The race for 66kV

OFFSHORE WIND ACCELERATOR (OWA)
66kV Cable Qualification Competition

Invitation to Tender

Offshore Wind Accelerator (OWA) members

This ITT has been developed by OWA in collaboration with

Executive summary

- OWA developers DONG Energy, E.ON, Mainstream Renewable Power RWE Innogy, ScottishPower Renewables, SSE Renewables, Statkraft, Statoil and Vattenfall, representing 77% (36GW) of the UK’s licenced capacity, believe that 66 kV is the optimal intra-array voltage for future offshore wind farms
- They would like to use 66 kV in commercial projects as soon as possible – preferably before 2015
- To make this happen, developers will need to procure 66 kV transformers, switchgear and cables
- Transformers, switchgear and dry-type 66 kV cables are available on the market today
- However, developers would like to use 66 kV cables that are cost competitive with 33kV cables, such as 66kV wet-type cables. The work should focus on new 66 kV designs with cost optimistion potentials, leaving out lead designs.
- We know that cable suppliers are designing and qualifying 66 kV cables, and OWA would like to promote and accelerate these activities to ensure the OWA developers have a good understanding of the market as they start procurement for commercial projects
- OWA is therefore launching a 66 kV Cable Qualification Competition to reward cable suppliers designing and qualifying 66 kV cables
- The intention is for funding of up to £300k to be awarded to at least two cable suppliers, based on the lifecycle cost of the cable design and the time to complete qualification of the cable
- The OWA developers will use the information from the 66 kV cable qualification competition to inform cable procurement for future 66 kV wind farms
20th May 2013

Dear Sir/Madam,

**66 kV Cable Qualification Competition: Invitation to Tender for Offshore Wind Accelerator (OWA) to qualify 66kV intra-array Cable System that is cost competitive with current 33kV cables**

The objective of the OWA 66 kV Cable Qualification Competition is to accelerate the commercialisation of 66 kV intra-array Cable Systems for use in offshore wind farms in time for UK Round 3. The 66 kV Cable Systems should be economically competitive with existing 33 kV intra-array Cable Systems.

A Higher Voltage Array Engineering Design Study¹ conducted by the Offshore Wind Accelerator (OWA) concluded that higher voltage arrays have the potential to deliver significant benefits to future offshore wind farms. It was found that moving to 66 kV demonstrated a material improvement in lifecycle costs compared with 33 kV, especially as the size of wind turbines increases.

The OWA members DONG Energy, E.ON, Mainstream Renewable Power, RWE Innogy, ScottishPower Renewables, SSE Renewables, Statkraft, Statoil and Vattenfall (developers with licences to develop 36GW [77%] of the UK’s licenced capacity) therefore would like to use 66 kV in their future projects, and to be able to use them as soon as possible – preferably before 2015.

The study assessed the supply chain for transformers, switchgear, cables and related accessories and concluded that although certain suppliers can deliver suitable transformers and switchgears (though not yet a standard product) for 66 kV at a suitable size and price. Dry-type 66 kV cables are available, but to maximise the benefits of 66 kV, cables that are cost competitive to current 33 kV cables still need to be qualified before developers can use them in their commercial wind farms.

In order for developers to be able to procure 66 kV cables, suppliers must demonstrate that the cables have been sufficiently tested to prove to the developers that they are ready for deployment.

The OWA is therefore running a competition to encourage the suppliers to complete the design and qualification of 66 kV Cable Systems so that developers are confident that they can procure 66 kV for their commercial projects.

Minimum cable design specification requirements:

1. Cable system (cables and accessories) shall be of an AC 66 kV three-core (3C) submarine design
2. 66 kV shall be determined in accordance to the IEC 60183: [Uo / U and (Um), thus 36 kV / 66 kV and (72.5 kV)]
3. Cable shall include fibre optic data communication fibres
4. The 3C cables shall be constructed as such that they are suitable for coiling
5. Cable conductor size shall be 300 mm² Cu or 500 mm² Al.

The qualification process is to be proposed by the tenderer, but shall include the following elements:
- Prequalification and type testing according to the applicable standards, e.g. to Cigre TB 490 recommendation
- Full scale accelerated ageing in sea water (an evaluation will be performed after 1 year ageing to decide if further ageing is needed).

The OWA therefore intends to award at least two cable suppliers up to £300,000 each as a contribution towards the testing and certification of 66 kV Cable Systems, as well as

¹ Higher Voltage Engineering Design Study’, Offshore Wind Accelerator, September 2011
significant exposure to the OWA members and feedback from them about their functional requirements for the future projects. The OWA developers will use the information from the 66 kV cable qualification competition to inform cable procurement for future 66 kV wind farms. The winners will also be announced by the Carbon Trust and promoted to the industry in conferences and in the media.

You are invited to submit a tender for the 66 kV Cable Qualification Competition. Successful Bidders will receive funding of up to £300,000, which may be used as a contribution for the qualification of a 66 kV intra-array cable.

Your attention is drawn to the section entitled ‘Important Information for Bidders’ below. Should your tender be successful, a signed Award Letter, a Scope of Work and the OWA Conditions of Contract, will be issued to your company confirming that your company is eligible to this financial support.

The OWA Electrical project group is supported by our Technical Delivery Consultant DNV KEMA Ltd., who will be coordinating activities and support Carbon Trust and OWA partners with the evaluation of tenders. Each tender will be evaluated in detail by OWA members including Carbon Trust, DONG Energy, E.ON, ScottishPower Renewables, Statkraft and Vattenfall.

For information about the OWA programme, please see the Carbon Trust’s web site www.carbontrust.com/offshorewind. Unless informed to the contrary, tenders and communications shall be sent by e-mail to the following e-mail address: OWA@carbontrust.com

Tenders must be submitted using the Bidder Proposal Form which accompanies this ITT (Appendix 1). Supporting documentation must be quoted in the Bidder Proposal Form in the sections provided.

Please submit your tender in electronic form before 10am UK time by 7th July 2013.

Clarification questions shall be emailed to OWA@carbontrust.com any time before 31st May 2013. The answers to questions will be made available on the 7th June 2013 to all Bidders for download off our tender website: http://www.carbontrust.com/about-us/work-with-us. If deemed necessary, Carbon Trust / OWA reserves the right to conduct a clarification telephone conference with all Bidders at a date to be arranged.

Prior to the announcement of the successful Contractor, the Carbon Trust / OWA may require selected Bidders to attend interviews in order to explain or expand upon aspects of their Proposals.

We propose the following preliminary timeline
Deadline for final clarification questions 31st May 2013
Clarification responses 7th June 2013
Submission of Proposal 5pm UK time on 7th July 2013
Successful Contractors announced Early August 2013

If you have any concerns about the timing, please let us know. I look forward receiving your tender.

Yours sincerely,

Jan Matthiesen
For and on behalf of THE CARBON TRUST

The Carbon Trust
4th Floor, Dorset House, 27-45 Stamford Street, London SE1 9NT
T: +44 (0)20 7170 7000 F: +44 (0)20 7170 7020 www.carbontrust.co.uk
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Registered at 4th Floor, Dorset House, 27-45 Stamford Street, London, SE1 9NT

3 Version 0.32
IMPORTANT INFORMATION FOR BIDDERS

The contents of this document and all other information associated with this Invitation to Tender (ITT) are strictly confidential. Neither this document, nor any part of it nor any other information supplied in connection with it may, except with the prior written consent of the Carbon Trust, be published, reproduced, copied, distributed or disclosed to any person other than in confidence to the recipient's advisers nor used for any purpose other than consideration by the recipient of whether or not to submit a Tender.

If the recipient decides not to submit a Tender or if the Carbon Trust notifies the recipient that the award process has ceased or that the recipient is no longer being considered for the award of a Contract in relation to this Invitation to Tender or otherwise upon request by the Carbon Trust, the recipient will promptly return this document and any other information provided in connection with it (without retaining any copies or reproductions in any form) to the address stated on the front cover.

Bidders should note that this ITT does not constitute an offer to contract with the Carbon Trust. It only represents a definition of specific requirements and an invitation to submit a tender addressing these requirements. Issuance of this invitation to tender and the subsequent receipt and evaluation of the tenders by the Carbon Trust does not commit the Carbon Trust to enter into a Contract with any Bidder.

Bidders should also note that:

- the Carbon Trust reserves the right to accept more than one tender
- formal notification that a tender has been successful will be communicated in writing by the Carbon Trust and,
- the costs of tendering are the full responsibility of the Bidder.

The information contained here, in the Scope of Work and in any documents or information it refers to or incorporates (the "Disclosed Information") has been prepared to assist interested parties to decide whether to make a bid. The Disclosed Information is not a recommendation by the Carbon Trust. It does not purport to be all inclusive or include all the information that a Bidder may require.

Neither the Carbon Trust nor any of its directors, employees, agents or advisers makes any representation or warranty (express or implied) as to the accuracy, reasonableness or completeness of the Disclosed Information. All such persons or entities expressly disclaim any and all liability (other than in respect of fraudulent misrepresentation) based on or relating to the Disclosed Information or any subsequent communication. The only information which will have any legal effect and/or upon which any person may rely will be such information (if any) as has been specifically and expressly represented and/or warranted in writing to the successful Bidder in any written contract that may be entered into with the Carbon Trust.
The Carbon Trust Offshore Wind Accelerator

Invitation to Tender for Offshore Wind Accelerator Support for the Qualification of a 66 kV Intra-array Cable System

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1 Introduction

1.1 The Engineering Challenge. The UK is expected to be the World’s largest offshore wind market for the next 10 years. To meet the European Union’s 15% renewable energy target for the UK, as much as 40% of electricity production will need to come from renewables by 2020. As of Q3 2012, 11% of electricity came from renewables, so an almost four-fold increase is required to achieve this target. Mass deployment of offshore wind will be necessary - it has the potential to supply 25% of the UK’s electricity by 2020.

1.2 The Economic Opportunity. Research by industry groups\(^2\) has shown that in the coming years there could be a market for up to 1000 km of intra-array cable per year in the UK alone. The total demand throughout Europe could be double this.

1.3 A Higher Voltage Array Engineering Design Study conducted by the Offshore Wind Accelerator (OWA) identified the potential for higher voltage arrays to deliver significant cost benefit to the design of future offshore wind farms. It was found that moving to 66 kV demonstrated a material improvement in lifecycle costs compared with 33 kV, especially as the size of wind turbines increases. In addition, as ever larger wind turbines are brought into service, there will be demand for higher voltage intra-arrays.

1.4 The Carbon Trust’s Offshore Wind Accelerator (OWA). The Carbon Trust is an independent company backed by the UK Government with the mission to accelerate the move to a low carbon economy.

1.5 In October 2008, the Carbon Trust launched a major Technology Accelerator focussed on reducing the cost of energy from offshore wind by 10%, concentrating on five research areas: Foundations, Wake Effects, Access Systems, Cable Installation and Electrical Systems, the research area of focus for this competition. The Offshore Wind Accelerator (OWA) is funding research, development and demonstration projects to unlock technological barriers to advance the industry. The initiative is co-funded by major European energy companies (the “OWA Parties”).

1.6 Details of this can be found on the Carbon Trust’s web site: [www.carbontrust.co.uk/emerging-technologies/current-focus-areas/offshore-wind/pages/offshore-wind.aspx](http://www.carbontrust.co.uk/emerging-technologies/current-focus-areas/offshore-wind/pages/offshore-wind.aspx).

1.7 The OWA Parties. The Offshore Wind Accelerator is a unique partnership initiated by the Carbon Trust co-funded and executed in collaboration with nine international energy companies representing 36 GW of licensed wind generation capacity in UK waters.

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\(^2\) ‘UK Offshore Wind: Building an Industry: Analysis and scenarios for industrial development’ RenewableUK, June 2010
1.8 The Carbon Trust’s partners for the OWA are:

Dong Energy, the leading Danish offshore wind farm developer with over 20 years’ experience. [Click here for website]

E.ON is one of the world’s largest investor-owned power and gas companies. [Click here for website]

Mainstream Renewable Power, founded by Dr. Eddie O’Connor and Fintan Whelan, the former CEO and CFO of Airtricity. [Click here for website]

RWE Innogy, Europe-wide renewables business arm of the German RWE group. [Click here for website]

ScottishPower Renewables, the UK’s largest onshore wind farm developer. [Click here for website]

SSE Renewables the renewable energy development division of Scottish and Southern Energy. [Click here for website]

Statoil is an international energy company with over 35 years’ experience on the Norwegian continental shelf, today with operations worldwide. [Click here for website]

Statkraft, Europe’s largest renewable energy company. [Click here for website]

Vattenfall, one of Europe's largest generators of electricity. [Click here for website]
## 2 Definition of Terms

In the context of this Invitation to Tender, the following **Terms** shall have the meaning as described in the **Definitions** shown below.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bidder</td>
<td>A cable manufacturing company which makes a <strong>Proposal</strong> in accordance with this <strong>ITT</strong> to be considered in the <strong>Competition</strong>.</td>
</tr>
<tr>
<td>Cable System</td>
<td>A system for the electrical connection of a Wind Turbine to a substation. For the purposes of this <strong>ITT</strong>, a <strong>Cable System</strong> includes the following components: (i.) Cable, (ii.) Terminations, (iii.) Joints.</td>
</tr>
<tr>
<td>Cable System Testing Activities</td>
<td>Actions required to conduct the tests defined by this <strong>ITT</strong> of the subsea 66 kV intra-array cable system which will be supplied for this purpose by the <strong>Contractor</strong> as part of the <strong>Deliverables</strong>.</td>
</tr>
<tr>
<td>Carbon Trust</td>
<td>An organisation which helps businesses, governments and the public sector to accelerate the move to a low carbon economy through carbon reduction, energy-saving strategies and commercialising low carbon technologies. The <strong>Carbon Trust</strong> will act as the agent of the <strong>OWA</strong> in this <strong>Project</strong>.</td>
</tr>
<tr>
<td>Competition</td>
<td>The process by which the <strong>Carbon Trust</strong>, in association with the <strong>OWA</strong>, will determine the most suitable recipient of the <strong>Funding</strong>.</td>
</tr>
<tr>
<td>Contract</td>
<td>An agreement which will be signed between the <strong>Carbon Trust</strong> and the <strong>Contractor</strong>. Under this <strong>Contract</strong>, the <strong>Contractor</strong> will agree to implement the <strong>Deliverables</strong>. In return, the <strong>Carbon Trust</strong> will agree to make available a total sum of up to £300,000 which may be used to cover costs associated with <strong>Cable System Testing Activities</strong>.</td>
</tr>
<tr>
<td>Contractor</td>
<td>The organisation which will be responsible for implementing the <strong>Deliverables</strong>.</td>
</tr>
<tr>
<td>Deliverables</td>
<td>The delivery of a 66 kV <strong>Cable System</strong> for use in offshore wind farm intra-array and conduct of testing thereof in accordance with the instructions described in this <strong>ITT</strong>.</td>
</tr>
<tr>
<td>Disclosed Information</td>
<td>The information contained in this <strong>ITT</strong>, in the <strong>Scope of Work</strong> and in any documents or information to which they refer or incorporate.</td>
</tr>
<tr>
<td>Funding</td>
<td>A total sum of up to £300,000 which will be made available by the <strong>Carbon Trust</strong> to each <strong>Contractor</strong> in order to cover costs associated with the testing of the 66 kV <strong>Cable System</strong> which will be manufactured as part of the <strong>Deliverables</strong>.</td>
</tr>
<tr>
<td>Funding Payments</td>
<td>Individual payments made by the <strong>Carbon Trust</strong> to the <strong>Contractor</strong>. The <strong>Funding Payments</strong> will be made in partial or full payment of <strong>Cable System Testing Activities</strong>. The total value of all <strong>Funding Payments</strong> made to a single <strong>Contractor</strong> will not exceed the <strong>Funding</strong>.</td>
</tr>
<tr>
<td>Invitation to Tender (ITT)</td>
<td>This document, which invites prospective <strong>Bidders</strong> to offer a <strong>Proposal</strong> to be considered within the <strong>Competition</strong> and which details the regulations for doing so.</td>
</tr>
<tr>
<td>Minimum Criteria</td>
<td>The minimum requirements which must be fulfilled within the <strong>Proposal</strong> for a <strong>Bidder</strong> to be considered as a participant in the <strong>Competition</strong>.</td>
</tr>
<tr>
<td>Offshore Wind Accelerator (OWA)</td>
<td>A collaborative R&amp;D programme between the <strong>Carbon Trust</strong> and nine offshore wind developers that aims to reduce the cost of offshore wind by 10%.</td>
</tr>
<tr>
<td>Project</td>
<td>The actions undertaken by the <strong>Contractor</strong> in order to achieve the <strong>Deliverables</strong>.</td>
</tr>
<tr>
<td>Project Delivery Schedule</td>
<td>A schedule of dates which will be specified by the <strong>Carbon Trust</strong> and which will define the time milestones by which the <strong>Contractor</strong> must complete the various stages of the <strong>Project</strong> in order to be eligible to take advantage of the <strong>Funding Payments</strong>.</td>
</tr>
<tr>
<td>Proposal</td>
<td>A tender made by a <strong>Bidder</strong> in response to, and in conformance with, this <strong>ITT</strong>.</td>
</tr>
</tbody>
</table>
| Scope of Work               | A document which will be issued to those **Bidders** which have been...
selected as Competition winners; and which will therefore be invited to become Contractors. The Scope of Work will explain in detail the financial support which the Contractors may receive and the actions which they must complete in order to be eligible for this.

<table>
<thead>
<tr>
<th>Scoring Criteria</th>
<th>The criteria against which Bidders which have fulfilled the Minimum Criteria will be compared within the Competition.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Testing Agency</td>
<td>An agency qualified to perform Cable System Testing Activities.</td>
</tr>
<tr>
<td>Testing Purchase Order</td>
<td>Any purchase order placed by the Contractor to a Testing Agency for the conduct of Cable System Testing Activities.</td>
</tr>
</tbody>
</table>

### 3 Objective of the Project

3.1 The OWA intends to support the development of 66 kV submarine power cables that are cost competitive to current 33 kV intra array cable systems. To this end, the OWA is expected to select at least two Bidders (‘Contractors’) to each of which it will provide financial support for the testing of a 66 kV submarine intra-array Cable System.

3.2 The objective of this Project is the manufacture and supply of a 66 kV Cable System for use in an offshore wind farm intra-array and conduct of testing thereof in accordance with the instructions described in this ITT.

3.3 The Carbon Trust, which will act as the agent of the OWA in this Project, will make available Funding of up to £300,000 to each Contractor. This Funding will be used to contribute towards the costs of the Cable System Testing Activities.

3.4 The successful Bidders will have the opportunity to work together with the members of the OWA and will be able to offer a product which has received positive recognition from those developers. The developers will use the information from the competition and the Project to inform their procurement decisions for future projects.

### 4 Minimum Criteria to enter the Competition

4.1 This section sets out the requirements and provides details of the commercial and legal provisions required by Carbon Trust for a Bidder to be considered eligible to enter the Competition. The section aims to provide sufficient information to the Bidders to enable them to respond fully to this ITT with an offer capable of acceptance. The Carbon Trust will not consider any Proposal which does not meet all of the conditions laid down in this section.

4.2 Tenders must be submitted using the Bidder Proposal Form which accompanies this ITT (Appendix 1). Supporting documentation must be quoted in the Bidder Proposal Form in the sections provided.

4.3 Quality plan. The Bidder must provide evidence of its own quality control and guarantee procedures or those used by any sub-suppliers which it proposes to use to manufacture the components of the Cable System. Quality procedures shall include as minimum project design, manufacturing design, manufacturing processes, quality control, storage, shipping, installation support and testing. Documents providing evidence of the quality process of the Bidder and/or proposed sub-suppliers (e.g. a valid ISO 9001 certificates) should be submitted as a supporting document.

4.4 Cable Testing requirements. The Bidder shall develop a 66 kV submarine cable system. The cable system shall successfully pass the testing program mentioned in Annex B. Summarized it is stated that the cable system shall
successfully meet the requirements mentioned in the following standards and regulations:

i) Cigré Electra TB 490  
ii) IEC 60840  
iii) Cigré Electra No. 189 (April 2000)  
iv) Cigré Electra No. 171 (April 1997)  
v) DNV-RP-F401

4.5 Capability to fulfil Deliverables. The Bidder must provide the following information in order to demonstrate its capability to implement the Deliverables:

i) Detailed testing methodology and programme to prove that the HV Cable System will be ready to be deployed in commercial projects by the defined Time to Market  
ii) Costs for the intended Cable System testing in accordance with the methodology and programme  
iii) Time window in which the Contractor proposes to conduct the test programme  
iv) These outputs will include technical commentary on the testing methodology.

4.6 Time to market. The Bidder must be in the position to have the 66 kV submarine Cable System commercially available by 2015 or earlier.

4.7 Production capacity. The Bidder must produce evidence to show that it will have access to sufficient manufacturing capacity to produce sufficient subsea intra-array Cable Systems to supply at least 100 km a year to the UK by 2015; either using its own assets, or by collaborating with other suppliers.

4.8 Accessories. In addition to the cable manufacturing capacity described above, the Bidder must demonstrate that the appropriate cable accessories will be available in suitable quantities; including as a minimum:

i) Factory joints  
ii) Repair joints  
iii) Terminations.

5 Competition Scoring Criteria

5.1 Bidders which have entered Proposals which fulfil the Minimum Criteria will be compared with each other on the basis of Scoring Criteria. The winning Bidders will be chosen on the basis of their performance in the Scoring Criteria. This section explains and provides guidance to the Bidder on these Scoring Criteria.

5.2 The assessment of Scoring Criteria will be based on a weighting which is shown in Table 1.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Score [%]</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Price</td>
<td>25</td>
<td>Benchmark will be made using submitted prices</td>
</tr>
<tr>
<td>2 Electrical</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>3 Mechanical</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>4 Production capacity</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>5 Design Qualification</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>6 Time to Market</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>7 Repair time</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>8 Compatibility</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>
The Bidder must submit an indication of the values of each of the criteria values providing whatever evidence it regards as appropriate to support these values. The Carbon Trust and the OWA will assess the values submitted by the Bidder, and will score the bids according to how realistic the OWA members believe are realistic. In all cases, Carbon Trust and the OWA reserve the right to adjust any submitted criteria value which it adjudges to be unrealistic.

Price. Future 66 kV intra array Cable Systems should be cost competitive with current 33 kV systems. Therefore, a high portion of the Bidder score will be based on the affordability of the proposed Cable. The Bidder shall indicate an indicative proposed price [GBP/metre] for the Cable System based on the parameters shown at Annex A.

Electrical. The values of the following electrical characteristics will form a basis of the Bidder scoring:

- MF field
- Losses (DC and AC resistance)
- Cable ampacity for the conditions:
  - Direct buried
  - In Air
  - Below sea level in sea bed (soil thermal conductivity 0.7 k*m/W, sea water temperature 15 degrees Celsius, 1 m below surface seabed).

Mechanical. The values of the following mechanical characteristics will form a basis of the Bidder scoring:

- Cable design
- Conductor design (e.g. Milliken, stranded round conductor, profile wire conductor (hollow or filled) or solid (round, oval, hollow). Components that negatively influence the cable by moving relative to each other design may be marked down
- Cable design materials (including purity classes)
- Coiling method allowed
- Bending radius (minimum)
- Outer Sheath material of the cable e.g. PVC will be a disadvantage - preferably HDPE with use of state-of-the-art practise having a minimum thickness of 5mm. Alternatives may be provided, if any.

Design Parameters. Bidders will be expected to describe the design of the cable system including a description of the material used, its properties and dimensions of the cable cross section. As supporting documents dimensioned drawings shall be provided to describe the mechanical properties of the cables.

Production capacity. Production capacity in excess of the minimum capacity which has been defined as a Minimum Criteria will be a basis for scoring. This may be existing production capacity available to the Bidder. However the Bidder may also present evidence that it will have access to future production capacity. The following items will be assessed:

- Maximum continuous cable length without the use of factory joints (by which is meant a continuous un-jointed cable core)
- Maximum continues cable length with the use of factory joints
- Cable repair joints (third party supplier is allowed)
- Cable accessories.
5.10 **Design Qualification.** Bidders shall provide detailed information on how they will qualify the design and the manufacturing of the Cable System against the conditions of the intended application (e.g. conductor and isolation materials, carrying and storage components for the cable, production process, etc.). The Bidder may want to consider also ageing methodology test information (prequalification tests). The bidder shall submit a development-, test- and inspection plan and schedule and a breakdown of the costs of the test procedures.

5.11 **Time to market.** Bidders shall provide adequate information for the time needed to have the Cable System commercially available. Bidders will be more positively scored the earlier they are able to offer the 66 kV Cable System commercially before the latest date specified in the Minimum Criteria. The Bidder shall specify the timing of the test cable manufacturing, the commencement date for testing, and the expected test completion date.

5.12 **Repair time.** Bidders shall provide adequate information about the cost and time it will take to repair the cable with a repair joint and the pre-conditions needed to meet this timeline. Timeline is defined as actual repair time starting from the moment the cable and needed accessories are on deck of the vessel until the time the Cable System is ready for re-employment. Cables which can be repaired more quickly will be more positively scored.

5.13 **Compatibility.** Bidders shall provide adequate detail information to assess the compatibility of the new to be designed and build 66 kV Cable Systems with the current existing tools and materials used for the built wind farms or/and oil rigs. This should also include compatibility with a range of installation methods.

5.14 The compatibility information shall include as a minimum the current joints, terminals, terminations, vessel types and coiling methodology. Coiling methodology is likely to be an area of particular interest, as this will have a significant influence on the range of available installation vessels. If there is in some areas no compatibility, please explain why this is not a problem and which actions are taken to mitigate any risks in delay of a project with regards to this incompatibility. Proposed cable systems with a high degree of compatibility will be more positively scored.

5.15 The Bidders shall consider the suitability of the cables for use with conventional J-tubes, with J-tubeless cable entry systems, and free-hanging from the transition piece.

5.16 **Others.** The Bidder may also explain any additional features which have not been considered within the other criteria. This criterion is not scored within the scoring matrix. It may however be used on a qualitative basis to compare competing Proposals in the event that they are scored equally.

6 **General Competition entry requirements**

6.1 **Multiple Entries.** Bidders are permitted to submit more than one Proposal to the Competition. However each Proposal must be entered separately. The Carbon Trust is unlikely to award more than one set of Funding to a single Bidder.

6.2 **Competition Parameters.** The Bidder’s Proposal must be based on those parameters specified in Annex A of this ITT and make use of the Bidder Proposal Form shown at Appendix 1.
7 Contractor Responsibilities and Support of Carbon Trust Resources

7.1 Jan Matthiesen of the Carbon Trust will serve as overall Programme Manager and also as the main point of contact for the Contractor. If the Programme Manager becomes unavailable for any reason, the Carbon Trust shall make reasonable alternatives available.

7.2 If selected, the Contractor shall be responsible to the Carbon Trust for discharging its responsibilities under the Contract to successfully achieve the Deliverables specified in this ITT. The Contractor will also be responsible for the performance of all activities listed in the Scope of Work except where responsibility is allocated elsewhere in this document.

7.3 The Programme Manager will be the Contractor’s first point-of-contact for all matters concerning the Contract and shall be primarily responsible for providing the Contractor with all instructions, releases, approvals and the like. The Programme Manager will review any project Deliverables which will be defined in the Contract and will approve Funding Payments accordingly if Deliverables meet the agreed standard and schedule.

7.4 The Contractor shall appoint a named person as the Contractor's Representative who shall be responsible for the overall quality and timeliness of the activities performed and Deliverables created under the Contact.

8 Management of Contract

8.1 Successful Bidders will be invited to enter into the Contract with the Carbon Trust. The Contract will specify the terms under which the Project will be conducted. The successful Bidder will be given the opportunity to comment upon and propose reasonable amendments to the Contract before agreeing to its terms. If it is not possible to agree upon the terms of the Contract, the Carbon Trust reserves the right to enter into a contract with another bidder.

8.2 The Project Delivery Schedule under the Scope of Work shall be monitored throughout the duration of the Contract by the Carbon Trust Programme Manager.

8.3 The Carbon Trust will be entitled, at reasonable notice, from time to time during the term of the Project to inspect the Contractor's Project Delivery Schedule. The Carbon Trust will be entitled to question the Contractor on the Project progress and actions being undertaken to achieve the milestones specified in the Project Delivery Schedule.

8.4 Failure to fulfil the Project Delivery Schedule milestones, or failure to communicate such fulfilment of milestones, as laid down by the Carbon Trust may be grounds for the Contractor being made ineligible to take advantage of any outstanding Funding Payments.

9 Intellectual Property and Knowledge

9.1 It is the intention of the Carbon Trust and the OWA parties that a confidential and intellectually safe environment be created by the competition where technology developers will feel free to share their ideas and concepts without fear of plagiarism or impact on their secrecy. As a result the Carbon Trust and the OWA parties guarantee that the Intellectual Property (IP) included in submissions to the OWA Competition and IP that will be developed during any subsequent phase is and will remain property of the provider, will be treated in confidence and exclusively for the purpose of assessing and evaluating the
competition entry. For more details, please refer to Annex C – Summary of IP Provisions.

10 Competition and Project Timeline

10.1 The Competition will be conducted in accordance with the following schedule.

- 20th May 2013: ITT issued
- 7th June 2013: Clarification questions published
- 7th July 2013: Submission of Proposal
- Mid August: Contract Award

11 Appendices

11.1 Appendix 1: Bidder Proposal Form (Separate document)
Annex A – Competition Proposal Parameters

This Annex provides benchmark figures that shall be used as a basis of the Bidders’ Proposals so as to allow the Carbon Trust to make a like for like comparison.

Material price assumptions

All Bidder pricing estimations must assume the following materials prices:
1. Copper price  5,080 GBP/ tonne
2. Aluminium price   1,300 GBP/ tonne
3. Lead price   1,450 GBP/ tonne

Foreign exchange assumptions

Any assumptions made regarding foreign exchange must assume that 1 GBP is equal to:
- 9.37 CNY (China Yuan Renminbi)
- 1.16 EUR (Euro)
- 145 JPY (Japanese Yen)
- 1,677 KRW (Korean Won)
- 1.51 USD (US Dollar).

Any exchange rates not shown above must be based ‘bid’ values quoted by Reuters (http://uk.reuters.com/business/currencies) at the end of 14th March 2013.

Minimum cable system design specifications

1. Cable system (cables and accessories) shall be of an AC 66 kV three-core (3C) submarine design
2. 66 kV shall be determined in accordance to the IEC 60183: [Uo / U and (Um), thus 36 kV / 66 kV and (72.5 kV)]
3. Cable shall include fibre optic data communication fibres
4. The 3C cable systems shall be constructed as such that they are suitable for coiling
5. Cable conductor size shall be 300 mm2 Cu or 500 mm2 Al.

Cable system price

The Bidder must be aware that the cable system market price is one of the important scoring criteria. To be confident that Carbon Trust is able to make a like for like comparison, the production length of 400 km must be assumed. The price must be quoted for the supply of this length (purely for benchmark purposes) and must include design engineering, testing costs, material costs and margin.

The price for the cable system shall be quoted in GBP/m. Costs of accessories (joints and terminations) shall also be included within this price.

This proposed price shall include any costs required to deliver the cable system to any potential customer site in the United Kingdom.

The cable system price shall be itemised to at least the following level:
- Cable costs
- Joint costs
- Termination costs
- Delivery costs
Annex B – Test Specifications

This Annex provides the minimal test specifications that are applicable for the 66 kV submarine cable system. The tests are aimed to provide evidence that the design-, construction- and manufacturing processes used result in a submarine cable system that is reliable and compliant for the envisioned offshore projects.

It is important to notice that the required test programme is intended to demonstrate the satisfactory performance of the cable system as opposed to only the cable. This means that all important accessories, such as factory joints, termination- and repair joints shall be included in the tests.

The tests program consists of four parts:
- Prequalification tests
- Type tests
- Sample tests
- Routine tests.

The cable system shall comply with the requirements of the standards and recommendations given in priority order laid out below. The used versions of the standards and recommendations (including all amendments and revisions) shall be valid on the date of contract award.

1. Cigré Electra TB 490 ; Recommendations for Testing of long AC Submarine Cables with Extruded Insulation for System Voltage above 30 (36) to 500 (550) kV
2. IEC 60840 ; Power cables with extruded insulation and their accessories for rated voltages above 30 kV (Um = 36 kV) up to 150 kV (Um = 170 kV) – Test methods and requirements
3. Cigré Electra No. 189; Recommendations for testing of long AC submarine cables with extruded insulation for system voltage above 30 (36) to 150 (170) kV
4. Cigré Electra No. 171; Recommendations for mechanical tests on sub-marine cables
5. DNV-RP-F401 ; Electrical Power Cables in Subsea Applications

In case the above standards refer to other Cigré and IEC standards, then those standards in addition shall apply to the test specifications.

Prequalification tests and type tests shall be successfully performed, especially when new materials or designs are proposed for the submarine cable system. Examples are given below.

New materials
If the proposed submarine cable system is to be constructed with new materials, not tested before, appropriate evaluation tests shall be performed (e.g. dielectric strength, loss angle, leakage current, dielectric response test, water vapour permeability, stability in sea water, abrasion resistance, carbon-black content, etc.).

Corrosions performance
All new metals or designs in the proposed submarine cable system shall be tested for corrosion performance where the used metal alloys in the cable system shall be tested separately from each other and (if applicable) the combinations regarding for galvanic behaviour.
Sheathing alloys
If the proposed submarine cable system is to be constructed with lead sheathing alloys, this shall be tested for fatigue properties.

1. Prequalification tests

The prequalification tests (PQ-test) for land cables systems described in IEC 60840 were introduced to validate the long term performance of the complete cable system. In here special focus points are on the cable and accessory insulation characteristics including the cable core, accessory interfaces and the thermo-mechanical behaviour over time.

For an AC extruded submarine cable system there are mainly four items that make a difference compared to an AC extruded land cable system:

1. a flexible joint is normally needed
2. the cable has normally an armour
3. the repair joints have normally an mechanical housing (external design)
4. the cable conductor is normally not of a segmented design.

The test requirements and tests have been described in Cigré Electra TB 490.

The flexible joint (item 1) must be qualified in a PQ-test but the mechanical design (2 and 3) (external design) is best qualified prior to the electrical type test or as a separate sea trial test. From a mechanical point of view a segmental conductor (4) is more severe and may therefore be qualified in a land cable PQ-test.

2. Type tests

The type tests shall be successfully performed in accordance with the Cigré Electra TB 490. The test program consists of mechanical tests on the complete cable system, longitudinal / radial water penetration test, electrical tests on the complete cable system, and non-electrical tests on cable components and complete cable system.

The proposed submarine cable system shall be subjected to appropriate mechanical stress tests with regards to the standards e.g. Cigré Electra No. 171. In addition the bidder shall also consider all stresses and incidents that are appropriate regarding installation and operation of the cable system. Examples are pinching and impacts (e.g. from caterpillar pads, wheeled cable engines, curved roller racks, etc.). The Bidder shall come up with a plan and agree with Carbon Trust the necessity and character of the tests applicable.

3. Sample tests

The sample tests shall be successfully performed in accordance with the Cigré Electra TB 490.

4. Routine tests

The routine tests shall be successfully performed in accordance with the Cigré Electra TB 490.

COMPETITION ENTRANTS KEEP THEIR IP

The Carbon Trust recognises the value and sensitivity of commercial intellectual property (IP) to the Contractor.

The following gives an overview of the approach that the OWA will be taking to IP:

- All IP that existed before the OWA competition started (‘Background IP’) and which belongs to the Contractor will remain the property of the Contractor.
- IP that is created during the course of the competition and subsequent development (‘Foreground IP’) will become the property of the Contractor, but the Carbon Trust will be granted a licence by the Contractor (which shall be sublicensable to the other OWA Parties) to use all deliverables submitted under the Contract (including any Background IP and Foreground IP therein) for the purposes of evaluating the Contractor’s concept, comparing that concept with other concepts and preparing evaluation and assessment reports to enable the OWA Parties to make commercial decisions.
- If the Contractor has used IP belonging to any of the OWA Parties during the Contract, this shall remain the IP of the relevant OWA Party.