PPA energy

Planning Energy
for a Sustainable World

NIC Competition
Final Interrogation Report

Offshore Cable Repair Vessel and Universal Joint (OCRV)

submitted by

TC Ormonde OFTO Ltd

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1 Project Summary

TC Ormonde Ltd is proposing a project that aims to improve the availability of connections between offshore wind farms and their onshore connection point, by reducing cable repair times (and costs). Repair times are currently subject to delay due to a number of factors, including mobilising a vessel, obtaining key staff (e.g. jointers), and sometimes limited availability of spare parts. Cable outages result in lost revenue to the associated offshore Generator, and repair costs for the OFTO. This project would aim to reduce repair times and costs by:

(1) Converting an existing telecoms vessel to include the capabilities of a power cable repair vessel;

(2) Making the vessel available to all OFTOs (and other parties) through a commercial arrangement with the ACMA (Atlantic Cable Maintenance & Repair Agreement) on standard terms;

(3) Developing, manufacturing and testing a universal cable joint; and

(4) Training staff in the above items (1) and (3).

Financial benefits have been estimated as:

- Ranging from £2.4 million per annum to £6.2 million per annum, from today to 2030 respectively, for wind generators, in terms of increased wind output; and

- Ranging from £1.7 million per annum to £10.5 million per annum, from today to 2030 respectively, for OFTOs, in terms of reduced repair costs.

Global Marine Systems Ltd (GMSL), the owner of fleet of cable ships including the vessel proposed for modification, has been selected as the prime subcontractor for this work. Other subcontractors, including the jointing subcontractor, will be selected through tendering processes.

The total project cost is £10,329k, and the request for NIC funding is £9,016k. The project runs from January 2015 to July 2018 (3 years 7 months).

2 Assessment Against Criteria

2.1 Summary of Assessment Criteria

The criteria against which each submission will be assessed as outlined in the Electricity NIC Governance Document:

(a) Accelerates the development of a low carbon energy sector and/or delivers environmental benefits whilst having the potential to deliver net financial benefits to future and/or existing Customers;

(b) Provides value for money to electricity transmission Customers;

(c) Generates knowledge that can be shared amongst all relevant Network Licensee;

(d) Is innovative (ie not business as usual) and has an unproven business case where the innovation risk warrants a limited Development or Demonstration Project to demonstrate its effectiveness;

(e) Involvement of other partners and external funding;

(f) Relevance and timing;

(g) Demonstration of a robust methodology and that the project is ready to implement.

2.2 Criterion (a): Accelerates the development of a low carbon energy sector and/or delivers environmental benefits whilst having the potential to deliver net financial benefits to future and/or existing Customers

2.2.1 Key Statements

The project aims to improve the availability of connections between offshore wind farms and their onshore connection point, by reducing cable repair times (and costs). This would be achieved by providing the facility of a power cable repair vessel with better availability than current arrangements; the use of a universal cable joint for certain types of cable (which is independent of manufacturers); and improved availability of key staff for the universal cable joint (e.g. jointers).

Carbon claims and Environmental benefits

The associated carbon and environmental benefits with improved offshore cable availability are claimed as follows:

- Increased contribution of renewable generation output through reduced cable outage times – these benefits have been quantified as ranging from 7,220 – 26,689 tonnes of CO_2 per annum, between today and 2030 respectively;

- Reduced fossil fuel generation, which may otherwise be dispatched to make up for the shortfall in offshore wind output when a wind farm cannot (fully) export;

- Accelerating the development of a low carbon energy source (offshore wind) by reducing the levelised costs of generation for future projects, by improving export cable availability and reducing risk;

- Potentially improving the availability of interconnectors and bootstraps, which facilitate the connection and integration of renewable generation, through access to the cable repair vessel.

There is also reference to an environmental benefit whereby the solution has the potential to reduce the number of export cables required for each project, which would reduce the environmental impact of cable installation work. The reduced number of cables would arise from increased availability of cables, and a reduced requirement for security (e.g. the minimum number of high capacity cables compared to more cables at a lower rating).

Quantitative analysis and Financial benefits

Financial benefits for Generators have been estimated based on reductions in cable repair outage time through use of (1) the vessel and universal cable joint, (2) just the

universal cable joint, and (3) just the vessel. Financial benefits for OFTOs have been estimated based on the expected fault rate under certain scenarios, and the expected reduction in cost due to use of the modified vessel. Financial benefits are shown to accrue to:

- The wind generators, in terms of increased wind output, ranging from £2.4 million per annum to £6.2 million per annum, from today to 2030 respectively; and

- The OFTOs, in terms of reduced repair costs, ranging from £1.7 million per annum to £10.5 million per annum, from today to 2030 respectively.

The above savings are expected to benefit existing Generators and OFTOs. There are anticipated savings for future projects through lower generation costs due to expected increased output / lower risk, and lower OFTO costs due to reduced repair costs and potentially changes in project designs. At a high level, TC Ormonde has considered the financial benefits of savings through changes in offshore cable connection designs that lead to reduced project capital costs, by suggesting that even a small saving in future OFTO costs, e.g. 5%, would result in a considerable sum being saved (£1 billion).

Capacity released

The amount of capacity released has been calculated from additional energy output from renewable generation due to greater cable availability. In 2030, this is estimated at 62.1 GWh per annum, which has been converted to 7.089 MW of capacity.

Project replicability

In terms of replication, there are a number of factors that limit the applicability of the solution, including:

- The universal cable joint is relevant to 132 - 150 kV AC cables only (i.e. not higher voltages, cables with a novel design, or DC cables). It is estimated that this limits the applicability of the universal cable joint to 20% of future cables associated with offshore wind farms;

The vessel can only be used for cables that are laid at greater than a certain depth in the sea, due to restrictions of the vessel. It has been assumed that 60% of cables are lower than this depth (10m), and that 75% of cable faults can be repaired at this depth.

2.2.2 Challenges and Potential Shortfalls

Criterion (a): Accelerates the development of a low carbon energy sector and/or delivers environmental benefits whilst having the potential to deliver net financial benefits to future and/or existing Customers;	
Sub-criterion (a.i)- Carbon claims	No challenge presented
Sub-criterion (a.ii)- Environmental benefits	Challenge (a.ii).1: In addition to the carbon benefits expected to arise from reduced repair times, it is claimed that there is potential for environmental benefits, in terms of reduced environmental impact of cable installation work due to use of fewer higher rated cables. Given the impact on Generators of a cable outage, the likelihood of Generators accepting a reduced number of offshore cables should be further explored.
	Answer (a.ii).1: Of the 15 projects for which the OFTO appointment process has commenced, 8 have generation that can be disconnected by a single offshore cable fault. This includes some of the newest projects. Therefore it is not the case that offshore wind farms cannot accept the risk of a prolonged disconnection. Rather it is the case that the time required for offshore cable fault repairs is a very important input into the analysis undertaken by the generation developer, an analysis which seeks to balance the risk and consequences of a fault on a single circuit against the extra cost of using multiple smaller circuits. The proposed NIC project should result in a dramatic reduction in average cable repair times, and potentially an order-of-magnitude reduction in the "worst case" repair times that can occur under severe but credible conditions. This can be expected to tip the balance to cheaper single-cable solutions for many projects.
	Conclusion (a.ii).1: In order to realise a benefit in terms of impacting cable connection design, the project will need to be successful, and may need to have demonstrated sufficient benefits for Generators to be confident enough to take account of the outcomes. It is considered that this may require some

	evidence / experience that the project reduces cable repair times to the level that is expected at this stage. While this potential benefit is considered to be credible, it is noted that the timescale for realising the benefit could be relatively long.
Sub-criterion (a.iii)- Quantitative analysis of Carbon/ Environmental claims	No challenge presented
Sub-criterion (a.iv)- Robustness of financial benefits	Challenge (a.iv).1: The benefit to the OFTO is calculated as the expected number of faults (per scenario) multiplied by the reduction in repair costs. Repair costs are estimated as £[redacted]m under Business As Usual (BAU) and £[redacted]m using the modified vessel. In response to a clarification question, it is understood that the £[redacted]m reflects the cost of the repair vessel and its equipment; the jointers and their equipment; costs associated with contracting and supervising the work; and the cost of insuring the repair work. The proposal text suggests that the £[redacted]m is based on the vessel hire and fuel costs for the modified vessel, but TC Ormonde has stated in response to a clarification question that the figure includes the cost to insure the repair work, and that the two cost figures have been estimated on a comparable basis. Given that insurers are going to be consulted in the initial phase, and the suggested build-up of the £[redacted]m cost on page 10 of the proposal document, the robustness of this claim should be explained.
	Answer (a.iv).1: Insurance is not a major part of the cost of a repair (typically [redacted]%). Furthermore as part of the ACMA service arrangements GMSL provides a warranty for the work they undertake: if this work is undertaken incorrectly and/or they damage the cable handled in the course of the repair then they will undertake remedial work at their cost. As a result no additional insurance (beyond that carried in any event by GMSL) should be required for an ACMA repair.
	Conclusion (a.iv).1: As well as the above response, TC Ormonde has provided a response to a clarification question on the two figures being comparable. The responses are considered to be sufficient to address the challenge.

	Challenge (a.iv).2: It is claimed that the proposed solution could result in changes to offshore connection designs, in terms of reducing the number of cables, and thus reducing capital costs. TC Ormonde has assessed potential savings in two ways. The first is noting that using half the number of double sized cables could reduce cable costs by 40%, and overall connection costs by 15-20%. The second is to assume a small saving (5%) as a result of the project on estimated OFTO investment under Ofgem's enduring regime (£15-20 billion). As with challenge (a.ii).1, the likelihood of Generators accepting changes to connection designs, in terms of reduced number of cables, should be considered.
	Answer (a.iv).2: As indicated in our response to (a.ii)1, the existing fleet of offshore wind farm connections includes a mix of projects with single-circuit connections (where a single fault will disconnect wind turbines until repairs are complete) and multiple-circuit connections (where a single fault will reduce the power that can be sent ashore from the wind farm, but will not completely disconnect it). Both designs are also found on projects currently under construction. The mix of designs found, combined with our discussions with the persons within wind project developers responsible for export cable system design, indicate that the decision between cheaper single-cable designs and more expensive multi-cable designs is often finely balanced. The shorter outages that will result from the proposed NIC project are likely to "tip the balance" in favour of cheaper single-circuit connection designs for many projects.
	Conclusion (a.iv).2: As for conclusion (a.ii).1, the response is considered to address the challenge, noting that the benefit may not be realised for some time (taking account of the project duration, time for experience of the solution to be successfully demonstrated, and time taken for offshore wind farm projects to progress from design to installation and commissioning).
	[redacted]
	[answer redacted]
	[conclusion redacted]

Sub-criterion (a.v)- Capacity released and how quickly (if applicable)	No challenge presented.
Sub-criterion (a.vi)- Replication	Challenge (a.vi).1: The application of the universal cable joint to future projects is assumed to limited to 20%. It is claimed that the modified vessel will be capable of handling all cable types (provided that they are at a sufficient depth). This should be explored further, in terms of clarifying that larger / heavier cables will be accommodated by the proposed modifications to the vessel. In particular, as interconnector owners are referenced as potential beneficiaries in the proposal, the suitability of the vessel for application to interconnector cables should be confirmed.
	Answer (a.vi).1: The method that will be used to ensure that the *Wave Sentinel* is able to repair any cable (subject to the availability of jointers and their tools) is to size the cable handling equipment to match the industry standard parameters (e.g. radius of curvature) used by specialist cable installation vessels. This has driven, for instance, the design parameters of the quadrant shown in Appendix 10 to the application. Basing our design on the capability of industry standard cable lay vessels helps to ensure that cables that will be installed in the future can also be repaired by the *Wave Sentinel*. In addition we expect to talk to all potential Network Licensee users as the project design is refined, and we will use this opportunity to verify the suitability of our vessel-conversion designs. Such discussions will build on the conferences already arranged by ACMA and GMSL in 2013 and early 2014, which encompassed all relevant Network Licensees.
	Conclusion (a.vi).1: Through the above response, and during the first bilateral, TC Ormonde has stated the intention that the repair vessel will be capable of being applied to any cable that has been installed in Great Britain to date. This is because the vessel will be designed to handle the largest cable size that can currently be installed. In addition, TC Ormonde specifically referenced HVDC cables in the bilateral meeting, and confirmed that the vessel is expected to be able to be applied to them. These responses are considered sufficient to address this challenge.

	Challenge (a.vi).2: In relation to the challenge above, TC Ormonde should confirm the planned capability of (1) the modified vessel and (2) the universal cable joint, for different cables, differentiated by: • Supply characteristic (e.g. AC / DC) • Type (e.g. XLPE, PILC) • Voltage level • Cable size Where relevant, a maximum value should be stated, e.g. voltage level and cable size. This should ideally be presented in a tabular form.
	Answer (a.vi).2: The detailed design to modify *Wave Sentinel* will aim to accommodate any design of cable (see (a,vi)1 above). The joint is intended to accommodate cables that are: • 3 core AC • XLPE insulation • Lead sheath / radial water barrier • Nominal voltages between 132kV and 150kV. • Copper conductor (an extension to include Aluminium, which is not currently used in UK export cables, is to be reviewed at the initial stage of the project) • Conductor sizes between 300mm^2 and 1000mm^2 (extension to include 1200mm^2 to be considered at the initial stage of the project). There may be limitations on using the maximum size difference, but 300mm^2 can be jointed to sizes up to at least 630mm^2 and 630mm^2 can be jointed to 1000-1200mm^2. This is sufficient to encompass all cable combinations likely to be needed to cover Britain's existing OFTO cable fleet, along with all future

	OFTO and TO cables that use similar cable designs.
	Conclusion (a.vi).2: It is helpful that TC Ormonde has confirmed that the modified vessel is intended for use for all cable types (and an explanation has been provided in Response (a.vi.1) as to why this is the case). It is also helpful to understand that the universal cable joint is intended to cover only one cable type (XLPE insulation), which was also the subject of discussion at the first bilateral meeting. This response is considered to be sufficient to address the challenge.

2.3 Criterion (b): Provides value for money to electricity transmission Customers

2.3.1 Key Statements

Proportion of the benefits attributable to the transmission system

There are two types of benefits in this project; (1) benefits to parties involved in projects that have already been financed, and (2) benefits that might arise for future projects. The former category are benefits for OFTOs and Generators. The latter category are expected to be passed through to customers, via lower OFTO costs, due to the competitive nature of the bidding regime, and similarly lower generation costs through competitive forces. In the short term TC Ormonde expects that the split of benefits between Generators and OFTOs will be approximately 50/50, and that in the longer term the benefits all accrue to customers.

How learning relates to the transmission system

The aim of this project is to reduce the time and cost to repair faults of cables that connect offshore wind generation (and could be used for other types of connections). While a portion of the learning relates to modifying a vessel, the purpose of the vessel modification is directly related to offshore transmission.

Approach to ensuring best value for money in delivering projects

TC Ormonde has provided a list of ways that they have sought to ensure value for money in this project, which includes:

- The proposed commercial arrangements with ACMA, which:
    - gives rise to a lower-cost solution than a purpose built power cable repair vessel, due to the dual purpose of the vessel between telecommunications and power cable repairs;
    - gives all OFTOs (and other interested parties, such as interconnector owners and Transmission Owners) access to the vessel under the same terms and costs;
    - gives all OFTOs access to the outcomes of the project straight away, without the need for them to implement the learning outcomes of the project in their own systems; and
    - prevents GMSL from increasing the charge rate for the modified vessel for power cable repairs, as the telecommunication members, who are the predominant members of ACMA, will not tolerate an increase in charge rate.

- The use of competitive tendering in the project for subcontractors who will:
    - manufacture and install equipment to make the vessel modifications;
    - develop the universal cable joint; and
    - provide jointing training.
- Measures put in place with the prime contractor, GMSL, in the Memorandum of Understanding (MOU), including:
    - Agreeing a fixed profit margin (of [redacted]%) with the prime subcontractor, GMSL. It is proposed that this is reasonable because of the level of risk assumed by GMSL;
    - A compensation arrangement, in the event that the modified vessel is no longer contracted to ACMA during the seven year period;
- Previous experience of TC Ormonde and GMSL in managing technically and commercially complex projects, including, by GMSL, the modification of a previous vessel for power cable installation.
- Monitoring the progress of GMSL and their subcontractors, using a combination of in-house staff and external advisors.
- The inclusion of an initial phase of work (capped at £[redacted]k) to fully scope and cost the project, which will be reviewed and become a decision point before deciding to proceed.

The prime contractor, GMSL, has not been selected by competitive tender. TC Ormonde has stated that this is because there are only two companies that own vessels with ACMA, and that GMSL put forward a unique proposal.

2.3.2 Challenges and Potential Shortfalls

Criterion (b): Provides value for money to electricity transmission Customers;	
Sub-criterion (b.i)- Proportion of benefits attributable to transmission system (as opposed to elsewhere on	Challenge (b.i).1: As well as the parties identified by TC Ormonde as beneficiaries of the project (i.e. OFTOs and other offshore cable owners, Generators and customers), it is also considered that GMSL stands to benefit from owning the modified vessel (and potentially increased usage of the vessel) and that the jointing company stands to benefit from future manufacturing and sales of the universal cable joint. A number of measures are in place to ensure that GMSL does not

supply chain)	profit unreasonably from the modified vessel, as described above, particularly noting that the proposed arrangement with ACMA prevents GMSL from increasing the charge rate for the modified vessel for power cable repairs. Clarification has been sought on the commercial arrangements for the universal cable joint and provision of trained jointers. TC Ormonde responded that "any commercial structure will comply with the following principles …profits earned by GMSL and/or the joint development subcontractor must be reasonable". Given that the universal cable joint will be developed using funding from customers, further reassurance is required that the profits gained by the jointing subcontractor and/or GMSL in relation to the universal cable joint will be restricted to a level that is commensurate with those achieved on other commercial jointing products.
	[This answer is confidential]
	[This conclusion is confidential]
	Challenge (b.i).2: It is noted that, in the short term, financial benefits are expected to accrue to OFTOs and Generators. Clarification is required as to how benefits are expected to flow to end use customers, and over what time frame. An assessment should also be provided of the level of financial benefits expected to accrue to end customers, in relation to the level of NIC funding requested.
	Answer (b.i).2: Our response below initially calculates the consumers' payback period by focusing solely on the project's benefits for offshore wind connections. In doing this it is assumed that no benefits are passed through to consumers until CfDs start to be awarded on a competitive basis. We believe that this is a highly conservative assumption: if offshore generation cannot get to market we would expect this to have an adverse effect on the electricity prices paid by consumers (analogous to the effect of increased demand) even if the project affected pre-dates competitive CfDs. Our response then illustrates how the actual payback period is likely to be much shorter due to improved wind farm connection designs, and improved availability of interconnectors and bootstraps.

	Consumer benefit through competitive-CfD offshore wind. Future awards of CfDs to offshore wind farms will be through a competitive process. Where CfDs are allocated in this way we would expect competitive pressure to mean that the benefits of increased wind output due to faster cable repairs would be passed through to consumers. In addition competition among OFTO bidders would force them to pass through to generators their anticipated savings from lower repair/insurance costs, and the generators would in turn be forced by competition to pass these savings through to consumers. Our understanding of the levy control framework is that it provides funds for the development of circa 500MW of offshore wind per annum under competitively-allocated CfDs (source: RenewableUK, 15 August 2014). This equates to 100-150km of additional cable being added annually: circa 13% of the amount currently installed. The benefit from the proposed NIC project can similarly be expected to be 13% of the level calculated for the current wind fleet (i.e. 13% of £1.7m+£2.4m pa). This yields a benefit from the NIC project of just over £0.5m pa from each new 500MW wind farm. All of this benefit would be passed through to consumers. It should be noted that this £0.5m pa of benefit recurs with each new competitive-CfD wind farm that is built. Thus the first CfD contract to benefit would presumably be signed in 2016 (after the proposed NIC project completes its initial phase, so developers will be able to reasonably expect the project's successful delivery) with power being delivered in 2018. This would save the consumer £0.5m in 2018. In 2019 the next wind farm would come on line, increasing savings in that year to £1.0m and with a cumulative saving to the end of 2019 of £1.5m. This cumulative saving would continue to grow to £3m in 2020, £5m in 2021, £7.5m in 2022, and £10.5m in 2023. This means that the entirety of the funding provided for the project should have been repaid by 2023, circa 5 years after the end of the project. After this the benefits should continue to mount. Even if offshore wind construction continues to be limited to 500MW pa benefits should reach a cumulative value of over £45m by 2030: many times the capital invested by consumers.

	Other consumer benefits As noted in (a.ii)1, more rapid cable repairs is likely to lead generators - especially given the increased competitive pressure - to adopt cheaper connection designs using fewer larger cables in order to reduce their CfD bids, with consequent benefits for consumers. On a single project a change from two cables to a single cable could save as much as £60m in capex terms, which would equate to a consumer benefit on the order of £6m pa. It is thought very likely that at least one of the projects commissioning by 2023 will opt for a reduced number of cables as a result of the reduction in repair times that this project makes possible. This could accelerate the consumer payback by several years. The more rapid repair of interconnector cable faults would have direct benefits for consumers through reduced energy prices. National Grid estimates that 4-5GW of additional interconnection will reduce consumers' bills by £1bn per annum (source: press release 31 March 2014). Scaling this value pro-rata implies that reducing the fault repair time on a 1GW interconnector by an estimated 1 month will benefit consumers by just under £20m. Thus a single interconnector repair being undertaken by the *Wave Sentinel* could yield immediate consumer payback. Based on published grid connection dates, we expect that the total length of offshore interconnector cables to GB will have increased to 2000km by 2020, implying faults at a rate of roughly one a year. Published figures in relation to the cost of constraints between England and Scotland suggest that the cost to consumers from the extra constraint payments that would occur should a bootstrap (2.2GW) fail could be £1m per day or more. The benefits of accelerating a bootstrap repair are therefore likely to be similar to those from accelerating an interconnector repair. Depending on the number of bootstraps in service by 2023, faults are estimated to occur between once every 2 years and once every 4 years. There is therefore a high likelihood that at least one bootstrap fault will have occurred before 2023.
	Conclusion (b.i).2: TC Ormonde has described how customers will receive benefits through reduced costs of offshore wind generation, when generators compete for Contracts for Difference (CfD). They have proposed that generation developments that sign CfDs in 2016 could benefit from the project, and that benefits would start to flow from 2018. While the principal of the benefits seems sound, there remains

	a potential issue around timing, given that the project is scheduled to complete in mid-2018, and experience of the solution may be required to ensure sufficient confidence to reduce costs. In addition, it is not clear how this relates to the anticipated timing of the offshore generation Round 3. It is noted that TC Ormonde has proposed a number of other means of benefits flowing to consumers, relating to reduced repair time for interconnectors and bootstraps. Provided that the vessel can accommodate such cable types, these claims seem credible, although noting that the financial benefits have been estimated at a high level, are based on figures provided from other studies and have not all been provided on a per annum basis, to be comparable with previous benefits identified.
Sub-criterion (b.ii)- How learning relates to the transmission system	No challenge presented.
Sub-criterion (b.iii)- Approach to ensuring best value for money in delivering projects	Challenge (b.iii).1: A contingency has been included in the project budget of £[redacted]k ([redacted]% to total project cost). Clarification has been sought on how this will be used after the fixed price offer has been received from the prime subcontractor. TC Ormonde states that the contingency covers two risks, (1) relating to the fixed price offer from GMSL and (2), relating to additional costs incurred outside the scope of the fixed price offer. As the GMSL cost represents such a high proportion of the total project costs, the arrangements for the level of contingency after the fixed price offer has been received should be reviewed. In addition, further justification is required as to why there is both a risk margin in the GMSL budget, and a contingency in TC Ormonde's cost items.
	Answer (b.iii).1: We believe that the contingency provided is reasonable as it is based on the level of contingency we would have provided for a project of this type in the absence of any public funding. The risk margin in the GMSL budget is present because the fixed price must be set above the sum of the major subcontract items (plus profit and internal costs) in order to allow for minor subcontract costs and cost escalation on larger

	subcontracts due to variation orders after contracts have been placed. The contingency amount is to allow for: (i) A higher than expected fixed price due to higher than expected subcontract prices (this might be driven by higher materials costs, market conditions or additional requirements being identified during detailed design). (ii) Circumstances that require a variation order to be issued in relation to GMSL's fixed price contract. [Example redacted]. (iii) Increases in the licensee's internal and advisory costs due, for instance, to delays in project execution. For the avoidance of doubt, our intention is that any unspent part of the contingency amount will be returned to transmission customers via a refund to NETSO.
	Conclusion (b.iii).1: The overall level of contingency does not seem unreasonable, given the size of the project overall. In their response, TC Ormonde has identified three different needs for contingency. However, the contingency budget has not been weighted against these needs. Given that is could be reasonably assumed that the largest part of the contingency relates to the risk associated with the fixed price offer, such information would be helpful.
	Challenge (b.iii).2: The prime contractor has not been selected through a competitive process. The reason for selecting GMSL on a non-competitive basis should be restated here for clarity.
	[redacted]
	Conclusion (b.iii).2: The reasons given by TC Ormonde for not using a competitive process to identify the prime contractor, given what they set out to achieve (i.e. a vessel that is part of the ACMA) seem reasonable.

2.4 Criterion (c): Generates knowledge that can be shared amongst all relevant Network Licensee

2.4.1 Key Statements

Potential for the generation of new or incremental learning

The outcomes from this project come in two forms:

(1) The knowledge from the project in the development and design of the universal subsea joint and modified repair vessel; and

(2) The products that will be delivered by the project (as above), and immediately available to all interested parties through membership with ACMA, without requiring other parties to implement the learning in their own systems.

There will also be knowledge transfer in the form of training on the universal cable joint. TC Ormonde states that there will be knowledge creation in terms of a model for cable repairs, which could be replicated for other circumstances (e.g. shallow waters, other cable types).

Applicability of learning to other Network Licensees

TC Ormonde has identified a number of stakeholders (and licensees) to whom the learning is relevant:

- OFTOs;
- Transmission Owners and Distribution Network Operators (who may have offshore assets as part of their networks, e.g. to connect to islands);
- Interconnector owners;
- Generators – although not responsible for the export cables, there are other offshore cables (i.e. between the turbines and the offshore substation) for which the Generators are responsible.

The learning outcomes of the project will be made available to all of the above parties via the ACMA. The membership fee to the ACMA is charged on a per-km basis, and is estimated to be in the order of [redacted] per annum for TC Ormonde OFTO Ltd, with daily vessel fees charged for use of the vessel.

Proposed IP management

No deviations are proposed to the default IPR arrangements. The MOU between Transmission Capital Services and GMSL states that IPR shall align with the

Electricity NIC Governance Document understanding, and the jointing company will be required to adhere to the default NIC IPR arrangements. TC Ormonde states that:

- They will not gain any IPR advantage over other OFTOs, as the terms of service and fees will be the same for all ACMA members;
- GMSL will not gain IPR from the project, as the modifications will be specific to each vessel and would not give rise to general patentable conversion techniques;
- The jointing company will be required to provide long-term support, and / or training at pre-arranged reasonable prices.

TC Ormonde states that the project has been structured so as to prevent subcontractors from making unreasonable profits from IPR generated from a customer-funded project.

Credibility of proposed methodology for capturing learning from the trial and plans for disseminating

The following methods are proposed for knowledge dissemination:

- A final project report, summarising the work undertaken and lessons learned, as well as recommendations for the future of the project concepts, in terms of a vessel sharing club and cable-owner development of jointing equipment. The report will be sent to all relevant GB network licensees.
- A peer review conference, presenting the final report findings.
- Marketing of the vessel and jointing services, through ACMA and GMSL. For example, this could take the form of forums, which have already been hosted by ACMA / GMSL in London, Belfast and Portland (on board the vessel). Marketing of services through forums is seen as a key dissemination method.

2.4.2 Challenges and Potential Shortfalls

Criterion (c): Generates knowledge that can be shared amongst all relevant Network Licensee;	
Sub-criterion (c.i)- Potential for new/incremental learning to be generated by the	Challenge (c.i).1: It is understood that under current practices vessels are equipped, as required, for cable repair. The extent to which the vessel modification creates new knowledge should be explained (see also challenge (d.i.1)).

project	Answer (c.i).1: The new knowledge created by the project may be "embedded" within the products created (an ACMA repair service for power cables and a new "universal" joint) or it may be disseminated through reports, peer reviews, etc. The former type of knowledge is likely to be particularly important as this knowledge is useable without needing to be learned and applied by others. Key areas of new knowledge in relation to the vessel conversion that would be created include: • How to successfully apply "pooled vessel" concepts, and in particular the ACMA approach. This may act as a model for future repair vessels (eg for shallow water repairs). • How to specify a vessel to ensure that can be used to the maximum extent possible for the repair of third party cables. • How to layout a repair vessel so that there are two independent sets of cable handling equipment (for power and telecom cables respectively). In particular, how equipment can be moved and exchanged so as to immediately reconfigure the vessel's back deck between power and telecom cable repairs. • Suitable contracting strategies for vessel modifications in situations where the client cannot accept a risk of cost escalation subsequent to the sign-off of the detailed design. • A design approach for cable vessels that focuses on optimising them for repairs, rather than on cable laying. • A test regime for vessels (integrated with the joint test regime), along with the associated test results.
	Conclusion (c.i).1: TC Ormonde has set out in their response the areas in which they believe the vessel modification element of the project is generating new knowledge. Whilst there is incremental new knowledge evident in the specific aspects of the project detailed above, issues remain over the level of new knowledge expected to be generated by this element of the

	project.
Sub-criterion (c.ii)-Applicability of learning to other Network Licensees	No challenge presented.
Sub-criterion (c.iii)-Proposed IP management and any deviations from default IP principles	Challenge (c.iii.1): It is proposed that GMSL will keep and maintain the stockpile of universal cable joints at the end of the project, and that when joints from this stock are used, the cost of the joint will be passed on to the relevant cable owner. The issue of whether there will be any restrictions on what GMSL, or the jointing company, can charge in future for the universal cable joint should be discussed. This also relates to (b.i).1.
	Answer (c.iii).1: Parts for the replacement of stockpiled joints are to be ordered by GMSL or the joint development subcontractor on a cost-plus-fee basis. For GMSL profit margins would be the same as on the vessel modification work (i.e. xx%). For the joint development subcontractor the fee would be fixed for an extended period (probably xx years) at a level provided by the subcontractor at the time of their competitive bid, and hence subject to competitive tension.
	Conclusion (c.iii).1: As per challenge (b.i.1), the response is considered to have sufficiently addressed the challenge.
Sub-criterion (c.iv)-Credibility of proposed methodology for capturing learning from the trial and plans for disseminating	Challenge (c.iv).1: A project close down report is proposed, to capture the work undertaken and lessons learned. More detail should be provided on how the key learning outcomes of the project (e.g. vessel modification design, and universal cable joint design / methodology) will be presented and made available. This also relates to (g.v.2).
	Answer (c.iv).1: We would expect the close down report to include the

	following areas: • The initial specification of the vessel modification and the joint, and any trade-offs made in this specification. • The commercial arrangements for vessel modification and joint development. • The commercial structure of the project and the role of ACMA, GMSL, network licensees and other parties. • The commercial arrangements within ACMA for the allocation of the operational costs of ACMA repair vessels, and the commercial arrangements for the execution of repairs (including jointing, where relevant). • The operational arrangements within ACMA for use of the repair vessel. • The stakeholder-interface process undertaken at the initial stage of the project, the information gained and any changes made as a result. • Technical information concerning the modifications made to the *Wave Sentinel.* • Technical information concerning the design of the 132-155 kV joint. • Lessons learned from the design of the vessel modification and the new joint. • Lessons learned from the vessel modification work and the joint assembly work. • The test requirements for vessel and joint • Lessons learned from the test process • How licensees with offshore assets can take advantage of the vessel and (where relevant) the joint. • Suggestions for future development of the pooled repair vessel concept (e.g. for shallow water repairs) and the universal joint concept (e.g. for higher voltages and

	different cable types).
	Conclusion (c.iv).1: The list provided above is considered to contain significantly more detail than was available in the original proposal, and is considered to be sufficient to address the challenge.

2.5 Criterion (d): Is innovative (ie not business as usual) and has an unproven business case where the innovation risk warrants a limited Development or Demonstration Project to demonstrate its effectiveness

2.5.1 Key Statements

Justification that the project is truly innovative

There are two key elements of this project – modifying the repair vessel and developing the universal cable joint – both of which TC Ormonde claims are innovative:

- The main innovation for the vessel modification is the commercial arrangement; GMSL has already modified a vessel for cable installation.
- The development of the universal cable joint will be the first time that an offshore universal joint will be available for OFTO-type cables, which is not a product of a cable manufacturer and is not restricted to use on their own cables, or with their own jointers.

It is noted that there is precedence with the development of universal joints in (1) a universal joint for submarine fibre optic telecom cables, and (2) onshore universal joints.

Justification that NIC funding is required and credibility of claims

A number of claims are made in relation to the justification for NIC funding, including:

- OFTOs cannot fund such a project under BAU as the cost is large relative to opex budgets, and OFTOs do not have the capital available to fund the upfront cost;
- In addition to this, there would be no incentive for a single OFTO to fund such a project, as all OFTOs would then be able to benefit after the project, through the ACMA arrangement, and on the same terms. TC Ormonde describes this as a "free rider" vulnerability of the concept;

- The benefits are based on savings to multiple different Generators and OFTOs, which means the project depends on being used by multiple licensees. Previous attempts to coordinate funding for shared cable repair arrangements have not been successful; and

- Consumers and Generators, not OFTOs, stand to gain the most benefits from the project.

Identification of project specific risks

A risk register is presented in Appendix 7, which contains the identification of risks, mitigating actions, and an assessment of the risk impact and likelihood. These risks have been categorised as technical, commercial, legal, skills, and environmental.

Appendix 8 contains mitigation and contingency plans, which have been categorised as:

- Ensuring project technical success;

- Ensuring project delivery within budget;

- Ensuring GB wide concept adoption; and

- Ensuring anticipated benefits are achieved over the long-term.

2.5.2 Challenges and Potential Shortfalls

Criterion (d): Is innovative (ie not business as usual) and has an unproven business case where the innovation risk warrants a limited Development or Demonstration Project to demonstrate its effectiveness;	
Sub-criterion (d.i)- Justification that the project is truly innovative	Challenge (d.i).1: GMSL has previously modified a vessel for cable installation, and current practice for cable repairs can involve chartering a general purpose vessel and converting it into a repair vessel. TC Ormonde claims that the main innovative elements of the vessel modification relate to the proposed commercial arrangements. However the notion of pooling as a commercial arrangement is known in other industries. More justification is required on the innovation associated with the vessel modification.
	Answer 1: Although the basic concept of pooled access to resources is not unique to this application, the concept of using

	the *existing* pooled arrangements for telecom repairs and applying them to power cables is entirely new. We note that although the ACMA has existed since 1965, and although the UK has had major offshore cable investments in interconnection for almost 30 years and in offshore wind for circa 10 years, no attempt has previously been made modify an ACMA vessel to enable it to repair high voltage power cables. In contrast over the past 10 years there have been several attempts to interest UK cable owners in pooled access to a dedicated repair vessel or repair equipment. All of these attempts have failed. [Sentence redacted]. Several alternative approaches to undertaking power cable repairs within ACMA were examined and rejected before the concept of fitting power cable handling equipment to a vessel already used by ACMA while retaining the existing telecom cable handling equipment and using a low-cost/low-capacity cable storage turntable optimised for repairs was selected. This finally provided the correct mix of a reasonable conversion cost, low operating cost, and acceptability to telecom cable owners. The length of time required to develop an appropriate vessel-conversion approach, and the absence of any similar proposals in the previous decades, shows that our concept is genuinely innovative, and not obvious.
	Conclusion 1: TC Ormonde has set out in their response the ways in which they believe the vessel modification element of the project is innovative, and they have made the case that, while there is some innovation in the technical elements of the design and development of the vessel modification, much of the innovation lies in the commercial arrangements proposed. Issues remain over the level of innovation associated with this element of the project.
Sub-criterion (d.ii)- Justification that NIC funding is required and credibility of claims	As above (d.i.1).
	Answer - NIC funding is required for the project to be viable because: • The project is only economic due to its use of an ACMA vessel, where the bulk of the cost of holding a vessel on

	24/7 standby will be taken by the telecom cable owners. This means that access to the repair vessel must be in accordance with ACMA's rules. [redacted] • Of particular importance within ACMA's rules is the principle that the organisation is open to essentially all potential members, without discrimination. This is part of what makes membership ACMA attractive to power cable owners, but it also means that the party who funds the upgrade of the *Wave Sentinel* cannot prevent other parties from taking equal advantage of this upgrade. • OFTOs cannot fund the project because of their financial structure: these projects are structured to deliver dividends and loan repayments, not to invest in new ventures (and particularly not to invest in a non-infrastructure opportunity like a repair vessel). Additionally the extensive use of insurance on existing projects makes it impossible to quantify investor benefits with the certainty needed to justify the project. • Potential bidders for future OFTO projects similarly cannot fund the project because of the competitive nature of OFTO appointment and the open nature of ACMA. An OFTO bidder funding this project would find that all of their competitors benefited equally from the availability of the *Wave Sentinel*; bid prices in the OFTO selection process would therefore fall, with a consequent benefit of the consumer – but with no benefit going to the company that had funded the project. • Other network licensees have not funded a project of this type despite the fact that major subsea cable projects have been in service for several decades. This is likely to reflect the diverse interests of these projects which have different marine installation conditions, technical designs and regulatory agendas. The benefit to each individual project owner is small, and it has never been possible to form a group sufficiently large to undertake a project of the type proposed. There is no indication that this situation will change in the foreseeable future. • GMSL (or other vessel owners) cannot fund the project because they would not be able to increase their fees to ACMA in order to recover their costs. [redacted]

	Therefore without NIC funding consumers will lose the very substantial benefits that they would receive from the project (see (b.i)2).
	Conclusion (d.ii).1: The case for the difficulty associated with OFTOs and GMSL funding the project is clearly stated, and seems reasonable. TC Ormonde has stated elsewhere that the case for using the ACMA arrangements is the advantages gained from a shared telecoms / power cable repair vessel; a vessel purpose built for power cable repairs would not be utilised enough to be an attractive proposition. However, the ACMA arrangements, which is proposed as being the only way to make the solution economic, also gives rise to the "free rider" problem. This makes it unlikely that an individual would be willing to fund the work. The issue remains as to whether NIC funding is the most appropriate funding route.
Sub-criterion (d.iii)- Identification of project specific risks (including commercial, technical, operational or regulatory risks)	Challenge (d.iii).1: The CCI report presented in Appendix 4 identified a number of issues which, in their opinion, required resolution before the universal cable joint development commences. These include the willingness of export cable owners to use the universal cable joint rather than joints provided by the original cable manufacturer, when the universal cable joint may not be fully compliant with CIGRE standards. In addition, the willingness of insurance companies to accept a repair using the universal cable joint was also raised as an issue. In response to a question TC Ormonde states that "other cable owners and insurers are to be consulted at the initial stage of the project". While this does limit the amount of NIC funding that would have been spent by this stage, the reasons why initial approaches have not been made and the significance of this issue on the success of the project should be explained.
	Answer (d.iii).1: It is not feasible for other cable owners and insurers to assess the proposed joint design until a joint development subcontractor and a joint concept have been selected. As noted elsewhere, this was not done prior to the submission of the NIC application in order to maximise the use of competitive tendering and provide better value for money. However, in view of the fact that final agreement of the joint design will not be possible until the initial phase of the project,

	we have taken the following actions to ensure that the risk of the design being rejected is minimised: • We have briefed other OFTOs through the ENA Forum, to ensure that they are in agreement with the project concept. • We retained CCI to advise on the issues likely to be raised by a prudent OFTO (i.e. ourselves or others) when considering the use of a new joint type. The test regime, and the relatively large number of tests, was selected based on their recommendations. • We will be adapting a tested onshore joint, not creating an all-new joint design. • We have investigated previous situations where non-OEM joints have been used. We have found that one UK wind farm export cable system has already used non-OEM joints, though these were bespoke to the project in question rather than "universal". We have also found that the insurers of a cable similar to that used by OFTOs encouraged the owner to develop a non-OEM jointing capability.
	Conclusion (d.iii).1: In their response above, TC Ormonde has outlined the ways in which they have sought to engage with other OFTOs about the project, and ways in which they have sought to ensure acceptance of the proposed solution. In discussions at the first bilateral meeting TC Ormonde indicated that they could aim to get a robust sign on to the project during the initial stage, if requested by Ofgem / the Expert Panel. Together, these are considered to be sufficient to address the challenge.
	Challenge (d.iii).2: Another issue identified by CCI is that of environmental approvals for repairs, stating that the overall time for a repair could be influenced by the time taken to gain environmental permits. In response to a question TC Ormonde states that they are "currently investigating where there are particular circumstances where generic permissions do not apply". This should be expanded upon, including the expected time frame of these investigations.
	Answer (d.iii).2: [redacted]

	Conclusion (d.iii).2: It is encouraging that TC Ormonde raised this as an issue at the ENA OFTO forum, that OFTOs have started a process with the Marine Management Organisation (MMO) relating to environmental permits for repairs, and that the process is expected to be complete by the end of the project. This response is considered to be sufficient to address the challenge.
	Challenge (d.iii).3: There is a concern that the use of the universal cable joint, introducing spare cable that is different from that being repaired, and/or use of staff who are independent from the original manufacturer would give rise to the warranty of a cable being invalidated. This should be clarified, and the impact of this on the success of the project understood.
	Answer (d.iii).3: The use of a non-OEM joint/jointer/vessel will mean that the location where the repair is undertaken is no longer covered by any manufacturer warranty. However coverage of the remainder of the cable would not be affected. The location where the repair is undertaken will instead be covered by a warranty provided by GMSL for its workmanship as part of the ACMA service package. Warrantees on third party parts and services (if any) will be provided by their respective suppliers. [Sentence redacted]
	Conclusion (d.iii).3: Given that the cable will be covered by a warranty either by the cable manufacturer or by GMSL, the response is considered to be sufficient to address the challenge.

2.6 Criterion (e): Involvement of other partners and external funding

2.6.1 Key Statements

Appropriateness of collaborators

A key party in the project is the prime subcontractor, GMSL (Global Marine Systems Limited), who will undertake, or be responsible for, the majority of the project (£[redacted] out of a total project cost of £10,329k), including the initial design phase;

vessel modification; and development of the universal cable joint (via subcontractors). GMSL:

- Owns the world's largest fleet of cable ships, with a particular strength in telecom repairs;
- Owns the Wave Sentinel, which is the vessel that is proposed to be modified for this project. The Wave Sentinel operates under the ACMA, and is the only British-based ship to operate under the ACMA; and
- Has agreed to the commercial conditions required by the NIC fund, and have expressed a high level of interest in the concept.

GMSL will subcontract another key party in the project, a jointing company, to undertake the development of the universal cable joint. This company will be selected by a tender process during the initial phase; a shortlist of companies has been provided.

It is stated that other subcontractors will be employed by GMSL for various work packages.

In addition to the subcontractors, TC Ormonde proposes to engage technical specialists in the field (vessel modification and cable joints) to assist with supervising the work undertaken by GMSL. These would be similar to the experts used to assess the feasibility of these work areas, providing appendices for the proposal document (RedPenguin and CCI).

External funding

The possibility of external funding was explored with GMSL; GMSL is not able to contribute external funding (noting that GMSL is providing the compulsory contribution), however they will be prevented from profiting from the vessel conversion by charging higher fees, due to the ACMA arrangements (ACMA insists on maintaining vessel costs at a level appropriate for a telecom only repair vessel). This also prevents other vessel owners from contributing.

OFTOs are deterred from contributing by the issues described previously, in relation to limited availability of upfront funds, and the "free rider" effect.

Effectiveness of process for seeking and identifying new project partners and ideas

In terms of seeking project concepts; these came from a pool of three Initial Submission Proformas (ISPs) that were submitted to Ofgem last year, but which were not developed into full submissions. Those concepts in turn came from a larger pool of concepts, which were either brought to the attention of TC Ormonde by third parties, were identified as needs by asset managers, or were general known issues in

the offshore cable industry. New concepts were sought in 2014, but none were considered to be sufficiently attractive.

For subcontractors, TC Ormonde has stated a preference for using competitive tendering processes where possible to ensure value for money. However, in the instance of the prime subcontractor, GMSL, they did not want to take this approach, because:

- They wanted to demonstrate project readiness; and
- It is considered critical to the project to find a subcontractor who is willing to take a number of risks identified (potential for cost overrun, funding claw back, and the risk that the vessel ceases to be contracted to the ACMA in the future).

2.6.2 Challenges and Potential Shortfalls

Criterion (e): Involvement of other partners and external funding;	
Sub-criterion (e.i)- Appropriateness of collaborators (including experience, expertise and robustness of commitments)	Challenge (e.i).1: Since the adoption of the universal cable joint depends on the acceptance of the solution by other cable owners, justification should be provided as to why involvement has not been sought, or has not been demonstrated to have been sought, from other OFTOs, for example in the form of a project partner.
	Answer (e.i).1: Other OFTOs have been kept informed of the project through the ENA OFTO Forum and their position (along with the other factors referred to in (d,iii)1 above) provides confidence that the proposed solution will be accepted. Partnering with other OFTOs was considered, but was rejected on the basis that this would considerably complicate the governance of the project. It would also be unnecessary given that the OFTO Forum provides a suitable mechanism for ensuring that we remain fully aware of the views of all other OFTOs.
	Conclusion (e.i).1: It is encouraging that TC Ormonde is using, and intends to continue to use, the ENA OFTO forum to engage with other OFTOs for this project. During the first bilateral meeting, TC Ormonde responded positively to gaining a robust sign on from other relevant and interested parties during the initial phase of the project; it is considered

	that this would also address this challenge.
Sub-criterion (e.ii)-External funding (including level and security of external funding)	Challenge (e.ii).1: There is no external funding for this project. Through clarifications, TC Ormonde has explained that they have struggled to raise external funding from parties with revenue that is regulated (in the case of OFTOs) or limited by commercial arrangements (in the case of GMSL, although it is noted that GMSL is providing the compulsory contribution). However, this warrants further explanation.
	Answer (e.ii).1: All other OFTOs were approached, but none were willing to provide external funding. This was due to the absence of budgetary resources in their (efficient) financial structures, the unwillingness of OFTO lenders and investors to take on the risks associated with the NIC process (e.g. clawback), and a lack of willingness to fund a project that would then be equally available to their non-contributing competitors (the "free rider" problem). GMSL is not in a position to provide external funding as it will not be able to recover any such expenditure through the fees it charges for its vessels. This is because the ACMA insists that the fees that it pays to GMSL must not increase as a result of the introduction of power cable repair capability. GMSL is providing the compulsory contribution as they expect this amount to be returned following the successful completion of the project. Therefore, unlike the provision of external funding, this is not seen as representing a long-term cost to the company.
	Conclusion (e.ii).1: In their response above, and in response to clarification questions on this matter, TC Ormonde has set out the difficulties in obtaining external funding, which largely relate to the restrictions on relevant companies to access additional funds. There are also issues with the "free rider" effect, which might, for example, deter a single offshore generator from contributing to the project. TC Ormonde's response is considered to be sufficient to address the challenge.
Sub-criterion (e.iii)-Effectiveness of process for seeking and identifying new project partners and ideas	No challenge presented, although (b.iii.2) is relevant.

2.7 Criterion (f): Relevance and timing

2.7.1 Key Statements

Significance of the project in overcoming current obstacles to a future low carbon economy

TC Ormonde states that a key challenge associated with the move to a low carbon economy is the construction, maintenance and repair of an increasingly large and critical fleet of offshore cables. These offshore cables facilitate offshore wind connections, interconnections (which can be used to facilitate renewable generation import and export) and bootstraps (also used to facilitate national transfer of renewable generation). This project seeks to improve the availability of offshore cables for offshore wind generation with both the modified vessel and the universal cable joint, and for all types of cable with the modified vessel.

Significance of the project in trialling new technologies that could have a major low carbon impact

The impacts of the project are stated as: (1) reduced costs for cable repair, (2) increased renewable generation output, and (3) reduced capex of future offshore wind projects due to reduced number of (higher rated) cables. Items (1) and (2) have been quantified in some detail; item (3) has been quantified at a high level. The estimated savings are discussed under Criterion (a).

Significance of the project in demonstrating new system approaches that could have widespread application

In terms of a widespread application of the outcomes of the project, TC Ormonde expects the concept to be rapidly adopted by all existing OFTOs and OFTO bidders (and other interested parties, e.g. owners of other offshore cables), through access to the modified vessel through the membership of ACMA.

The applicability of the project to future business plans, regardless of uptake of LCTs (Low carbon Technologies)

TC Ormonde has noted that the payback period of the project is still short if based on current levels of offshore wind generation, i.e. even if no more offshore wind generation comes forward.

2.7.2 Challenges and Potential Shortfalls

Criterion (f): Relevance and timing;	
Sub-criterion (f.i) – **Significance of the project in**: (a) overcoming current obstacles to a future low carbon economy	No challenge presented.
(b) trialling new technologies that could have a major low carbon impact	No challenge presented.
(c) demonstrating new system approaches that could have widespread application	No challenge presented, although (b.i.1) and (c.iii.1) are related.
Sub-criterion (f.ii)- The applicability of the project to future business plans, regardless of uptake of LCTs (Low carbon Technologies)	No challenge presented.

2.8 Criterion (g): Demonstration of a robust methodology and that the project is ready to implement

2.8.1 Key Statements

Feasibility of project proposal

TC Ormonde has ensured that the underlying technologies used in vessel modification and the universal joint are not new. The equipment required to modify the vessel is off-the-shelf, and the universal joint would be based on proven onshore jointing technologies. In addition, basic design for the modified vessel has been undertaken, and independently reviewed, and the universal cable joint concept has been reviewed. The review of the modified vessel concluded that the work required is significant but achievable, as well as supporting the concept of the initial phase of work. The review of the universal cable joint development also concluded that the work is technically feasible, subject to identification of a suitable organisation and adherence to test regimes and carrying out sea trials.

Review of all risks, including customer impact, exceeding forecast costs and missing delivery date

A number of steps have been taken or are proposed to minimise cost overruns, including:

- Provision of a robust and detailed budget;
- Independent verification of the budget;
- A risk margin in the prime contractor budget ([redacted] or [redacted]% of total project costs) and contingency in the overall budget ([redacted] or [redacted]% of total project costs);
- Fixed price work (other than initial phase);
- The experience of the prime contractor in vessel modification; and
- Proposals to monitor the prime contractor.

An initial phase of work (capped at [redacted]) is proposed to fully scope and cost the project, which will be reviewed and become a decision point before deciding to proceed. At this stage, if the fixed price offered is too high, a number of options have been identified including halting the project, seeking permission for additional funding, changing the project scope, or selecting a new prime contractor.

As discussed under criterion (d), Identification of project specific risks, a risk register, and mitigation and contingency plans, have been produced.

The independent review of the universal cable joint development identified a number of risks.

Three to six months have been allowed between the expected date at which the activity is completed, and the specified project completion date, to allow for overruns in the programme.

Whether items within project budget provide value for money

The cost estimates for the vessel conversion are based on:

- GMSL's marine cost database and experience of previous vessel conversions; and
- Budget prices provided by manufacturers of certain items of new equipment that would be required;

In addition, costs have been reviewed by independent specialists, and uncertainty over the requirements for one high cost item (modification of the electrical switchboard) were confirmed by arranging for technical specialists to visit the vessel.

Cost estimates for the development of the universal cable joint are based on [redacted].

Project methodology

The project plan has been structured into a number of phases:

- A preliminary phase (contractual arrangements, selection of jointing subcontractor);
- An initial phase (detailed design, tendering, ACMA vote);
- A main phase (vessel modification work and development of universal cable joint); and
- A close out and reporting phase (compiling project reports, deliver jointer training).

Appropriateness of Successful Delivery Award Criteria (SDRC)

Four SDRCs are proposed, relating to (1) completion of the initial phase, (2) the vessel modification, (3) the universal joint, and (4) project close.

2.8.2 Challenges and Potential Shortfalls

Criterion (g): Demonstration of a robust methodology and that the project is ready to implement;	
Sub-criterion (g.i)- Feasibility of project proposal	Challenge (g.i).1: The concept for the development of the universal cable joint has been reviewed by an independent company, CCI (Appendix 4). While concluding that the development of the joint is technically feasible (subject to identifying a suitable company and adhering to a full test regime), the review report notes that the "development of the joint is at an early stage with no prototype available". Further evidence should be provided that the universal cable joint plan is sufficiently developed and robust.
	Answer (g.i).1: CCI's comment that "no prototype is available" for the offshore joint simply reflects the fact that development work has yet to start. They were not suggesting that a project that has yet to receive funding or start development work should be expected to have already built a prototype. As previously noted, the key element of the new joint – the electrical connection – will be based on an "off the shelf" onshore joint. Thus while the offshore joint as a whole has yet to be prototyped, the most important element already exists: not just as a prototype but as a proven product. Our plan for joint development (see (g.iv)2) is consistent with or more conservative than the plans put forward by multiple specialist jointing companies.
	Conclusion (g.i).1: The above response, in conjunction with the response to (g.iv.2), is considered to be sufficient to address the challenge. The response to (g.iv.2) gives more details on the proposed methodology for the development of the Universal Cable Joint.
	Challenge (g.i).2: In the proposal document, TC Ormonde refers to the universal cable joint for this project being based on proven onshore jointing technologies, and off-the-shelf onshore joints. It would be helpful if TC Ormonde could confirm whether there is precedent for an onshore universal cable joint at 132kV.

	Answer (g.i).2: Onshore universal joints do exist at 132kV. In fact the applicant's management company has already purchased a set of onshore universal joints: six [redacted] single-phase joints were purchased in 2012 and these are currently in storage on the premises of a specialist jointing contractor. These joints mean that onshore cable faults on one cable within our portfolio of projects can be repaired using surplus onshore spare cable from other portfolio projects.
	Conclusion (g.i).2: The response above, confirming that onshore universal joints exist at the 132kV voltage level, is considered to be sufficient to address the challenge.
Sub-criterion (g.ii)- All risks, including customer impact, exceeding forecast costs and missing delivery date	Challenge (g.ii).1: As noted in the key claims, an initial phase of work is proposed, after which options for taking the project forward will be reviewed, depending on the offer put forward by GMSL. If the fixed price is too high, TC Ormonde states that one of the options to be considered is to "seek Ofgem's permission for additional funding". Explanation should be provided as to why the level of uncertainty around the cost is so great that additional funding could be required.
	Answer (g.ii).1: It is believed that additional funding will be not required and that the contingency amount requested will be adequate. The phrase "seek Ofgem's permission for additional funding" referred to above was simply intended to show that a number of options would be open to the applicant in the unlikely event that subcontractor tendered costs were very much higher than expected.
	Conclusion (g.ii).1: The response above links to the matter of the weighting of the contingency budget against different factors driving the need for contingency. Notwithstanding the conclusion for (b.iii.1), the above response is considered to be sufficient to address the challenge; we understand that Ofgem is considering the process implications of TC Ormonde's proposed approach.
	See challenge (g.iii.1) in terms of robustness of costs of universal cable joint work package, and (d.iii) for risks.

Sub-criterion (g.iii)- Whether items within project budget provide value for money	Challenge (g.iii).1: The project costs for the development of the universal cable joint are based on [redacted]. TC Ormonde claims that the costs for the development of the universal cable joint have been "independently reviewed and verified as adequate". However, the CCI report could be interpreted as not explicitly confirming that the budget for this activity is adequate. TC Ormonde should provide further reassurance on this point.
	Answer (g.iii).1: [redacted]
	Conclusion (g.iii).1: It is helpful to understand that CCI would have highlighted any concerns with the budget proposed for the development of the Universal Cable Joint. This response is considered to be sufficient to address the challenge.
Sub-criterion (g.iv)- Project methodology (including depth and robustness of project management plan)	Challenge (g.iv).1: The development of the universal cable joint aims to overcome challenges including availability of manufacturer jointers, and where stockpiles of cables and/or joints have been exhausted. The proposed solution is a technical one, in terms of developing a joint (or stock of joints) that could be used independently of the original cable manufacturer. However, it is not clear whether other approaches have been considered, such as approaching manufacturers to explore the possibility of a formal call-off agreement for the provision of cable parts / trained staff, with fixed response times to undertake the repairs.
	Answer (g.iv).1: [redacted]
	Conclusion (g.iv).1: [redacted]
	Challenge (g.iv).2: As noted in (g.i.1) the development of the universal joint is at the early stages of development. More details should be provided on the proposed methodology for

	developing the universal cable joint.
	Answer (g.iv).2: in more detail the joint development methodology involves: • Selection of the joint development subcontractor and the joint concept (including the source of the onshore joint body on which the concept is based). • Creating the engineering drawings, assembly instructions and a bill-of-materials for the first prototype joints. • While the drawings are being created the joint testing programme would be developed in detail, and a specification for the test labs would be written. • Bid prices would then be obtained from parts suppliers and tests labs, prior to finalising a fixed price. • In parallel with the above, an independent external review would be undertaken, examining both the drawings of the proposed joint and the proposed test regime. • The joint concept and the development/testing concept would be presented to stakeholders, along with the independent external report. • (This marks the end of the initial phase). • Ordering of parts for the assembly of test articles and booking of test labs would take place once authority to proceed beyond the initial stage is available. Along with this, lengths of spare cable would be collected from OFTOs for the assembly of the test articles. • Component tests and initial assembly tests would be undertaken alongside the assembly of the first test article. If necessary experience at this stage may lead to the modification of the drawings and assembly instructions. Major changes could require the external review to be repeated. • Mechanical and electrical tests would then start on the first test article. The second test article would be

	assembled in parallel with this. • The second and then the third test article would be tested in sequence once the first is complete. The programme allows for gaps between tests so that lessons learned in one test can be applied in the next, along with the necessary mark-up of drawings and instructions. Additional time for contingencies (e.g. failed tests) is also provided. • A combined (mechanical) test of the vessel and joint is then undertaken which involves a joint being made on board the *Wave Sentinel* and then lowered to the seabed along with a length of cable.
	Conclusion (g.iv).2: The response has provided more detail than was available in the submission on the steps involved in the development of the Universal Cable Joint. It is not clear which party is responsible for undertaking some of the early stage steps. However, in general the response has provided more clarity on the methodology and is considered to be sufficient to address the challenge.
	Challenge (g.iv).3: TC Ormonde notes in their submission that, in Denmark, offshore wind farms are often connected with a small number of high capacity cables. It would be helpful to understand why this is the case, and whether TC Ormonde has taken account of other international experience in offshore cable repair when formulating the project proposal.
	Answer (g.iv).3: The applicant is aware of work being undertaken by the DECC-sponsored Offshore Wind Programme Board to compare wind farm connection designs in the UK to those in Denmark and elsewhere. The applicant chairs this group and so is very familiar with its work; however it may be some time before results are available. In the absence of a definitive view on the reasons for the difference highlighted, however, it seems relevant to note that the windfarm export cables in Denmark are owned by a state-owned transmission company, and we understand that it is this company (not private sector generators or OFTOs) that takes the commercial penalty in the event of a cable fault. Thus the aversion of generators to prolonged severe outages referred to

	in (a.ii)1 above is substantially mitigated. It also appears that, unlike in GB, the generators have little say over the number of cables used.
	Conclusion (g.iv).3: It is evident from the above response, as well as from responses to clarification questions, that TC Ormonde has taken account of international experience when formulating the project proposal. The responses are considered to be sufficient to address the challenge.
Sub-criterion (g.v)- Appropriateness of Successful Delivery Award Criteria (SDRC)	Challenge (g.v).1: One of the aims of the project is to train and qualify jointers to repair cables (1) on board the modified vessel, and (2) using the universal cable joint. This element of the project has not been covered in the proposed SDRCs.
	Answer (g.v).1: We consider this to be part of the "universal joint" criteria (#3). If considered necessary by the Expert Panel we can extend the relevant text in Section 9 to include jointer training and (if relevant for the jointing subcontractor selected) commencement of a long-term support contract.
	Conclusion (g.v).1: The proposal to extend the wording of SDRC 3 to include the jointer training, and arrangements for the long-term availability of the jointers, is considered to sufficiently address the challenge in principal, noting that the exact wording would need to be reviewed in order to consider the issue addressed.
	Challenge (g.v).2: The evidence proposed to justify the SDRC is not very detailed, and could be made more specific. For example, it is not clear how the learning from the vessel modification and universal cable joint development work will be made available. Regarding Criterion 3, there is no reference to the number of joints / cable types to be tested.
	Answer (g.v).2: If considered necessary by the Expert Panel we can extend the relevant text in Section 9 to include reference to the peer-review meeting and marketing by GMSL and/or ACMA. We can also add text to Section 9 stating that three test articles are to be assembled and tested.
	Conclusion (g.v).2: As per (g.v.1), the proposal to extend the wording of the SDRC is considered helpful, while noting that

	the exact wording would need to be reviewed.

3 Response Summary

Following a detailed review of the proposal documents, as well as attendance at bilateral meetings and responses from the Question and Answer process, a number of challenges have been presented in this report to the proposed project put forward by TC Ormonde, against the evaluation criteria of the Network Innovation Competition. Through the responses in this report, as well as responses to the clarification questions and at the bilateral meetings, the majority of these challenges are considered to have been addressed.

The remaining issues regarding this project concern the following points:

- The timescale of expected benefits, in terms of the time taken for the industry to have sufficient confidence in the solution to take account of reduced repair times when forming financial requirements for their projects;

- The additional financial benefits to consumers, in terms of reduced repair times for interconnectors and bootstraps, and the potential for the solution to tip the balance in favour of fewer, higher rated cables. These benefits were not quantified in the original proposal; it would be helpful if they could be quantified on a per annum basis.

- The contingency allowance – this has not been weighted against the different factors.

- The level of new knowledge generated and innovation associated with the vessel modification activity.

- Gaining a robust sign-on from other anticipated users of the vessel, including OFTOs and onshore Transmission Owners (TOs).

The underlying question of whether NIC funding is the most appropriate funding route for this project is one that remains for consideration by Ofgem.