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

Apr 2016

Project Reference Number

NIA_NGGT0090

Project Registration

Project Title

Infra-red photography for maintenance

Project Reference Number

NIA_NGGT0090

Project Licensee(s)

National Gas Transmission PLC

Project Start

April 2016

Project Duration

0 years and 9 months

Nominated Project Contact(s)

Mark Allatson, box.GT.innovation@nationalgrid.com

Project Budget

£52,200.00

Summary

Over the past few years there have been considerable advances in non-invasive thermal imaging techniques. These techniques and the associated equipment offer considerable opportunities to for the effective monitoring of National Grid's compressor fleet. To maximize the advantage of these opportunities, it is necessary to effectively evaluate the technology within a closely defined structured programme such that appropriate and consistent solutions can be applied across the National Grid's compressor fleet.

Third Party Collaborators

WSP UK Limited

Nominated Contact Email Address(es)

Box.GT.Innovation@nationalgrid.com

Problem Being Solved

Heat build-up on a component or system can be a precursor to impending failure of that component or system; National Grid has used infrared cameras on an ad-hoc and limited basis on some of their compressor station assets as maintenance and inspection aids, however there is no formal evidence of the effectiveness of infrared cameras for monitoring National Grid assets where temperature rise can indicate the presence of a fault or an impending failure. As a consequence the use of this technology, and the potential benefits that it might realise are not being achieved.

To further optimise the maintenance and monitoring of electrical and other assets across the network, increasing operational efficiency there is a need to assess the latest advances in infrared camera technologies and where clear benefits exist, embed these techniques in the current maintenance processes.

Method(s)

The programme will conduct a comprehensive feasibility study of infrared diagnostic and evaluation technologies, highlighting where the technology fits with need. The study will cover the following three areas:

Desktop Study – An overview of the technology and the type of inspection, diagnostics and maintenance activities that can be undertaken with the aid of an infrared camera will be produced. Inputs for this study will include information from equipment suppliers and other sources and provide information related to suitable infrared equipment that would provide the most effective solutions.

Field Data Gathering and Assessment - Specific application areas on National Grid compressor station assets where infrared cameras can improve on inspection diagnostics and maintenance will be identified and examined in detail. These areas will include:

- Standard Gas Transmission Electrical systems
- Electric Compressor drive system
- Other auxiliary mechanical systems

This task will involve visiting up to three compressor stations nominated by National Grid to examine plant and equipment where it is perceived that infrared cameras can be used to aid diagnostics, inspection and maintenance activities.

It may be that some plant items, although suitable candidates for infrared inspection, diagnostics and maintenance, may in practice not be readily accessible for various reasons. Such plant items, if and where they exist, will be highlighted and where possible, a methodology suggested allowing for infrared inspection.

In addition to highlighting the areas where infrared cameras will improve on the existing maintenance activities, the current maintenance processes for the targeted areas will be assessed. This examination will include broad discussions with maintenance personnel about the existing maintenance activities that they perform. This activity is intended to formulate a method for how the addition of infrared cameras would fit into the existing maintenance regime and the necessary process modifications that would need to be put in place to integrate this technology effectively into the business.

Following the field data gathering and assessment, the suitability assessment will outline the specific requirements for the successful use of infrared cameras on a National Grid compressor station:

- Type of compressor station assets that infrared examination should be applied to.
- Potential minor and cost effective modification to plant items (e.g. infrared window to check on heat build-up on an internal component).
- Training requirement.
- Data interpretation requirement.
- Costs factors, including camera costs and their maintenance.
- Overall perceived benefits of using infrared cameras for targeted assets.

Recommendation – Based on the suitability assessment, a set of business and implementation options will be given for the use of infrared cameras on National Grid compressor station assets.

Scope

Over the past few years there have been considerable advances in non-invasive thermal imaging techniques. These techniques and the associated equipment offer considerable opportunities to for the effective monitoring of National Grid’s compressor fleet. To maximize the advantage of these opportunities, it is necessary to effectively evaluate the technology within a closely defined structured programme such that appropriate and consistent solutions can be applied across the National Grid’s compressor fleet.

Objective(s)

The objective of this project is an evaluation of the effectiveness of infrared cameras for maintenance, inspection and diagnostics when applied to compressor station plant assets. The evaluation will include recommendations on the most appropriate use of infrared cameras.

The outcome of this study will enable National Grid to focus structure and optimize their maintenance resource and effort.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

This project will produce a comprehensive document with recommendations that detail the appropriate use of infrared cameras for inspection, diagnostics and maintenance across the National Grid compressor fleet.

The programme will enable National Grid to make an informed decision on whether to implement the use of infrared cameras as an aid for inspection diagnostics and maintenance of the compressor fleet. If a decision is taken to use such a tool, it will provide the maintenance engineer with the information to target appropriate and critical parts of their compressor station plant for maintenance using infrared cameras. This process could then lead to the leveraging of the strengths of infrared cameras (remote sensing, non-intrusive and temperature visualisation) to tackle appropriate maintenance activities more effectively. In addition, because infrared cameras can give the maintenance engineer the ability to spot some developing faults before they adversely impact on operability, the early detection and subsequent intervention will improve plant availability.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

A initial desk based study followed by practical trials on National Grid operational sites.

Technology Readiness at Start

TRL8 Active Commissioning

Technology Readiness at End

TRL9 Operations

Geographical Area

At various locations on the National Grid gas transmission network with potential for use on all sites.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

NIA total : £51, 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)

Technology advances in non-invasive thermal imaging techniques offer considerable opportunities to for the effective monitoring of National Grid's compressor fleet. As the annual compressor maintenance budget is in the region of £10m, small targeted improvements in the timing of maintenance and replacement activities potentially offers significant benefits.

Damage to a compressor could vary from replacing a part to site closure – replacing a high voltage electric motor may cost in the region of £1500k; Having said that there is a likely hood that additional material may need to be replaced. In the instance that a site had to close costs may run into millions depending on the site.

There are other potential saving in the area of health and safety.

Please provide a calculation of the expected benefits the Solution

The feasibility study will inform the type of inspection, diagnostics and maintenance activities that can be undertaken with the aid of an infrared camera . It will then be possible to ascertain where and, to what degree, savings against compressor maintenance can be realized.

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

The method of infrared imaging could be applied across the 21 compressor stations on the NTS.

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

This will be fully determined as part of the project, however at this stage the cost of one site survey is expected to be in the region of £3000.

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

Infrared detection technologies have a wide range of applicability across all aspects of gas transmission and distribution networks. This formal review will provide a baseline of the capabilities of these technologies

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