electricity north west

Bringing energy to your door

Our small-scale low carbon projects

Electricity North West operates the electricity network in the North West of England. It's our job to deliver a safe, reliable supply of electricity to the region's homes and businesses through our network of overhead lines, underground cables and substations.

Part of our role as a network operator is to plan for the future. We invest money from customers' bills right back into the region's electricity network.

To meet the decarbonisation challenge laid down by the Government, our customers are being encouraged to adopt new low carbon technologies such as electric vehicles and heat pumps. Government forecasts suggest that there may be up to a 60% increase in total electricity demand in Great Britain by 2050.

As well as meeting additional demand we also need to adapt so that low carbon generation sources such as wind and solar power can connect directly to our network.

> "We need to adapt so that low carbon generation sources can connect directly to our network"

Here at Electricity North West we are preparing for the future in a number of ways:

- We are striving to improve how we manage our network with new research, innovation and technology
- We are developing smart grid technologies to enable us to intelligently manage our network and match supply with demand in the best way possible
- We are developing new flexible contracts to benefit our customers
- We are continually taking steps to reduce energy usage and encourage our customers to use electricity more efficiently.

The projects detailed in this document are funded under Ofgem's Network Innovation Allowance (NIA).

ENWL001

DEMAND SCENARIOS WITH ELECTRIC HEAT AND COMMERCIAL CAPACITY OPTIONS

There is significant uncertainty around the timescale and location of future changes in peak electricity demand. Distribution network operators (DNOs) like Electricity North West need to make assumptions about the timescales and location of demand growth so they can invest efficiently in network capacity. Existing methods of demand analysis and forecast do not capture and address this uncertainty in a structured way.

This project developed and demonstrated better technical approaches to estimating current and future load by distribution network asset, reflecting the associated uncertainties in load. We have delivered a set of scenarios based on a corrected version of past demand which then formed the foundation for assessing two commercial solutions to capacity problems.

Timescales:
April 2015 - April 2017

ENWL002

DISTRIBUTION ASSET THERMAL MODELLING

One of the key challenges facing DNOs today is the expected increase in the uptake of low carbon technologies such as electric vehicles and heat pumps. The increased load on the network will result in distribution asset thermal overload due to higher operating temperatures. In addition, we have limited understanding of the behaviour and performance of distribution assets and their potential to accept increased load.

This project delivered a model which provides greater understanding of the thermal behaviour exhibited by distribution assets. This model could be used by DNOs to maximise their lifetime by applying new understanding to network design, maintenance and asset management procedures.

Timescales:
July 2015 - October 2016

ENWL003

REVIEW OF ENGINEERING RECOMMENDATION P2/6

Engineering Recommendation P2 is a national standard which ensures sufficient capacity is available to meet peak demand in a manner and timeframe consistent with the size of electricity network.

The most fundamental issue regarding the future evolution of the P2 standard is whether it prescribes economically efficient investments, given the many changes affecting the energy market at present. Working with the other DNOs, Electricity North West led a comprehensive review of Engineering Recommendation P2 in relation to customer and system requirements and the long-term development of networks.

Timescales:
January 2015 - July 2017

ENWL004

COMBINED ONLINE TRANSFORMER MONITORING

In line with our innovation strategy to maximise the use of our existing assets, we are looking at refurbishment options for some of our high voltage transformers that are due for renewal.

Under a First Tier LCN Fund project we have already monitored and assessed the condition of six transformers. The data from this project will be further validated and calibrated using a new dashboard/decision tool which we have developed to help explore the optimum life of a transformer.

Timescales:
September 2014 - September 2022

ENWL005

ASSET RISK OPTIMISATION

This project enhanced our knowledge of the issues around optimising programmes of work and investigated the impact of investment decisions on different asset types. Using input generated from our data sources, the project carried out a trial optimisation of the RIIO-ED1 asset investment programmes for grid transformers, distribution high voltage (HV) switchgear, HV pole (supports) and underground link boxes.

Timescales:
July 2015 - March 2017

ENWL006

SENTINEL

DNOs come under scrutiny for their customer service particularly in respect to fault response during severe weather. This mainly affects the rural areas of our network that are predominantly constructed from long spans of overhead lines, and which may be impeded by overgrown trees. Traditionally faults on rural networks can be difficult to locate, which increases the time to restore supplies. As well as impacting on the availability of supply, these faults can become a safety hazard if not detected and repaired quickly.

The £4 million Sentinel project will trial two new fault location techniques on overhead networks. By developing novel fault location sensors, which enable earlier detection and response to broken or damaged conductors, this project will improve the quality of supply for customers who experience weather-related outages and improve the safety of the electricity distribution system.

Timescales:
September 2015 - September 2019

ENWL007

RELIABLE, LOW-COST EARTH FAULT DETECTION FOR RADIAL OVERHEAD LINE SYSTEMS

Rural distribution networks are largely comprised of long overhead lines, controlled via one or more circuit breakers and manually operated line switches, with typically low customer number densities. These networks often represent an operational challenge to network operators, owing to the higher-than-average incidence of faults, the large geographic regions they serve, and the reduced availability of network automation.

The aim of this project was to target how network operators respond to faults after they occur, by providing fault passage information to control engineers in real-time via SCADA. The project developed and trialled fault passage indicator units for overhead line networks. The units are integrated into our network management system which allows us to detect faults in real time and consequently improves restoration times. We have developed a technical specification based on the learning from this project, which is available as an appendix to the project closedown report.

Timescales:
October 2015 - October 2017

ENWL009

CABLE HEALTH ASSESSMENT FOR LV CABLES

Low voltage cables represent a significant proportion of the Electricity North West asset base, yet there is little availability of data to permit asset condition assessment. This project will develop the technology, data processing, support services, business as usual operating model and Condition Based Risk Management (CBRM) modelling required to give network operators the ability to assign health indices to low voltage cables and associated networks.

Timescales:
November 2015 - November 2019

ENWL010

VALUE OF LOST LOAD TO CUSTOMERS

Electricity supply interruptions can have a significant financial and social impact on customers, which vary by season, time of day, customer load and customer type. Understanding the value of lost load (VoLL) is important in determining network planning and investment strategies and will become increasingly important as customers become more reliant on electricity in the low carbon future.

Through an extensive programme of engagement with a diverse range of customers, this project has delivered a comprehensive understanding of VoLL over time and by customer segment.

Timescales:
October 2015 - October 2018

ENWL008

ARCHITECTURE OF TOOLS FOR LOAD SCENARIOS (ATLAS)

Loading is the basis of the requirement for distribution network capacity and supports all distribution network investment, either directly or indirectly. Trends in network loading are a combination of demand and generation, and are increasingly uncertain. Given the challenges of the low carbon future and changes in regulatory requirements, there is a need to update our current load analysis and scenario processes beyond the current focus on peak loading, and develop automated tools to deliver a wider scope of load analysis, and to do this consistently across all network assets.

ATLAS has delivered the methodology, prototypes and specifications for an enduring automated business solution to analyse current load, generate future scenarios and provide indicative capacity assessments.

Timescales: **November 2015 - July 2018**

ENWL0011

ENHANCED VOLTAGE CONTROL

Our Second Tier LCN Fund project, CLASS, has now reached a conclusion and has proven there is a relationship between voltage and demand which can be exploited to reduce peak demand and assist with balancing generation. Although CLASS provided a fit-for-purpose technical solution, it is recognised that other solutions that are more appropriate for business as usual rollout, and the services required, could be available. This project will define the technical requirements to allow CLASS to be rolled out across Great Britain.

The project will also review voltage control settings to allow faster connection of generators to enable us to offer voltage managed connection contracts.

Timescales:
November 2015 - March 2019

ENWL0012

INVESTIGATION OF SWITCHGEAR RATINGS

Historically DNO networks are designed to cater for unidirectional power flow, predictable fault current paths and predictable fault current levels. The increasing amount of generation being connected to the network at all voltage levels will lead to bidirectional power flows, unpredictable fault current paths and higher fault current levels.

While our Respond project has investigated methods of controlling fault level, particularly focusing on the 11kV primary substation circuit breakers, this project developed a short circuit (fault withstand) performance 'envelope' for a range of the more commonly used distribution switchgear variants. This will allow 'tailored' replacement decisions based on the actual fault levels at the equipment location and the actual capability of the equipment.

Timescales:
December 2015 - July 2017

ENWL013

DETECTION OF ISLANDS

An island refers to a part of the network which continues to be supplied by an HV customer generator when surrounding parts of the network are off supply. The combination of altering settings or controls on generators to allow them to remain connected for smaller system disturbances and the increase in demand and associated demand side response contracts, will potentially lead to an increase in the risk of a generator supporting an islanded network on the local distribution system. The problem is how to reliably and economically detect when an island has formed and to determine what steps are appropriate to take once an island has been detected.

The project will investigate the use of SCADA and ADMS functionality to detect and then fragment islands formed on the distribution network.

Timescales:
January 2016 - October 2018

ENWL014

OPTIMISING OIL REGENERATION FOR TRANSFORMERS

A key part of our innovation strategy is to maximise the use of our existing assets. We are therefore proposing that approximately 50% of our 132kV and 33kV transformers due for renewal in RIIO-ED1 will be refurbished and their oil regenerated. This will maximise the life span of the transformers past their original design life and defer their replacement.

The project will carry out field trials using condition monitoring equipment installed at 13 mid-life transformer sites. Analysis of the data provided will enable us to optimise the oil regeneration process and identify the optimum point at which oil regeneration can be used in the life cycle of a transformer.

Timescales:
February 2016 - February 2022

ENWL015

TAPCHANGER MONITORING

There is currently no accurate online means of monitoring the condition of tapchangers to identify when intervention is required for repair, maintenance or replacement. This project will develop, bring to pre-production and trial a tapchanger condition monitoring system and explore other tapchanger monitoring techniques.

Field trials will be carried out over a 24-month period on a representative sample of the transformer population to identify the optimum point at which tapchanger monitoring is required in the life cycle of a transformer.

Timescales:
February 2016 - February 2020

ENWL016

FUTURE NETWORK MODELLING FUNCTIONS

Low carbon technologies and smart grids are asking new, more complex questions of network design and planning. Electricity North West uses a variety of static models for network planning which operate independently and provide a limited range of functionality. This kind of worst case static load analysis is no longer sufficient to meet the challenges of the future.

This research project produced a robust assessment of the expected future requirements for system modelling within a DNO, which can be used to inform strategic decision-making in this important area.

Timescales:
March 2016 - September 2017

ENWL017

ELECTRICITY AND HEAT

Electricity demand will increase and change through the adoption of low carbon technologies and general load growth, including the increased deployment of air conditioning. As traditional reinforcement to accommodate this load could be costly and disruptive, new and innovative solutions are being sought. Air conditioning systems tend to release a significant amount of heat as a by-product which is currently a wasted resource.

This project will investigate the feasibility of utilising the heat currently wasted to improve overall energy efficiency (reducing electrical demand), allowing electrical demand to be better managed.

Timescales:
March 2016 - March 2019

AIR CONDITIONING SYSTEMS TEND TO RELEASE A SIGNIFICANT AMOUNT OF HEAT AS A BY-PRODUCT WHICH IS CURRENTLY A **WASTED RESOURCE**

ENWL018

AVATAR

The customer service landscape is changing. Wide spectrums of political, economic, social, demographic and technological factors are accelerating a shift in our customers' needs and expectations, with some sectors adopting more radical customer service solutions to match to their customer base. Customers today are better informed and more empowered than ever before. DNOs need to understand and predict customers' current and future needs to ensure they maintain and improve upon the level of service provided. Continuous investment is required in the right technologies and techniques that best meet the needs of different customers.

The Avatar project will carry out a programme of detailed customer and stakeholder engagement to deliver a comprehensive understanding of functional and emotional service needs by specific customer group. This will be key in informing DNO policies and investment plans for our new price control period in 2023 and beyond.

Timescales:
October 2016 - December 2019

OVERHEAD LINE RATINGS

Statistical ratings for distribution overhead lines were published nearly 30 years ago and are now considered out of date. In addition, these 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.

Changing demands on networks and the predicted future climate change are increasing the pressure to maximise overhead line capacity. Led by Western Power Distribution, this project delivered a cost-effective, up-to-date and robust methodology for calculating and optimising overhead line ratings at regional and line-specific levels for today and the future.

Timescales:
July 2015 - December 2017

REACTIVE POWER EXCHANGE APPLICATION CAPABILITY TRANSFER (REACT)

In recent years, there have been difficulties in managing voltage levels during minimum demand periods. Analysis of this issue has shown that the root cause is related to the significant decline in reactive power relative to active power. While minimum active power demands have fallen by around 15% in the last five years, reactive power has declined by 50% in this time. Current trends show that this reduction is broadly continuing across the country.

Led by National Grid, this project delivered a model which provided a better understanding of the challenge of managing voltage levels within licence standards. This will help us to plan for additional future reactive compensation requirements and give us a thorough understanding of the reactive power trend. The outputs from this project were used in our ATLAS project.

Timescales:
May 2013 - May 2015

SMART GRID FORUM WORKSTREAM 7

The workstream 7 (WS7) study has broadened our understanding of what a future distribution network is and how it will operate. This study forms part of the Smart Grid Forum work, looking at how electricity network companies will address challenges from decarbonisation of the electricity supply. WS7 was led by National Grid working with all DNOs.

The study carried out the technical analysis necessary to confirm in more detail how the smart grids described in previous workstreams will be realised. This will confirm technical viability and provide an understanding of smart grid characteristics. It will also highlight any new technical roles and responsibilities that a DNO will be required to accept.

Timescales:
July 2014 - September 2016