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

Sep 2017

Project Reference Number

NIA_SPEN0024

Project Registration

Project Title

Endbox G38 Level Detection Phase 2

Project Reference Number

NIA_SPEN0024

Project Licensee(s)

SP Energy Networks Distribution

Project Start

October 2017

Project Duration

4 years and 3 months

Nominated Project Contact(s)

Andrew McDiarmid & Eric Brunger

Project Budget

£200,000.00

Summary

This project will focus on the validation of the technique to measure G38 levels in endboxes by trialling on a representative sample of switchgear across the SP Distribution and SP Manweb networks. In addition to this trial, the methodology for the determination and classification of the status of the endboxes will be developed.

Preceding Projects

NIA_SPEN0021 - Endbox G38 Level Detection

Nominated Contact Email Address(es)

innovate@spenergynetworks.co.uk

Problem Being Solved

A large number of transformers and switchgear on our networks use G38 compound in their endboxes as an insulator. The endboxes should be either full or almost full of G38 to ensure safe operation and reduce the risk of a flashover occurring. However, the G38 can leak out of the end box down the cables or through gaps in the box. Additionally, air pockets or voids may form in the body of the compound. Both of these issues will reduce the effectiveness of the G38 as an insulator, and can cause a flashover if not addressed.

Identifying these issues is difficult, however; while the G38 which leaks can stain the endbox or form puddles, these can't always be identified as G38 leaks, and are often cleaned up with no follow-up action. As such, endboxes with reduced levels of G38 are often unidentified. As a result, there have been a number of instances where a flashover has occurred, causing a large amount of damage to the substation and the substation equipment.

Our previous NIA project proved that ultrasonics could be used to detect the level of G38 compound in these endboxes; this allows the endbox to be assessed for safety, and remedial action taken if deemed necessary. The initial trials were undertaken on a test rig in our workshop and subsequently on a small sample of switchgear on the network.

Method(s)

Through the previous NIA project, a methodology for the measurement of the G38 has been developed. This Second phase project will extend the trial across voltages, and types of and sizes of G38 equipment across the network and test a representative sample of the G38 equipment across the SPEN Network. This will allow the measurement technique to be validated, a necessary step to prepare for integration into business as usual as an inspection technique.

Scope

This project will focus on the validation of the technique to measure G38 levels in endboxes by trialling on a representative sample of switchgear across the SP Distribution and SP Manweb networks. In addition to this trial, the methodology for the determination and classification of the status of the endboxes will be developed.

Objective(s)

The main objectives of this project regard the validation of ultrasound measurement of the level of G38 compound in an endbox. This will include determining a classification method to categorise the criticality of the endboxes, depending on the level of G38 in the endbox, and whether the cables entering the gear are fully covered and insulated.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The delivery of the above objectives, within budget and within agreed timelines, as is reasonable depending on the knowledge at this stage of the development phase.

The project will be managed within SPEN applying due diligence and best practices where appropriate.

Project Partners and External Funding

Inspectahire

Potential for New Learning

This project will build upon the previous learning, for the detection of G38 levels in endboxes, to determine whether the process is suitable for use on on a variety of G38 equipment of varying ages, models and voltages.

Scale of Project

The scale of the project is appropriate for technique validation. It must be tested on a wide variety of endboxes to ensure that it has been comprehensively tested, and to ensure that the technique is as effective as initially outlined in the first stage of the project.

Technology Readiness at Start

TRL7 Inactive Commissioning

Technology Readiness at End

TRL9 Operations

Geographical Area

The device will be tested in a representative sample of sites containing G38 equipment across the SPD and SPM licence areas.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£200,000

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 particular saving depends on the equipment; as an example, a recent incident involving a G38 endbox cost £70,000 to repair the damage caused and replace equipment. This cost, along with the additional cost of interruptions to customers and the potential for severe injuries or fatalities, can be avoided through the use of a detection method.

Please provide a calculation of the expected benefits the Solution

N/A – As outlined above, the savings are dependent on the equipment and the scale of the issues identified.

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

The project can be rolled out across all licensees, and it can be applied to all sites which have G38 equipment. This can be integrated into the usual substation inspection routine.

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

The rollout costs are not possible to determine at this stage as they are dependent on factors like the final cost of the selected transmitters, receivers and ultrasound signal generator per unit, the number of units each licensee would buy, the quantity of relevant endboxes in each licensee area requiring inspection and the frequency of inspection required..

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

All network licensees have equipment which uses G38 as an endbox insulator. The issues which G38 endboxes are, therefore, experienced by all licensees. As such, the learning which are generated through this project will be relevant to and usable by all licensees.

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.

To the best of SPEN's knowledge, there have been no projects which have looked at using ultrasound in this way to detect the levels of G38 compound in endboxes.

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