Date of Submission

01/04/2019

NIA Project Registration and PEA Document

Notes on Completion: Please refer to the **NIA Governance Document** to assist in the completion of this form. Please use the default font (Calibri font size 10) in your submission. Please ensure all content is contained within the boundaries of the text areas. The full-completed submission should not exceed 6 pages in total.

Project Registration

Project Title		**Project Reference**
Intelligent Network meshing switch		**ENWL 023**
Funding Licensee(s)	**Project Start Date**	**Project Duration**
Electricity North West	01/04/2019	12 months
Nominated Project Contact(s)		**Project Budget**
InnovationTeam@enwl.co.uk		£1.87m

Problem(s)

Existing DNO networks are not designed to cope with the highly variable power flows that will be caused by the introduction of LCTs, such as vehicle charging and generation. Interconnection of LV networks is one of the means by which voltage, thermal and harmonic problems created by LCT loads and generation connected to LV networks can be significantly reduced.

The Smart Street and FUN-LV projects proved that dynamic meshing offers considerable benefit in managing these power flows and successfully trialled retro-fit devices installed in link boxes to remotely mesh the network when required.

The projects trialled different devices which are proven technology and suitable to be deployed on 80% of the low voltage network. However, some technical issues have been identified that require additional research to resolve to ensure the solution can be applied to 100% of sites. The issues currently restricting a GB wide BAU deployment in all areas of the network are:

- Condensation
- Communications
- Water ingress
- Heat Dissipation

Method(s)

This project will be a research and development piece to overcome the final technical issues in retrofitting a simple link with a remote controlled link box switch for wide scale BAU purposes. These improvements will be tested via simulations, a test network and live system testing.

Scope

The project will further improve the link box meshing device to allow deployment in all locations and environments. The improved link box meshing device will be trialled at a number of link boxes on the LV network. These sites will be selected to cover the full range of location types covering all the environmental issues identified.

Objective(s)

A staged approach is proposed to produce a final device that is suitable for installation network wide. The three stages can be summarised as follows:

Stage 1
Improve the existing devices to make the device smaller with an improved water ingress IP rating. Investigate and select communication protocols that will provide maximum connection time to the installed device. Multiple protocols may be required to cover all location types.

Stage 2

Simulate heat and humidity in a link box with the device fitted. Investigate solutions and trial in a test environment. Develop a power supply and electronic design that will reduce overall heating and trial in a test environment.

Stage 3

Complete type testing and install a number of devices for live field testing. Evaluate live trial results.

Success Criteria

The following criteria will be used to determine if the project has been successful

- Link box meshing devices show no signs of condensation during the trial period
- Link box meshing devices show no signs of water ingress during the trial period
- Link box meshing devices show high level of communication availability during the trial period

Technology Readiness Level at Start	Technology Readiness Level at Completion
6	9

Project Partners and External Funding

Kelvatek

Potential for New Learning

The project will look at fundamental design aspects of the link box meshing switch and help inform future developments of electronic devices that are required to operate in challenging environments.

Scale of Project

The project will be conducted by small scale trials which will initially be on a test system and will then result in field trials on selected areas with known environmental issues.

Geographical Area

North West of England

Revenue Allowed for in the RIIO Settlement

Indicative Total NIA Project Expenditure

£1.7m

Project Eligibility Assessment

Specific Requirements 1

1a. A 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 systems and 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	☐

Specific Requirements 2

2a. Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees ☒

Please answer one of the following:

i) Please explain how the learning that will be generated could be used by relevant Network Licenses.

The project will produce an improved design which can be deployed in all environments. The design and communications protocols investigated during the project will also provide insight on device requirements in challenging environments.

ii) Please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the Project.

This project addresses 3 challenges in our innovation strategy

- Capacity – Maximising the use of our existing assets
- Efficiency – keeping costs low by maximizing the use of our assets
- Commercial evolution – increased network control to help progress move to system operator

Is the default IPR position being applied?

Yes	☒
	☐

If no, please answer i, ii, iii before continuing:

i) Demonstrate how the learning from the Project can be successfully disseminated to Network Licensees and other interested parties

ii) Describe how any potential constraints or costs caused, or resulting from, the imposed IPR arrangements

iii) Justify why the proposed IPR arrangements provide value for money for customers

2b. Has the Potential to Deliver Net Financial Benefits to Customers ☒

Please provide an estimate of the saving if the Problem is solved.

Based on the outcomes of the Smart Street project deployment of these devices can save £20.76m across GB out to 2060

Please provide a calculation of the expected financial benefits of a Development or Demonstration Project (not required for Research Projects). (Base Cost – Method Cost, Against Agreed Baseline).

The total savings from the deployment of Smart Street were calculated as £519m across GB. The meshing accounts for 20% of these savings which is £103.8m assuming we could deploy to all GB sites. Therefore the savings associated with rectifying these issues accounts for £20.76m of the total savings.

Please provide an estimate of how replicable the Method is across GB in terms of the number of sites, the sort of site the Method could be applied to, or the percentage of the Network Licensees system where it could be rolled-out.

The switch could be deployed in any GB link box

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

Cost of link box switch £3500 (expected to reduce)
Number of suitable link boxes in ENWL 1000
Total cost of full ENWL roll-out £3.5 million
If other DNO's have a similar amount of link boxes this figure could be increased to £49 million for a full GB roll-out

2c. Does Not Lead to Unnecessary Duplication ☒

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

As stated before projects have deployed devices of this type is Smart Street and FUN-LV. These projects highlighted the issues that this work is looking to resolve.

We are also aware that SPEN are looking at temperature monitoring in link boxes. This project is not looking at temperature monitoring.

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

Additional Governance Requirements

The project is innovative (ie not business as usual) and has an unproven business case where the risk warrants a limited Research, Development or Demonstration Project to demonstrate its effectiveness ☒

(i) Please identify why the project is innovative and has not been tried before.

Historically there was no need to monitor or control the low voltage network but with the increase in low carbon technologies more control devices are required. Attempts to retrofit link box switches in link boxes have failed in certain areas due to environmental issues that this project aims to tackle.

(ii) Please identify why the Network Licensee will not fund such a Project as part of its business as usual activities

This Project will provide valuable learning and inform the production of a device that will benefit all DNO's from a safety and operational point of view.

iii) Please identify why the Project can only be undertaken with the support of the NIA, including reference to the specific risks (eg commercial, technical, operational or regulatory) associated with the Project

The project risk is that the device cannot be improved to enable a larger scale deployment in all areas which is why NIA funding is required.

Has been approved by senior member of staff ☒

Additional Registration Information

Short Name

Intelligent Network Mesh Switch

Introduction

Existing DNO networks are not designed to cope with the highly variable power flows that will be caused by the introduction of LCTs, such as vehicle charging and generation. Interconnection of LV networks is one of the means by which voltage, thermal and harmonic problems created by LCT loads and generation connected to LV networks can be significantly reduced.

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Benefits

Enables radial LV networks to be meshed when required giving the following benefits

- Safety – reduced manual operation
- Reinforcement reduction
- System losses reduction
- Quicker connection of LCT's

Technologies (Please Select one of the following)

Active Network Management	☒
Asset Management	☐
Carbon Emission Reduction Technologies	☐
Commercial	☐
Comms & IT	☐
Community Schemes	☐
Condition Monitoring	☐
Conductors	☐
Control Systems	☐
Cyber Security	☐

Demand Response	☐
Demand Side Management	☐
Distributed Generation	☐
Electric Vehicles	☐
Energy Storage	☐
Energy Storage and Demand Response	☐
Environmental	☐
Fault Current	☐
Fault Level	☐
Fault Management	☐
Harmonics	☐
Health & Safety	☐
Heat Pumps	☐
High Voltage Technology	☐
HVDC	☐
Low Carbon Generation	☐
LV & 11kV Networks	☐
Maintenance & Inspection	☐
Measurement	☐
Meshed Networks	☐
Modelling	☐

Network Automation	☐
Network Monitoring	☐
Offshore Transmission	☐
Overhead Lines	☐
Photovoltaics	☐
Pre-Heat	☐
Protection	☐
Resilience	☐
Stakeholder Engagement	☐
Substation Monitoring	☐
Substations	☐
System Security	☐
Transformers	☐
Voltage Control	☐
Gas Distribution Networks	☐
Gas Transmission Networks	☐
Electricity Transmission Networks	☐