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

Mar 2016

Project Reference Number

NIA_SSEPD_0027

Project Registration

Project Title

Low Cost LV Substation Monitoring

Project Reference Number

NIA_SSEPD_0027

Project Licensee(s)

Scottish and Southern Electricity Networks Distribution

Project Start

March 2016

Project Duration

2 years and 10 months

Nominated Project Contact(s)

SSEN Future Networks Team

Project Budget

£1,233,000.00

Summary

To develop and test a representative quantity of low cost substation monitoring devices from a number of different manufacturers. These will be deployed in a selection of secondary substations and their measurements integrated with a central data centre using GPRS communications. This will be in order to allow informed decisions to be made by network planners and other staff with respect to operational decisions, network planning and customer service

Third Party Collaborators

Eneida

PNDC

Nominated Contact Email Address(es)

fnp.pmo@sse.com

Problem Being Solved

Within the SHEPD and SEPD licence areas there are large numbers of 11Kv/415v secondary substations (around 100,000). Only a few of these secondary substations have any form of monitoring of the voltage and current values at the feeders or phases level.

While the commercial market has a number of suitable and readily available monitoring devices, they are expensive to procure and install. Based on learning from the recent, LCNF tier 2 project - New Thames Valley Vision (NTVV) project, typical costs are around £3,600 per substation.

If this voltage and current data was available at a lower cost it would be useful for operational decisions, network planning and customer service use as outlined below:

Operational Decisions

Records of “maximum” or “minimum” values would be easily assessed for significant periods (days, weeks, months, and possibly even years). This would be helpful in building a “big picture” view of the network performance to support decisions such as the suitability of back-feeds or generator sizing for planned works.

Operational users usually have to strike a balance between seeking more accurate information (e.g. going to site to take readings of current or voltage) and relying on experience, intuition and judgement. The quicker they can access real trustworthy information (from monitoring equipment) the more likely they are to follow the more objective approach to decision making.

Network Planning

Accurate and detailed historic loading information from monitoring, particularly maximum and mean currents can be used by planners to respond to requests from customers for new and increased capacity connections.

Planners have to strike a balance between seeking site based readings and employing more expedient heuristic techniques.

Power quality information such as voltage harmonic content can be drawn upon to assist in initial decision making e.g. permitting a particular load to be connected. This data will also assist in assessing the consequences of actions such as permitting a connection. The monitoring system provides good quality information of “before” and “after” that can be used to objectively inform commercial and technical discussions with customers.

Customer Service

Enquiries from customers are diverse, including requests for new connections, concerns about their own service (load or voltage), or concerns about the performance of the network. The availability of comprehensive periodic data can allow DNOs to respond objectively. If a network performance issue is identified, this can be addressed in an informed manner, in line with other agreed procedures.

Speed of response is crucial in meeting customers’ expectations and in complying with agreed procedures. Having access to a database that already contains the relevant periodic data is much quicker than visiting site for each request, deploying localised monitoring equipment for a week, then returning to site to recover the equipment, and downloading the data. By the installation of low cost monitoring devices consequential savings will be realised in the LV network by the deferment of a portion of the planned £38.7M reinforcement cost.

The proposal is to develop a system that can be fitted quickly, by a suitably trained competent person, and that will cost substantially less when purchased in the bulk quantities that SHEPD and SEPD are expected to require.

Method(s)

This is a technical method to develop and test a quantity of low cost devices from different manufacturers which will measure voltage and current at the outgoing feeders from a number of secondary substations.

A representative number of devices from each manufacturer will be trialled.

Data will be transmitted via the GPRS network from each substation to a central data centre where it will be available to the network planners and other relevant licensee staff.

Scope

To develop and test a representative quantity of low cost substation monitoring devices from a number of different manufacturers. These will be deployed in a selection of secondary substations and their measurements integrated with a central data centre using GPRS communications. This will be in order to allow informed decisions to be made by network planners and other staff with respect to operational decisions, network planning and customer service

Objective(s)

The aim of this project is to reduce the cost of LV monitoring to make it economically viable to fit LV monitoring devices in large volumes to the secondary substations.
The cost of an existing LV monitoring system using figures obtained from the NTVV project is approximately £3,600 per substation This project aims to procure the basic communications unit for a target price in the region of £30 to £40.However, the biggest cost associated with the present methodology is the current measurement device e.g. 24 for a six way feeder pillar. Taking both these into

account, it is intended that the project will deliver complete systems which can be procured for a figure in the region of £500 with the potential to lower costs if economies of scale can be achieved by purchasing the current measuring devices in sufficiently large quantities.
The data parameters delivered will be similar to those obtained in the New Thames Valley Vision project. We expect a lower level of accuracy but still sufficiently accurate to determine the benefits which low cost monitoring of a large section of LV network can bring in terms of customer service, network planning and operational decisions.

The data will also assist us in reporting asset health, criticality and monetised risk in line with the Common Methodology required by Ofgem.

Demand clusters could be identified from the data together with the potential to identify pre-fault indications allowing early intervention.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

This project will be deemed successful if it can determine the technical and financial viability of low cost substation LV monitoring equipment in comparison with traditional higher cost equipment.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

To gain the necessary learning from the project, the sample size has to be big enough to provide sufficient data for the identified applications.
The project will therefore monitor a number of 11kV rings derived from Distribution networks in Dundee, Elgin and Aberdeen.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL9 Operations

Geographical Area

Trials will be performed within the SHEPD licence area.

Revenue Allowed for the RIIO Settlement

Within the RIIO ED1 settlement SHEPD and SEPD identified a figure of £38.7M for L V cable asset replacement.

Indicative Total NIA Project Expenditure

The indicative Total NIA Project Expenditure is £1,233,000, 90% (£1,109,700) of which is Allowable NIA 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)

The saving which LV network monitoring could unlock on the basis of deferral of underground cable reinforcement within SSEPD'S areas is £12.6M . based on the RIIO-ED1 submission. The projected increase in Electrical Vehicle (EV) uptake and other low carbon technologies is the main driver to arrive at this figure.

In order to benefit from these smart savings i.e. intelligent allocation of smart technology (such as energy storage units) which lead to deferment of conventional reinforcement, there needs to be sufficient network monitoring equipment in place on the LV network. This is because visibility of the LV network is needed in order to identify areas where smart technology can be implemented. Along with network modelling (that requires network monitoring) these two technologies can identify optimum locations for smart technology investment leading to significant savings. These savings are consequential and not directly attributed to LV monitoring (or modelling) but are made available by the use of these technologies.

Please provide a calculation of the expected benefits the Solution

Base Cost =£1,203,000

Method Cost =£498,000

Net Financial benefit = Base cost – Method cost

Accordingly the project net financial benefit is calculated at £705,000.

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

This methodology could be applied by all UK DNOs. It is estimated that there are around 500,000 secondary substations within the UK. The availability of a method that can provide actual data at low cost would be invaluable.

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

Production of the units in bulk quantities would enable competitive costs to be obtained allowing the UK LV network asset base to be suitably equipped.

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 problem of visibility of the low voltage network is a common issue for all UK DNOs. Conventional equipment is available but at a cost which is prohibitive for large scale roll out. Should the low cost equipment give sufficient accuracy and reliability, it would be available as an option for use by any DNO .
All outputs and project reports will be shared with the OTHER DNO's to enable informed choices to be made.

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