

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 2019

Project Reference Number

NIA_NGTO036

Project Registration

Project Title

Optimised Infra-Red Image Systems (OsIRIS)

Project Reference Number

NIA_NGTO036

Project Licensee(s)

National Grid Electricity Transmission

Project Start

October 2019

Project Duration

1 year and 3 months

Nominated Project Contact(s)

Oliver Cwikowski

Project Budget

£228,000.00

Summary

Infra-red images are used to perform periodic inspections of transmission assets. These cameras provide a method of mitigating risk and identifying specific failure modes. Experience from collecting many infra-red images has highlighted that false positives can occur, which can lead to unnecessary additional follow on work to mitigate the perceived defect. This project will investigate the sources of intrinsic error within the systems that use infra-red image scans and identify methods to mitigate these errors. This will reduce the number of false positives and result in our Infra-red image systems being optimised.

Nominated Contact Email Address(es)

box.NG.ETInnovation@nationalgrid.com

Problem Being Solved

Non-invasive scans of assets allow asset owners to collect important information on the condition of their assets. This information is then used to direct follow on actions, such as further inspections or even invasive inspections of the assets. Infra-red scans are one way that National Grid Electricity Transmission (NGET) assesses the condition of our assets.

While non-invasive scans provide significant benefits over invasive alternatives, they have the additional complexity of introducing more factors which can impact the images taken. These factors can then impact the decisions made based on the information inferred from these images. This can lead to false positives on occasion, which can lead to additional activities which were not required. Identifying methods which reduced the number of false positives, while retaining the ability of the system to detect the asset's underlying condition would enable these instances to be reduced.

Method(s)

This project will solve this problem by reviewing the existing data, processes and tools used to collect infra-red images. This review will generate an uncertainty budget, which will quantify the possible levels of uncertainty within the system. Mitigations for the distinct

sources of uncertainty will then be proposed.

Scope

The project will cover the following items:

WP1 – Literature & Reference Materials Review

A detailed measurement review will encompass detailed observations of the protocol and process deployed by NGET, algorithms and systems employed, previous measurement results, calibration certificates and other pertinent sources of information. Based on this review a theoretical uncertainty assessment will be performed.

WP2 – Development of an Uncertainty Budget

An uncertainty budget for the measurement system will be created, quantifying the inputs and uncertainties from each component, and combining them together. This approach will be consistent with the ISO JCGM 100 “Evaluation of measurement data – Guide to the expression of uncertainty in measurement” (ISO/IEC Guide 98-3). Mitigations will then be proposed to support the reduction of false positives due to the different sources of uncertainty.

WP3 – Measurement of a Test Artefact

An example asset will be tested in a laboratory conditions to identify key parameters which can affect the measurement of the surface temperature. This data collection will help improve the mitigations proposed in WP2.

Objective(s)

The objectives of this project are to:

1. Understand the potential sources of uncertainty in our measurements in greater detail
2. Propose mitigations to reduce uncertainty

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

This project will be deemed successful if:

1. The magnitude of possible errors in our infra-red imaging systems are understood in greater detail
An uncertainty budget is developed and potential mitigations proposed

Project Partners and External Funding

-

Potential for New Learning

This project could provide information to support the interpretation of information from infra-red images. This will support all licensees that use infra-red images to support their asset management processes. These scans are frequently recommended by suppliers, even if the licensee does not use them routinely.

Scale of Project

This scale of this project was chosen to allow sufficient information to be collected to meet the project's objectives. Reviewing existing data, processes and performing the testing are all necessary to deliver the project's goals.

Technology Readiness at Start

TRL5 Pilot Scale

Technology Readiness at End

TRL7 Inactive Commissioning

Geographical Area

Desktop study and small scale laboratory testing.

Revenue Allowed for the RIIO Settlement

none

Indicative Total NIA Project Expenditure

£228,000

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)

If the uncertainties in our image capture systems can be reduced, this could prevent unnecessary work from being undertaken; such as additional repeat scans. These scans can cost around £1000 and delay other capital investments. Given that we undertake several thousand scans each year, if we can prevent 50 false positives a year this would save £50,000 a year. However, the main benefit from this project is foreseen to be improvements in safety rather than a reduction in operating costs.

Please provide a calculation of the expected benefits the Solution

Base Case = £500,000

£50,000 per year due to 50 repeated scans a year. Over 10 years this could cost us £500,000.

Method Case = £236,000

Method = £186,000 one off cost plus an additional £50,000 of implementation costs.

Benefit (Base – Method):

£500,000 - £236,000 = £264,000

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

This knowledge could be implemented into a licensee's business by adopting the outcomes into their technical and policy documentation; which could be adopted by all network licensees.

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

This would cost around £50,000 to review and update the policy documentation to reflect the outcomes of the project.

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

The outcomes of this project will be relevant to any licensee who uses infra-red images to assess the condition of their assets. This will also include any licensee who asks a supplier to perform periodic scans on their behalf. The majority of licensees will use this type of technology and could learn from the project's outcomes.

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

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.

The two most relevant projects on the ENA portal are the following:

- NIA_NGGT0090: Infra-red Photography for maintenance: https://www.smarternetworks.org/project/nia_nggt0090
- NIA_NGTO015: CSE fault analysis by 3D monitoring https://www.smarternetworks.org/project/nia_nget011

These projects do not investigate the inherent uncertainties for the application in the transmission network, and therefore this project is not duplicating previous research efforts.

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

As Infra-images have only been routinely captures for a few years, the value from understanding the data capture system in greater detail has only recently come to light. While the technology has been around for many years, the application and the scale of its use within the transmission network has only occur recently.

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

The benefits from this project are seen to come from two areas; improved safety and reduced operating costs. These benefits are contingent on suitable mitigations being developed as part of this project, which may not be possible or may be impractical to delivery. This induces significant risk around the outcomes of the project, which translates to a large financial risk. This risk means that the business cannot justifiably use other funds to deliver this project.

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

The project can only be funded through the NIA as there are significant risks which warrant further investigation and development of this research area, prior to its use within the business. The main risks are: • No proven business case – While a value case has been defined for this project, it is contingent on obtaining an as yet unknown level of technical knowledge. This means that the benefits outlined in this document may not materialise, or may require significant further investment to adopt. • Technical challenges – As this research is looking a specific application of Infra-red technologies, we may find that there are uncertainties in these systems which cannot be easily resolved. This may mean that we will be aware of the uncertainties in these systems, but it may be challenging to achieve any effective mitigations of these uncertainties. Without the NIA funding these risks would never be mitigated, and the business would justifiably not research this area; resulting in the potential benefits never being obtained or investigated.

This project has been approved by a senior member of staff

Yes