# NIA Project Registration and PEA Document

## Date of Submission

Oct 2018

## Project Reference Number

NIA_WPD_036

## Project Registration

### Project Title

LCT Detection

### Project Reference Number

NIA_WPD_036

### Project Licensee(s)

National Grid Electricity Distribution

### Project Start

October 2018

### Project Duration

0 years and 5 months

### Nominated Project Contact(s)

Ricky Duke

### Project Budget

£346,020.00

## Summary

The energy market is complex and evolving – particularly with growing smart technologies and embedded, renewable generation. For DNOs, the increasing number of 'invisible' changes (growth of Electric Vehicles (EV), photovoltaic (PV) and other Low Carbon Technologies (LCTs)) challenge existing network practices. At present, technology change is outpacing changes in modelling and forecasting of consumer uptake of 'smart', Distributed Energy Resources (DER) or Electric Vehicle (EV) technology; therefore, it is difficult to monitor or understand the change in requirements on the LV network under existing arrangements, without monitoring EV and DER impacts directly at source (or substation level). While smart meters will improve the visibility of network load and generation in the longer term, there is a need for a solution that can identify unregistered equipment. The problem this project addresses is how to improve WPD's ability to identify EVs, DERs and other LTCs connected to its network so that future operational and future investment decisions can be improved. It will also support some of the informational requirements needed in its transition to a DSO.

## Third Party Collaborators

ElectraLink

IBM

## Problem Being Solved

The energy market is complex and evolving – particularly with growing smart technologies and embedded, renewable generation. For DNOs, the increasing number of 'invisible' changes (growth of Electric Vehicles (EV), photovoltaic (PV) and other Low Carbon Technologies (LCTs)) challenge existing network practices. At present, technology change is outpacing changes in modelling and forecasting of consumer uptake of 'smart', Distributed Energy Resources (DER) or Electric Vehicle (EV) technology; therefore, it is difficult to monitor or understand the change in requirements on the LV network under existing arrangements, without monitoring EV and DER impacts directly at source (or substation level). While smart meters will improve the visibility of network load and generation in the longer term, there is a need for a solution that can identify unregistered equipment. The problem this project addresses is how to improve WPD's ability to identify EVs, DERs and other LTCs connected to its network so that future operational and future investment decisions can be improved. It will also support some of the informational requirements needed in its transition to a DSO.

## Method(s)

The project will use IBM's cutting-edge AI and cognitive analytics capability to extract key information, related to EV/DER proliferation from the DTS dataset. The dataset has been constructed by ElectraLink using over six years of market interactions. This data contains 100s of millions of transactions, structured and unstructured market messages related to WPD's area, across over 100 market processes. The project is looking to improve modelling at LV in particular, though having more realistic distribution substation data/profiles will potentially benefit HV planning.

ElectraLink will extract data sent across the DTS regarding consumption and export relating to WPD's network. This data will be analysed by IBM's cognitive analytics and where appropriate combined with third party datasets, to develop candidate locations for validation. Once validated, this improved an output that can be overlaid onto WPD substation information can be used to develop a reporting framework to enable WPD to forecast future requirements for network monitoring and potential sites for active network management.

## Scope

By using innovative data analytic techniques, this project tackles a key network and operational issue which forms a part of an overarching industry need – the increased requirement for data to support energy market operations. This project will take industry data from the Data Transfer Service (DTS) data set and apply leading-edge cognitive analytics to provide WPD improved visibility of EVs and DER to support forecasting of the proliferation of PV/EV across networks and other DER connections to support network planning including the options of active/flexible network management. The project will help define the requirements for the delivery of an enhanced dataset proof of concept model allowing us to leverage the analytics tools and techniques to support WPD to identify unregistered LCT, understand how best to validate suspected installations and to estimate the likely uptake of technologies in different areas for planning purposes. The project will overlay and analyse data on a number of representative network topologies across WPD's Electricity Service Areas (ESAs). It is likely that all the ESAs will be required in order to ensure a sufficient number of known locations to help train and validate the model. This is particularly true for heat pumps where there are relatively few records. The number of customers assessed for LCT identification will reflect the volumes required to generate a sufficiently large candidate set to validate the model and to identify regional differences in model effectiveness. Many of the project costs are not scale dependent.

## Objective(s)

By using Electralink's DTS dataset, combining this with a range of other structured and unstructured data and then applying IBM's Cognitive analytics, the objective is to identify patterns in the data that indicate the presence of EV, PV or other LCTs that had not previously been identified. IBM will apply its Watson technology to perform advanced analytics on the ElectraLink, combined with other datasets. IBM will use a progressive and iterative methodology to detect patterns in the data that was not detected hitherto. By improving detection of LCT on the network, the project will also build the foundation for improving forecasting capabilities and, ultimately, garner an understanding the effectiveness and costs for the various options would allow for the validation process to be optimised.

## Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

## Success Criteria

The success of the project is predicated on the following:

1. An advanced POC analytics model that identifies LCT on the LV network

2. Introduction of the project to a DNO and energy industry audience at WPD's Balancing Act event in November 2018.

3. Presentation of the final report to a DNO and industry audience at WPD's Balancing Act event in May / June 2019.

4. Analysis of data on a number of representative network topologies across WPD's Electricity Service Areas (ESAs).

5. Validation – recommendations as to what validation approach WPD should use for each candidate set.

6. Delivery to WPD of a POC model - a process design document and demonstration dashboard that will identify Low Carbon Technologies (LCTs) to support network planning and investment strategy.

## Project Partners and External Funding

WPD is the host DNO.
ElectraLink – Project Lead, data, data governance and dissemination activity.
IBM – Supplier of Data Analytics and AI.

## Potential for New Learning

The potential for new learning is significant. The project will develop an enhanced analytics capability; it will have the capability to support existing and developing industry processes, including dynamic network control, network asset management and DNO installation support for smart installations, thus delivering value for money for customers, and accelerating the development of the low carbon energy sector. The project will disseminate its findings across the GB energy networks sector and beyond. Once proven through the project, the data – analytics capability will be replicable across all GB DNOs.

## Scale of Project

The project will overlay and analyse data on a number of representative network topologies across WPD's Electricity Service Areas (ESAs). It is likely that all the ESAs will be required in order to ensure a sufficient number of known locations to help train and validate the model. This is particularly true for heat pumps where there are relatively few records. The number of customers assessed for LCT identification will reflect the volumes required to generate a sufficiently large candidate set to validate the model and to identify regional differences in model effectiveness. Many of the project costs are not scale dependent.

## Technology Readiness at Start

TRL4 Bench Scale Research

## Technology Readiness at End

TRL7 Inactive Commissioning

## Geographical Area

This project covers all of WPD's network license areas.

## Revenue Allowed for the RIIO Settlement

None

## Indicative Total NIA Project Expenditure

£311,418

# Project Eligibility Assessment Part 1

There are slightly differing requirements for RIIO-1 and RIIO-2 NIA projects. This is noted in each case, with the requirement numbers listed for both where they differ (shown as RIIO-2 / RIIO-1).

## Requirement 1

Facilitate the energy system transition and/or benefit consumers in vulnerable situations (Please complete sections 3.1.1 and 3.1.2 for RIIO-2 projects only)

Please answer **at least one** of the following:

### How the Project has the potential to facilitate the energy system transition:

n/a

### How the Project has potential to benefit consumer in vulnerable situations:

n/a

## Requirement 2 / 2b

Has the potential to deliver net benefits to consumers

Project must have the potential to deliver a Solution that delivers a net benefit to consumers of the Gas Transporter and/or Electricity Transmission or Electricity Distribution licensee, as the context requires. This could include delivering a Solution at a lower cost than the most efficient Method currently in use on the GB Gas Transportation System, the Gas Transporter's and/or Electricity Transmission or Electricity Distribution licensee's network, or wider benefits, such as social or environmental.

### Please provide an estimate of the saving if the Problem is solved (RIIO-1 projects only)

The nature of the project makes it impossible to provide robust estimates of the projected savings at this stage. One of the outputs of the final report will be a cost benefit analysis. From similar engagements we are confident that the model will lead to improved identification of LCTs on LV networks, with the aim of identifying up to 70-80% of LCTs across WPD's licence areas.

Clusters of undetected LCT's may cause network overloading or repeated fuse blowing at the local substation. The typical cost of reinforcing an LV feeder is £63 per meter, based on replacing cable with 300 Wavecon and current excavation and backfill costs. If WPD knew where the LCT clusters were then WPD would be able to proactively deploy an LCT management system, similar to the system being developed in LV Connect and Manage. This would delay the need for expensive network re-enforcement to a time more suitable, and it would prevent repeat visits and investigations by field staff for repeated fuse blowing.

If the tool detected LV feeders with clusters of LCT's on then this would enable WPD to take a proactive response delaying a reactive and more costly response.

### Please provide a calculation of the expected benefits the Solution

A typical LV feeder with a length of 100 meters would cost £9,181.15 to upgrade and re-enforce, this could be bought on prematurely by LCT clusters. The total cost of the project is £346,020, if the tool detected 38 LV feeders with LCT clusters that require management, then the tool will have saved the equivalent re-enforcement costs.

It is difficult to put exact cost savings in place as each LV re-enforcement project would differ as would the costs. The above calculation also does not account for staff time and resources that would be required for repeated visits to replace blown fuses raised as a network fault.

### Please provide an estimate of how replicable the Method is across GB

Given the wholesale coverage of the ElectraLink dataset across all GB DNO licence areas, the Method could be replicable across the entire Network Licensees' system.

### Please provide an outline of the costs of rolling out the Method across GB.

*** The below prices are indicative and not open to acceptance***

Cloud Infrastructure storage and data platform services – roughly 50k GBP per year.
Data Science Services 1 x senior data scientist & 1 x data scientist/ data technician 200 days per year - roughly 800k GBP per year.

## Requirement 3 / 1

Involve Research, Development or Demonstration

A RIIO-1 NIA Project must have the potential to have a Direct Impact on a Network Licensee's network or the operations of the System Operator and involve the Research, Development, or Demonstration of at least one of the following (please tick which applies):

☑ A specific piece of new (i.e. unproven in GB, or where a method has been trialled outside GB the Network Licensee must justify repeating it as part of a project) equipment (including control and communications system software).

☐ A specific novel arrangement or application of existing licensee equipment (including control and/or communications systems and/or software)

☐ A specific novel operational practice directly related to the operation of the Network Licensees system

☐ A specific novel commercial arrangement

RIIO-2 Projects

☐ A specific piece of new equipment (including monitoring, control and communications systems and software)

☐ A specific piece of new technology (including analysis and modelling systems or software), in relation to which the Method is unproven

☐ A new methodology (including the identification of specific new procedures or techniques used to identify, select, process, and analyse information)

☐ A specific novel arrangement or application of existing gas transportation, electricity transmission or electricity distribution equipment, technology or methodology

☐ A specific novel operational practice directly related to the operation of the GB Gas Transportation System, electricity transmission or electricity distribution

☐ A specific novel commercial arrangement

## Specific Requirements 4 / 2a

### Please explain how the learning that will be generated could be used by the relevant Network Licensees

The project will disseminate its findings across the GB energy networks sector and beyond. Once proven through the LCT Detection project, the data capability will be replicable across all GB DNOs. The main project deliverable will be a proof of concept model – a process design document and demonstration dashboard that will identify Low Carbon Technologies (LCTs) to support network planning and investment strategy. The POC model will be designed in such a way as to be modular such that it can be applied to other use cases and to simplify the adoption by other DNOs.
For project dissemination purposes, the LCT Detection project will be introduced to a DNO and energy industry audience at WPD's Balancing Act event in November 2018. The project team will be present at LCNI in October 2018, at which point a leaflet will be available for stakeholders to learn about the project. This leaflet will be used to actively raise awareness of the project at LCNI. The final report will be presented to a DNO and industry audience at WPD's Balancing Act event in May / June 2019.

### Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

n/a

☑ Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees

### Is the default IPR position being applied?

☑ Yes

## Project Eligibility Assessment Part 2

### Not lead to unnecessary duplication

A Project must not lead to unnecessary duplication of any other Project, including but not limited to IFI, LCNF, NIA, NIC or SIF projects already registered, being carried out or completed.

### Please demonstrate below that no unnecessary duplication will occur as a result of the Project.

There is no current NIA or NIC project that addresses the same challenge, nor one that delivers the same outcomes. ElectraLink's DTS dataset lies at the heart of this project; this dataset has not been used for any similar activity, nor combined with any other datasets to date, as will be the case in the project, thereby giving confidence that this project is not duplicating other activity. In addition, advanced

analytics has not been used in this particular use case before, in order to identify LCTs on LV networks. The project will present at WPD's Balancing Act in both October 2018 and June 2019; along with associated PR and marketing activities, the project will raise awareness of its activities to ensure no duplication occurs post project approval.

## If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

n/a

# Additional Governance And Document Upload

## Please identify why the project is innovative and has not been tried before

To date, it has not been possible to extract key insights from the DTS dataset. This project will develop that insights generation POC and use IBM's cutting-edge AI and cognitive analytics capability to extract key information from the DTS dataset, combined with other datasets that has been constructed by ElectraLink using over six years of market transactions. This dataset contains 100s of millions of previously unextracted transactions, structured and unstructured market messages, related to WPD's area, across over 100 market processes.

## Relevant Foreground IPR

n/a

## Data Access Details

n/a

## Please identify why the Network Licensees will not fund the project as apart of it's business and usual activities

This project will deliver a novel and enhanced application of the ElectraLink dataset via a Proof of Concept. As such, until proven, it is not suitable to be delivered under BAU activity. Once proven through the project, the data analytics capability will be replicable across all GB DNOs.

## Please identify why the project can only be undertaken with the support of the NIA, including reference to the specific risks(e.g. commercial, technical, operational or regulatory) associated with the project

As noted in the NIA guidance, certain projects are speculative in nature and yield uncertain commercial returns. This is the case with this project, as a previously untested and novel application of technology; any Licensee would carry the commercial risk of not securing a return on the resource expenditure, making this project untenable without NIA support.

## This project has been approved by a senior member of staff

☑ Yes