConnect** is a recently registered the NIA project which will ensure plug-in electric vehicles (PIVs) charge at home in harmony with the electricity grids capacity.

Electric and plug-in hybrid cars are becoming a practical choice for drivers, with the variety of makes and models available on the market continuing to increase. In the last two years alone, the UK has seen a 716% increase in PIV registrations. With increases in battery size and charger rating, PIVs and hybrids are set to become commonplace, with a widening mass appeal. Analysis shows that by 2050 the electricity industry in Great Britain may have to invest an additional £2.2billion to upgrade electricity supply infrastructure to customer premises owing to the additional demand from plug-in-vehicles.

CarConnect is hosted by Western Power Distribution and delivered by EA Technology, Drive Electric and Lucy Electric Gridkey. CarConnect will find solutions that could avoid the need to replace electricity substations and cables to customers' homes and workplaces, saving significant cost and disruption to customers. The project will run for three and a half years and will demonstrate the concept of co-ordinated EV charging at an appropriate scale to develop operating standards and policies. It will also evaluate the implication of vehicle to grid power transfer capability. This project will deliver:

- A functional specification and commercial framework for future procurement and deployment of Plug In Vehicles (PIV)/Vehicle to Grid (V2G) Demand/Export Control Services by DNOs to delay or avoid network reinforcement in cases where PIV installation numbers create network stress.
- An Electric Vehicle LV Network Assessment Tool for DNOs.
- A technique to monitor and understand the effects of electric vehicle charging on LV networks across different levels of penetration.
- The policies, procedures and training to enable WPD (and other GB DNOs) to adopt the LV Network Assessment Tool and PIV/V2G Demand/Export Control Services into business as usual nature of the in-house operation.



**Project ENTIRE** commenced in June and is a four year project that will be building on the lessons learned from the commercial trials within Project FALCON. It is proven to be very difficult for customers to participate in multiple DSR (Demand Side Response) programmes due to conflicts between a DNO's contractual requirements and those offered by National Grid, we are seeking to address this. We will look to recruit customers to contract with WPD while developing new systems and contracts with large commercial customers, which will then enable us to sell aggregated capacity into other DSR schemes when we don't need it, such as balancing services procured by National Grid. Initial engagement will begin with owners of existing generation to explain the benefits of joining our new DSR scheme, which will include regular payments for making their assets available to WPD and third party DSR opportunities.

New systems developed within the project will provide the ability to manage customer's assets such as stand-by generators and large loads from heating, cooling and pumps. We will be able to monitor these in real-time from a new Control Room facility to ensure that they are available, as well as start, stop, meter outputs and settle the billing for the services they participate in.

The project will be focussed on two locations within the East Midlands that have been identified as requiring new GSPs (Grid Supply Point) which is major capital works that will take several years to complete. WPD will use the new DSR capability to reduce peak winter demands and potential constraints on the existing GSPs which are becoming increasingly heavily loaded and reduce any operational risks associated with them.





## Customers



**LV Connect & Manage;** Due to uncertainties in volume, location and type of low voltage (LV) connections, it is not possible or efficient in every circumstance, for WPD to plan network reinforcement ahead of need. If rapid clustering occurs (such as with electric vehicles and PV installations) on LV networks, low carbon technology (LCT) connections may be subject to costly and time-bound reinforcement schemes, delaying customers' connections to the network.

Technology for LV Active Network Management (ANM), which extends communications and controls to customers' meters and is able to deal with bi-directional power flows, is still unproven and needs to be trialled by WPD in a low-risk way, to assess whether or not this option is a viable alternative to network reinforcement.

This project will deploy controlled domestic energy storage and controlled electric vehicle charging across 100 homes in Nottingham and Milton Keynes to develop and demonstrate the DNO control system and customer control equipment required to enable bi-directional active load management on an LV network. Substation monitoring installed on our network, and equipment installed behind the meter in customers' homes will communicate via Broadband over Powerline and curtail charging of LCTs to ensure the network stays within limits.

If successful, this technology could be supplied to customers to install within their homes and manage their loads until WPD has carried out the required reinforcement, enabling cheaper, quicker and more efficient connections for customers.

**Customer Export Limitation Scheme;** Western Power Distribution has led the other DNOs in developing a policy to allow customers to connect more generation behind the meter in order to balance their own local demand. WPD's SD1E standard technique has allowed more generation to be connected in a consistent and transparent manner since its launch in July 2015. Other DNOs have used this document as a basis for a new ENA Engineering Recommendation – G100, which will be published once ratified by all network operators.

## Find out more

**Join us at our upcoming conference; Future Networks – A Balancing Act**

**8<sup>th</sup> September 2016: 09:30-16:00 Etc Venues, Victoria Conference Centre, London.**

Discussions will include; The changing nature of the electricity grid, the role of Distribution Network Operators and the transition to Distribution System Operators, intelligent ways of controlling power flows and voltage, providing customers with greater choice for their energy connection and more advanced methods of network management and planning.

**Visit our website for more information and details of how to register**

**<http://www.westernpowerinnovation.co.uk/Events/WPD-Balancing-Act-Event.aspx>**

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