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

May 2017

Project Reference Number

NIA_NGET0207

Project Registration

Project Title

Development of Tools for the Assessment and Control of Impressed Voltage

Project Reference Number

NIA_NGET0207

Project Licensee(s)

National Grid Electricity Transmission

Project Start

May 2017

Project Duration

1 year and 7 months

Nominated Project Contact(s)

Dongsheng Guo

Project Budget

£80,000.00

Summary

This project aims to:

- research the potential use of live detectors for impressed voltage purposes by way of a desktop study and site trials which will provide suitable recommendations upon completion

- design, prototype and test a suitable solution to enable the safe mitigation of foreseeable / known impressed voltage scenarios that could be encountered within either a high voltage or low voltage substation and overhead line working sites.

Nominated Contact Email Address(es)

box.NG.ETInnovation@nationalgrid.com

Problem Being Solved

Within a typical National Grid substation, the magnitude of impressed voltage (IV) could be significant enough to cause personal harm and/or, in extreme cases, fatality. Although for most of the scenarios, IV normally only causes nuisance, shocks and startles, secondary consequences could still be not only unpleasant but also harmful. Therefore, there is a need for the detection of and mitigation against IV on all transmission and distribution networks.

National Grid has identified an opportunity to improve our understanding of impressed voltages and have identified recognisable value in developing a tool kit for measuring and improving the way we mitigating the risks from IV within high voltage and low voltage substations. Current tools available for this purpose have proved difficult to use due to being rated above the expected duty as well as being inflexible.

National Grid also seeks to improve its understanding of impressed voltage live detectors at 275 and 400 kV, which until now have only been tested at distribution levels.

Method(s)

This project seeks to advance the knowledge and understanding of the existence and the magnitude of impressed voltage within either a high voltage or low voltage substation and overhead line working environment, by way of a desk top study to identify potential live detectors, which can be used to detect electrified equipment within a substation, that could be used for either live or charged plant. Site trials will follow to prove the feasibility of adopting live detectors at transmission level.

This project also seeks to design, build a prototype and test a clamp which would be able to assist with the need to for the control of earthing and bonding against impressed voltages.

Scope

This project aims to:

- research the potential use of live detectors for impressed voltage purposes by way of a desktop study and site trials which will provide suitable recommendations upon completion
- design, prototype and test a suitable solution to enable the safe mitigation of foreseeable / known impressed voltage scenarios that could be encountered within either a high voltage or low voltage substation and overhead line working sites.

Objective(s)

The first objective of this project is to produce recommendations on the potential use of live detectors for impressed voltage purposes at transmission level, by way of a desktop study and site trials.

The second objective is to design, test, and produce a solution suitable (impressed voltage clamp) to ensure safe mitigation of all foreseeable / known impressed voltage scenarios within either a substation or overhead line site.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

There are two success criteria for this project:

- create a shortlist of suitable live detectors for impressed voltage purposes at transmission levels
- develop and successfully test a solution suitable (impressed voltage clamp) to ensure the safe mitigation of all foreseeable / known impressed voltage scenarios within either a high voltage or low voltage substation.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

This project will conduct a desktop feasibility study into the use of live detectors within a substation environment for the purpose of identifying impressed voltages.

Site trials will follow, which are expected to take place in one or two NG substations.

This project will also design and develop a prototype IV clamp to mitigate and discharge IV where the detectors have identified the presence of impressed voltages.

Technology Readiness at Start

TRL4 Bench Scale Research

Technology Readiness at End

TRL7 Inactive Commissioning

Geographical Area

This is initially a desk based exercise to undertake a feasibility study into the suitability of live detectors at transmission levels, and to design a suitable solution to ensure the mitigation of impressed voltage scenarios.

Following the design stage, proto-typing and testing of the solution (IV clamp) will be carried out at the manufacturers' premises in the South West.

Once developed, full site testing and validation will be carried out at a suitable site location.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£80,000

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)

This project is predominantly safety related and will have a direct impact on the safety and wellbeing of site personnel. There have been fatalities, numerous injuries and even much more near-misses within NG as well as across the whole industry. The benefits have been thoroughly debated and discussed inside the NG-wide Impressed Voltage working group, comprising of Legal, SSR, Ops and Network Engineering representatives.

Please provide a calculation of the expected benefits the Solution

Based on the ENA Safety Case Benefit Scorecard this project would rank as High (5) as it has the potential to save over £1m.

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

If successful, this method would be replicable across all GB Network Licensees high voltage or low voltage substations.

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

The cost of rollout would be determined following the successful design and testing of a suitable solution for the mitigation of impressed voltage scenarios.

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

☐ 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 knowledge generated by this project will be of relevance to all Network Licensees as they are all affected by impressed voltage conditions.

Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

This project fits within the all of the below value areas of the Electricity Innovation Strategy:

Managing Assets - Managing assets throughout their lifecycle
Efficient Build - Building new assets faster and at lower capital and whole-life costs
Service Delivery - Developing new service-based propositions and business models
Corporate Responsibility - Doing the right thing

☑ 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

- [x] Yes