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

Nov 2016

Project Reference Number

NIA_SPT_1608

Project Registration

Project Title

Reducing Energy Losses from Transmission Substations

Project Reference Number

NIA_SPT_1608

Project Licensee(s)

SP Energy Networks Transmission

Project Start

January 2017

Project Duration

2 years and 7 months

Nominated Project Contact(s)

Watson Peat & Andrew McDiarmid

Project Budget

£200,000.00

Summary

There will be four work packages in this project.

WP1 – Energy Audit

Identify and apply evaluation measures and technology, and establish possible on-site energy saving measures, monitoring their overall effectiveness. Infra-red Thermography will be utilised both before and after the intervention to assist with the identification of opportunities.

WP2 – Physical monitoring of Substations Energy Breakdown and Analysis

Assessment and data breakdown of substation sample. The loadings of each circuit will be individually monitored and examined. The ambient levels of heat and light in the substations will be monitored as part of this, with potential control strategies to be examined.

WP3 – Building Design Evaluation

The substation buildings with and without the potential energy saving measures will be modelled, considering what measures will be possible to carry out. This will allow the impact on load demand to be determined, while accounting for potential risks in the substation environment.

WP4 – Wider Substation Improvements

Taking learnings from the study of the three initial substations, a further 5 or 6 substations will be identified and analysed for their energy performance. These studies, while at a lower level of detail and with fewer energy saving measures implemented, will allow a wider study to evaluate the impact of the energy and cost savings, and the environmental benefits, on the wider SP Transmission network.

Nominated Contact Email Address(es)

SPInnovation@spenergynetworks.com

Problem Being Solved

At present, substation energy consumption is uncontrolled and unmonitored. Energy is consumed for a number of processes- heating, battery charging or dehumidifying, for example - to ensure network resilience and ensure the security of the electricity network. Typically, the supply for Grid substations comes from the secondary windings on 33kV neutral earthing transformers, and is unmetered. As such, substation demand is not monitored or accounted for while it contributes to the SPEN transmission losses.

Method(s)

This project will initially aim to establish, through audits and metering, the baseline level of energy usage of a number of trial substations in the SPT licence area, and then use the collected data to model the performance of the substation buildings. These data models will allow opportunities for energy efficiency to be identified, then enable the development for a plan for substation energy efficiency

Scope

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Objective(s)

WP1 – Energy Audit

Three summary reports to be produced, one for each substation, detailing the energy evaluation and measures implemented.

WP2 – Physical monitoring of Substations Energy Breakdown and Analysis

An energy breakdown report to be produced to contribute to the main improvement strategy report.

WP3 – Building Design Evaluation

To produce a report that identifies the potential improvements for the substations and their respective impacts on energy usage and cost.

WP4 – Wider Substation Improvements

A Quantifiable Improvement report to be written for the wider substations owned and managed by SP Transmission.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Each use case will have a distinct success criteria.

WP1 – Energy Audit

The delivery of three reports showing the key measures which have delivered energy savings at each substation.

WP2 – Physical monitoring of Substations Energy Breakdown and Analysis

Production of a breakdown analysis of the loading at each of the identified substations, with an evaluation of possible energy control strategies.

WP3 – Building Design Evaluation

Production of a report which identifies points of improvement for the fabric of the substation buildings, with proposals for improving heating and lighting within the substations.

WP4 – Wider Substation Improvements

Production of a report showing the improvements which could be made across all transmission substations in the SPT Licence Area, quantifying the benefits of rolling out the changes across SPT.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The project will fully study and implement energy saving solutions in three transmission-level substations. A reduced and refined study will be applied to a further 5 or 6 substations, with some energy-saving solutions implemented at these locations. This will allow the methods and solutions to be trialled in each type of substation, and to allow the refined outcomes of the initial trials to be tested on a range of substations.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL6 Large Scale

Geographical Area

SP Transmission's substations cover the Central and Southern Scotland region. The main substations to be studied are all in the region of East Kilbride.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£200,000

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)

The project has this potential to bring financial benefits as it seeks to minimise the energy usage at substations, increasing the efficiency of the auxiliary systems in the substations.

The size of the potential reduction is to be determined is one of the outcomes of WP1 in this project, and so cannot be estimated at this stage.

Please provide a calculation of the expected benefits the Solution

N/A - Research Project

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

All UK transmission license operators will face the same issues with power usage and loss in transmission substations. The outputs from this project will be a methodology for improving the energy efficiency of each type of transmission substation which can be applied to each license operator's substations.

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

The implementation cost for each level of substation will be determined through this project. As such, the full implementation cost cannot be estimated at this stage . As this project will examine the application of the energy saving solutions to each archetype of transmission substation, the cost for implementation across GB will scale from the cost for implementation across the SPT license area.

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

All networks licencees face the same issues with energy usage in their substations; similar technology and switchgear is deployed in each substation, with similar power requirements, and the associated losses at substation level are yet to be modelled and mitigated with energy-saving solutions.

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