NIA Project Registration and PEA Document

Date of Submission

Nov 2020

Project Reference Number

NIA_UKPN0070

Project Registration

Project Title

Envision

Project Reference Number

NIA_UKPN0070

Project Licensee(s)

UK Power Networks

Project Start

December 2020

Project Duration

2 years and 3 months

Nominated Project Contact(s)

John Moutafidis

Project Budget

£1,971,000.00

Summary

The objectives of the project are to have:

1) a single system with LV network data on customer energy consumption, energy generation, and DER information (volumes and types)
2) a model for the LV network consumption per secondary substation
3) a user interface to visualise and use the above data

Nominated Contact Email Address(es)

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Problem Being Solved

There is a requirement to have network visibility especially in the historically less monitored part of the network. LV visibility was a key ask from our stakeholders during our 2017/18 'a smart grid for all campaign' and it remains a key enabler for our EV Readiness Strategy and our industry first Heat Strategy. It is also one of the key DSO enablers identified in the Ofgem key enablers consultation.

More recently, customers have asked us to go beyond devices and explore the use of data to achieve network visibility for less. Therefore in our approach to increase network visibility at the low voltage network, we will put on a smart toolkit that includes a range of solutions, LV monitoring devices, smart meter capabilities, data from third parties such as smart EV chargers and grid edge devices.

A hardware based monitoring strategy requires a significant investment in materials and labour, and is dependent on resource availability. Therefore hardware based monitoring of the entire network is unlikely to be a feasible solution in all instances, therefore such programmes are expected to target their efforts to the highest priority based on forecasts. Consequently there is a need to undertake least regrets activity to achieve network visibility across our networks cost-effectively to ensure we are helping build a net zero future for all.

There is also opportunity in utilising third party data and that is what we will explore. Many devices such as PV installations and electric car chargers monitor the network they are connected to and this data typically goes to the supplier for their own purposes.

Method(s)

September 2022 Update:

This change is for a five-month extension to the project taking the project end date to 28 February 2023.

The reason for the change is due to delays in implementing regular data transfers and addressing data quality issues that impacted prediction accuracy. During the extension period, the following will be undertaken for Work Package 1:

- Complete the deliverables. Specifically, the development of predictive models that generate half hourly profiles for ground mounted and pole mounted transformers,
- Refine predictive models already developed following establishment of a robust data pipeline that refreshes on a monthly basis and resolution of nearly 100 data quality issues.
- Finalise the methodology for improving the load predictions for interconnected transformers that typically have lower accuracy

In addition, we are working with the participants in the Automated Asset Registration (AAR) competition announced in September 2022, funded by BEIS, to understand the impact on Work Package 2. Specific areas we are assessing include the solution architecture, boundaries of responsibility, and data sharing agreements.

There is no impact on the project budget as a result of the extension.

It is proposed to bring in information from third parties and process data, which we have, to generate information about our network. A number of different elements need to be developed to be able to have software based visibility of the network.

Work Package 1: Software based network visibility

Trial Magic MDI (Maximum Demand Indicator) at scale in partnership with CKI Delta. Magic MDI is a machine learning solution to model maximum demand on secondary substations demonstrated in an earlier business funded proof of concept (PoC). This proved the model on ground mounted secondary substations and provided maximum monthly demand. The Magic MDI PoC was based on manual handling of data inputs and a very limited number of substations. As part of this work package, we will extend the trials to a larger part of our network and automate all data handling with the outcome of demonstrating a 'data-first' approach in achieving blanket network visibility. Additionally we will define the requirements and best practice for BAU integration long term.

We will extend the capabilities of the model to include pole-mounted transformers and model the full daily profiles of secondary substations. It is our ambition to increase granularity of the model down to LV feeder ways and include other data such as smart meters.

Work Package 2: Third party visibility of connected Distributed Energy Resources (DER)

We will demonstrate it is commercially and technically possible to procure useful external data sets and that processes can be developed to internally manage this data to drive value. We will focus on data products and their value to internal users, and plan to start with EV charge data products.

These useful 'deliverables' include: visibility of the process and documentation of the contract between us, the data aggregator and the technology vendors (data suppliers); data value; data processing and cleansing; stakeholder engagement processes; and a commercial business case for the ongoing existence of a 'DER Gateway'. We will progress and build a gateway portal that collects data from a limited number of suppliers and presents actionable information to stakeholders. This portal will provide the technical proof and knowledge needed to develop a full solution in the future.

Work Package 3: Value of data under re-deployment device delivery strategies or on one feeder

Assess the value of data from redeployed devices. UK Power Networks deploy Weezaps, Alvins and Bidoyngs and re-deploy each device to multiple locations. We will demonstrate how data from these devices can be used to increase network visibility. The planned approach will be to review sample data from devices and assess the strengths and weaknesses of the data.
The overall target of the project is to identify the cheapest unit cost for visibility.

Scope

Deliverables per work package.

Work Package 1: Software based network visibility

In this work package a model to estimate secondary substation demand will be developed based on machine learnig techniques and unique databases. This model will be trialled in the UK Power Networks network and the accuracy of estimation will be defined. As part of the model development and accuracy improvement activities, a methodology for the prioritisation of hardware monitoring devices will be produced. Finally a user interface will be developed for easier use of the estimated values.

Work Package 2: Third party visibility of connected DER

In this work package we shall identify the data offerings in the market and the value for a DNO or DSO. Then we will undertake a technical trial of developing a portal that collects these data from data suppliers and presents the results in a digestable way to the network operator. Lastly we will identify the possible commercial possibilities for such a portal to exist.

Work Package 3: Value of data under re-deployment device delivery strategies or on one feeder

In this work package we will identify the availability and quality of data from existing redeployable devices. We will define the best way to take advantage of them for visibility purposes.

Objective(s)

The objectives of the project are to have:

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2) a model for the LV network consumption per secondary substation
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Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Criteria per work package:

Work Package 1:

· Have a model that estimates the half hourly demand for secondary substations

· Have a method to prioritise deployment of hardware based monitoring

Work Package 2:

· Identify the availability of third party data packages and their value for a DNO

· Trial a limited scale DER data gateway portal

Work Package 3:

Identify method to use redeployable devices data for visibility of network demand

Project Partners and External Funding

No external funding has been granted for this project.

Potential for New Learning

As part of this project, it is expected to learn the accuracy of software based demand estimation for the different parts of the network. Additionally the value that could be extracted out of DER data will be identified and a way to achieve it defined. The main learning of

the project is to identify the lowest cost for achieving visbility of network demand.

All this learning will be disseminated through the NIA official reports, the UKPN Innovation website and other industry events.

Scale of Project

The scale of the project is the minimum required to successfully prove the solution.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL7 Inactive Commissioning

Geographical Area

In the area covered by Eastern Power Networks, London Power Networks and South Eastern Power Networks.

Revenue Allowed for the RIIO Settlement

There was no revenue allowance in RIIO-ED1 for this activity. However the data provided would help better targeting of load driven reinforcement expenditure on secondary voltage networks.

Indicative Total NIA Project Expenditure

£1,773,900

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 new solution would help with the effective utilisation of secondary substations in line with a DNO's utilization strategy. It has been previously shown (SP Energy Networks Flexible Networks project) that monintoring techniques can achieve a capacity release on secondary substations compared to traditional techniques of demand estimation. Additionally there is safety benefit from a reduction of site visits to retrieve maximum demand data. Lastly better visibility of demand at the secondary substation level can provide useful knowledge for the deployment of network flexibility.

Please provide a calculation of the expected benefits the Solution

We assumed that the solution releases 6% capacity (based on SPEN project where hardware monitoring released 8%, we assumed a 75% accuracy based on PoC results) with benefits reducing at the end of the full smart meter rollout. Based on the results of the latest "Consultation on Smart Meter Policy Framework Post-2020", the industry could achieve a 56% - 68% coverage by end-2024. Assuming a continuation of 10% coverage increase per year, we can make an estimation of full smart coverage towards the end of 2027.
Base cost in NPV: £68m ------ Method cost in NPV: £64m ------ Project cost in NPV: £1.94m
Benefits in NPV: £2m
These benefits are calculated for ED2.
The benefits of work package 2 will be defined as part of the project.

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

The solution developed by work package 1 is replicable across GB depending on the amount of existing data DNOs hold. The work package 2 work can be replicated across GB.

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

Based on the project costs we can assume that the rollout for the remaining five DNO groups in GB would cost £10m. This depends on the avaialability and scale of data.

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

We will share the results of the trials so other Network Licensees can develop the confidence to use the system in their network. Other Network Licensees can then develop the same solution to estimate customer demand in their network.

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 an NIA funded project by WPD undergoing that seeks to solve the same problem using a software based solution.

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

The proposed solution is first of its kind and was not previously available in the market. The growth of machine learning tecniques in

the recent years has made this solution available.

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

These techniques are unproven in the utility network and the initial capital required to deploy is high therefore there is a risk that prevents funding this as part of business as usual activities.

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

The project can only be undertaken as an innovation pilot given the operational risks associated with the deployment of an unproven solution in network operations. As noted in the NIA guidance, certain projects are speculative in nature and yield uncertain commercial returns. This is the case with this project. There is a commercial risk that the solution developed as part of the project is not adopted by the stakeholders involved following the trial period. This could be due to the fact that the solution has not reached the level of maturity required for business-as-usual application. This risk is being mitigated against through early engagement with stakeholders and ensuring requirements are clearly defined and documented. If the project is successful, it will have proven a number of technical solutions and business processes which will improve customer service.

This project has been approved by a senior member of staff

☑ Yes