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

Feb 2014

Project Reference Number

NIA_NGET0092

Project Registration

Project Title

Partial Discharge on Existing HV Cable

Project Reference Number

NIA_NGET0092

Project Licensee(s)

National Grid Electricity Transmission

Project Start

May 2013

Project Duration

3 years and 2 months

Nominated Project Contact(s)

Carl Johnstone

Project Budget

£330,000.00

Summary

The scope of the project covers the installation, evaluation, and compatibility of new-to-market sensors for partial discharge in HV Cable. The reason this project is innovative is because this work has never been done before. National Grid have been offered a service from one manufacturer, whose kit is being tested, however this is on a stand alone platform without integration into the existing condition monitoring system. Therefore, National Grid are going to test the core technology and try to incorporate into the SAM programe.

Nominated Contact Email Address(es)

box.NG.ETInnovation@nationalgrid.com

Problem Being Solved

National Grid has many kilometres of underground HV cable either approaching or exceeding its design life. More information is required to be able to optimise replacement, avoid failures and reduce costs while still managing risk to the Transmission System. There has been little work completed in the area of online monitoring of HV Cables due to the complexity and lack of viability to retro-fit sensors. This is due to oil filled cables being designed to be closed loop, both electrically and hydraulically, for life. The capture of a signal is also complex due to the nature of Transmission cables being longer and having attenuated signals. The problem that National Grid face is that there is no proven methodology for online condition monitoring of HV cable currently available.

Method(s)

Development

The method proposed involves evaluating new sensors for application on the HV Cable system in the Transmission Network, and developing 2 systems that are able to monitor in a remote and harsh location. From there, National Grid are going to investigate the compatibility of the sensors with the existing SAM system. This solution will then provide a means of evaluating cable condition for optimised capital replacement and risk mitigation.

Scope

The scope of the project covers the installation, evaluation, and compatibility of new-to-market sensors for partial discharge in HV Cable. The reason this project is innovative is because this work has never been done before. National Grid have been offered a service from one manufacturer, whose kit is being tested, however this is on a stand alone platform without integration into the existing condition monitoring system. Therefore, National Grid are going to test the core technology and try to incorporate into the SAM programe.

Objective(s)

To be able to provide online PD information on HV cables installed on the Transmission system.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

This project will be successful if National Grid can quantitively monitor PD on HV cables.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

This project is appropriately scaled to increase chance of success for delivery of a solution that actually works. The two suppliers have been chosen in order to try and introduce market competition and provide value for consumers.

Technology Readiness at Start

TRL5 Pilot Scale

Technology Readiness at End

TRL6 Large Scale

Geographical Area

This work is being trialled in Wales.

Revenue Allowed for the RIIO Settlement

Zero

Indicative Total NIA Project Expenditure

£330,000

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)

Early detection of faults would enable a repair and avoid failure. A failure generally means an immediate trip, impacting the security of supply on the network. This means (for a cable failure) the cutting out of the failed joint and replacing with 2 new joints with a new section of cable in between. The physical failure also means the uncontrolled leakage of oil into the land or nearby water course. For specific circuits, generation could rely on the cable being in service to provide power to the grid. If the cable is not in service, the generation will have to be constrained off. All of these issues are costly to both National Grid and the end consumer.

Please provide a calculation of the expected benefits the Solution

Base-Method is not complex enough for this project, therefore the following statement is issued instead:

If it is assumed that online PD monitoring could avoid 15% of failures, it could enable the following benefits:

- Difference in direct fault/repair costs (£870,000)
- Oil Leakage decontamination and fines (£200,000)
- Reduce demand on limited oil filled cable stock
- Reduce impact on Network Capability
- Increase customer satisfaction
- Enable more information on replacement prioritisation
- Increase network availability

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

This methodology could impact the whole of the GB transmission system, however would only need to be implemented on the HV Cable systems.

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

This is unclear. The project will address the most challenging aspect of integration of PD sensors into the HV cable system. Roll-out would need to be large scale purchasing of sensors and integration into the SAM platform, however, National Grid do not have a need to roll this out to every single cable system at the moment, so would introduce this solution as and when is needed. Commercial discussions will be undertaken once the project has provided the required information to do so.

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)

This project addresses the following aspects of the Innovation strategy:

Safety : Safe Working Practices

Reliability : Optimising Asset Management

Environment : Enhanced Capacity

Connections : System Access

Connections : Smarter Transmission Philosophy

System Operability : Smarter System Operation

System Operability : Ancillary Services and Energy Storage

☑ 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