Scottish and Southern Energy Power Distribution

Date of Submission

March 2014

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
Insulated Cross Arms – 132kV Trials		NIA_SHET_0007
Project Licensee(s)	**Project Start Date**	**Project Duration**
Scottish Hydro Electric Transmission	Apr 2011	4 Years
Nominated Project Contact(s)		**Project Budget**
David MacLeman		£394,000

Problem(s)

Currently the only method open to Transmission Network Owners (TOs) who wish to uprate their 132kV lines to 275kV is to rebuild the towers to a higher specification (i.e. larger towers), at a significant cost, due to the increased clearances from ground required by law for higher voltage lines.

Insulated Cross Arms (ICAs) will enable the uprating without the need to rebuild the towers (by effectively raising the height of conductors from the ground). This would allow greater throughput of power on the existing network with less expense on upgrades and quicker time frames for increasing network capacity.

The aim of the Insulated Cross Arms is to maximise the capacity of existing infrastructure without rebuilding tower lines.

Method(s)

- Under IFIT_2009_01, the Insulated Cross Arm technology was successfully tested for mechanical integrity on a de-energised line at the Lecht in Scotland and for electrical performance in a simulated non-operational environment at St Fergus also in Scotland.
- This project will install 6 Insulated Cross Arms on two 132KV towers as a trial of the retrofit Insulated Cross Arm concept on a real operational tower line.
- The trial cross arms will then be monitored for up to two years for mechanical and electrical performance.

Scope

To perform trial installation of insulated cross arms on the towers of an operational 132kV circuit and monitor them for a period of up to two years to evaluate their electrical and mechanical performance when used in a real live operational environment.

Objective(s)

- Install Insulated Cross Arms on an operational 132kV tower line.
- Capture the learning of the installation methods.
- Monitor and evaluate the installed trial Insulated Cross Arms for both electrical and mechanical performance in order to establish their readiness for use in the real operational environment.

Success Criteria

The successful installation of the cross arms along with capturing the learning from their installation.

Technology Readiness Level at Start	Technology Readiness Level at Completion
6	7

Project Partners and External Funding

None

Potential for New Learning

The project has potential learning in the following areas:

- Experience from the installation process could help in identification of unforeseen operational challenges helping to shape standards for future practice.
- Project results will determine readiness of the technology to be used in lines being upgraded to higher voltages and also its potential to lead to reduction of tower sizes for future designs.

Scale of Project

The scale of the Project is considered appropriate to the scale of the potential benefits. If the technology is successful, the financial and environmental benefits resulting from not rebuilding tower lines could be significant.

Geographical Area

This project will be undertaken within the SHE Transmission Licence area in Scotland

Revenue Allowed for in the RIIO Settlement

We currently envisage using this technology as an alternative to new-build towers for some of our Strategic Wider Works projects. These projects are subject to Ofgem review and assessment on a case by case basis and therefore no funding is allowed as part of the RIIO-T1 settlement. We will provide further information as part of our project submissions.

Indicative Total NIA Project Expenditure

For 2013-14 the project plans to be funded through SHE Transmission's NIA allowance.

£178k has been budgeted for this period (of which 90% is allowable NIA spend)

Note: The project has manufactured the 6 cross-arms, the next stage is their installation on the transmission network.

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.

Experience from the trial installation process will provide learning which other Network Licensees can use to help formulate their safety and operational procedures.

Learning from this trial is expected to ultimately lead to the Insulated Cross Arms being commercially available to Network Licensees.

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

The project will support the Innovation Strategy Objective of Maximizing the use of existing assets to deliver capacity.

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

The aim of this project is to develop learning relating to the installation method for the ICAs, and we have agreed with University of Manchester and Arago that all learning and reports prepared by SHE Transmission on the installation methods can be shared with other Network Licensees provided they do not contain any confidential information or trade secrets.

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

Inability to share test result limits the opportunity for other Network Licensees to assess this technology in its currently state, however, the focus of this project is on the method and installation of the ICAs which can be shared.

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

The resulting product, which provides an alternative to rebuilding towers, will be commercially available to all Network Licensees. In addition SHE Transmission receives a discount on the future purchase of the ICAs.

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

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

By uprating a transmission tower without the need to rebuild, there is a potential significant cost saving. Construction of a new tower line involves substantial civil works to construct and de-construct temporary access roads and tower foundations.

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).

Comparing the cost of replacing a 132kV tower with a new 275Kv tower, against the cost of installing Insulated Cross Arms to uprate the existing tower:

- The cost of replacing a 132kV tower with a 275kV tower is estimated as approximately £160k per tower;

- When manufactured in bulk, the Insulated Cross Arms are estimated to cost (including installation) £80k-£110k per tower (i.e. 6 cross-arms + installation costs).

Therefore the potential cost saving is significant.

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.

Increasing network capacity is a challenge faced by all Network Licensees. If this method has a successful outcome leading to the eventual commercial availability of Insulated Cross Arms, it will be an option available to all 132kV to 275kV transmission reinforcement projects in GB.

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

The development cost of each Insulated Cross Arms is £25k, and this would be expected to reduce significantly with mass production, to make the method a cost effective alternative to rebuilding towers to uprate a transmission line from 132 to 275kV.

2d. Does Not Lead to Unnecessary Duplication ☒

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

To the best of our knowledge, the use of insulated composite cross arms on an operational 132kV line is novel in GB. SHE Transmission has been involved with the technology's development with other parties; the 132kV trial is unique to SHE Transmission.

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

While this project focuses on uprating 132kV Towers to 275kV; National Grid are also partnering with the University of Manchester to develop Insulated Cross Arms, focusing on uprating 275kV towers to 400kV. There are several voltage levels at Transmission and at each level the specifications for the Insulated Cross Arms would be different. Although the trial at 132kV may indeed prove successful, it does not necessarily follow that the test will be successful at 400kV due to differences in physical sizes and electrical stresses encountered at the different voltage levels. As a result, trials of the Insulated Cross Arms at different voltage levels represent distinct methods different from each other.