21 February 2022

Dear Sir/Madam,

Invitation to Tender for the Roadmap to 'Power to X' project for the Integrator programme

You are invited to submit a proposal for the Roadmap to 'Power to X' project which is part of the Integrator programme. The key objective of this project is to identify barriers to the deployment of the novel approaches for offshore wind integration and make recommendations on the next steps to overcome barriers and who needs to deliver these actions.

Please be aware that this process is a non-mandatory procurement process, published for transparency and best practice. All timescales are based, as near as possible, to the Open Procedure. However, 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 proposal be successful an Award Letter, the Scope of Work, the Carbon Trust Conditions of Contract ("**Conditions**"), and any clarifications agreed in writing, will establish the Contract for the Roadmap to 'Power to X' (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 that 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.

Clarification questions must be emailed to Hannah.evans@carbontrust.com and Integrator@carbontrust.com any time before 17:00 GMT on Monday 7th March. Answers to clarification questions will be communicated by email by 17:00 GMT on Wednesday 9th March. Answers can be found at: https://www.carbontrust.com/about-us/tenders.

Unless informed to the contrary, tenders and communications should be sent by e-mail to the following e-mail addresses: Hannah.evans@carbontrust.com and Integrator@carbontrust.com.

Please submit your proposal by **17:00 GMT, Monday 28th March 2022** [updated 14th March 2022].

The timeline of this procurement process is as follows:

Deadline for clarification questions	17:00 GMT, 7 March 2022
Clarification response date	17:00 GMT, 9 March 2022
Submission of full proposal	17:00 GMT, 28 March 2022
Bidder interviews	Week commencing 18 or 25 April 2022
Project kick off	late April/early May 2022

If you have any questions about the timing, please let us know.

We look forward to receiving your tender.

Yours sincerely,

Hannah Evans
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 (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 proposal addressing these requirements. Issuance of this ITT 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 Integrator Partners 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 ITT, 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. Furthermore, the Carbon Trust does not warrant or provide any undertaking with respect to the fairness, accuracy, adequacy or completeness of the information provided. The bidder should conduct its own due diligence and seek its own professional, legal, financial and other advice as appropriate.

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.

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.

Integrator Programme

Invitation to Tender for the “Roadmap to ‘Power to X’” Project

Contents

1. Introduction to the Integrator Programme

1.1. The Integrator programme (“**Integrator**”) is a collaborative R&D initiative between The Carbon Trust and participating industry partners EnBW, Equinor, ScottishPower Renewables, SSE Renewables, TotalEnergies and Vattenfall (the latter are collectively referred to in this document as “**Integrator Partners**”), that aims to research and develop the opportunities to overcome offshore wind system integration challenges. In this Phase II of the programme there is a particular focus on hydrogen and system services.

1.2. The objective of the Integrator is to investigate challenges associated with offshore wind integration and identify and research opportunities to overcome these barriers.

1.3. Contractors receive technical direction from Integrator Partners through the Carbon Trust management team.

1.4. Please note, the term “Contractor”, where used within this document, refers only to successful bidders.

2. Objective of the Work

2.1. The objective of the Roadmap to ‘Power to X’ project is:

- To study different ‘Power to X’ scenarios which could improve wind integration into the German and UK systems by increasing the volume of wind generation that can be connected for a given connection size and better matching the wind farm output to the system demand.
- To determine the realities and practicalities of integration of those technologies from the windfarm perspective.
- To deliver a roadmap identifying the policy, regulatory and technical barriers to deployment of each ‘Power to X’ scenario and make recommendations for next steps. To inform wider policymakers and stakeholders on the barriers and realities of Power to X scenarios.

2.2. Please note that this project is not intended to study the specifics of the Power 2 X technology itself, rather the integration of those technologies with a grid connected windfarm. From a technology perspective a “black-box” approach should be adequate. It will be necessary to have understanding of the electrical load characteristics of the demand, including typical load profiles, and electrical characteristics impacting the wind farm.

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	The Carbon Trust Conditions of Contract for this project are attached. The Contract will be constituted by the Award Letter, the Carbon Trust Conditions of Contract and the Scope of Work (including any agreed clarifications to it). Failure to accept these documents in their unamended form or requesting amendments to them means that a bidder's tender is a non-compliant tender. Submission of a tender shall constitute unqualified acceptance of the Carbon Trust 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 (£). Staff employment rates must be quoted as hourly rates in GBP (£). All additional expenses must be included under Work Package B: Costs and Expenses. Bidders are requested to input the person-hours involved in the project for each work package in table 1, section 5.7. 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. Contractor Requirements

Contractor Responsibilities and Support of Carbon Trust Resources

4.1. Hannah Evans of the Carbon Trust will serve as overall Project Manager and also as the main point of contact for the Contractor. If the Project Manager becomes unavailable for any reason, the Carbon Trust shall make reasonable alternatives available.

4.2. The Contractor shall be responsible to the Carbon Trust for discharging its responsibilities under the Contract to deliver the Roadmap to 'Power to X' project. The Contractor will also be responsible for the performance of all activities listed in this Scope of Work except where responsibility is allocated elsewhere in this document.

4.3. The Project 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 Project Manager will review any project deliverables defined within this Scope or Work and will approve invoices accordingly if deliverables meet the agreed standard.

4.4. The Contractor shall, prior to commencement of the Contract, 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 this Scope of Work.

4.5. The Contractor engaged will manage and deliver the work packages as defined in Annex A. This role will involve working closely with the designated Project Manager and the Integrator Partners.

4.6. The Contractor will be required to provide services in the form of one or more lead consultants as required by the Carbon Trust to lead delivery of the project to the required scope, within the given budget and in the allocated time. The Contractor will need to be flexible to the requirements of the workload.

4.7. 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.

4.8. The Contractor is expected to work at their own premises but also to meet at the Carbon Trust's offices in London, probably around once every two months, to attend Integrator Partner meetings when required. In addition, a certain amount of travelling, both within the UK and overseas, may be required during the Contract in order to engage with relevant companies in the sector and to ensure the robust delivery of the project. However, where possible and appropriate, meetings will take place virtually.

4.9. The core activity under the Contract is to manage and deliver the Scope of Work. The Contractor may be required to undertake a range of other tasks that fall within the scope of the Contract but that are not necessarily specified here, to enable the efficient and smooth operation of the Integrator. The Contractor will be required to report regularly to the Integrator Steering Committee, complete schedule and budget reports each month (Flash Reports), produce an executive summary at the end of the project, containing a summary of key findings and recommendations for future work, and deliver a final project webinar to Integrator Partners. Without limiting the reference in this paragraph to the range of other tasks falling within the scope of the Contract, the Contractor may also be requested by the Carbon Trust to provide additional services with respect to additional analysis or more in depth work on any or all aspects of the project referred to herein. Such additional analysis or more in depth work shall form part of the Services defined in the

Contract. The Contractor must be prepared to receive such requests(s) and provide such additional Services agreed between the parties.

4.10. The Contractor must appoint secondary "backup" resources in order for the Contractor to continue providing the services in the event that the primary consultant(s) is(are) unexpectedly unavailable for periods of more than 1 week (for instance, due to illness or vacation). The nominated primary consultant(s) must be available to work on the project for the expected duration of the Contract, and only in exceptional circumstances should a replacement be necessary.

Intellectual Property and Knowledge

4.11. All rights in and relating to pre-existing intellectual property and knowhow contributed by the Contractor, third parties or Integrator Partners shall remain the exclusive property of the contributing party.

4.12. 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.

4.13. Results of this project, which the Contractor will be expected to keep strictly confidential in addition to all other information disclosed to the Contractor during the project, will be owned by the Carbon Trust for the benefit of the Integrator Partners, who will be entitled to commercially exploit the Results.

Management of Progress

4.14. Work and expenditure under the Scope of Work shall be monitored throughout the duration of the Contract by the Project Manager. Flash Reports are to be provided by the Contractor to the Project Manager at the end of each month after the start of the project. The Flash Report template will be provided to the Contractor at the beginning of the project.

4.15. The Carbon Trust will be entitled, at reasonable notice, from time to time during the term of the Scope of Work (and for a period of 2 years following its termination for any reason) to inspect all of the Contractor's book of accounts and records so far as they relate to the subject matter of the Contract.

4.16. Failure to submit deliverables in a timely manner at the end of a stage will be grounds for suspension or termination of the Contract as described in section 4.25. Any suspension, reinstatement or dismissal shall be solely at the discretion of the Programme Manager.

Contract Price & Commitments

4.17. The Contract price to be paid by the Carbon Trust to the Contractor under the Contract will be on a time and materials basis capped at the approved maximum cost specified in the Award Letter ("**Approved Maximum Cost**").

4.18. The total price and any expenses paid or payable under the Contract shall not in any circumstances exceed the Approved Maximum Cost. The Approved Maximum Cost shall be the maximum sum for which the Carbon Trust shall be liable under the Contract to pay the Contractor for all work and services. The Approved Maximum Cost may be revised by the Carbon Trust in

order to accommodate any adjustment necessary in relation to any additional services required by the Carbon Trust and agreed between the parties.

4.19. The Approved Maximum Cost for the Contract shall be equal to the Contract price. The Carbon Trust Project Manager reserves the right to vary the Approved Maximum Cost by informing the Contractor of the revised Approved Maximum Cost in writing at any time.

4.20. It shall be sufficient authority for the Contractor to undertake services or work in accordance with the Contract if it has received a purchase order from the Carbon Trust.

4.21. Notwithstanding any other term of the Contract:

i) the Carbon Trust shall not be liable to pay the Contractor for any service or work in connection with this Contract unless and until it is authorised in accordance with section 4.20; and

ii) the amount payable to the Contractor shall not exceed the amount stated in the purchase order; and

iii) in no circumstances shall the total amount payable by the Carbon Trust to the Contractor, for the work or services to be carried out under the Contract, including project expenses, exceed the Approved Maximum Cost.

4.22. If the Carbon Trust terminates or suspends the Contract under section 4.24 or 4.25 provided that such termination or suspension does not arise out of any default of the Contractor (or any of its employees, agents or sub-contractors) or any failure to perform to the Carbon Trust's satisfaction under the Contract, then subject to sections 4.21.iii) and 4.23, in such circumstances the Carbon Trust will pay the Contractor a proportion of the next instalment of the Contract price falling due for payment, pro rata to the proportion of the period that has elapsed at the date of the termination or suspension.

4.23. The Contractor shall, if requested by the Carbon Trust, deliver to it all work and deliverables (including work in progress and incomplete deliverables) that have been undertaken prior to the date of termination or suspension (as the case may be).

Contract Duration and Early Termination

4.24. The Contract will commence on the date specified in the Award Letter and shall continue until the project has been completed in accordance with the Contract, to the satisfaction of the Carbon Trust and subject to the rights of early termination and break under the Carbon Trust Conditions of Contract and under section 4.25 below, but in any case shall be subject to termination upon 30 calendar days' notice by the Carbon Trust at the discretion of the Project Manager.

4.25. In addition, the Carbon Trust will have the right to immediately suspend or terminate the Contract without liability either in whole or in part if:

i) satisfactory deliverables are not submitted in a timely manner; and/or

ii) activities agreed with the Project Manager are not being completed to the timescales and/or quality standards set out in the Contract or otherwise agreed between the Contractor and the Project Manager; and/or

iii) the work or service is not likely to be completed within the Approved Maximum Cost.

Judgement as to whether these conditions are met will be at the sole discretion of the Project Manager.

5. Invoicing & Payment

5.1. 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 ~£100,000 (excluding optional work packages). The Contract Price submitted with the tender must be derived from the cost breakdown table requested in section 5.7, 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.

5.2. 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).

5.3. Payments for the Contract price to the Contractor will only be made upon presentation by the Contractor of a valid invoice stating:

i) The current purchase order number

ii) The Contract number

iii) The name of the Project Manager: Hannah Evans

iv) Description of work completed and account for resources expended

5.4. All invoices are to be issued electronically to accountspayable@carbontrust.co.uk, with Hannah Evans (Hannah.evans@carbontrust.com) on copy, or to another email address as advised in writing by the Carbon Trust to the Contractor.

5.5. The payment terms for this project will be within 30 days of the Carbon Trust's receipt of a valid and undisputed invoice from the Contractor. The Carbon Trust shall be under no obligation to make any payment whatsoever to the Contractor in respect of any work or services not completed in accordance with the Contract.

5.6. Payments will be made when a Work Package has been completed and the Deliverables accepted by the Steering Committee.

5.7. The Contractor is required to fill in the following staff rate and project cost breakdown table as part of their tender. For consortia, the time and budget allocation of each consortium partner should be clearly stated. The project is expected to take approximately 9 months.

Table 1: Staff rates and project cost breakdown

Staff member	Time spent per work package (WP) **in hours**				Total time **in hours**	Staff rate (£/hour)	Staff cost to project (£)
	WP1	WP2	WP3	WPA: Project mgmt			
Name (Role/Title)	hr	hr	hr	hr	hr	£	£
Name (Role/Title)	hr	hr	hr	hr	hr	£	£
Name (Role/Title)	hr	hr	hr	hr	hr	£	£

Etc.	hr	hr	hr	hr	hr	£	£
Total Time **In hours**	hr	hr	hr	hr		WPB: Expenses	**£**
Total cost of each WP	**£**	**£**	**£**	**£**		**Total Cost**	**£**

Note: Additional rows and columns should be added as appropriate for additional staff members and work packages.

5.8. All rates quoted in Table 1 must be in GBP (£) and represent the **Hourly Rate** for employment of staff members.

5.9. Bidders should be aware that the Carbon Trust and Integrator Partners usually require at least 2 weeks for the review and feedback procedure after delivery of each WP. This should be taken into account when the project Gantt chart is completed.

5.10. Tender submissions should be limited to 15 pages of A4 in the main body of the proposal (excluding CVs). Supporting information should be included in an Appendix.

6. Tender Evaluation Criteria

Bidders should take the following evaluation criteria into account when preparing and submitting their tenders.

Criterion 1: Approach to Work (Weighting: 40%)

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 [25%]	Bidders are required to provide a detailed description on how they plan to develop each work package described in Annex A. 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 [5%]	Suggestions of additional areas of work 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 of offshore wind integration. Some examples are given in the project description in Annex A. 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 [10%]	Bidders are required to describe how they will manage the project utilising appropriate resources and describe how they will work with

	the various stakeholders to acquire information and manage potentially conflicting relationships.

Criterion 2: Experience & Staff Skills (Weighting: 40%)

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

Description	**Information required from Bidders**
Experience in relevant projects and industries [20%]	Bidders should elaborate on experience of the criteria described. Explain how these past experiences are relevant for this tender. 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 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.
CVs/Resumes and applicable skills [10%]	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. Bidders should elaborate on the most relevant skills of the selected staff that will be applicable in the project.
Expert engagement [10%]	A close working relationship with key stakeholders, such as wind farm developers, network companies and technology developers are seen as relevant to the success of this project. Please supply ideas of how these groups can be engaged and leveraged.

Criteria 3: Price (Weighting: 20%)

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-hours for all staff grades [10%]	Bidders are required to provide hourly rates for all staff grades and to input the man-hours involved in each work package described in Annex A.

Fixed price for the core project scope [10%]	Project cost breakdown by work package, time and rate of person completing the work as specified in Section 5.7. 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. **As noted in Annex A and above in the 'Suggestions' criteria, the cost of any proposed extensions to the project should be clearly costed separately to the core project scope.**

Annex A - Scope of Work

Background – General

The deployment of offshore wind into existing electricity markets is hindered by the existing capacity and rate of development of the transmission networks, where there is insufficient immediate capacity to accept new wind farm connections. If windfarms are regularly curtailed this presents an opportunity for capture of intermittent volumes of unutilised energy "behind the meter".

Significant volumes of offshore wind are needed to meet decarbonization targets in the UK and Germany, however they will be challenging for the system operator to manage due to lack of flexibility and dispatchability and therefore addition of flexible demand and storage will benefit the operability of the system.

More novel approaches are needed to manage these connection and transmission constraints, and to manage significant capacity of offshore wind on the grid. This could include co-location of generation and storage, converting power to hydrogen, or new contractual arrangements linking power output from a wind farm directly with local demand.

This project will develop descriptions of these novel approaches and assess their value in the UK and German markets from an offshore wind developer's perspective. It will then assess the policy, regulatory, and technical rules relevant to these scenarios to identify barriers to the deployment of the novel approaches and make recommendations on the next steps to overcome barriers and who needs to deliver these actions.

Objective of the Work

- To study different 'Power to X' scenarios which could improve wind integration into the German and UK systems by increasing the volume of wind generation that can be connected for a given connection size and better matching the wind farm output to the system demand.
- To determine the realities and practicalities of integration of those technologies from the windfarm perspective.
- To deliver a roadmap identifying the policy, regulatory and technical barriers to deployment of each 'Power to X' scenario and make recommendations for next steps. To inform wider policymakers and stakeholders on the barriers and realities of Power to X scenarios.

Exclusion: This project is not intended to study the specifics of the Power 2 X technology itself, rather the integration of those technologies with a grid connected windfarm. From a technology perspective a "black-box" approach should be adequate. It will be necessary to have understanding of the electrical load characteristics of the demand, including typical load profiles, and electrical characteristics impacting the wind farm.

Work Packages

WORK PACKAGE	Description of work
WP1: Scenario Development	The contractor shall identify 'novel' approaches (scenarios) which could help increase the rate of offshore wind integration into the UK and German networks. This should cover alternative approaches outside of a generic point-to-point connection of an offshore wind farm. Examples of this include, but is not limited to: • Co-location of OSW generation and storage assets (both retrofit and new build). • Co-location of OSW generation and demand, ie converting power to hydrogen (both injection into gas network) or direct sale to transport/industrial user, converting power to other fuels (e.g. ammonia), other forms of demand including supply to private wire network behind the meter. • Novel arrangements for complex grid connections which enable power output from a wind farm to be twinned directly with coordinated local demand to reduce combined grid capacity needed. This could include; connection of demand, storage or private wire network at windfarm's onshore substation; "virtual" twinning between connections that are closely located, multiple ownership scenarios. The contractor should also characterise a counterfactual scenario for comparison. The counterfactual is a point-to-point connection for a windfarm unconnected to demand/storage plants. The contractor should consider the list above and propose their own solutions within the budget to be agreed with the Integrator partners. Where other approaches can be identified by the contractor, this will be looked on favourably by the Integrator partners. If additional scenarios could be covered as an extension to the budget (e.g. energy islands), these should be detailed in the bid and clearly labelled as an extension to the main scope with a separate cost allocated. The contractor shall engage with relevant stakeholders in the UK and Germany to identify and develop these and other approaches which could make offshore wind integration easier in each market. The contractor should produce a report detailing: - A description of each scenario with representative metering scheme, including at a high level the impact on wind farm design including identification of any additional equipment or substantial changes required to the wind farm. It should be noted that other projects within the Integrator programme are undertaking more detailed

	technical reviews of hydrogen production and ancillary service provision, so only a high-level overview is needed here. - (Where available), Examples of where these scenarios have been piloted and the outcome of these pilots. A summary of relevant research related to these pilots A qualitative assessment of the extent to which each approach could be valuable in the UK and German markets, in terms of -Value to the offshore wind developer/owner/operator. Impact of doing nothing. -Value to the system operator. Impact of doing nothing. -Value to 3rd party (ie Hydrogen producer) - How it benefits offshore wind integration (from both a system and offshore wind developer perspective) Depending on the number of scenarios identified, contractors should propose criteria for selecting a number of scenarios to be taken forward to WP2. This should be at least two for each of the UK and German markets. The scenarios proposed for WP2 will be presented to, and agreed with, Integrator partners.
- **D01: Report detailing the 'Power to X' scenarios and their values to the UK and German markets** - **D02: Presentation to Integrator partners on proposed scenarios to take forward to WP2**	
WP2: Barrier Identification	For the selected scenarios, the contractor shall undertake stakeholder engagement and review relevant literature and undertake any necessary studies to identify the barriers to each of the scenarios from the following perspectives: - Policy and Regulatory Framework: Compared to a conventional offshore wind farm with point-to-point connection, what impact do current policy and regulatory frameworks have on: • If/how any new assets (e.g., storage, offshore hydrogen/other fuel production) obtain planning permission • The ownership model for new assets (e.g., is it necessary for co-located assets to be under same ownership) • Connection and/or use of system charges paid by the OSW farm. • Subsidies/Incentives received by the wind farm (e.g. Contract for Difference, Renewables Obligation). If the scenario includes retrofitting technologies, challenges associated with this should be specifically considered. • How the offshore wind farm engages with the Balancing Mechanism • [Where relevant to the scenario] Interactions/Potential sources of conflict between the gas and electricity grids This review should also consider any live policy consultations relevant to the scenarios.

	- Technical
	  • Are there any gaps in the Grid Network Codes? This review should also consider any relevant ongoing modifications to codes and standards.
	  • For hybrid schemes with gas grid connection, what are the technical requirements of the gas grid and could they impact the electricity connection ie via uncontrolled response to gas network issue?
	  • What are the technical standards for production and injection of hydrogen which would impact each scenario? Are there any gaps which would hinder the development of the scenario?
	  • Does the presence of co-located demand or storage substantially impact the electrical design of the scheme, considering; grid code compliance, technical conditions of grid connection, voltage drops, protection philosophy, worst case demand trip?
	  • Does the scenario have any impacts on voltage stability?
	  • For complex connections, could the infeed limit of the windfarm be increased with coordinated control of a separately connected demand asset?
	  • Are there any practical limits on the reduction of the grid connection capacity compared with the installed wind generation? Is there a practical limit on the "module size" of demand to connect?
	
	- [For scenarios considering retrofit of technologies] Barriers to retrofit at existing sites (e.g. land lease conditions, etc)
	- Health and Safety: Are standards/procedures in place that cover each scenario? What gaps remain?
	- Any wider non-technical barriers: Where relevant, the contractor should note any additional barriers to this scenario (e.g. lack of skilled personnel to deliver and operate each scenario)
	
	For the avoidance of doubt, this project should not assess the status of the technology being connected, rather the impacts and plausibility of each scenario, and barriers to delivering each scenario.
	
	For the scenarios covered in WP2, the contractor shall identify actions required to overcome barriers and identify the stakeholders in the UK and German markets who should take these actions forward.
	
	These barriers and recommendations should be presented to Integrator partners in a workshop prior to finalising the report
	
	Optional Extension
	
	In response to the core scope detailed above the contractor should set out how they will assess the barriers to each scenario. If there are more detailed studies which contractors believe would provide additional depth to their assessment, but which cannot be covered within the core scope budget, these can be included in the tender, but should be clearly marked as extensions to the project, with a separate budget provided.

- **D03 Report summarising market, policy, regulatory and technical standards implications and current barriers for each scenario in the UK and German markets.** - **D04 Delivery of workshop on scenario barriers and recommended actions**	
WP3: Final Report	The final report should summarise the project approach, scenario selection, barrier, and recommendation identification. It should also highlight recommendations for future work (for example, additional markets or scenarios not covered in WP2 which would be valuable to analyse).
- **D05 Final Report**	
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 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 Integrator.
- **D06: Monthly flash reports** - **D07: Project executive summary** - **D08: Delivery of webinar**	
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.

****Note on deliverables:***
All written deliverables should include a short Executive Summary (~2-5 pages) and larger deliverables should also include an extended Synthesis (~10-20 pages) of the key findings from the work undertaken.

Appendix – Key Information

Double click and change 'Default Text', then select all and update. This page can then be omitted before the document is passed onto bidders.

Project Details

Project title	Roadmap to Power to X
Research area	Integrator
Project Manager name	Hannah Evans
Project Manager email	Hannah.Evans@carbontrust.com
Key Objective is…	To identify barriers to the deployment of novel approaches to offshore wind integration and make recommendations on the next steps to overcome barriers.
Project duration (months)	9 months
Indicative budget (excluding additional suggestions)	£100k

Key Dates

Date of issue	21 February 2022
Date & Time of submission	17:00 GMT, 28 March 2022
Clarification deadline	17:00 GMT, 7 March 2022
Clarification response date	17:00 GMT, 9 March 2022
Bidder Interviews	Week commencing 18 or 25 April 2022*
Successful Contractor Announcement	April 2022
Project kick off Meeting	Late April/Early May 2022

*Please indicate your availability for interview during these two weeks in your response