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 2013

Project Reference Number

NIA_NGET0102

Project Registration

Project Title

13kV Shunt Reactor Refurbishment

Project Reference Number

NIA_NGET0102

Project Licensee(s)

National Grid Electricity Transmission

Project Start

December 2013

Project Duration

1 year and 4 months

Nominated Project Contact(s)

Ruth Hooton & Andrew Roxborough

Project Budget

£1,071,400.00

Summary

The scope of the project covers the relocation of a failed 13kV 2x30MVA shunt reactor (English Electric design) from Willesden substation, London to ABB, Drammen, Norway for inspection; technical teardown (to include recommendations on refurbishment options); redesign and if economically feasible, manufacture of the active part; refurbishment of reactor tank and cooler bank (with option to replace cooler bank with modern equivalent); factory acceptance test of refurbished unit to modern standards and installation and commissioning of the refurbished reactor in its original location at Willesden substation i.e. the reactor will reuse the existing plinth therefore negating the need for extensive civil works.

Nominated Contact Email Address(es)

box.NG.ETInnovation@nationalgrid.com

Problem Being Solved

National Grid uses shunt reactors to compensate for the high capacitance found in either long conductor lengths, or in cable systems due to their inherent nature. Without them, the Transmission system would be much more expensive to run.

Asset replacement of reactors is costly (if only due to the capital cost of the new equipment). If the new reactor has a different footprint to the reactor it is replacing, large civil costs can also be incurred with concrete bund rework and/or noise enclosure modifications. Such work is not only costly but also has a large carbon footprint.

Improvements in the electrical properties of the steel used to build reactors means that the losses on a 40 year old reactor design often can be significantly higher than a modern equivalent unit. This means that, unless the active part of the reactor is redesigned, the lifetime costs of a refurbished unit could be prohibitive i.e. cost benefit would not be achieved.

It is not possible to currently refurbish a reactor using the old designs as this unit would not meet the new specifications required for equipment to be installed on the Transmission system

Method(s)

Development

A reactor currently identified for replacement will be returned to a refurbishment centre for teardown, redesign, refurbishment and redeployment.

Scope

The scope of the project covers the relocation of a failed 13kV 2x30MVA shunt reactor (English Electric design) from Willesden substation, London to ABB, Drammen, Norway for inspection; technical teardown (to include recommendations on refurbishment options); redesign and if economically feasible, manufacture of the active part; refurbishment of reactor tank and cooler bank (with option to replace cooler bank with modern equivalent); factory acceptance test of refurbished unit to modern standards and installation and commissioning of the refurbished reactor in its original location at Willesden substation i.e. the reactor will reuse the existing plinth therefore negating the need for extensive civil works.

Objective(s)

To establish viability of refurbishment (including active part redesign) of a 13kV reactor.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

This project will be successful is we establise a methodology for refurbishment of 13kV Shunt Reactors suitable for modern standards. Further success for this project will be if the refurbishment is economically viable, and also if we can roll out the refurbishment option to the National Grid 13kV reactor fleet.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

This project is being trialled on one 13kV reactor as a proof-of-concept work. We cannot reduce the scale any more and still provide the same benefits to the customer. Conversely, we feel that increasing the scope of the project will not provide enough value for the customers to be justifiable under the NIA.

Technology Readiness at Start

TRL6 Large Scale

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

Willesden 275kV substation where a Shunt Reactor has been identified as a candidate for refurbishment.

Refurbishment is to be completed at ABB Refurbishment Centre, Drammen, Norway

Revenue Allowed for the RIIO Settlement

Zero

Indicative Total NIA Project Expenditure

£1,071,400

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)

In the example of the Willesden shunt reactor, it is expected that by maintaining the current footprint there will be a reduction in the civil engineering works required at site, estimated as an 80% saving on the cost of the civil engineering costs required to deploy a new reactor. This figure will vary by site/reactor design.

Additional savings may be identified during the refurbishment if parts other than the tank are identified as suitable for reuse. This is dependent on the condition of the reactor being refurbished.

Please provide a calculation of the expected benefits the Solution

Redacted for comercial sensitivity

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

National Grid has a population of ~70 reactors at 13kV; this project will inform the asset management/replacement strategy for reactors at this voltage and could be applied to reactors of similar family types on other licensee's networks.

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

Project will establish baseline costs which then can be analysed to provide an outline cost for rolling out across the GB networks. Currently the expected cost of a refurbished reactor of this design for future projects is £823k.

If this first shunt reactor can be successfully refurbished, it is anticipated that any future refurbishment of a similar reactor can be achieved at a cost that is less than the cost of procuring a new reactor (subject to a normal procurement exercise). This would be in addition to the anticipated civil engineering cost reduction.

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

If the proof of concept is achieved this could inform the asset management of 13kV Shunt reactors by all relevant licensees.

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