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_SHET_0010

Project Registration

Project Title

New Suite of Transmission Structures

Project Reference Number

NIA_SHET_0010

Project Licensee(s)

Scottish and Southern Electricity Networks Transmission

Project Start

December 2013

Project Duration

1 year and 11 months

Nominated Project Contact(s)

SSEN Future Networks Team

Project Budget

£650,000.00

Summary

The intention of this project is to leverage innovations (for example: ICAs and low-sag conductors) to design a new suite of transmission structures to exploit fully their potential.

The scope of the project will include the following:

- Identify the requirements and standards that govern transmission voltage of 275kV
- Assess new structure design options, including the use of new materials, from a review of what is being built internationally, and other innovations;
- Develop designs for a small number of the structure options that show the most potential
- Finalise a design that should be taken forward for field trials and tests
- Scale model prototypes of the new suite of structures
- Assessment of the safety, health and environmental impact of the new design (with the aim of improving safety, and reducing the environmental impact)
- Review the economics of the new structures (taking into account, foundations, access requirements, construction time and maintenance).

Note: the term ‘Transmission Structure’ has been used to indicate the breadth of scope of the project, i.e. the scope is not limited to considering just classic steel lattice towers, and will consider: poles, guide supported structures etc. as

Nominated Contact Email Address(es)

transmissioninnovation@sse.com

Problem Being Solved

The UK transmission system faces a series of changing demands to meet the challenges of a low carbon future, and this is driving significant network investments to build new transmission circuits and provide additional capacity in existing circuits. This will involve building a significant number of new transmission structures over the coming years.

Transmission structure design in the UK has not changed significantly over past 40 years (i.e. based on steel-lattice tower with single earth wire and hanging insulators), despite a number of innovations which could reduce the size, height, cost, foundations and construction of towers. These innovations include: low-sag conductors, Insulated Cross Arms (ICAs), twin earth lines, and the use of other construction materials (e.g. concrete, tubular steel).

Furthermore, the success of many of these new build projects relies on securing the appropriate consents and permissions at an early stage. Failure to secure the relevant consents can lead to delays and increase the overall cost of the project. Many of the issues raised are related to the increased visual impact of the towers and the associated civil works.

Reducing the size, cost and civil works for the transmission towers required for 275kV would not only reduce the visual impact, and therefore ease the planning process but would potentially reduce the time and resources required to build them. If smaller towers are employed they will require smaller foundations with associated cost savings in civil and access works (and reduced carbon footprint).

Method(s)

This project will focus on developing the design of a suite of new transmission structures for 275kV.

A staged approach to design and option studies is proposed:

Stage 1 – Gather and review emerging technologies, with innovations such as ICAs and low sag conductors, and other national/international innovations.

Stage 2 – Confirm applicable standards, design approach and criteria for the new structure design.

Stage 3 – Develop a range of conceptual designs and evaluate against criteria (and select preferred design).

Stage 4 – Develop selected designs, suitable for trialing and construction (minor component builds may be built at this time if this is required to confirm constructability).

Stage 5 – Construct scale models.

Stage 6 – Collate and report on outcomes.

Scope

The intention of this project is to leverage innovations (for example: ICAs and low-sag conductors) to design a new suite of transmission structures to exploit fully their potential.

The scope of the project will include the following:

· Identify the requirements and standards that govern transmission voltage of 275kV;

· Assess new structure design options, including the use of new materials, from a review of what is being built internationally, and other innovations;

· Develop designs for a small number of the structure options that show the most potential;

· Finalise a design that should be taken forward for field trials and tests;

· Scale model prototypes of the new suite of structures;

· Assessment of the safety, health and environmental impact of the new design (with the aim of improving safety, and reducing the environmental impact); and

· Review the economics of the new structures (taking into account, foundations, access requirements, construction time and maintenance).

The timing for this work has been increased due to longer than expected time to conduct the research in bullet one. This activity forms the basis of the project and it is imperative that this work is undertaken carefully so that the project does not undertake development work on incorrect data. This work took longer than planned as there were unexpected deviations between standards which had to be reconciled.

Note: the term 'Transmission Structure' has been used to indicate the breadth of scope of the project, i.e. the scope is not limited to considering just classic steel lattice towers, and will consider: poles, guide supported structures etc. as appropriate.

Objective(s)

The objective is to design a suite of new 275kV transmission structures, incorporating a range of innovations, that are smaller, cheaper and quicker to build, and easier to maintain. Safety and environmental impacts are also to be actively considered so that benefits from the new design can be maximized.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Success criteria would be to provide a new developed design of a suite of 275kV transmission structures and produce scaled models of the new design.

At the end of this project, there should be sufficient understanding and confidence to decide whether to deploy the new structure designs as an alternative to the traditional designs. At this point, the decision should be made whether to go for full scale construction and testing.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The scale of this project is sufficient to fully investigated and develop designs for 275kV transmission structures.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL4 Bench Scale Research

Geographical Area

As a research project, the project will be managed by SHE Transmission staff from their offices in Perth, with Energy Line Ltd (based in North Yorkshire) providing technical support.

The resulting designs are intended to be applicable to new 275kV transmission structures across GB.

Revenue Allowed for the RIIO Settlement

At this stage no saving on expenditure can be assumed.

Indicative Total NIA Project Expenditure

The project expects to fund the full project from SHE Transmission's NIA allowance.

The total expenditure is expected to be £650k, 90% of which is allowable NIA expenditure.

Stage 1 – £20k

Stage 2 – £30k

Stage 3 – £300k

Stage 4 - £125k

Stage 5 – £75k

Stage 6 - £25k

Contingency - £50k

SHE Transmission resource - £25k

Total Budget Requirement - £650k

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)

A new design has the potential to reduce costs across the following areas (as compared against the current standard tower designs). Indicative savings could be in the order of:

- Access costs: savings of 5 – 10%
- Foundation design: savings of 10 – 20%
- Structure materials: savings of 15 – 25%
- Structure erection: savings of 20 – 25%

Please provide a calculation of the expected benefits the Solution

Not Required

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

This project focuses on developing an improved 275kV transmission structure, which could be used for all new 275kV structures in GB.

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

This project intends to produce developed designs which will be freely available to all GB Network Licensees, for 275kV transmission structures.

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

This project intends to produce a set of structure designs for 275kV which will be freely 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)

Not Required

☑ 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