Scottish and Southern Energy Power Distribution

Date of Submission

November 2013

NIA Project Registration and PEA Document

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.

Project Registration

Project Title		**Project Reference**
New Suite of Transmission Structures		NIA_SHET_0010
Project Licensee(s)	**Project Start Date**	**Project Duration**
Scottish Hydro Electric Transmission	Dec 2013	16 Months
Nominated Project Contact(s)		**Project Budget**
David MacLeman		£650,000

Problem(s)

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).

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.

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.

Technology Readiness Level at Start	Technology Readiness Level at Completion
2	4

Project Partners and External Funding

None

Potential for New Learning

This project aims to produce a suite of new transmission structure designs which will be freely available to other network licensees.

While the project would be focused on 275kV structures, it is possible that the learning would be applicable to a broader range of

transmission voltages down to 132kV and up to 400kV.

Scale of Project

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

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 in 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

Specific Requirements 1

1a. A 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 systems and 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	☐

Specific Requirements 2

2a. Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees ☒

Please answer one of the following:

i) Please explain how the learning that will be generated could be used by relevant Network Licenses.

This project intends to produce a set of structure designs for 275kV which will be freely available to all network licensees.

ii) Please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the Project.

Not Required

2b. Is the default IPR position being applied?

Yes	☒
No	☐

If no, please answer i, ii, iii before continuing:

i) Demonstrate how the learning from the Project can be successfully disseminated to Network Licensees and other interested parties

ii) Describe any potential constraints or costs caused or resulting from, the imposed IPR arrangements

iii) Justify why the proposed IPR arrangements provide value for money for customers

2c. Has the Potential to Deliver Net Financial Benefits to Customers ☒

i) Please provide an estimate of the saving if the Problem is solved.

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%

ii) Please provide a calculation of the expected financial benefits of a Development or Demonstration Project (not required for Research Projects). (Base Cost – Method Cost, Against Agreed Baseline).

Not Required

iii) Please provide an estimate of how replicable the Method is across GB in terms of the number of sites, the sort of site the Method could be applied to, or the percentage of the Network Licensees system where it could be rolled-out.

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

iv) 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.

2d. Does Not Lead to Unnecessary Duplication 

i) Please demonstrate below that no unnecessary duplication will occur as a result of the Project.

Based on published IFI and NIA information, discussion with UK tower design companies and discussion with National Grid and Scottish Power; there are no known projects being undertaken by other network licensees to use technological advances to optimise transmission structure design.

National Grid is developing a new T-Pylon for 400kV, however the new suite of transmission structure project is distinct since we are focusing on 275kV structures and our design drivers take account of recent technical innovations, remote site locations, limitations on site access and exposure to high winds, ice loadings and marine environments.

ii) If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

Not Applicable