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

Jun 2015

Project Reference Number

NIA_SSEPD_0009

Project Registration

Project Title

Automated Loop Restoration

Project Reference Number

NIA_SSEPD_0009

Project Licensee(s)

Scottish and Southern Electricity Networks Distribution

Project Start

June 2015

Project Duration

3 years and 5 months

Nominated Project Contact(s)

Joe McNeil

Project Budget

£309,281.00

Summary

Two sections of 11kV overhead line networks have been chosen which share a common switching point and this is normally kept open to separate the line sections. These two sections will be combined into an overall scheme with 8 sections by installing 7 pole mounted circuit breakers (CBs).
These 11kV circuits on the Kintyre Peninsula are supplied from sub stations at Campbeltown and Ballure.Data on supply interruptions is available and has been analyzed for the 8 year period 2007 to 2015 to establish a base line. The 7 pole mounted CBs will be installed with one placed at the common normally open point and 3 CBs on each line. The CBs will be fitted with a low cost communications option using mobile telephone technology. The operation of the scheme will not be dependent upon this communications technology but it will be used to provide information on the status of the scheme and occasional monitoring of network power flows. It is expected that installation on site will be completed for the start of winter 2015/16. We will then monitor the faults on the line for a three year period to the end of 2018. In early 2019 we will analyze the effectiveness of the scheme.

If the scheme effectively improves the network performance by reducing CIs and CHLs then it will be left in place as a business as usual deployment.

Nominated Contact Email Address(es)

fnp.pmo@sse.com

Problem Being Solved

UK DNOs use a range of automation schemes to improve Customer Interruptions (CI) and Customer Hours Lost (CHL) performance by automatically restoring supply to sections of the network which are initially affected by a fault but do not actually have a fault within the specific section. Most of the existing automation schemes in the UK rely upon communications links to transfer data to enable the effective automatic restoration of supplies to customers. These communications links can of themselves fail and lead to a failure of the automation scheme. Or they only restore supplies to customers in healthy sections closest to the source sub station. Reliable secure communications systems can be expensive to install especially in more remote and rural parts of UK DNO licensed areas.

Method(s)

It is proposed to carry out a technical trial of the loop reconnection system developed by S&C Electric as this does not reply upon communications links for effective operation. In the event of a fault then the new Circuit Breakers (CBs) will operate automatically such that only one section of line will be left off supply with sections of the faulted line having either being restored or not affected by the interruption.
If the network had an even distribution of customers and faults then the proposed scheme would automatically maintain or restore supplied to 75% of customers. If the same number of CBs were utilized without the automatic loop reconnection process then it is estimated that supplies to only 37.5% of customers would be maintained following a fault.

Scope

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Data on supply interruptions is available and has been analyzed for the 8 year period 2007 to 2015 to establish a base line. The 7 pole mounted CBs will be installed with one placed at the common normally open point and 3 CBs on each line. The CBs will be fitted with a low cost communications option using mobile telephone technology. The operation of the scheme will not be dependent upon this communications technology but it will be used to provide information on the status of the scheme and occasional monitoring of network power flows. It is expected that installation on site will be completed for the start of winter 2015/16. We will then monitor the faults on the line for a three year period to the end of 2018. In early 2019 we will analyze the effectiveness of the scheme.

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Objective(s)

Achieve an effective reduction in CIs and CHLs over the three year trial period by 50% when compared to the base line figures for the 8 years from 2007 to 2015.
No network fault to affect 100% of customers on the feeder during the trial period.
Demonstrate that it is feasible to restore supplies to 50% of customers on the overhead line from Ballure substation towards Campbeltown, following a fault on the single 33kV circuit to Ballure sub station.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Determine the impact on network performance delivered by the automated loop restoration methodology on the trial network sections.

Project Partners and External Funding

None

Potential for New Learning

Establish if the automated loop restoration scheme works in the UK and how best to apply it to UK type networks.

Scale of Project

This project while comprising 7 circuit breakers is typical of what might be expected on parts of our distribution networks.

We considered using a lesser number of CBs per circuit or only doing one circuit with the alternative circuit only being used to provide a back feed but this was rejected as this would present fewer challenges in terms of protection grading and would mean that a further trial scheme would be required to prove that adequate protection grading could be achieved using a larger number of CBs.

Technology Readiness at Start

TRL8 Active Commissioning

Technology Readiness at End

TRL9 Operations

Geographical Area

Kintyre Peninsula, Argyle, Scotland.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

The indicative Total NIA Project Expenditure is £309,281, 90% of which (£278,352.90) 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 cost benefit analysis for the trial project shows a positive return on investment of £12,510 compared to the business as usual case.

Please provide a calculation of the expected benefits the Solution

The cost of faults derived from CI and CHL costs for RIIO-ED1 is £547,661 based on the presently installed network protection scheme. By installing this alternative scheme, the overall costs of the scheme, CI and CHL costs are forecast to be reduced to £535,151 giving a saving of £12,510. The reduction in reportable CHLs and CIs is estimated as 40% on one feeder and 52% on the other feeder for 63% of all faults.
It is considered from our analysis that if the customers on the overhead lines between substations were evenly distributed then a reduction of 75% would be possible and this could be higher if customers were distributed towards the more remote ends of the overhead feeder lines. Sensitivity analysis shows that a reduction in costs would provide a positive payback with smaller savings as approximately 15% of the project costs are one off costs associated with the trial and would not be repeated if the scheme was to be used else where.

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

The method can be used for any 11kV interconnected circuit for which a logical restoration plan can be defined. The method would have widespread use in much of the SEPD area away from larger towns and in much of rural Scotland.
It is not considered to be generally applicable in areas where the majority of customers are feed from large spur lines nor if the automatic transfer of load is required from one feeder to another while both sides of the CB are live

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

It is difficult to make this assessment without detailed knowledge of the network and likely fault rate going forward for each DNO. Details will be provided by SSEPD of the benefits which can be obtained by the use of the scheme to allow other DNOs to make an assessment of their own networks.

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

If the scheme works then it will have the potential to improve network performance on suitable 11kV rural feeders, particularly where communications links are difficult or expensive to establish and maintain.

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.

SSEPD have checked the ENA Smarter Network Portal and have also established with the equipment supplier that this method is not being trialed by another UK DNO nor is it in use within the GB network.

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