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## **NIA Project Registration and PEA Document**

### **Date of Submission**

Apr 2015

### **Project Reference Number**

NIA\_SSEPD\_0008

## **Project Registration**

### **Project Title**

Parade (Polemounted Auto-Recloser Automated Distribution Evaluation)

### **Project Reference Number**

NIA\_SSEPD\_0008

### **Project Licensee(s)**

Scottish and Southern Electricity Networks Distribution

### **Project Start**

April 2015

### **Project Duration**

2 years and 5 months

### **Nominated Project Contact(s)**

SSEN Future Networks Team

### **Project Budget**

£165,000.00

## **Summary**

The scope of the project is to evaluate the technical operation of, and business case for, the Intelliteam distribution automation technology in the SEPD and SHEPD regions.

The main delivery plan will work as follows:

- The new type of radios will be installed progressively on further lines, over the first six months of the project, with each line being commissioned and its functioning evaluated before proceeding to the next
- Once all feeder lines have been commissioned and are relying on Interruption for protection, the long term performance will be independently evaluated to quantify the operational aspects and business benefits of the Interruption/Intelliteam system
- The project will also examine the combination of the Interruption/Intelliteam system with existing pole-mounted switchgear

## **Third Party Collaborators**

Fusion People

Lane Global

Radio Structures Ltd

Wightlink

## **Nominated Contact Email Address(es)**

fnp.pmo@sse.com

## **Problem Being Solved**

Many faults affecting overhead networks are transient in nature, and Distribution Network Operators (DNOs) can address this by deploying Pole-Mounted Autoreclosers (PMRs) that detect the fault, interrupt the supply and then reclose. This allows transient faults to self-clear without extended outages to the customers fed by that section of network. Standard PMRs have no situational awareness of their network position in relation to customer load, so when they trip and lockout (stay open as the fault is permanent) they remain open until reclosed by manual switching, either locally or remotely. They don't have the functionality to understand the surrounding network and whether it could be reconfigured to minimise the outages experienced by local customers. This means that customers are subjected to longer outages while the faulted section of network is tracked down.

This project aims to better understand what advanced PMRs can achieve when combined with distributed intelligence, to see whether customer outages can be reduced.

## Method(s)

Under a previous IFI project (2007\_07 Distribution Automation) 32 pole-mounted Intellirupter PulseClosers, supplied by S&C Electric, were installed on eleven distribution feeder lines on the 11kV network on the southern and western half of the Isle of Wight. This project was intended to evaluate their advanced functionality, including the Intelliteam automatic post-fault circuit restoration capability which minimises the interruption of supply to customers caused by faults.

Intellirupters are designed to work in teams which are actively co-ordinated so as to identify and isolate the section of a circuit on which a fault occurs, quickly and automatically restoring power to other segments of the line, and restoring the entire line when the fault clears. This advanced functionality requires high data rate peer-to-peer digital radio communications to be established between the pole-mounted devices and the substations at each end of the lines concerned.

The radios installed at the outset did not deliver sufficient communications capacity and reliability to complete the evaluation of the Intelliteam functionality. New radios installed in February 2015 during the IFI project 2011\_16 Advanced Radio Control, provided higher performance on one circuit, demonstrating that it is now possible to complete the deployment and evaluate the advanced functionality,

The methodology of this project is therefore the deployment of commercially supplied hardware, some of which (Intellirupters) is proven in other countries, and some (the new digital radios) is on its first deployment at scale; a consultant-led analysis of the radio performance; and a consultant-led statistical analysis of the effect on our network and the quality of service performance as measured by the metrics Customer Interruptions (CI) and Customer Minutes Lost (CML).

## Scope

The scope of the project is to evaluate the technical operation of, and business case for, the Intelliteam distribution automation technology in the SEPD and SHEPD regions.

The main delivery plan will work as follows:

- The new type of radios will be installed progressively on further lines, over the first six months of the project, with each line being commissioned and its functioning evaluated before proceeding to the next
- Once all feeder lines have been commissioned and are relying on Intellirupters for protection, the long term performance will be independently evaluated to quantify the operational aspects and business benefits of the Intellirupter/Intelliteam system
- The project will also examine the combination of the Intellirupter/Intelliteam system with existing pole-mounted switchgear

## Objective(s)

The learning objectives are:

1. To evaluate the year-round performance of this distribution automation technology, in terms of communications performance; behavior during faults; and impact on CI/CMLs
2. To consider the suitability of the communications technology for any other applications of high data rate digital radio communications in the utility sector, at the frequencies allowed in the UK
3. To quantify the commercial benefits of Intelliteam technology for the distribution business and so provide the information needed to determine whether it is advantageous to deploy it elsewhere on the network

## Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

## Success Criteria

The project will succeed if:

1. The suitability of the new radios for providing protection functionality can be determined
2. The performance of the technology over a 12 month period of operation can be measured and evaluated
3. An analysis can be made of the performance of the communications sufficient to inform an assessment of their suitability for general utility applications
4. An evaluation can be made of the benefits in terms of C/CMLs

## Project Partners and External Funding

n/a

## Potential for New Learning

n/a

## Scale of Project

The project budget is approximately £165,000 which enables a trial on all of the 11kV feeder lines fitted with Intellirupters. A trial on this scale is necessary to test the performance under a geographical range of conditions, and to have a high chance of capturing data during randomly occurring transient faults, which are inherently unpredictable.

A smaller scale deployment of the technology has been carried out (on one 11kV line) under the IFI Advanced Radio Control project, which was adequate to demonstrate the feasibility of the present project, but not to substitute for it, and which did not capture performance data during real faults (rather than simulations).

## Technology Readiness at Start

TRL7 Inactive Commissioning

## Technology Readiness at End

TRL9 Operations

## Geographical Area

The geographical scope of the project is the distribution network on the Isle of Wight. This has been selected because it contains a mixture of rural and urban topology, and is exposed to harsh conditions, especially in winter. It has also proved to be a challenging environment for radio communication, through a combination of rugged conditions, undulating landscape, and radio noise from broadcast transmissions. The results of the study should then provide a suitable base for extension (by statistical analysis) to other demanding environments such as rural areas of Scotland in the SHEPD region.

## Revenue Allowed for the RIIO Settlement

The project was not specifically allowed for in the ED1 settlement.

## Indicative Total NIA Project Expenditure

Of anticipated £165,000 expenditure, 90% is allowable and 10% will be contributed by SEPD and SHEPD.

## 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 savings will be in the form of improved C/CML performance for SSEPD.

#### Please provide a calculation of the expected benefits the Solution

In the calculations made for the original project (2007\_07 Distribution Automation), an estimate of the impact on C/CMLs was made based on standardized fault rates applied to the 11kV lines concerned and the value of CHL (hours lost) and CI which then applied, combined with estimates of the impact of the technology on interruptions. The annual benefit calculated was £89,900. CI and CHL are now more highly valued, which increases the potential financial benefit. Using actual historical fault rate data for the last 5 years, coupled with similar assumptions of the impact of the technology, the average annual C/CML penalty for these lines is £357,000, at today's rates, offering an annual improvement in the area of £100,000 over the existing systems in place.

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

All DNO licensees may be able to benefit from a reduction in C/CMLs. The project will provide information on which they can decide which locations may benefit from the technology.

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

This would have to be based on network designs and operating policies which cannot be determined at present.

### 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)**

The area addressed is Network Performance. In the RIIO scheme defined by Ofgem, quality of service is measured in terms of CI/CMLs, and the Interruption/Intelliteam technology is designed to address these in a direct way.

- 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