Notes on Completion: Please refer to the appropriate NIA Governance Document to assist in the completion of this form. The full completed submission should not exceed 6 pages in total.

NIA Project Registration and PEA Document

Date of Submission

Aug 2016

Project Reference Number

NIA_WPD_019

Project Registration

Project Title

LV Plus

Project Reference Number

NIA_WPD_019

Project Licensee(s)

National Grid Electricity Distribution

Project Start

August 2016

Project Duration

2 years and 1 month

Nominated Project Contact(s)

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Project Budget

£1,175,567.00

Summary

By the end of this project we expect to have developed a prototype which would be at a sufficient TRL to enable large-scale trials and commercial launch within 3-years.

Third Party Collaborators

Exceptions EMS

Anvil Semiconductors

Schneider Electric

Turbo Power Systems

Aston University

Problem Being Solved

A key challenge facing the UK Distribution Network Operators (DNOs) today is the increasing demand for power being placed on residential networks e.g. by the proliferation of electrical vehicles (EVs) and the move to electro-heat. The increase in distributed generation (DG) in areas of network conventionally designed for supplying demand can lead to local voltage rises limiting capacity.

Networks are also limited by the thermal current carrying capability of the existing assets. Losses within the network are defined by the inherent impedance in the assets and the load utilisation.

Method(s)

This project follows on from a TSB Feasibility Study which showed that a cost effective solution to these problems can be achieved on the existing infrastructure by increasing the local network phase voltage to 400V and stepping the voltage back down to 230 V at each

house. DNO-owned, low-cost, 99% efficient power electronic converters (PECs) will need to be installed in the meter-box.

From the earlier TSB Feasibility Study, it is suggested that a 62% capacity increase could be achieved at roughly 1/3 of the cost of reinforcement.

This system will not only increase network capacity, but also provide optimised connections for emerging EV charging, DG and energy storage - the “smart-grid”.

Scope

By the end of this project we expect to have developed a prototype which would be at a sufficient TRL to enable large-scale trials and commercial launch within 3-years.

Objective(s)

The completion of the project combined with the individual partners’ expertise will enable the ideas & products developed to be adapted for almost any LV distribution network.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

- Develop a performance specification for the system
- Carry out R&D of different control and protection strategies to meet regulatory/H&S requirements and assess alternative PEC circuits
- Design, build and test a number of different prototype PECs
- Develop and build a number of new 3C SiC MOSFETs
- Identify, design and build a test network for the PEC system trials
- Validate the trial data
- Devise a road-map for future functionality and commercial development.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

WPD will be installing up to 20 devices to be field-tested on an LV network.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL4 Bench Scale Research

Geographical Area

WPD Midlands

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£145,000

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)

Once a domestic property reaches its agreed supply capacity limit, a service upgrade is required to a larger single phase cable or a three phase installation. Typical costs for this are:

Assessment and Design: 1 three phase LV service with W/C metering: £118

Construction: 1 three phase LV UG service from a passing main, including service cable (up to 5m), mains service joint, excavate and backfill joint hole (to site boundary, in tarmac footpath) and termination. Duct installed by others: £835-1862

Construction: 1 three phase LV OH service to existing OH line, including installation of new service with pole termination to connect to overhead network, up to 10m. Pole at site boundary and assumes no additional poles: £572-817

If 0.1% of domestic LV customers are upgraded, this would be between £28m and £57m

Please provide a calculation of the expected benefits the Solution

For this project, the base costs would be in the order of £950 to £1,950 per domestic user, assuming an underground installation.

The method cost is aiming to develop a system with a cost price of £350 per unit.

Assuming a further £250 for installation, then the financial benefit would be between £350 and £1.350.

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

29 Million Customers domestic customers in the UK. Assumed 0.1% of LV Networks are upgrading (ED1 2015-2023). This would be applicable to 29,000 customers.

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

In order to roll this solution out, the costs would be in the order of 29,000 x £600= £17.4m.

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 develop a technical specification for the Power Electronic Device for other DNOs to procure similar devices. It will also develop and demonstrate both the technology and the supply chain for implementation of this device within the UK.

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.

n/a

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

n/a

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

n/a

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

n/a

This project has been approved by a senior member of staff

☑ Yes