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

Jan 2014

Project Reference Number

NIA_NGET0099

Project Registration

Project Title

Thermal Efficiency Trials

Project Reference Number

NIA_NGET0099

Project Licensee(s)

National Grid Electricity Transmission

Project Start

July 2013

Project Duration

1 year and 7 months

Nominated Project Contact(s)

Harry Hubbard & Jude Robinson

Project Budget

£650,000.00

Summary

Currently, we do not provide heat recovery equipment to National Grid sites as there had been no need for us to install such equipment. Moving forwards, it has been noted that some of our older and larger sites are very energy inefficient. With technology becoming widely available to address the issue of energy efficiency, we are looking to trial some equipment that takes advantage of the secondary effects of Electricity Transmission. When a transformer is in service, is produces heat. This heat is often extracted from the transformer in order to keep the operating temperature below a certain level, and the heat is usually expelled. For those systems where cooling is not an issue, we leave the transformer to perform its duty and focus on another secondary effect – noise. Within the noise enclosure, there is usually a warm environment as the heat has been contained. It is this part of the system we want to exploit, using air source heat pumps, to help minimise the electrical & environmental impacts of the older substations.

Nominated Contact Email Address(es)

box.NG.ETInnovation@nationalgrid.com

Problem Being Solved

Some of the older National Grid sites require large amounts of energy to keep at a sufficient operating temperature for both Operational Equipment, and personnel needs. Many of the larger sites that this is the case for, are also the older, less energy efficient sites where old style radiators and electric heaters are common. In order to minimise our impact on the environment, and reduce the demand for LVAC electricity to the substation, we are proposing to use heat recovery methodology to recover otherwise lost heat from the transformers.

The problem for National Grid, it that we want to be able to commission an appropriately sized installation at the correct price. In order to understand what we want to roll out across National Grid sites, we need to understand the performance of the equipment when installed, and how we can adapt the equipment to deliver the most efficient solution. For two of the sites, this should be fairly straightforward and will focus around performance of units, due to the nature of installation of the transformer. For the third site, it will be more complex as the transformer is open to the elements, and is not housed in a noise enclosure where the heat can be contained.

Method(s)

Demonstration

The methods involve a heat recovery system that is retro-fitted to the Transformers (not requiring outages), and then provides heat directly into the buildings themselves. This means that the standard, inefficient heating system can be removed or switched off and as a result, carbon savings are incurred, as well as smaller electricity bills.

This is distinctly different to the National Grid project 'Feasibility Study for Sustainable Substation Design' where heat recovery features in the project as that method of recovery requires a new transformer, and is an invasive method of heat recovery requiring complex design work. This work is designed to have the potential to retrofit to existing transformer installations without making changes to the configuration or accessibility of the network. This method will cover the majority of our network and will be much cheaper to complete.

Scope

Currently, we do not provide heat recovery equipment to National Grid sites as there had been no need for us to install such equipment. Moving forwards, it has been noted that some of our older and larger sites are very energy inefficient. With technology becoming widely available to address the issue of energy efficiency, we are looking to trial some equipment that takes advantage of the secondary effects of Electricity Transmission. When a transformer is in service, is produces heat. This heat is often extracted from the transformer in order to keep the operating temperature below a certain level, and the heat is usually expelled. For those systems where cooling is not an issue, we leave the transformer to perform its duty and focus on another secondary effect – noise. Within the noise enclosure, there is usually a warm environment as the heat has been contained. It is this part of the system we want to exploit, using air source heat pumps, to help minimise the electrical & environmental impacts of the older substations.

Objective(s)

The objectives of this project are to be able to provide National Grid Electricity Transmission's management & policy team an effective demonstration of heat recovery for use in future schemes. This will give options to the business to implement cost saving solutions, giving a pass through saving cost to the end consumer.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

- Installation of Heat Recovery system at Melksham
- Installation of Heat Recovery system at Bishops Wood
- Installation of Heat Recovery system at Rainhill
- Commissioning of system at Melksham
- Commissioning of system at Bishops Wood
- Commissioning of system at Rainhill
- Performance monitoring of all 3 systems (in electrical terms)

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

This project is designed at an appropriate scale to deliver the best value for consumers. To reduce the scale of the work would lead to an inappropriate decision being made on the back of this work. We need the range to identify the best solution for implementation, and ultimately deliver best value to consumers.

Technology Readiness at Start

TRL7 Inactive Commissioning

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

Melksham Substation, Beanacre, Gloucestershire.

Bishops Wood Substation, Stourport on Severn, Worcestershire.

Rainhill Substation, St.Helens, Merseyside.

Revenue Allowed for the RIIO Settlement

Zero

Indicative Total NIA Project Expenditure

£650,000

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)

<£1m over 8 years

Please provide a calculation of the expected benefits the Solution

Base cost (electrical consumption) = 20k p/a

Method Cost (electrical consumption) = 4k p/a

B-M = £16k p/a

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

60% of the NG sites are applicable for roll out.

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

Circa £100k per site, therefore £100,000 * 56 sites * 0.6 = £3.5m

We think it is reasonable to expect the costs of each unit to be reduced when we know what we have to specify. £100,000 is a target cost that we want to achieve to experience a payback period of 6.25 years. This would mean we could break even in RIIO T-1 period, and realize financial benefits in T2.

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 principles of non-intrusive, retrofit heat recovery can be applied in a very similar manner across the area of specific Transmission assets.

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

- [x] Yes