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_NGET0024

Project Registration

Project Title

Composite Cross-Arms Study

Project Reference Number

NIA_NGET0024

Project Licensee(s)

National Grid Electricity Transmission

Project Start

June 2008

Project Duration

8 years and 1 month

Nominated Project Contact(s)

Dave Clutterbuck & Mike Fairhurst

Project Budget

£1,214,000.00

Summary

The scope of this project is to develop a composite crossarm that can be used for uprating Overhead Line routes without replacing existing towers with taller more visually instrusive ones. This work starts as basic, initial research, and will give a final solution, suitable for use on suspension towers in GB. It will also identify what further work needs to be done in order to address the issues associated with turning corners, and use on tension towers.

Nominated Contact Email Address(es)

box.NG.ETInnovation@nationalgrid.com

Problem Being Solved

Currently the only method available to GB Electricity Network Licensees for the uprating of 275kV OHL circuits to 400kV circuits is to re-build the towers to a higher specification. Composite Cross Arms will allow GB Electricity Network Licensees to up-rate 275kV to 400kV without the need for building new circuits. This is due to the electrical properties of the cross-arms, and the slightly altered installation configuration compared to standard cross-arms, which results in the conductor being raised higher from the ground.

This technology will be valuable to GB Electricity Network Licensees and consumers and stakeholders in helping to provide extra capacity to the Transmission system without the need for the construction of new and taller towers that are more visually instrusive upon the landscape.

Method(s)

Research, Development & Demonstration

The method proposed involves a 5 stage approach.

Stages 1 & 2: Feasibility Study on the uses of composite crossarms on 275kV and 400kV system and prototype manufacture.

Stage 3: electrical, mechanical and environmental testing of the crossarm, and ancillary system design.

Stage 4: involves Scottish Hydro Electric Tranmsission only and is described as part of their project NIA_SHET0003.

Stage 5: manufacture of 6 crossarms for testing, 4 x 6 monthly performance monitoring reports, and final reports on tension towers, and performance trials at 400kV.

Scope

The scope of this project is to develop a composite crossarm that can be used for uprating Overhead Line routes without replacing existing towers with taller more visually instrusive ones. This work starts as basic, initial research, and will give a final solution, suitable for use on suspension towers in GB. It will also identify what further work needs to be done in order to address the issues associated with turning corners, and use on tension towers.

Objective(s)

The objective of this project is to produce a crossarm made of composite materials, that is suitable for use on the 400kV transmission system on a suspension tower.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

- Production of a report detailing the feasibility of the use of composite crossarms on 275kV and 400kV overhead line towers
- Production of Case Study Specification
- Production of Techno-Economic Benefit Analysis
- Resolution of Technical Barriers
- Manufacture of Prototype
- Crossarm mechanical testing
- Crossarm electrical and environmental trials
- Ancilliary system design
- Production of final prototype drawings
- Development of crossarm solution, suitable for deployment onto the 400kV system
- Manufacture of crossarms, including type test
- Installation of crossarms at 400kV, including 4 x 6 month performance reports
- Final PhD thesis

Project Partners and External Funding

This project is being delivered by the University of Manchester and is a collaboration between National Grid Electricity Transmission and Scottish Hydro Electric Transmission.

Potential for New Learning

The use of composite materials as insulators on the transmission system is novel. This project will provide new learn about the mechanical and electrical properties of the proposed designs and materials, potential applications and limitations of their use and and what the further developments may be required to relaise their full potential.

Scale of Project

This project is being delivered on a full scale, from basic desk studies, to lab work, and on to prototype manufacturing and trials in real environements. This scale of project presents the best value to customers as it will deliver a solution that can be applied to the GB Transmission system directly, and made best use of by the Transmission System Owners.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

The project will mostly be conducted in Manchester, however trials are being carried out in Scotland as part of a complementary project - NIA_SHET0003

Revenue Allowed for the RIIO Settlement

Zero

Indicative Total NIA Project Expenditure

Total NIA expenditure: £164,000.

Previous IFI expenditure: £1,050,000.

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)

By uprating a transmission tower without the need to rebuild, there is a potentially significant cost saving. Construction of a new tower involves substantial civil engineering works in order to construct and de-construct temporary access roads and tower foundations. The conventional method of uprating an overhead line from 275kV to 400kV would require the construction of much taller towers which would have a greater visual impact on the surrounding areas.

Please provide a calculation of the expected benefits the Solution

Initially this is a research project, therefore this is not applicable. However, the benefits of this project are in delivering a lower visual impact to consumers as opposed to new build infrastructure projects. This project is als is addressing direct feedback from consumers about the visual intrusion of National Grids assets.

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

In theory, this cross arm could be used as a standard cross arm on every tower in the UK, however, locations for exploitation of uprating properties are yet to be decided.

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

The development of each composite crossarm is c.£25,000. However, this is expected to reduce significantly with mass production in order to justify being a cost effective alternative to rebuilding towers.

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

Experiences gained from this project will provide learning which can be utilised by other network licensees, in order to support their existing plans on infrastructure, safety and operational practices. Learning from this work is expected to lead to the Composite Crossarms being commercially available to all network 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.

Given a review of the ENA portal, and the standard supply base (including EPRI and the univeristies), National Grid confirm that this work has not been done before. This project is complementary of the Scottish Hydro project - NIA_SHET0003, which focusses specifically on phase 4 detailed above.

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