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_NGGT0029

Project Registration

Project Title

Assessment of hydrophobic treatment for gas compressor air intake values & screens

Project Reference Number

NIA_NGGT0029

Project Licensee(s)

National Gas Transmission PLC

Project Start

December 2012

Project Duration

1 year and 1 month

Nominated Project Contact(s)

Simon Kidd (box.GT.innovation@nationalgrid.com)

Project Budget

£40,000.00

Summary

Under certain climatic conditions it is possible for unacceptable levels of ice to build up on gas turbine air intakes. Ice build up on the air intake structures reduces the available cooling and combustion air for the gas turbine, reducing efficiency and the integrity of the unit if the ice should become ingested within the engine.This would have serious consequences for the integrity of the gas turbine unit and network supply capability due to unit failure.

There is considerable worldwide experience of operation gas turbine based infrastructure in low ambient temperatures and a number of ice treatment technologies are well defined. Dovetailing the most cost effective available ice treatments with the existing air intake structures. This and also employing any fortuitous effects such as surface roughness, will improve the overall effectiveness of water repulsion and ice management of gas turbine air intakes across the National Grid fleet.

Third Party Collaborators

DNV

Nominated Contact Email Address(es)

Box.GT.Innovation@nationalgrid.com

Problem Being Solved

At a number of National Grid compressor sites across the country, there is an issue with gas turbine air intakes freezing up during certain cold weather conditions; in particular freezing fog. The effect on the air intakes is that ice builds up on the metal structure, blocking the bird screens or louvers and preventing or reducing the amount of combustion air entering the gas turbine fuel system.

Method(s)

- Identify, obtain and conduct analysis of commercially available hydrophobic solution samples to support the data analysis sheets supplied by the manufacturer. This first pass analysis will aim to identify if the break off contains any abrasive components that can bypass the filters.
- Initial physical testing will be conducted within a laboratory environmental chamber.
- Discuss potential detrimental effects of hydrophobic solution with GT manufacturers.
- Conduct site trial on air intakes of gas turbines.
- Evaluation and report of findings, including recommendations.

Scope

Under certain climatic conditions it is possible for unacceptable levels of ice to build up on gas turbine air intakes. Ice build up on the air intake structures reduces the available cooling and combustion air for the gas turbine, reducing efficiency and the integrity of the unit if the ice should become ingested within the engine. This would have serious consequences for the integrity of the gas turbine unit and network supply capability due to unit failure.

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Objective(s)

If successful, the project will provide valuable information as to the effectiveness of conventional hydrophobic coatings for gas turbine air intakes. This will increase unit availability, improve unit reliability, reduce operating costs associated with unit overhaul, maintenance and offers potential improvements in long term unit efficiency.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

This programme of work should be seen as one component to improve the overall husbandry of the compressor fleet, although use of hydrophobic coatings may have universal applicability across National Grid.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

To ensure that the full implication of the proposed techniques can be assessed, it is necessary to carry out a full scale trial programme on an in service gas turbine unit.

Technology Readiness at Start

TRL5 Pilot Scale

Technology Readiness at End

TRL7 Inactive Commissioning

Geographical Area

The programme will be conducted with the project partners at suitable gas turbine facility within the UK.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

IFI - £20k
NIA - £20k

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)

Estimated savings will be dependent on number of instances where the climatic conditions are such that inlet air icing is likely to occur. During the winter of 2010 severe weather conditions affected 2 units, resulting in a £100k cost to get both compressors up and running again. Taking the gas compressor stations across the National Transmission System (NTS) that have experienced previous icing issues in an average winter, savings associated with a hydrophobic coating solution is predicted to be £40k/annum for this subsection of the fleet.

Please provide a calculation of the expected benefits the Solution

Base case: £40k per annum in additional maintenance activities across affected sites.
Method case: £0k per annum.

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

The proposed adoption of hydrophobic coating would be generic across the compressor fleet. However, hydrophobic coats may have wider adoption potential further enhancing programme value.

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

No additional implementation costs are envisaged as the introduction of hydrophobic coatings will be implemented as part of a dedicated commercial operation and maintenance procedure.

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

To reduce the issues of water/ice /oil build up on gas infrastructure requires high levels of maintenance, reducing efficiency and increasing costs. The use of hydrophobic coatings offer a number of protection benefits for infrastructure across the gas and potentially the electricity network.

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

Reliability: Capacity & Capability. The programme will offer considerable benefits in terms of gas turbine availability and efficiency improving the ability of the National Grid maintain security of supply.

Customer Connections: System Access. The introduction of the new welding and NDE techniques will improve the ability of National Grid to delivery timely customer connections to the NTS.

☑ 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