

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 pages</u> in total.</p> <p>Ofgem will publish all the information contained within the Screening Submission.</p>			
Funding Licensee			
TC Ormonde OFTO Limited and/or TC Lincs OFTO Limited (post-licence award)			
Network Licence Project Partners			
Funding Licensee area			
Offshore			
Project title			
Offshore Cable Repair Vessel and Universal Joint			
Project Summary			
<i>The Licensee must provide an approximate Project start and end date.</i>			
<p>This project will seek to:</p> <p>i) convert an existing telecom-cable repair vessel so that it can repair OFTO power cables (which are much larger and heavier than telecom cables and may require non-coiling storage).</p> <p>ii) manufacture and test a new "universal" cable jointing system which will allow dissimilar sections of OFTO-type subsea cable to be jointed together.</p> <p>iii) train and qualify jointers to repair cables on board the repair vessel referred to in (i) above using the joint referred to in (ii) above.</p> <p>It is envisaged that the project would have started by Q2 2015, with the project complete by the end of 2017.</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	£9.5m	NIC funding requested	£8.55m
Cross Sector Projects only: requested funding from Gas NIC, NIA or second tier LCN Fund?	<i>If yes, please specify</i>		

Problem

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

Once a subsea cable has experienced a confirmed fault, the owner must at present:

i) Procure a suitable vessel from which to undertake the repair. This typically involves either finding a power cable laying vessel or barge that is not otherwise engaged, or finding a general purpose vessel (or barge) of opportunity that can be converted into a repair vessel. Both approaches are very expensive and are likely to involve prolonged delays either waiting for a dedicated power cable laying vessel to become available or undertaking the design, approval, equipment rental, equipment installation and testing required to convert a vessel of opportunity to undertake just one repair.

ii) Procure a suitable jointing team and jointing tools. This typically involves requesting that the cable manufacturer provides one of their jointing teams; the people of these teams are assembled from staff that normally work on the manufacture and/or installation of new cables. Depending on the extent of the other activities being undertaken by the manufacturer it may not be possible to release staff immediately to form a repair team, and so it may be several months before a team can be made available.

New submarine power cables, as part of their construction, are provided with length(s) of spare cable and spare repair joints. These joints are generally bespoke to this particular type of cable. If the spare cable has already been used up on a previous repair then a delay of c. 12-18 months would result while new cable is manufactured. A similar delay would occur if the cable fault cannot be exactly located and as a result the amount of spare cable required for the repair exceeds the amount available.

Due to the above issues the typical time taken for offshore power cable repairs is very long with the average time being circa 3 months. Costs are also extremely high (many millions of pounds). An extreme example of this would be two repairs to the Moyle (Scotland-Northern Ireland) cable which cost £27.9m in 2012.

This affects consumers through:

i) Reduced generation at offshore wind farms due to prolonged outages, which increases the delivered cost of energy. In addition reduced wind output must be replaced by fossil-fired generation leading to higher carbon emissions

ii) Higher costs for OFTOs (insurance, risk, procurement of spares, etc) which leads to higher OFTO tariffs and ultimately higher energy prices for consumers.

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.

The project would consist of:

i) Detailed design, implementation and testing of the modifications necessary to enable a telecommunications cable repair vessel to conduct a subsea power cable repair. These are expected to include changes to the deck layout, installation of equipment to handle larger/heavier cables, installation of a turntable for storage of spare power cable, and improvements to station keeping. Although the modified vessel would not be able to operate in very shallow water, it is estimated that it would still be able to repair 80% of OFTO cable faults.

ii) Detailed design, manufacture and testing of universal repair joints capable of connecting dissimilar cable types. This will include: a mechanism for bonding conductors of different sizes, an insulation system that can interface between insulation layers with different dimensions, fibre-optic splices, a mechanical containment system to provide protection and to interface between different armouring systems, and bend restrictors to ensure that both cables' minimum bending radius requirements are respected during the repair process.

Method(s) continued

iii) Training and qualification of cable jointers for the new universal joint. A sufficient number of these jointers would be permanently assigned to the cable repair vessel referred to in (i) above to allow rapid response to any cable failure.

As there is currently insufficient demand for submarine power cable repairs to justify a vessel 100% dedicated to the needs of network licensees, the proposed commercial arrangement is that the vessel referred to in (i) above should be a vessel that is currently dedicated to the repair of telecom cables. Following the modifications, the bulk of the vessels activity would continue to be telecom-cable repairs, but work for network licensees would become a new and growing area of work. Sharing a vessel with the telecom sector in this way will enormously reduce ongoing costs for network licensees, but – because telecom repairs are completed very rapidly – it should not significantly delay power cable repairs.

A number of commercial arrangements for telecom cable repair exist. We have identified the Atlantic Cable Maintenance Agreement (ACMA) as a particularly attractive option, and have held discussions to confirm that network licensees will be able to join ACMA on essentially the same terms as telecom companies. This implies a much lower cost for cable repairs than with the current approaches. The ACMA also insists that cable repair vessels are permanently mobilised and ready to undertake repairs at 24 hours notice. Combined with the fact that (as noted above) telecom repairs are completed rapidly and so should not delay power cable repairs significantly, this implies that repairs for network licensees should be undertaken several times more quickly than is possible at present.

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.

The funding estimate includes:

- i) Costs calculated by Global Marine System Ltd (GMSL) based on the conversion of their vessel "Wave Sentinel", a British based and flagged vessel which is currently engaged in telecom-cable repair work within ACMA. Estimates are based on GMSL's in house knowledge of this vessel and the work required.
- ii) Costs estimated for manufacture and testing of a prototype joint, including testing estimates provided by an electrical testing laboratory.
- iii) An estimate of internal and external costs associated with supervision and management of the work.
- iv) Bid costs of £80k (internal and external)

We intend to refine all cost estimates between the ISP stage and the main NIC bid submission.

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.*

Rapid availability of a repair vessel (through ACMA, etc) and availability of a universal joint would both accelerate the development of a low carbon energy source (offshore wind) and directly reduce CO₂ emissions by expediting the repair of faults which reduce offshore wind output. The universal joint would reduce the cost of offshore wind energy and so reduce costs to customers.

We have undertaken a cost benefit analysis which shows that the project will reduce the duration of cable outages (over the set of all GB OFTO cables) by an average of 0.95 circuit-months pa for the present scale of the GB OFTO fleet and 4.05 circuit-months pa for the scale of the GB OFTO fleet expected in 10 years time; this is based on an analysis of cable lengths by The Crown Estate and international fault-rate data from Cigre.

This will lead to a direct CO₂ reduction as increased output from offshore wind will displace fossil-fired generation. Based on industry data we have calculated that having a single 132-155kV AC OFTO cable out of service will reduce wind energy output by 20 GWhr/mth and increase CO₂ emissions by 8,600t/mth. Thus the proposed Solution would reduce emissions by more than 8,000 tonnes of CO₂ per annum at present, rising to almost 35,000 tonnes of CO₂ per annum in 10 years time.

The value of the electricity that would otherwise have been lost due to cable outages is estimated to be £3.2m pa at present (calculated at £140/MWhr) and £9.3 pa in 10 years time (calculated at £100/MWhr to reflect the targeted fall in offshore wind costs). Adding the reduction in cable repair costs possible through a "repair club" such as ACMA gives a total saving of £4.5m pa now, rising to over £18m pa in 10 years time.

In response to the specific questions above:

i) The aspect of the Carbon Plan facilitated by this Solution is the increased contribution of renewable generation (para 2.3 of Plan refers to 30% by 2020). As noted above the contribution to reducing carbon emission is estimated to be 35,000 tonnes of CO₂ pa in 10 years time. As described in a subsequent section, in the absence of NIC funding (i.e. with only business-as-usual OFTO opex funding arrangements) this Solution would not be deployed at all and this renewable generation will continue to be lost.

ii) Environmental benefits will be delivered directly through reduced fossil-fired generation and hence reduced emissions.

iii) As noted above, the financial benefits of the Solution are estimated to be £4.5m pa at present, rising to more than £18m pa in 10 years time. Even with the present scale of OFTO cable deployment this equates to a payback period of only two years.

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.*

The benefits of the project will be directly available to all Network Licensees (see (i) below) without each needing to implement the concepts separately on their own systems. This, along with very strong commercial incentives, will contribute to its rapid roll-out among Licensees. Learning benefits will also be disseminated through reports.

i) The proposed Solution's impact will be to make available a mechanism for substantially reducing cable repair times and repair costs. All Network Licensees will be able to join the cable-repair "club" (ACMA, etc) on the same terms as the applicant.

ii) The cost of the project is justified by its direct financial benefits (see the previous section, note the short payback periods), by the way that the project will facilitate the development of a robust and cost-effective British supply chain for cable repairs, and by the learning that it creates, which may encourage the introduction of similar arrangements for offshore maintenance services generally, and in particular should encourage similar arrangements for the repair of other offshore cable types (e.g. wind turbine array cables or interconnectors).

iii) To ensure that the project is delivered at a competitive cost we have carefully selected our supply-chain partners, we will enter into fixed price agreements where possible, and we will use expert subcontractors to monitor, supervise and audit our supply chain partners. The applicant and its management company have considerable experience with the delivery of contractually and technically complex projects rapidly, efficiently and successfully.

iv) Current offshore commercial arrangements do not provide compensation to generators who are not allowed to generate due to grid failure; this contrasts to the arrangements onshore which provide full compensation. As a result offshore generators will obtain a benefit from the Solution in terms of a reduction in grid constraints for which they currently receive no compensation, and we expect competition to ensure that these benefits are passed through to consumers. However all of these benefits relate to reducing the impact of a failure within the Transmission System and therefore, as per 4.12 of the Governance Document, these benefits can be 100% attributed to, and are 100% applicable to, the electricity Transmission System.

v) The process used to select our supply chain partners is described further in a section below.

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.*

The knowledge created by the project will largely be contained within the design of the universal subsea joint and the modified repair vessel, which will be validated by testing to give confidence that the vessel and joint are ready for service.

The knowledge created will also create knowledge of a model of cable repair which could be adapted to other repair scenarios, e.g. shallow water repairs (less than 10m), jointing of HVDC cables and jointing of >155kV AC cables.

i) The new knowledge to be created concerns

- the adaptation of a vessel for power cable repairs and the results of tests and design-verification work,
- the design and manufacture of a universal joint and the results of tests and design-verification work, and
- the results of jointer training and qualification work.

ii) Results will be captured through reports and, once the work is complete, through marketing of the services of the vessel and the universal joint. Reports would be made available to all GB network licensees, with briefings available for GB network licensees who own offshore cable assets of the relevant type (i.e. "peer review").

iii) We expect to adhere to the default IPR arrangements.

Please tick if the project conforms to the default IPR arrangements set out in the NIC Governance Document?	✓
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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.

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?

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.

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

- i. Why the Project is innovative and has not been tried before;*
- ii. Why the Network Licensee will not fund such a Project as part of their business as usual activities;*
- 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.*

The project is innovative as it will:

- i) Modify a vessel that is part of a currently telecom-oriented shared-cost cable repair “club”, so that power cable repairs can be undertaken within this same commercial structure. The vessels available through such structures had previously not been capable of undertaking repairs on OFTO-type cables.
- ii) Design, produce and test a new type of submarine cable repair joint (a non-OEM universal joint). These are widely used onshore but have not been applied to OFTO-type cables offshore.

These measures have not been tried before because they necessitate expenditures on vessel modification and joint production ahead of need, i.e. ahead of a specific cable fault occurring. It is not possible to fund such work as part of business as usual as the cost is large relative to OFTO’s opex budget margins and OFTOs do not have the capital available to fund such large up-front development costs, this being one of the features of cost effective non-recourse project financing.

Additional barriers to applying these innovations without NIC funding include:

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)

- i) Although the cost benefit calculations show very short payback periods, these are dependent on the project being widely used by multiple GB licensees. However co-ordinated funding of these innovations by multiple network licensees from their business-as-usual sources is not feasible as these companies have different technical and business aims and are competitors. As a result previous attempts to arrange collective funding for shared cable repair arrangements have not been successful. However NIC funding allows the outcome of the project to be applied at a large enough scale to generate a benefit which justifies the initial investment.
- ii) Due to the "shared club" nature of organisations such as the Atlantic Cable Maintenance Agreement, where all of the parties access services at the same price, it is inherently difficult to prevent others from also benefiting from the investment. This "free rider" feature of the concept tends to prevent investment by any single party.
- iii) Consumers and offshore wind generators (not OFTOs) stand to gain much of the immediate benefit from these innovations, due to the higher generation outputs that are possible due to shorter cable repair times. If an OFTO were to fund the cost of the project from business-as-usual sources they would not be able to take account of these benefits, only the benefits arising from their own increased incomes and reduced costs.

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.

Because of the complexity of our requirements, and the lack of certainty regarding the availability of NIC funding, it was not feasible to enter into a formal competitive process and we opted instead for informal competitive discussions with potential partners in the cable vessel and joint design/manufacture fields.

As a result of this process we have selected a British company, Global Marine Systems Ltd (GMSL), as our supply-chain partner since they:

- i) Operate telecom cable repair vessels under the ACMA, our preferred commercial arrangement, and also produce universal joints for telecom cables.
- ii) Demonstrated a high level of interest in the concept, having already undertaken self-funded work on both vessel conversion and lower-voltage universal power cable joints.
- iii) Had the commercial scale and flexibility necessary.

Having separate supply chain partners for the cable joint and repair vessel was considered, but rejected given the benefits of having GMSL undertake both roles. In particular integrating the roles reduces complexity and helps to address the issue of the long-term provision of jointers on board the repair vessel.

Derogations or exemptions

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

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).

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.

Any further detail the Licensee feels may support its submission

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