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_SHET_0019

Project Registration

Project Title

Automatic Thermovision Surveys (ACTS)

Project Reference Number

NIA_SHET_0019

Project Licensee(s)

Scottish and Southern Electricity Networks Transmission

Project Start

April 2016

Project Duration

1 year and 4 months

Nominated Project Contact(s)

SSEN Future Networks Team

Project Budget

£141,000.00

Summary

The scope of the project is to have a fully automated live system installed and tested at Tealing substation.The system will be installed and commissioned by Pointer Ltd with technical support from FLIR Ltd to develop the required software enabling faults to be recognised and temperature alarms to be activated. The data will be gathered from continual thermovisual inspection during the winter period. Alerts will be actioned by the security bureau and passed to the site engineers for further investigation. An evaluation will be completed at the end of the trial with recommendations of the system's suitability for transfer to BAU.

Nominated Contact Email Address(es)

transmissioninnovation@sse.com

Problem Being Solved

A requirement of SHE Transmission asset management procedures is to complete a live thermovision survey of all exposed substation busbars at least once annually. These surveys are undertaken to identify hot spots which could lead to failures if undetected. Surveys are ideally undertaken during winter months when loads are high and thermal differentials are at their highest; however surveys cannot be undertaken when it is wet or sunny. The surveys are therefore rarely undertaken under ideal conditions and hot spots may be missed.

The Static Var Compensator (SVC) at Tealing and Beauly substations is surrounded by high wooden fences because of large magnetic fields and personnel cannot enter the compounds when the equipment is live to carry out a thermovision survey. This combination makes it virtually impossible to complete a thermovision survey under load on these assets. SVC's are high value assets c.£12m each, which operate at high temperatures and are therefore susceptible to thermal faults.

Method(s)

This project will install a fully automated thermovision survey system by the use of pan tilt zoom (PTZ) thermal imaging cameras and system management software to store data and issue alerts if any fault conditions are met. The PTZ thermal imaging cameras are

installed in positions where they can be moved to bring all equipment required to be surveyed into the field of view. The system will be programmed to follow pre-defined routes along connection points measuring the temperature at each position. The system is designed to operate completely unattended.

When combined with system management software, each camera is capable of monitoring multiple regions of interest and performing an automated “tour” of the substation with unique alarms checked at each tour stop. Image frames can be acquired at scheduled intervals rather than continuously or viewed live via web based access. Acquisition can also be triggered remotely or by temperature alarms tied to individual regions of interest and communicated via the security bureau.

Scope

The scope of the project is to have a fully automated live system installed and tested at Tealing substation.
The system will be installed and commissioned by Pointer Ltd with technical support from FLIR Ltd to develop the required software enabling faults to be recognised and temperature alarms to be activated. The data will be gathered from continual thermovisual inspection during the winter period. Alerts will be actioned by the security bureau and passed to the site engineers for further investigation. An evaluation will be completed at the end of the trial with recommendations of the system’s suitability for transfer to BAU.

Objective(s)

The objectives for the project are;

• To complete a field based trial of the thermal imaging system at Tealing substation; gather the data from the winter period and compare to data obtained from manual thermovisual inspection.
• Develop preferred system settings and rule based condition monitoring for SVCs.
• Evaluate the system’s suitability as a condition monitoring tool for BAU adoption and its impact on asset management.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The project will be successful if it can be determined whether or not the fully automated thermal survey system is able to provide timely and accurate condition monitoring for improved asset management efficiencies. Successful evaluation of the system’s performance on an operational SVC is key to the overall success of the project.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

This project is designed to get maximum learning for minimal cost and is expected to take this technology through to TRL 9 at which point it could be a candidate for full-scale deployment. Any smaller scale project would limit the possibility of conducting a full-scale field deployment of this technology directly after this project. The technology must be assessed in a live substation environment in order to determine whether it is fit for purpose

Technology Readiness at Start

TRL6 Large Scale

Technology Readiness at End

TRL9 Operations

Geographical Area

This project will be undertaken within the SHE Transmission licence area in Scotland.

Revenue Allowed for the RIIO Settlement

No revenue allocated in the RIIO settlement.

Indicative Total NIA Project Expenditure

The total expenditure expected from the project is £141,000 90% of which £126,900 is allowable NIA expenditure.

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)

Savings are estimated with respect the avoidance of an unplanned SVC outage due to the detection of hot spots. The estimate is based on a cost of £4 per hour per MVar for lost time. It does not include any cost of repairs that could be avoided by early hot spot detection.

As previously mentioned, un-planned outage costs have been used to indicate cost savings as existing methods of thermovision surveys cannot be undertaken due to safety restrictions within the SVC compound(s).

Please provide a calculation of the expected benefits the Solution

The costs identified below calculate the typical cost saving from each SVC using the current base cost;

Base cost for an unplanned SVC outage = £126,000
Based on £4 per hour per MVAr, using 150MVAr, 7 day hot spot repair time on an SVC.

Method cost of fully installed system = £72,550
Based on a 2 camera system

Estimated cost saving per SVC = Base cost – Method cost = £53,450.

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

Providing the demonstration and assessment of the thermovision system on the network is positive, the system could potentially be used at many substation locations containing SVCs. SHE Transmission currently has 2 SVCs with another planned for installation in the future. Similar sized Licensees are expected to have similar numbers of SVCs installed.

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

The costs detailed above indicate the cost saving of using the automatic thermovision survey inspection over the current base case cost. The costs of GB roll out of this method will depend on how frequently other GB network licensees wish to inspect their SVC health and the approach taken to roll out if the project is successful. System installation costs will be site-specific due to the individual implementation nature of primary substations.

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 requirement to periodically assess the condition of SVC assets in a live substation environment is common to all UK Transmission Network Licensees. The learning generated from the project will therefore directly benefit all UK Transmission Network Licensees. The learning provided by the project will include the operational and functional experience of using an automatic surveying system which will be widely valuable. The system can potentially provide better and more accurate knowledge of an operational SVC's health and condition.

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