WESTERN POWER DISTRIBUTION
Serving the Midlands, South West and Wales

Date of Submission

August 2016

NIA Project Registration and PEA Document

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.

Project Registration

Project Title	Project Reference
LV Plus	NIA_WPD_019

Project Licensee(s)	Project Start Date	Project Duration
Western Power Distribution East Midlands, Western Power Distribution South Wales, Western Power Distribution South West, Western Power Distribution West Midlands	Aug 2016	2 Years

Nominated Project Contact(s)	Project Budget
Ben Godfrey bgodfrey@westernpower.co.uk	£1,175,567

Problem(s)

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.

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.<!--[if !supportAnnotations]-->

Technology Readiness Level at Start	Technology Readiness Level at Completion
2	4

Project Partners and External Funding

- Western Power Distribution
- Exceptions EMS
- Anvil Semiconductors
- Schneider Electric
- Turbo Power Systems
- Aston University
- InnovateUK

Potential for New Learning

DNOs will develop the business case and technology for integrating Power Electronics onto the network which are able to insulate the customer's supply from wider network power quality issues.

Scale of Project

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

Geographical Area

WPD Midlands

Revenue Allowed for in the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£145,000

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 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.

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

2b. Is the default IPR position being applied?

Yes	☒
No	☐

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 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

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

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

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

ii) 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).

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.

iii) 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.

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.

iv) 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.

2d. Does Not Lead to Unnecessary Duplication ☒

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

No other projects of this TRL have been undertaken in the UK.

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