

29th June 2020

Dear Sir/Madam,

# Invitation to Tender for the Soil Thermal Properties for Subsea Cable Design [STP] project for the Carbon Trust's OWA Programme

You are invited to submit a tender for the Soil Thermal Properties for Subsea Cable Design [STP] project which is part of the Offshore Wind Accelerator (OWA) programme. The key objective of this project is to more accurately measure the thermal properties of soils and assess implications for subsea cable design.

Please be aware that dates referred to below may be subject to change where this is necessary in the interests of the project (such changes will be notified in advance).

Should your tender be successful an Award Letter, the Scope of Work, the OWA Conditions of Contract ("**Conditions**"), and any clarifications agreed in writing, will establish the Contract for the Soil Thermal Properties for Subsea Cable Design project (the "**Contract**") between you and the Carbon Trust. The Conditions accompany this ITT for your prior review. Please note that in the interests of transparency and fairness, these Conditions are non-negotiable, although we will provide clarifications to any queries you may have prior to submitting your tender, answers to which will be distributed to all bidders as set out below. Bids which fail to accept the Conditions in their full un-amended form (other than changes explicitly accepted and agreed by the Carbon Trust on the clarifications page) at the time of submission will be considered to be non-compliant and will be excluded from the procurement process.

Please e-mail clarification questions to ivan.savitsky@carbontrust.com any time before 8th July 17:00 BST. Answers to clarification questions will be posted on our website by 15th July 17:00 BST. Answers can be found at: https://www.carbontrust.com/about-us/tenders/

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 should be sent by e-mail to the following e-mail address: ivan.savitsky@carbontrust.com

Please submit your tender by 7th August 2020 12:00 BST.

The timeline of this procurement process is as follows:

Deadline for clarification questions Clarification Response Date Submission of full tender Bidder interviews Project kick off meeting 8th July 17:00 BST 15th July 17:00 BST 7th August 2020 12:00 BST August 2020 September 2020

If you have any questions about the timing, please let us know. We look forward to receiving your tender.

Yours sincerely,

Ivan Savitsky For and on behalf of THE CARBON TRUST



#### **IMPORTANT INFORMATION FOR BIDDERS**

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 for any purpose other than consideration by the recipient of whether or not to submit a Tender.

Bidders should note that the Scope of Work described in this Invitation to Tender 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:

- depending on the progress and/or results of the project referred to in this Invitation to Tender and the views of the Carbon Trust and/or the OWA programme as to whether additional analysis or more in-depth work in respect of any or all aspects relating to the project are desirable in order to achieve the objectives referred to in the Invitation to Tender, the Carbon Trust may request such additional analysis or work. Any additional analysis or work agreed between the parties shall form part of Scope of Work and the Services to be provided by the selected Contractor under the Contract;
- the Carbon Trust reserves the right not to accept the lowest priced tender or any tender whatsoever;
- the Carbon Trust reserves the right to accept more than one tender;
- unless a bidder makes a formal statement to the contrary, the Carbon Trust reserves the right to accept any part of a bidder's tender without accepting the remainder;
- formal notification that a tender has been successful will be communicated in writing by the Carbon Trust;
- the costs of tendering are the full responsibility of the bidder; and,
- the pricing set by bidders shall be valid for a minimum of 90 days.

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 in deciding 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 bidder should conduct its own due diligence and seek its own professional, legal, financial and other advice as appropriate. 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.

Tenders and all supporting documentation must be written in English. This ITT, the Contract, its formation, interpretation and performance will be subject to and in accordance with the law of England and Wales.



# The Carbon Trust Offshore Wind Accelerator

# Invitation to Tender for the "Soil Thermal Properties for Subsea Cable Design" Project

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#### 1. Introduction to the Offshore Wind Accelerator

- 1.1. The Offshore Wind Accelerator ("OWA") is a collaborative R&D programme between The Carbon Trust, SSE Renewables Developments (UK) Limited, Ørsted Wind Power A/S, RWE Renewables International GmbH, ScottishPower Renewables (UK) Limited, Equinor ASA, Vattenfall Vindkraft A/S, EnBW Energie Baden-Württemberg AG, Shell Global Solutions International B.V. and innogy SE, and any amendment thereof and/or any deed of adherence thereto (the latter 9 collectively referred to in this document as "OWA Partners"), that aims to reduce the cost of offshore wind as well as provide insights regarding industry standard (and best practice) health and safety requirements.
- 1.2. The focus is on improving the economics of offshore wind farms in European waters through developing innovative technologies that can be deployed in planned and operational European projects.
- 1.3. The Offshore Wind Accelerator currently covers five research areas:
  - Offshore Foundations
  - Yield & Performance
  - Logistics & O&M
  - Electrical Systems
  - Cables
- 1.4. Contractors receive technical direction and data from OWA Partners through the Carbon Trust management team and through their respective Technical Working Group ("**TWG**") (see Figure 1).
- 1.5. This project will fall under the Cables research area.
- 1.6. Please note, the term "Contractor", where used within this document, refers only to successful bidders.

#### 2. Background and objective of the Work

- 2.1. The OWA Cables would like to investigate testing methodologies to measure the thermal properties of soils, potential for more accurate testing, and the implications
- 2.2. Background:

The thermal properties of soil remain a major source of uncertainty in the design of offshore wind inter-array and export cables. Whilst tests are conducted to determine soil thermal properties, there is a lack of clear guidance on scoping, executing and interpreting such tests and results generated. As a consequence of uncertainty in test data, a conservative approach is often taken in cable design. Therefore, there are potential cost savings to be made in cable design with improved understanding of soil thermal properties and improved understanding of the in-place conditions experienced by the cable.

2.3. Objectives:

The OWA TWG-C wish to establish the differences between the pre- and postinstallation conditions, the effect that these conditions have on offshore wind farm



costs, and testing methodologies to accurately measure thermal properties. The main objectives of this work are to:

- Investigate the cost implications of poor characterisation of the thermal properties of soil for a subsea cable design from a material/manufacturing point of view;
- Establish an overview of all testing techniques available both in terms of laboratory and *in-situ* tests and evaluate their potential for offshore use;
- Identify aspects of subsea cable design that are challenged by offshore conditions compared with onshore cable design practice (i.e. HDDs, fully saturated conditions, a more stable ambient temperature field);
- A framework for determining characteristic values for design that will account for pre- and post-installation conditions for cable design;
- Develop best practice guidelines for scoping, executing, and interpreting both *in-situ* and laboratory tests of thermal properties of soils (i.e. thermal conductivity and heat capacity) for subsea cables;
- Recommendation for improvements of measurement techniques and interpretation of results for offshore use.

# 3. Pre-Conditions

3.1. Bidders should take the following pre-condition into account when preparing and submitting their tenders. The Carbon Trust may reject any non-compliant tenders without progressing such tenders through the evaluation phase. If the Carbon Trust, in its absolute discretion, considers that the bidder's response to the following pre-condition is not satisfactory, the bidder's tender will be non-compliant.

Description	Information required from Bidders
Conflict of interests	Bidders are required to state that they are free of any commercial interests, partnership arrangements or contracts underway or other matters which may present a conflict or potential conflict of interest in respect of the provision of these services.
	If a bidder thinks that they may have any conflict or potential conflict of interest, the bidder should describe the details of this conflict and provide details of whether and how it would propose to manage such a conflict in a satisfactory and robust manner.
	The Carbon Trust reserves the right to require the provision of further information in relation to the bidder's response to this pre-condition.
Conditions of Contract and Scope of Work	The OWA Conditions of Contract and draft Scope of Work for this project are attached. The Contract will be constituted by the Award Letter, the OWA Conditions of Contract and the Scope of Work (including any agreed clarifications to it).
	Failure to accept these documents in their un-amended form or requesting amendments to them means that a bidder's tender is a non-compliant tender and it would therefore be at



	the discretion of the Carbon Trust to accept such a tender. Submission of a tender shall constitute unqualified acceptance of the OWA Conditions of Contract.
	Bidders are required to submit a signed Form of Tender when submitting their tenders. The Form of Tender forms part of this Invitation to Tender. The failure by a bidder to submit a signed Form of Tender when submitting its tender shall mean that such tender is a non-compliant tender. Non-compliant tenders may be rejected without further consideration.
	If any bidder wishes to request an amendment to any term or condition, such amendment must be clearly stated and the exact wording which the bidder is requesting must be set out. No material changes will be considered.
Further Conditions	All documentation and correspondences must be in English with costs given in GBP ( $\pounds$ ). Staff employment rates must be quoted as hourly rates in GBP ( $\pounds$ ). All additional expenses must be included under Work Package B: Costs and Expenses.
	Bidders are requested to input the man hours involved in the project for each work package in table 1, section 6.3. Any additional information (e.g. CVs or References) that Bidders wish to provide must be included in the main bid document (preferably in PDF) as an appendix.

#### 4. Scope of Work

- 4.1. The Contract will be constituted by the Award Letter, the OWA Conditions of Contract and the Scope of Work (including any agreed clarifications to it). This final Scope of Work document will reflect any updates, changes or improvements to the technical scope and Work Packages as suggested by the Contractor in its proposal.
- 4.2. Failure to accept these documents in their un-amended form or requesting amendments to them means that a bidder's tender is a non-compliant tender and it would therefore be at the discretion of the Carbon Trust to accept such a tender. Submission of a tender shall constitute unqualified acceptance of the OWA Conditions of Contract.
- 4.3. If any bidder wishes to request an amendment to any term or condition, such amendment must be clearly stated and the exact wording which the bidder is requesting must be set out. No material changes will be considered.
- 4.4. The following section provides a summary of the key points relating to the technical content of this project and the proposed scope.

#### **Contractor Specification**

4.5. The Carbon Trust appreciates that due to the breadth of skills and experience required for this project a consortium may be required to successfully meet the objectives of the project. It is envisaged that it will take a small team of mixed seniority  $\sim 10-12$ 



months to complete. Contractors should use this scope to create a detailed project plan and Gantt chart outlining how they will deliver this project on budget and within the allocated time. This will be agreed by the Technical Working Group & Carbon Trust before work commences. It is expected that simplifying assumptions will be required to complete this work in the given timeframe; all assumptions will need to be clearly stated and approved by the TWG.

#### **Detailed Scope**

- 4.6. The following Work Packages are the initial ideas on the key activities that the Contractor is expected to undertake during this contract. Contractors are encouraged to offer a different or expanded approach that fulfils the high-level objectives and deliverables. If a different approach is suggested, the Contractor is expected to explain / justify any intended deviation from the advertised work packages.
- 4.7. It is expected that the Contractor will report on interim deliverables (if applicable) to the Technical Working Group and that the final report will contain documentation of all deliverables.



### **Work Packages**

WORK PACKAGE	Description of work			
WP1 – Cost sensitivity assessment	The objective of this work package is to quantify the cost implications for poor/uncertain characterisation of the thermal properties so that the potential value added by <i>insitu</i> , and laboratory testing can be established.			
	The primary focus of this WP should be assessing the impact of seabed thermal properties on the cable supply costs associated with different cross sections needed to achieve specific ratings.			
	This WP could be completed by undertaking a:			
	<ul> <li>Parametric study (numerical, possibly finite element) investigating the relationship between the soil thermal parameters and required cable cross sections.</li> <li>This study should initially consider continuous ratings, but can also consider impacts associated with dynamically rated cables typical of the latest generation of offshore wind farms.</li> <li>The contractor should define a series of case studies to support this work package. The OWA TWG-C may be able to provide data to support these case studies, but the Contractor should not assume that this is the case, and should detail an alternative approach to access reliable cost data.</li> </ul>			
	assessment report detailing the impact of soil thermal supply costs of cross sections needed to achieve specific the OWA TWG-C.			
WP2 – Testing methodology review	The objective of this work package is to provide an overview of the various available laboratory and in-situ tests to measure thermal parameters and to evaluate the reliability and cost-effectiveness of these.			
	We welcome creative proposals to achieve this objective, but suggest that this can be achieved with:			
	• A literature review and comparative analysis of commercially available thermal parameter testing methods; cost of testing; quantification of the precision and accuracy limitations of the test methodologies (also consider precision limitations introduced by interpretation of the results); compare methods with available test data.			
	• A literature review of standards for thermal test methods and relevance to offshore testing – are they fit			

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	for purpose? This standards review will include at a minimum ASTM D5334 and IEEE442, and the Contractor should identify additional relevant standards for investigation.			
	<ul> <li>Identification of the most effective test methodologies, appropriate standards and any potential improvements that should be made to current methodologies.</li> </ul>			
	<ul> <li>Identification of supplementary testing which can help characterise thermal soil parameters (i.e. dried out soil tests. mineralogical testing, or field measurements of in- situ temperature profiles along route).</li> </ul>			
	ology review report to provide a comparative analysis of d in-situ testing methodologies. the OWA TWG-C.			
WP3 – Design parameter framework	The aim of the TWG-C is to more accurately assess differences between soil conditions pre- and post-installation. The objective of WP3 is to provide a framework for generating appropriate data values for use in cable system design from probability distribution functions, e.g. a histogram, of thermal parameter data.			
	This work package should also consider the potential change of density/ fabric/ particle size distribution (PSD) of soils induced by installation processes and scale effects (i.e. the tendency of homogeneity when considering larger soil volumes). This could be achieved through a number of different routes, which should be identified by the Contractor in the proposal.			
	The work package conclusions should include recommendations for further work and/or methodologies for back analysis of temperature data along cable routes.			
D05 – Design Parar appropriate data values D06 – Presentation to t				
WP4 – Best practice guidelines	The objective of this work package is to bring together conclusions from earlier work packages to provide an optimal investigation strategy for laboratory and <i>in-situ</i> testing of soil thermal properties.			
	The Contractor should report on the project's earlier objectives by:			
	<ul> <li>Bringing to together conclusions from WP1, WP2 &amp; WP3.</li> </ul>			
	<ul> <li>Recommendation for the optimal investigation strategy with regards to the combination of laboratory and <i>in-situ</i> tests.</li> </ul>			



	<ul> <li>Establishing a framework which can characterise variation in the soil's thermal properties, pre and post trenching for design purposes.</li> </ul>
	<ul> <li>Establishing a basis for determining appropriate characteristic values to be used in design (statistical approach vs. general site conditions and use of parameter bound framework).</li> </ul>
	<ul> <li>Recommendation for improvements of measurement techniques and interpretation of results for offshore use.</li> </ul>
	delines document to provide a strategy for testing of soil e guidance may be published at the OWA's discretion. he OWA TWG-C.
WP5 – Recommendations for Future Work	The objective of this work package is to propose future work that builds on the projects recommendations to further minimise uncertainty around soil thermal properties for offshore wind projects.
	The Contractor should provide detailed scope recommendations for further work on this topic, including objectives of further work, and budget requirements.
	recommendations for future work on the topic to further round soil thermal properties for offshore wind projects. he OWA TWG-C.
WPA - Project Management	The Contractor should stipulate how they will manage the project efficiently and effectively. This should include specific costs for project management time, to include update calls with the Carbon Trust Project Manager and/or Technical Working Group as required.
	This should also include production of a one-page executive summary for the whole project, for internal dissemination. Carbon Trust will provide the template for this. The budget should also accommodate production of a final presentation and time dedicated to presenting this in the form of a short webinar to invitees from the developers of the OWA.
	Finally, if appropriate, resource should also be allocated to provide inputs into the 'OWA Cost Model'. The contractor is not expected to produce a cost model of its own, but rather provide an estimate, with appropriate explanation, for potential cost implications of the research. The Carbon Trust will provide a template to assist the Contractor in this process.
D11 - Monthly flash rep D12 - Project executive D13 - Delivery of webir D14 - Inputs to OWA Co	e summary. Nar.



WPB - Expenses	The Contractor should detail the capped amount of expenses it expects to incur throughout the project. Expenses will be
	paid as incurred and any unused balance will not be paid.



### 5. Intellectual Property and Knowledge

- 5.1. All rights in and relating to pre-existing intellectual property and knowhow contributed by the Contractor, third parties or OWA Partners shall remain the exclusive property of the contributing party.
- 5.2. In the event that bidders plan to use or rely on pre-existing intellectual property knowhow for the project, the Carbon Trust's expectation is that a premium will not be charged for leveraging this IP or knowhow.
- 5.3. Results of this project will be owned by the Carbon Trust for the benefit of the OWA Partners and OWA programme.
- 5.4. Full details of the intellectual property requirements and conditions can be found in the attached draft Contractor's Conditions.

#### 6. Bid Pricing

- 6.1. To provide bidders with greater clarity on the nature, level and type of work involved in the various Work Packages (WPs), the expected total budget is between £180k and £200k. The Contract Price submitted with the tender must be derived from the cost breakdown table requested in Table 1, and must include the costs for optional work packages as well as all expenses. Suggestions (within budget) are welcomed. If the Contract Price exceeds the budget (including where the bid includes alternative suggestions), to avoid receiving a lower score for this criterion, please provide a clear and justified reason why the Contract Price exceeds the expected budget.
- 6.2. For the avoidance of doubt, 'suggestions' referred to in preceding paragraph means 'additional areas of work or alternative or substitute activities to those described in Annex A, that would further support the objective of the work' (see description of criterion 1).
- 6.3. The Contractor is required to fill in the following staff rate and project cost breakdown table as part of their tender. The project is expected to take approximately 10-12 months.

	Time spent per work package (WP) in hours								Staff cost
Staff member	WP 1	WP2	WP3	WP4	WP5	WPA: Project mgmt	Total time in hours	Staff rate (£)	to project (£)
Project Sponsor	hr	hr	hr	hr	hr	hr	hr	£	£
Lead Consultant	hr	hr	hr	hr	hr	hr	hr	£	£
Analyst	hr	hr	hr	hr	hr	hr	hr	£	£
Etc.	hr	hr	hr	hr	hr	hr	hr	£	£
Total Time In hours	hr	hr	hr	hr	hr	hr		WPB: Expenses	£
Total cost of each WP	£	£	£	£	£	£		Total Cost	£

Table 1: Staff rates and project cost breakdown



As detailed in section 4, the work packages are as follows:

- WP1: Cost Sensitivity Assessment
- WP2: Testing Methodology Review
- WP3: Design Parameter Framework
- WP4: Best Practice Guidelines
- WP5: Recommendations for Future Work
- WPA: Project Management
- WPB: Expenses
- 6.4. All rates quoted in Table 1 must be in GBP (£) and represent the **Hourly Rate** for employment of staff members.
- 6.5. Bidders should be aware that the Carbon Trust and TWG usually require 2-3 weeks for the review and feedback procedure after delivery of each WP with at least one round of review comments to be accommodated. This should be taken into account when the table is completed.

# 7. Tender Evaluation Criteria

Bidders should take the following evaluation criteria into account when preparing and submitting their tenders. Tender documents should be no more than 20 pages excluding CVs.

# Criterion 1: Approach to Work (Weighting: 30%)

Bidders are required to provide the evidence of the approach to work within the main body of the tender (not in a separate document).

Description	Information required from bidders			
Proposed Approach	Bidders are required to provide a detailed description on how they plan to develop each work package described in Section 4.			
	The description should include an initial overview on the approach followed by a description on how each Work Package and task will be delivered.			
	Also, bidders need to justify how their proposed approach meets the project objectives.			
Suggestions	Suggestions of additional areas of work to those described in Section 4 of the ITT that the bidder proposes looking at as part of this study in order to achieve the required objectives, maintain an industry focus and provide valuable insights into the potential for reducing costs and risks for Round 3 offshore wind projects.			
	Bidders are required to differentiate which are their additional areas of work from the proposed approach. Besides, bidders should specify if the proposed additions affect to the total price and quote them separately.			
Project management	Bidders are required to describe how they will manage the project utilising appropriate resources and describe how they will work with the various stakeholders, such as the OWA TWG, to get information and manage potentially conflicting			



relationships. It is not expected that the Contractor will have
to run any workshops with stakeholders.

### **Criterion 2: Experience (Weighting: 30%)**

Bidders are required to provide the experience evidence as an appendix, at the end of the bid document (not in a separate document)

<i>Description (Projects of a similar nature)</i>	Information required from Bidders	
Experience in laboratory and in-situ testing of subsea soils.	Bidders should elaborate on experience of the criteria described. Explain how these past experiences are relevant for this tender.	
Experience and knowledge of designing guidance for use in industry.	In addition, the bidder should provide at least two examples (with reference to specific roles, responsibilities and activities the bidder undertook) of previous work which illustrates the bidder's skills, capabilities, and experience in all of these areas (bidders may wish to make reference to submitted	
Experience and knowledge of offshore wind subsea cables and costs.	examples of previous work for other clients) Bidders are advised that experience is considered a key important criterion and partnerships with other companies to support certain areas of experience are welcomed.	
	All experience / case studies should be attached as an appendix to the proposal, but a summary of each case should be listed in the proposal main text.	

# Criterion 3: Staff Skills (Weighting: 15%)

Bidders are required to provide the staff skills evidence as an appendix, at the end of the bid document (not in a separate document)

Description	Information required from bidders			
CVs/Resumes	Detailed CVs/Resumes for any staff who will be involved with this Contract together with proposed project structure, intended position of staff in the project, and main responsibilities. CVs should include professional memberships of proposed staff working on this project.			
Applicable skills	Bidders should elaborate on the most relevant skills of the selected staff that will be applicable in the project.			
Prior experience form involved staff	Please include examples of similar work performed by the proposed staff members, explaining how is relevant to the work described in Section 4.			



Expert engagement	A close working relationship with key stakeholders such as banks' engineers, LiDAR OEMs, offshore wind farm developers, wind turbine OEMs, as well as the OWA Technical Working Group are seen relevant to the success of this project. Please supply ideas of how these groups can be engaged and leveraged.

#### Criteria 4: Price (Weighting: 25%)

In the event that tenderers plan to use or rely on pre-existing intellectual property or knowhow for the project (e.g. existing O&M modelling tools), the Carbon Trust's expectation is that a premium will not be charged for leveraging this intellectual property or knowhow.

Description	Information required from bidders
Day rates and man-h for all staff grades	Bidders are required to provide day rates for all staff grades and to input the man-h involved in each work package described in Section 4.
Fixed price for the project	Project cost breakdown by work package, time and rate of person completing the work as specified in Section 6.3.
	Bidders are required to specify expected expenses apart from the estimated budget for each work package.
	Carbon Trust will reimburse reasonable expenses at cost and receipts may be requested. Pre-approval will be required for travel costs over £150 per return journey and combined hotels & subsistence cost exceeding £200 per day.
	Bidders will be required to confirm or comment on their ability to carry out the activities detailed in the Scope of Work within the initial term of the Contract and provide an outline plan of work