Scottish and Southern Energy
Power Distribution

Date of Submission

December 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
Alternative Tower Construction		NIA_SHET_0003
Project Licensee(s)	**Project Start Date**	**Project Duration**
Scottish Hydro Electric Transmission	Apr 2013	2 Years
Nominated Project Contact(s)		**Project Budget**
Heather Bain		£384,914

Problem(s)

Construction of transmission tower lines is currently a prominent activity on the SHE Transmission network as reinforcement work is under way to cater for increased renewable generation. Transmission tower lines do not always follow routes close to existing roads to enable cranes to access tower locations. This results in the need for temporary access tracks or the use of a Derrick, a lifting device that can be assembled at the point of use.

In addition to costs incurred with installing such access tracks, SHE Transmission are concerned about the visual and environmental impacts of temporary access roads as these can cause public concern, particularly in protected areas such as Sites of Special Scientific Interest, National Parks and National Scenic Areas. The costs associated with provision of temporary access roads raise project costs significantly. Using a Derrick as an alternative to temporary access roads and cranes has its own problems. A Derrick is attached by being freely hinged about an already constructed part of the tower and then lifting via a system of lines operated from an independent prime mover. This lack of independent solid ground fixation by Derricks imposes a constant hazard which increases the risk of safety incidents during tower construction.

In addressing the foregoing issues, the most cost-effective method of transmission line construction is one which has a short construction time, limits environmental impact to as low as is reasonably practicable, and has significant financial savings for customers.

This project proposes using Acier Profile SBB's Emergency Restoration System (ERS) as an alternative tower construction method to address all the issues raised so far. It is anticipated that employing the proposed method in conjunction with all terrain vehicles and/or helicopters will reduce the need for temporary roads, thereby reducing environmental impact. Successful implementation of the method is also expected to provide a safer working environment and reduce construction costs significantly.

Method(s)

The project proposes a technical trial of a modified Acier Profile SBB ERS to assess suitability and cost-effectiveness as a construction method for transmission tower lines.

SBB's ERS constitutes modular aluminium towers which can be quickly assembled without concrete foundations to form by-pass towers on damaged transmission lines in order to restore power quickly. In this project, this system will be modified into a Lightweight Tower Crane (LTC) and then trialled in the construction and dismantlement of towers.

A prototype of the modified ERS will be designed, manufactured and supplied by Acier Profile SBB to SHE Transmission. In preparation for the trials, a prototype of the Light Tower Crane has been built and has since undergone comprehensive third party mechanical assessment to ensure that all standards are met prior to deployment. The results of the assessment have shown that there is a limitation in the original design. It has therefore become necessary that another review of the design is undertaken in order to address the limitation that has been identified before trials can be performed. The crane will then be demonstrated through trials on SHE Transmission's 132kV, 275kV and 400kV tower lines. To ensure that the benefits of this method can be rigorously assessed, towers will be selected for trials on the basis of difficulty of access.

Scope

To investigate the use of a modified SBB Emergency Restoration System (ERS) as a Lightweight Tower Crane (LTC) in the trial construction and dismantlement of transmission towers in SHE Transmission's license area to establish if it is technically feasible, economical, minimises environmental impact and mitigates safety issues inherent in existing construction methods.

Objective(s)

To use a modified SBB ERS as an LTC in the trial construction and dismantlement of an appropriate range of towers (may include 132kV, 275kV and/or 400kV) to establish if the method can achieve:

- Reduction of construction time and costs
- Reduction of environmental impact by reducing need for temporary access roads
- Mitigation of safety issues of concern in tower construction that uses Derricks

Success Criteria

- Completion of trials using a modified SBB ERS as an LTC on an appropriate range of towers in SHE Transmission's licence area, to provide sufficient data for evaluation of the method's viability
- Establishment of the method's viability to reduce costs, construction time, environmental impact and safety hazards in Derricks

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

Project Partners and External Funding

None

Potential for New Learning

The project's outcome has potential to generate new lessons about:

- The method's viability to reduce construction time and associated costs
- Understanding of the extent to which the method can reduce the need for temporary access roads and the level of potential environmental benefits
- The best practice, procedure or methodology for using the method in the construction of transmission towers
- The range of tower designs to which the method would be applicable

The learning obtained from the project will be disseminated through reports and presentations.

Scale of Project

The proposed method is based on adaptation of an existing technology, rather than development of a new technology. The scale (demonstration in a working environment) is required for a robust assessment of the method's viability and cost effectiveness as an alternative to current methods of tower construction and deconstruction.

Geographical Area

The prototype will be made and modified by Acier Profile SBB in Canada

The trials will be performed in SHE Transmission's network licence area in Scotland

Revenue Allowed for in the RIIO Settlement

Under RIIO-T1, a revenue expenditure of £83,300,000 has been allowed for non-load related overhead line upgrades over the 8 year period. Part of this expenditure is related to tower works. No savings have been allowed for during project implementation but may be possible in future, depending on the project outcomes.

Indicative Total NIA Project Expenditure

The total cost of expenditure under IFI is £287,420.

The expected total cost for the remaining project activities under NIA is £97,494 (of which 90% is Allowable NIA expenditure).

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.

All transmission Network Licensees are likely to be involved with tower line construction, refurbishment or deconstruction at some point and will be faced with the same challenges as stated in the problem. If this project's outcome can be established as cost effective, other Network Licensees will be able to use the learning from this project to make informed decisions about where and how this alternative construction method could be used to provide benefits.

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

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.

The average length of temporary road to each tower is 0.5km. Each road construction and subsequent removal costs approximately £300,000 per kilometre. The avoidance of temporary road construction alone gives potential savings of hundreds of thousands per tower replaced.

There are also benefits derived from minimising environmental impact that are more difficult to quantify.

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).

Use of a LTC as a construction method reduces the need for temporary access roads when constructing tower lines. Indicative annual savings can be demonstrated by comparing the cost of providing access using temporary access roads with the cost of access using the proposed method in conjunction with all-terrain vehicles.

Based on recent experience from constructing 400kV lines, the average length of line constructed in a year is approximately 50 kilometres. The cumulative length of new temporary access roads tends to constitute approximately 70% of the total line length which represents 35km of new temporary access roads per annum.

The cost of constructing a double circuit 400kV is £1.65M per kilometre which includes a generic approximate cost of £141,000 of temporary road construction and the same amount for deconstruction and landscape restoration. Further costs are attributed to associated cranage for use with the temporary roads and these can be equated to the cost of procuring an SBB LTC. Indicative annual savings are therefore calculated below. These calculations are based on the assumption that 1 SBB LTC is provided per kilometre of line constructed. This assumption is made in order to provide only an estimation of the approximate minimum savings anticipated.

Base case cost

35 x £1,650,000 = £57,750,000

Method cost

35 x £1,368,000 = £47,880,000

Base case cost - Method cost = Estimated annual saving

£57,750,000 – £47,880,000 = £9,870,000

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 method could be applied to any transmission tower across GB which is in an area difficult or problematic to access by crane. This includes areas where space surrounding the tower is limited, as well as areas where crane access may cause negative environmental impacts e.g. through habitat damage or perceived reduction in visual amenity. This method is therefore potentially applicable to the entire GB power system network and decisions on use at individual sites would be made on case by case basis.

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

This would be dependent on the price of the technology but it is envisaged that it would be unlikely to exceed £100,000 per unit.

2d. Does Not Lead to Unnecessary Duplication ☒

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

This project method is only being trialled on the SHE Transmission network. Available IFI reports, other published literature and advice from the supplier have been used to rule out duplication.

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