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NIA Project Registration and PEA Document

Date of Submission

Oct 2024

Project Reference Number

NIA_ENWL_040

Project Registration

Project Title

Smart Street Rural

Project Reference Number

NIA_ENWL_040

Project Licensee(s)

Electricity North West

Project Start

November 2024

Project Duration

2 years and 2 months

Nominated Project Contact(s)

Chris Greenfield

Project Budget

£185,000.00

Summary

Until recently, voltage regulation technology was not mature for pole mounted distribution transformers meaning that customers connected to them could not take advantage of the benefits of Conservative Voltage Reduction (CVR) as proven on ground mounted transformers as part of the Second Tier project, Smart Street.

Pole mounted voltage regulation technology has now matured and this project will conduct desktop analysis to determine whether the application of CVR is cost beneficial for overhead networks including an assessment of the available voltage regulation equipment. If benefits can be realised, Smart Street Rural will scope a testing methodology for a small-scale network trial to be carried out in a potential future project.

Third Party Collaborators

EPRI

Nominated Contact Email Address(es)

innovation@enwl.co.uk

Problem Being Solved

The application of Conservative Voltage Reduction (CVR) to reduce peak demand, defer reinforcement and facilitate consumer energy savings has been proven at the domestic level as part of the Second Tier project, Smart Street.

When Smart Street was delivered, CVR could only be enabled using ground mounted distribution transformers fitted with an On Load Tap Changer (OLTC) to allow the voltage to be actively controlled in real time. Voltage regulation technology was not mature for pole mounted transformers meaning that customers connected to them could not take advantage of the Smart Street benefits.

Pole mounted voltage regulation technology has now matured and this project will determine whether the benefits seen by those customers connected to ground mounted substations can also be seen by those connected to pole mounted substations.

Method(s)

A modelling analysis will be undertaken by the Electric Power Research Institute (EPRI) on a number of representative overhead assets within the ENWL Low Voltage (LV) network. The results from which will then be extrapolated across the wider ENWL network.

Using load flow analysis combined with time series historical demand data, substations will have voltage regulating capabilities applied to reduce demand and determine a potential cost saving on any potential reinforcement, along with potential energy savings to consumers.

Conversely, analysis will be carried to determine whether voltage regulating capabilities can be applied to increase the voltage and assist the resilience of circuits with long lengths of overhead line.

The project will also assess available voltage regulation equipment and scope a testing methodology for a small-scale live network trial to be carried out in a potential future project.

Scope

Task 1: Modelling

- Create a model of the ENWL LV overhead network including substations, cables, and consumer point loads on a number of representative circuits.
- Apply historical time series demand data and determine overload and reinforcement requirements.
- Determine the net benefits of applying CVR to substations.

Task 2: Equipment and Trials

- Determine the feasibility and benefit of installing a chosen voltage regulation device onto the LV overhead network.
- Select an area of the ENWL LV network to carry out a small demonstrator trial as part of a potential future project.

Objective(s)

Task 1: Modelling

- Perform a detailed network study on a number of representative LV overhead circuits to determine the expected benefits from deploying assets to enable or enhance CVR.
- Determine the cost and benefits in deploying CVR on overhead LV distribution systems.
- Extrapolate the results to the wider network determining the costs and benefits of scaling the solution across the ENWL area.

Task 2: Equipment and Trials

- Select a voltage regulation device to use and plan for deployment as part of a potential future project.

Consumer Vulnerability Impact Assessment

An assessment of distributional impacts (technical, financial and wellbeing related) for this project has been carried out using a bespoke assessment tool, which assesses the project as having a positive, negative or neutral effect on consumers in vulnerable situations. To help inform the assessment, this tool considers the categories of consumers identified in the Priority Services Register.

This project has been assessed as having an overall positive impact on consumers in vulnerable situations. The assessment has identified that this project will look to reduce the costs for households while reducing the amount of disruptions to them in the home. Other considerations including the projects impact on supply, immediate health and safety in the home have been made in carrying out this assessment.

Success Criteria

A technical report that summarises the costs and benefits to deploy a CVR system on the ENWL overhead network along with a plan for a small-scale demonstration of the solution.

Project Partners and External Funding

Electric Power Research Institute (EPRI)

Potential for New Learning

The project will determine the benefits of applying CVR to overhead distribution systems. All documents related to the project including registration, deliverables and outcomes will be uploaded to the Smarter Network Portal for the benefit of dissemination and collaboration.

It is expected that the beneficial outcomes of this project where applicable will be useful for other network operators and ENWL will proactively seek to disseminate the benefits for all customers GB wide.

Scale of Project

Electricity North West Low Voltage overhead network

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL4 Bench Scale Research

Geographical Area

North West of England

Revenue Allowed for the RIIO Settlement

£0

Indicative Total NIA Project Expenditure

£165,000

Reason for change – We encountered significant delays with agreeing and signing contract with our project partner EPRI mainly due to differences between UK and US law. This resulted in a significant delay to the actual start date of the work and there were delays during project delivery which impacted the delivery timeline further.

Project Eligibility Assessment Part 1

Requirement 1

Facilitate the energy system transition and/or benefit consumers in vulnerable situations

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

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

It was previously not possible to apply the Smart St solution to overhead vulnerable consumers. However, the technology for overhead voltage regulation has now matured. Many of these overhead fed communities are not connected to the gas grid and are therefore more likely to transition to electric heating, additionally they tend to be areas with high levels of fuel poverty making them priority areas for the Smart Street solution.

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

N.A.

Please provide a calculation and/or description of the expected benefits of the solution

The initial study is a desktop research piece so will not yet have the expected cost benefits calculated.

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

There are approximately 16,000 overhead substations on the ENWL network which is 50% of the total distribution substations. Assuming a similar level on other DNO areas, there is a high potential to scale the solution out across the wider GB area.

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

Once the cost is known for a chosen voltage regulating device, the cost per number of substations to implement the solution can then be calculated.

Requirement 3 / 1

Involve Research, Development or Demonstration

Projects 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 trialed 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

Involve Research, Development or Demonstration - Please select all that apply

- 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 other network licenses could have consumers on their networks fed via overhead systems facing voltage excursions or vulnerability. The CVR technology to be used in this project likely be applicable for other areas since the network topologies, technologies and assets used through GB is similar.

n/a

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. Networks must explicitly mention similar projects that they have considered and how these differ.

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

The Smarter Network Portal has been checked prior to project registration and there were no previous or similar project in the same area relating to the proposed project. It was identified that most projects within this area specifically focus on ground mounted solution and the overhead solution as part of this project is novel.

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 costs and benefits of applying CVR to networks fed from pole mounted substations is not as well understood as those for ground mounted substations. This project will allow networks to fully understand the benefits as well as the technologies which can be used to deliver the solution enabling the roll out of CVR across all customers.

Relevant Foreground IPR

N.A.

Data Access Details

All data will be shared in line with the Electricity North West data sharing policy as published on our website. (<https://www.enwl.co.uk/future-energy/innovation/our-innovation-strategy/our-innovation-data-sharing-policy/>)

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

The initial feasibility desktop study needs to be carried out to understand the potential benefits and de-risk rolling out the solution across the network.

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 the solution is unproven and has a low TRL an NIA project allows us to fully understand the benefits as well as the technologies which can be used to deliver the solution.

This project has been approved by a senior member of staff

Yes