NIA Project Registration and PEA Document

Date of Submission

Nov 2015

Project Reference Number

NIA_UKPN0015

Project Registration

Project Title

Tunnel Data Capture Enhancement

Project Reference Number

NIA_UKPN0015

Project Licensee(s)

UK Power Networks

Project Start

November 2015

Project Duration

1 year and 7 months

Nominated Project Contact(s)

Lynne McDonald

Project Budget

£240,000.00

Summary

This project will be applicable to all GB DNO and third party tunnels containing electrical assets. These assets are expected to primarily be LV, HV and EHV cables and associated joints.

The enhanced inspection method will be trialled on a proportion of tunnels within UK Power Networks area.

Nominated Contact Email Address(es)

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Problem Being Solved

Within UK Power Networks operating licence areas there are 45 km DNO owned tunnels, this accounts for 34% of the total DNO owned tunnels in the GB.

LPN - 35km Cable Tunnel Owned by DNO

SPN - 6km Cable Tunnel Owned by DNO

EPN - 4km Cable Tunnel Owned by DNO

All GB DNOs - 131km Cable Tunnel Owned by DNO

In addition to DNO owned cable tunnels, there are often third party tunnels within urban centres, including tunnels owned by National Grid, local councils and other utilities which are utilised by DNOs.

Both DNO and third party owned tunnels represent complex confined spaces and may pose an enhanced level of risk to people entering them. The aims of this project are to:

1. Use new and innovative techniques to enhance the monitoring of assets within tunnels to more accurately calculate the health of the assets.

2. Improve data collection within tunnels to develop condition based maintenance and inspection where possible.

1. Improve public and employee safety by reducing the risk of disruptive failures and identifying joint, cable and tunnel defects.

2. Develop a proactive repair/replacement regime to reduce the impact of cable and joint faults on customer service reliability (reduced CIs and CMLs)

3. Improve public and employee safety by reducing the risk of disruptive failures and identifying joint, cable and tunnel defects.

4. Develop a proactive repair/replacement regime to reduce the impact of cable and joint faults on customer service reliability (reduced CIs and CMLs)

These deliverables will minimise the risk to both staff carrying out work in the tunnels and the public in its locality by reducing the number of visits within the tunnels and enhancing the knowledge of the health of assets within the tunnel.

Method(s)

The project is split into three key phases:

Phase 1: Literature Review of Enhanced Inspection Techniques

- Identification of tunnel inspection techniques to measure the condition of assets within tunnels (e.g. joints, cables, equipment, supports, tunnel fabric and fixed access equipment etc.) It is envisaged this may include:

o Liaison with other tunnel owners to develop an understanding of best in class inspections

o Review of related company, national and international standards to identify beneficial practices

o Enhanced photography to provide a virtual walk through of the tunnel

o Use of specialist partial discharge equipment to assess the health of assets during the inspection

o Deployment of continuous partial discharge monitoring to asses changes to equipment over time

o Use of mobile 3D laser scanning equipment to quickly identify movement of assets within the tunnel and of the tunnel structure itself

- Proposal of the enhanced tunnel inspection techniques that should be implemented and trialled

- Selection of techniques based on recommendation and peer review

Phase 2: Develop, design and build technology & inspect tunnels using advanced techniques

- Develop, design and build one/two prototype devices or obtain existing equipment that is commercially available or enhance commercially available equipment

- Train a small number of inspectors on the use of prototype or equipment

- Support further development of units based on feedback of use by inspectors

- Peer review each inspection technique to identify the safest and most cost effective method of tunnel inspection

Phase 3: Development of equipment, systems and policies

- Return of prototype units and production of up to five devices

- Produce instructional guide on use of technology

- Produce report detailing how the system works and tunnel inspection & maintenance policies

- Training on use of unit to all inspectors

- Production of a strategy for the enhanced inspection of tunnels to be available to all GB DNOs

Scope

This project will be applicable to all GB DNO and third party tunnels containing electrical assets. These assets are expected to primarily be LV, HV and EHV cables and associated joints.

The enhanced inspection method will be trialled on a proportion of tunnels within UK Power Networks area.

Objective(s)

The objectives of the project are to:

· Identify methods of inspection that are currently used on other assets that enable enhanced data capture.

· Capture sufficient data as part of tunnel inspections in order to reduce the need for staff to enter tunnels and enable condition based monitoring of tunnel sections. This will provide a reduced chance of injury to staff and minimised risk of failure of equipment by employing a proactive approach to improved inspection and monitoring.

· Test the identified methods and/or peer review to confirm observations noted that provide a true representation of the degrading health of the assets.

· Develop the tunnel inspection strategy to enable a condition based monitoring approach to tunnel inspections.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The success of the project will be judged against the four objectives described below:

- Recommended list of tunnel inspection techniques

- Test case report on the innovative inspection techniques in tunnels

- Developed tunnel inspection strategy that includes condition based monitoring of assets within tunnels

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

Enhanced inspections will be carried out on approximately 25% of tunnels which contain UK Power Networks assets.

Technology Readiness at Start

TRL7 Inactive Commissioning

Technology Readiness at End

TRL9 Operations

Geographical Area

The project will be carried out in all three of UK Power Networks DNOs. These are South of England Network, East of England Network and London Network.

Revenue Allowed for the RIIO Settlement

There is no revenue allowed in the RIIO ED1 settlement for enhanced inspection of tunnels.

Indicative Total NIA Project Expenditure

£240,000 is the total expenditure which we expect will be incurred during the duration of the project.

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)

By using enhanced inspection methods for tunnel inspection will enable for improved data collection to formalise a condition based maintenance and inspection regime supporting the development of a proactive repair/replacement regime.

It is estimated the total potential savings from this project could be up to 5% of the budget for the tunnel repair and maintenance from 2017/2018 through to the end of the ED1 period. This would represent a saving of £60k without taking into account the increased inspection cost.

Please provide a calculation of the expected benefits the Solution

A CBA has been used to confirm expected return from this project if successful, this can be summarised as:

Base Cost: £2.48m

Based on the expenditure for the inspection, maintenance and repair for 25% of the tunnels within London Power Networks.

Method Cost: £2.51m

This is made up of the base inspection costs with an addition of £110k for the demonstration and use of technology to undertake enhanced inspections assessments. This also includes the base repair and maintenance costs with the assumed introduction of 5% efficiency savings costs from 2017/18 onwards.

Benefits: £0.07m

Benefits will arise from targeted repair and maintenance works, assumed 5% efficiencies would be achieved on tunnel repair and maintenance costs from 2017/18 onwards.

Financial benefit: £0.04m

Expected Net Present Value over the ED1 period when applying the equation (Base Cost – (Method Cost – Benefits)).

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

Twelve of fourteen GB DNOs have tunnels owned by the DNO. Moreover, the project method could be applied to third party tunnels that DNOs have their assets located within, therefore also applicable to shared tunnel sites

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

Based on the following assumptions, it is estimated that the cost of rolling out to GB would be approximately £466k

· Across the DNOs in GB, there are approximately 131km owned tunnels.

· The repeatable implementation cost of the project is assumed to be £2k per tunnel site.

· Assuming for UK Power Networks 45km tunnel lengths this is for 80 sites, for 131km it can be expected that there could be 233 sites.

Therefore 233 sites with an additional £2k additional cost for enhance inspections it would be expected to be £466k.

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 successful the learning will provide best practice for tunnel inspections that can be applied to all GB DNOs that have assets situated within tunnels.

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.

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