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

Jan 2018

Project Reference Number

SPMWEN02

Project Registration

Project Title

LV Engine

Project Reference Number

SPMWEN02

Project Licensee(s)

SP Energy Networks Distribution

Project Start

February 2018

Project Duration

4 years and 11 months

Nominated Project Contact(s)

SPEN Innovation Team

Project Budget

£6,900,000.00

Summary

The integration of low carbon technologies (LCTs) is creating a strain on LV networks. Consequently, there is a need to make a significant change in the way LV networks are planned and operated. Passive LV networks with limited flexibility may not deliver value for money for our customers in a low carbon energy system.
Project LV Engine aims to add flexibility to LV networks by informing the design and selection of intelligent secondary transformers to enable the cost effective uptake of LCTs. It will achieve this objective by carrying out a live network trial of two innovative technologies;

1. Solid State Transformers (SSTs) as a direct replacement and;
2. Vacuum Tap Changers as a retrofit option to the conventional secondary transformer (11kV/415V).

This trial will provide the LV network with the flexibility it requires to accommodate future uncertainties in the uptake of LCTs and customer behaviours. LV Engine will demonstrate the first grid trial of SSTs within the UK electricity network and provide valuable learning to other UK DNOs. The project will also make an LV DC supply available to customers to satisfy the increasing demand for Direct Current.

Third Party Collaborators

ERMCO

University of Strathclyde

WSP UK Limited

Nominated Contact Email Address(es)

innovate@spenergynetworks.co.uk

Problem Being Solved

Method(s)

Scope

Objective(s)

In order to develop a novel and informed approach to the selection of secondary transformers, we propose trialling smart Solid State Transformer (SSTs) within secondary substations and comparing their effectiveness in supporting the LV network with that of conventional MV/LV transformers retrofitted with vacuum tap changers. The trial will lead to policy documents, design tools, technical specifications and a methodology which will inform the optimal selection of the secondary transformers given the specific characteristics of the local LV networks.
This project will trial intelligent transformers for three distinctive applications where potential trial areas have already been investigated.
Application 1 – SST for Voltage Regulation & Power Quality
We have identified potential trial areas where the uptake of PV has been severely limited due to the capacity of the LV network to accommodate further generation without significant network reinforcement. Some of these LV networks supply tower social houses with PV fitted to address fuel poverty.

Application 2 – Vacuum Tap Changer for Voltage Regulation
It is expected that under certain network conditions SSTs may not be the most cost effective solution to reinforce the LV network where the penetration of LCTs is less severe. For this reason, the project will also trial vacuum tap changers as an alternative method of voltage regulation.
Application 3 – SST for LV DC
SSTs are capable of providing a LV DC supply to
satisfy the increasing DC requirements of our customers and reduce network losses. We intend to inform the future DC micro grid by trailing a DC supply for the connection of LCTs, EV charging stations, and large commercial customers. LV DC can also provide a DC link between two secondary substations to add power flow control functionality. This allows load balancing between secondary substations, additional network flexibility, and better utilisation of network assets.
We will use the learning from the aforementioned applications to inform the future selection of the most techno-economical technology given the characteristics of local LV network, reducing costly network reinforcement and delivering value for money to our customers.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

n/a

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

n/a

Geographical Area

Revenue Allowed for the RIIO Settlement

Indicative Total NIA Project Expenditure

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)

n/a

Please provide a calculation of the expected benefits the Solution

n/a

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

n/a

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

n/a

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

n/a

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

Please demonstrate how the learning from the project can be successfully disseminated to Network Licensees and other interested parties.

Please describe how many potential constraints or costs caused, or resulting from the imposed IPR arrangements.<

Please justify why the proposed IPR arrangements provide value for money for customers.

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