

Electricity Network Innovation Competition

Screening Submission Pro-forma

Notes on completion			
<p>Before completing this form, please refer to the Electricity Network Innovation Competition (NIC) Governance Document, which details all of the information that you are required to provide. Please use the default font (Verdana size 10) in your submission, the text entry areas are predetermined and should not be changed. The full-completed submission should not exceed <u>11</u> pages in total.</p> <p>Ofgem will publish all the information contained within the Screening Submission.</p>			
Funding Licensee			
Scottish Hydro Electric Transmission plc (SHE Transmission)			
Network Licence Project Partners			
None			
Funding Licensee area			
Scottish Hydro Electric Transmission plc (SHE Transmission) area			
Project title			
New Suite of Transmission Structures (NeSTS)			
Project Summary			
<i>The Licensee must provide an approximate Project start and end date.</i>			
<p>SHE Transmission's current NIA Project (NIA_SHET_0010) is developing a suite of new transmission structure designs which reduce the size, cost and civil works necessary to build 275kV towers, compared to traditional methods. The project incorporates recent national and international innovations such as insulated cross arms and low sag conductors into the redesign.</p> <p>If successful, this approach will enable construction of new structures and associated works which are smaller, faster and cheaper to deploy and which have a reduced visual impact compared to current designs. SHE Transmission is seeking NIC funding to progress the development of these transmission structures.</p> <p>The NIC project will develop and demonstrate:</p> <ul style="list-style-type: none"> • The full scale build and testing of proposed structures (including design refinement); • The full design for a 275kV reinforcement project, utilising new structure designs; and • A partially funded reinforcement project to cover the additional risk, additional costs and knowledge gathering requirements associated with deploying this new design. <p>The project will, where relevant, use learning from work done by other Transmission Licensees to develop new structure designs e.g. National Grids T – Pylon, however, this project will look at designs which are applicable to lower voltage levels and have the potential to be deployed in more challenging terrain and in more demanding weather conditions</p> <p>Project Start Date: January 2015; Project End Date: January 2020.</p>			
Estimated Project funding			
<i>The Licensee must provide an approximate figure of the total cost of the project and the NIC funding it is applying for.</i>			
Total cost of Project	£34.4m	NIC funding requested	£7.5m
Cross Sector Projects only: requested funding from Gas NIC, NIA or second tier LCN Fund?	<i>If yes, please specify</i> The project will not request funding from either Gas NIC or LCNF.		

Problem

The Licensee must provide a narrative which explains the Problem(s) which the Project is seeking to address.

The Carbon Plan advises of the requirement for carbon emissions to be reduced by at least 35% of base levels set in 2000 by 2022. This will be achieved by the increasing volume of renewable energy generation and the consequent low carbon electrification of heating, transport and industrial processes, which is likely to steadily increase electricity demand by between 30% and 60% by 2050. Both of these factors mean that extensive work is needed to prepare the electricity network so that it can cope with these changes; investment in transmission structures will be necessary to cope with the increase in electricity demand and facilitate the connection of renewable energy.

Transmission structure design in the UK has not changed significantly over the past 40 years; design traditionally consists of a steel-lattice tower with single earth wire and hanging insulators. Several innovations have been introduced to the market very recently which could reduce the size, height, cost, foundation size and construction time of structures. These innovations have only just been proven individually, or at fairly small scale, but have not yet been deployed at scale. This project looks to deploy and test a combination of these new components using new innovative structures to provide an alternative to traditional techniques.

The success of many new build transmission projects relies on securing appropriate consents and permissions at an early stage. Failure to secure the relevant consents in a timely way can lead to delays and increase the overall cost of the project. Many delays are related to the perceived negative visual impact of the towers and the associated civil works.

The current NIA project (NIA_SHET_0010), will develop designs for a suite of transmission structures which incorporate the use of a number of new innovations on the market. However the GB Transmission Licensees will not have the confidence to recommend their deployment, due to the fact that they have not been deployed at full scale.

Method(s)

The Licensee must describe the Method(s) which are being demonstrated or developed. It must also outline how the Method(s) could solve the Problem. The type of Method should be identified where possible eg technical, commercial etc.

Reducing the size of transmission towers required for 275kV, with associated civil works and cost reductions, 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 structures are deployed they will require smaller foundations with related cost savings in civil and access works, and will potentially create a reduced carbon footprint.

The method is to develop and demonstrate full scale structures (towers and associated transmission equipment), using the designs created in NIA_SHET_0010. The NIC project will prototype and test a new suite of structures, developing a detailed design blueprint to be used in a planned transmission overhead line project. SHE Transmission will then decide whether it is suitable to deploy the new designs in lieu of traditional tower specifications.

The designs will incorporate recent innovations such as insulated cross arms, low sag conductors etc, which are relatively new to market and as such, have not been deployed at scale in GB to date (although many have been the subject of individual IFI or NIA funded investigations and trials).

Method(s) continued

This design creates a smaller, cheaper, and faster to deploy set of up to 275kV transmission structures. The new structure design will facilitate the use of smaller foundations – together this means that the new design will have a reduced negative visual impact and a reduced environmental impact. It will also reduce time and resources necessary to build them.

The project will be developed in stages, and will build on the work being done by the ongoing NIA project. Stage 1 will build on the generic designs being developed in the NIA project then move them toward deployment through the other stages of the project. This will allow the new designs to be available for one of SHE Transmission's proposed overhead line projects.

NIA project (NIA_SHET_0010) to develop new set structure design.

Stage 1 - NIC project starts: prototyping and testing of new suite of structures.

Stage 2 - Detailed Design: develop a detailed design specifically for a proposed overhead line project using this new technology. This will be run in parallel with a design utilising traditional methods to ensure delivery of the project. At the end of this phase, there will be sufficient information available to decide whether to proceed with the innovative option or continue with the traditional design.

Stage 3 - Deployment - Demonstration of new Design: if appropriate the project will implement the new designs for the first time on an overhead line project. This will include development of new operational practices, tools and equipment and training to implement the new equipment for the first time.

Stage 4 - Monitoring and Evaluation to ensure that equipment performance is as anticipated.

Stage 5 - Learning and Dissemination activities

The project will be structured to deliver learning from an early stage from prototypes etc, as well as extensive monitoring during the operational phase.

Funding commentary

The Licensee must provide a commentary on the accuracy of its funding estimate. If the Project has phases, the Licensee must identify the approximate cost of each phase. OFTOs should indicate potential bid costs expenses.

As identified in the previous section, the project can be broken into a number of discrete phases: building on earlier IFI and NIA projects before moving into development and demonstration of the new structures by carrying out detailed design and construction on a planned overhead line project:

Stage 1: for Prototyping and testing, approx 20% of costs

Stage 2: for Parallel refinement phase, approx 15% of costs

Stage 3: for Execution activity phase, approx 40% of costs

Stage 4: for Monitoring and Evaluating, approx 10% of costs

Stage 5: for Learning and Dissemination, approx 15% of costs

The bulk of the costs will be incurred during Phase 3. Further details will be included in the full submission document.

The cost of the project is subject to confirmation and will be further refined as the project develops prior to full submission. We will also continue to endeavour to identify further sources of external funding in order to try and reduce the total funding requirement under NIC.

Bid costs of £165k have been estimated.

Specific Requirements (please tick which of the specific requirements this project fulfils)

A specific piece of new (ie unproven in GB) equipment (including control and/or communications systems and/or software)	✓
A specific novel arrangement or application of existing electricity transmission equipment (including control and communications systems software)	✓
A specific novel operational practice directly related to the operation of the electricity transmission system	
A specific novel commercial arrangement	

Accelerates the development of a low carbon energy sector & has the potential to deliver net financial benefits to existing and/or future customers

The Licensee must demonstrate that the Solution has the potential to accelerate the development of the low carbon energy sector in GB and/or deliver wider environmental benefits to GB customers. The Licensee must demonstrate the potential to deliver net financial benefits to existing and/or future customers.

As stated in the Electricity NIC Governance Document, the Network Licensee must provide the following to demonstrate compliance with this criterion:

- i. How the proposed Project will make a contribution to the Carbon Plan. In particular the Network Licensee should outline:*
 - What aspects of the Carbon Plan the Solution facilitates*
 - The contribution of the rollout of the Method across GB can have in facilitating these aspects of the Carbon Plan*
 - How the rollout of the proposed Method across GB will deliver the Solution more quickly than the current most efficient method in GB; and/or*
- ii. How the proposed Project could deliver environmental benefits to customers; and*
- iii. The expected financial benefits the Project could deliver to customers.*

- (i) By 2020, the Government expects that 15% of the UK's energy needs will be met from renewable sources, with around 30% of electricity generation coming from renewable sources, as indicated in the Carbon Plan. The plan also estimates that electricity demand could increase by between 30% and 60% by 2050 because of the increased electrification of processes and proliferation of renewable energy. To achieve these targets and meet the anticipated rise in demand, extensive upgrade work is required across the UK's energy networks, including the reinforcement and upgrade of 275kV transmission network.

In order to meet the anticipated demand for renewable connections and to deliver the associated system reinforcement, SHE Transmission is required to upgrade or install up to approximately 200km of 275kV transmission structures, likely to cost in excess of £300m. The other TOs will have similar requirements to install or replace transmission structures on their network. Overall, deployment of a smaller model will help to accelerate the connection of large volumes of renewable energy, which will meet the increased demand for electricity.

- (ii) With improved design, the commissioning of new 275kV transmission structures will be smaller than traditional builds. In addition to the anticipated reduction of perceived negative visual impact, the use of steel and, subsequently, the new design's foundations will be reduced, delivering a smaller carbon footprint and environmental impact. The introduction of the new designs will also enable timely delivery of network reinforcements and therefore enable the connection of downstream demand and renewable generation. Overall, the new design will help deliver environmental benefits to customers.
- (iii) It is anticipated that the use of a smaller tower design will help to accelerate planning and consent processes, giving cost savings associated with reduced delays. If the design is successful, it could potentially be deployed across GB; the smaller design, reduction in steel, smaller foundations etc. are expected to deliver cost savings compared to traditional designs for tower suites, providing savings for customers. In addition to this, widespread use of the design could help lower unit costs, providing additional savings. Lower access and civil costs would contribute to further savings. It is our expectation that maintenance of the structures will be easier as the cross-arms will not require painting—this will reduce the requirement for some single circuit outages.

Initial studies and early engagement with equipment suppliers and stakeholders have indicated that savings of up to 10% may be achievable if this new approach is implemented.

Delivers value for money for electricity customers

The Licensee must demonstrate that the Method(s) being trialled can derive benefits and resulting learning that can be attributed to or are applicable to the electricity transmission system.

As stated in the Electricity NIC Governance Document, the Network Licensee must provide the following to demonstrate compliance with this criterion:

- i. What is the potential Direct Impact of the Project on a Network Licensee's electricity network or on the operations of the GB System Operator;*
- ii. Justification that the scale/ cost of the Project is appropriate in relation to the learning that is expected to be captured;*
- iii. The processes that will be employed to ensure that the Project is delivered at a competitive cost;*
- iv. The expected proportion of the benefits which will accrue to the electricity Transmission System as opposed to other parts of the energy supply chain; and*
- v. How Project Participants have been identified and selected including details of the process that has been followed and the rationale for selecting Project participants and ideas for the Project.*

(i) SHE Transmission's Innovation Strategy (January 2012) identifies several high-level innovation objectives which will be positively impacted by this NIC project. These include objectives to:

1. Accelerate network development and connections including the integration of increasing amounts of renewable generation.
2. Minimise the cost of providing network capacity.
3. Maximise the use of existing assets to deliver capacity and speed connection.
4. Maintain and improve safety and environmental performance.
5. Maintain and improve network performance.

The concept for this project arose as a result of ongoing work to achieve these objectives, and will have a direct impact against them.

(ii) The learning from the work carried out by this project will provide significant knowledge and learning for all TOs, and should contribute directly to reducing both the costs and the risks associated with these projects. This will be beneficial to both current and future customers.

These projects typically have very high capital costs, with the vast majority of these costs borne by transmission customers. If the new tower suite (incorporating ICAs and low-sag conductors) is proven to be a viable solution for providing additional network capacity, it has the potential to reduce the cost of transmission reinforcement projects through reduced materials and construction costs, and fewer consent-related delays. These reinforcement costs are passed directly to transmission customers. This new suite of designs will give another design option which, if proved successful, will provide an alternative when planning and designing network upgrades. Initial internal evaluation and engagement with supply chain indicates that this approach may produce savings of up to 10% when compared with the costs of conventional arrangements.

In order to give TOs the necessary confidence to adopt the new method on a widespread basis, this NIC project proposes to demonstrate the new design approach on a typical overhead line project. This project needs to be done at a scale which is sufficient to represent the full range of conditions which may be experienced.

(iii) The project will be delivered in accordance with SHE Transmissions procurement obligations and Large Capital Projects process, to ensure that this NIC project delivers best value.

(iv) These projects typically have very high capital costs, with the vast majority of these costs being borne by transmission customers. Therefore, transmission customers will benefit directly from any savings derived from the project. If this approach is found to be successful then it may be of benefit to other sectors in the supply chain including renewable developers.

(v) The project was developed in response to the objectives outlined in (i) above. The process for selecting the project and its participants involves ongoing extensive stakeholder engagement; this engagement includes other TOs, renewable developers, supply chain companies and academics as well as a range of internal stakeholders. Engagement is taking several forms: workshops, meetings and presentations have already been held to gauge interest in the project. SHE Transmission will identify partners via a formal selection process when appropriate, so as to ensure best value for our customers.

Demonstrates the Project generates knowledge that can be shared amongst all Network Licensees

The Licensee must explain the learning which it expects the Method(s) it is trialling to deliver. The Licensee must demonstrate that it has a robust methodology in place to capture the learning from the Trial(s).

As stated in the Electricity NIC Governance Document, the Network Licensee must provide the following to demonstrate compliance with this criterion:

- i. What new knowledge is intended to be generated from completing the Project;*
- ii. What methodology will be used to capture results from the Project and how the Project's results will be disseminated to other Network Licensees; and*
- iii. Whether the Network Licensee wishes to conform to the default IPR arrangements as set out in Section B: Chapter 9. If the Network Licensee wishes to deviate from the default IPR arrangements it must outline the proposed arrangements, justify why the arrangements are more suitable than the default arrangements and justify how the new arrangements will deliver value for money for customers.*

This project will demonstrate and prove new technology, which will be directly replicable by the other Network Licensees. The new structure designs incorporating innovations and the associated knowledge and learning gained from this project will allow this technique to be applied in other situations across the transmission network.

At the end of each stage, the project will produce an end of stage report, which will be shared with other Transmission licensees and following completion of the project, the outcomes and learning will be compiled into a close down report with sufficient information to enable Transmission Licensees to use the New Tower Suite as a design option. These reports will be available via the ENA's Smarter Networks web portal.

We have built into the project a specific stage 'Stage 5 – Evaluation' to monitor and evaluate the new structures, twin earth wires, Insulated Cross Arms (ICAs) and conductors, and the learning from this stage will be captured and disseminated through the close-down report.

The new designs for a suite of transmission structures will be shared among all relevant GB Network Licensees. A comprehensive description of planning to capture learning will be included in the full bid submission.


(i) Learning will be identified in many areas, including:

1. Design specifications for smaller 275kV structures and associated works;
2. Operational effectiveness of innovations (ICAs etc);
3. Safety, health and environmental impacts related to the new design;
4. Visual impact of new designs;
5. Overall footprint requirements including civil and access requirements;
6. Embedded carbon and losses associated with new design;
7. Stakeholder considerations – planners, environmental regulators, etc;
8. Construction Issues; and
9. Cost Implications etc.

(ii) SHE Transmission will use a standard framework to capture results from the project. Knowledge will be disseminated through various methods; these will likely include at least some of the following, although this is not an exhaustive list. A full description of our comprehensive knowledge and dissemination programme will be included in the full bid submission.

- SHE Transmission-hosted events for other TOs and relevant other third party organisations;
- ENA Learning Portal to upload presentations and lectures;
- Regular press releases published as appropriate;
- An e-learning course developed to share learning;
- The development of case studies with manufacturers to show best working practice.

(iii) SHE Transmission wishes to use the default IPR arrangements; however, this is subject to final confirmation depending upon the outcome of ongoing discussions with suppliers etc. Further details will be provided in the full submission if the default IPR arrangements cannot be used.

Please tick if the project conforms to the default IPR arrangements set out in the NIC Governance Document?	
<i>If the Licensee wishes to deviate from the default requirement for IPR then it must demonstrate how the learning will be disseminated to other Licensees and how value for money will be ensured. The Licensee must also outline the proposed alternative arrangements and justify why the arrangements are more suitable than the default arrangements.</i>	
<p>It is intention that the work undertaken using NIC funding will adhere to the NIC default IPR arrangements. However, this will be subject to confirmation depending upon the final outcome of commercial negotiations with equipment suppliers, our project partners etc. If appropriate we will provide further details in the full submission.</p>	
How is the project innovative and with an unproven business case where the innovation risk warrants a limited Development or Demonstration Project to demonstrate its effectiveness?	
<i>Demonstrate why the Licensee has not previously used this Solution (including where the Solution involves commercial arrangements) and why NIC funding is required to undertake it. This must include why the Licensee would not run the trial as part of its normal course of business and why the Solution is not Research.</i>	
<p><i>As stated in the Electricity NIC Governance Document, the Network Licensee must provide the following to demonstrate compliance with this criterion:</i></p>	
<ul style="list-style-type: none"> <i>i. Why the Project is innovative and has not been tried before;</i> <i>ii. Why the Network Licensee will not fund such a Project as part of their business as usual activities;</i> <i>iii. Why the Project can only be undertaken with the support of the NIC, including reference to the specific risks (e.g. commercial, technical, operational or regulatory) associated with the Project.</i> 	
<p>(i) This project has been developed to take advantage of improved technology and equipment that has been introduced by various equipment manufacturers and suppliers. Some individual components such as Insulated Cross Arms have been trialled in ongoing NIA or IFI projects; other equipment has been implemented in other parts of the world. However, this will be the first project which trials and tests a combination of these new innovations at scale on the GB Network.</p> <p>In order to allow GB Licensees to fully exploit the benefits of this alternative technology, there exists a need for the development of new design and operational practices. The development of these new practices, in addition to the uncertainty associated with using equipment for the first time, has prevented this technology from being adopted previously.</p> <p>The project will, where relevant, use learning from work done by other Transmission Licensees to develop new tower designs i.e. National Grid's T – Pylon, however, this project will look at designs which are applicable to lower voltage levels and have to potential to be deployed in more challenging terrain and in more demanding weather conditions.</p>	

How is the project innovative and with an unproven business case where the innovation risk warrants a limited Development or Demonstration Project to demonstrate its effectiveness? (Continued)

(ii) As development and connection of renewable energy increases, there has been a growing need to create additional overhead line capacity. However, transmission lines are costly and there is little incentive for a single project to carry the additional cost and uncertainty of developing new designs which incorporate innovations not yet tested at scale.

(iii) The NIC project will be used to fund the additional costs of developing and demonstrating new designs on an integrated basis, addressing any changes to existing operational practices required to implement the new designs. We are also proposing that the NIC project includes funds for additional measurement and monitoring equipment to allow the continued assessment of the new equipment once it is in service. No individual project can justify the incremental cost for these activities therefore NIC is the most appropriate means of funding these activities. Without NIC funding there would not be sufficient confidence to implement as Business As Usual.

Project Partners and external resourcing/funding

The Licensee must provide evidence of how Project Partners have been identified and selected, including details of the process that has been followed and the rationale for selecting participants and ideas for the project.

The Licensee should provide details of any Project Partners who will be actively involved in the Project and are prepared to devote time, resources and/or funding to the Project. If the Licensee has not identified any specific Project Partners, it should provide details of the type of Project Partners it wishes to attract to the Project.

The project will build on the learning from earlier IFI and NIA projects which have looked at some of these innovations on an individual basis. We are working with a number of supply chain partners and equipment suppliers to develop the project scope.

We are working with a range of potential project partners, including possible sources of external funding such as councils and development agencies, both in the UK and in Europe. We have engaged with the supply chain and with manufacturers to ensure that they are supportive of this project. Academic partners will also be engaged.

We are keen to involve a range of partners in this project and will continue to engage with them, looking to formalise their commitment prior to bid submission. The full submission bid will include details of our engagement plans. Commercial sensitivities mean that all partners can be identified only at full bid submission stage.

Derogations or exemptions

The Licensee should outline if it considers that the Project will require any derogations, exemptions or changes to the regulatory arrangements.

No derogations or exemptions are anticipated at this stage. However, as we further develop the design of the project and begin to investigate these new solutions in detail, there is potential that we may identify areas which may require us to consider derogations or exemptions. If necessary we will outline these in the Full Submission.

Customer impact

The Licensee should outline any planned interaction with customers or customers' premises as part of the Project, and any other direct customer impact (such as amended contractual or charging arrangements, or supply interruptions).

No interaction is planned or expected with customers or customers' premises as part of this project.

No other customer impacts are planned or expected as part of this Project. In order to ensure that we deliver the overhead line project within the anticipated programme we will continue to develop the conventional solution in parallel with the innovative design. This will allow us to make a fully informed decision prior to committing to implementation.

Any customer or developer who participates in the project will be recruited on a voluntary basis with an appropriate set of commercial arrangements in place to protect both parties. We do envisage any direct customer impacts via the project at this stage; however, as we develop the detail of the NeSTS project and identify the demonstration site we may need to reconsider this position. Further information will be provided in the full submission to identify any Customer Impacts.

Details of cross sector aspects

The Licensee should complete this box only if this Project forms part of a larger cross sector Project that is seeking funding from multiple competitions (Electricity NIC, Gas NIC or LCN Fund). The Licensee must explain about the Project it will be collaborating with, how it all fits together, and must also add a justification for the funding split.

Not Applicable.

Any further detail the Licensee feels may support its submission

This project has the potential to deliver significant benefits for customers by reducing the cost and time required to construct overhead line projects. This will be achieved by combining a number of innovative components in an innovative suite of new structure designs. The NIC project will demonstrate these new designs on a planned overhead line project. This project offers the opportunity to demonstrate these for the first time. Therefore, we will be looking to enter into an appropriate set of commercial arrangements with the supply chain to minimise risk and protect customers' money.

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Job title

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