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

Sep 2016

Project Reference Number

NIA_NGET0194

Project Registration

Project Title

Detailed design of 400 kV 240MVA Mobile Substation Bay

Project Reference Number

NIA_NGET0194

Project Licensee(s)

National Grid Electricity Transmission

Project Start

September 2016

Project Duration

0 years and 7 months

Nominated Project Contact(s)

Mark Osborne

Project Budget

£1,370,000.00

Summary

This project will research and develop the detailed design of a 400kV Mobile Substation Bay. The design will incorporate all transformer bay functionality; transformer switchgear, protection and control (P&C) in a transportable unit which is suitable for use in a range of site conditions and configurations.

Nominated Contact Email Address(es)

box.NG.ETInnovation@nationalgrid.com

Problem Being Solved

National Grid currently installs sufficient transformer capacity to cater for an N-2 contigency (as detailed within the Security & Quality of Supply Standards (SQSS)), to manage supply security during a transformer fault whilst one transformer is offline for maintainance. The exposure to this risk is limited to planned transformer maintainance activity.

Although we are aware that mobile substations have been deployed upto 500 kV, the concept of quickly interfacing a re-usable mobile transformer bay into an existing operational substation at 400 kV remains untried and untested.

Method(s)

The method this project seeks to advance is the use of a fully self contained mobile 400 kV substation bay, including a 240MVA transformer and auxillary supplies.

The project involves producing detailed designs for a 400 kV 240MVA mobile substation bay capable of being commissioned within 10 days.

Scope

This project will research and develop the detailed design of a 400kV Mobile Substation Bay. The design will incorporate all transformer bay functionality; transformer switchgear, protection and control (P&C) in a transportable unit which is suitable for use in a range of site conditions and configurations.

Objective(s)

The objective of this project is produce a fully workable detailed design, including functional specifications of a 400 kV mobile substation bay, including a 240MVA transformer and auxillary supplies.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The project will be deemed successful if National Grid Electricity Transmission is able to develop and procure a fully deployable mobile substation bay, at a reasonable cost, based on the detailed design produced.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The project will produce detailed designs to enable a fully functional mobile substation bay (including 240MVA transformer and auxillary supplies) to be manufactured.

Technology Readiness at Start

TRL4 Bench Scale Research

Technology Readiness at End

TRL5 Pilot Scale

Geographical Area

This is desk based exercise to produce detailed designs of mobile substation bay.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£1,370,000

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 estimated benefit from the availability of one MSB is £6.2m. This is based on the potential to avoid the replacement cost of 4 SGTs over a 4 year period. The MSB would be used to 'fill in' during the outage or until a decision whether to replace a failed transformer is taken. This will eliminate the restriction of outage seasons; allowing maintenance to take place on a planned basis throughout the year, maximising resources.

Please provide a calculation of the expected benefits the Solution

This is a development project and hence the output of this project would need to be built before it can deliver any benefits.

Looking only at one of the areas we could deliver benefits on, assuming the final design is built and works, one mobile bay could avoid the replacement of 4 x 400kV 240MVA or equivalent transformers.

Assuming the replacement of each transformer conservatively costs £5m, an MSB costs £13m, the deployment costs of an MSB is £200k, the building of one MSB would produce a total benefit of £6.2m.

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

This method is replicable across all 400kV networks in the UK. For National Grid alone, in order to meet all requirements outlined above and cover the whole network, we would expect to require at least 6 MSB systems.

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

We can estimate the cost of mobile bay systems, once the first prototype has been developed and refined, to go down in cost. If we estimate the cost of future systems to cost, £10m, the rolling out of this technology across the GB (6xNGET, 2xSPET, 1xSHE) would be of the order £90m.

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 knowledge generated by this project will be of relevance to all Network Licensees considering using a mobile substation bay solution to:

- reduce the cost associated with maintaining a constant network risk by allowing the removal of transformers, as opposed to replacing them
- eliminate the restriction of outage seasons by enabling maintenance to take place on a planned basis throughout the year
- provide a short term solution to temporary or uncertain demand profiles

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