Floating Wind Joint Industry Project

Floating Wind Technology Acceleration Competition

Competition scope and application guidance

Funded by:

The Scottish Government

With support from:

EnBW, ENGIE, EOLFI, e·on, equinor, VATTENFALL, innogy, Kyuden Mirai Energy, Ørsted, SCOTTISHPOWER RENEWABLES, Shell, sse, TEPCO, wpd think energy

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1 Executive summary

The offshore wind industry is growing rapidly as technologies mature, prices fall and ever larger projects are constructed. The floating wind sector, where turbines are constructed on floating structures, is at an earlier stage of development but presents a significant opportunity for investors, wind farm developers and the supply chain over the coming decade. Joint industry partnerships have delivered targeted and effective research and development (R&D) projects that have contributed to the rapid cost reductions seen across the offshore wind industry over the last decade. However, a number of challenges need to be overcome to allow large scale deployment of floating offshore wind.

Innovation challenges

The objective of this competition is to accelerate the development and commercialisation of floating offshore wind technology with a particular emphasis on mooring systems and Operations & Maintenance (O&M). The Floating Wind Joint Industry Project (JIP) is looking for project proposals across four key challenge areas and one miscellaneous category, as summarised below. For further details, please refer to Section 3.

Challenge 1: Safe and cost-effective exchange of large turbine components offshore when floating foundation structures are moving due to wave motion.

When performing lift operations offshore from a floating moving vessel to a floating moving foundation structure, the relative motions between the lift vessel and structure makes such operations very challenging.

We are looking for technologies that allow effective and safe major component exchange offshore.

Challenge 2: Safe and cost-effective disconnection and re-connection of offshore foundation structures when they are removed from the wind farm and towed to port for major maintenance.

Before towing a structure to port, mooring lines and electrical power cables need to be disconnected. This operation can take several hours and be limited by available weather windows. When leaving the disconnected power cables and mooring lines behind, they need to be secured so that a re-connection of the structure is easily achievable once it returns to the wind farm. This may be several months after it has been removed. In the meantime, safe and stable operation of the remaining turbines in the wind farm must also be ensured.

We are looking for technology that will allow cost effective and safe disconnection and re-connection operations when turbine foundations are towed to port.

Challenge 3: Cost-effective monitoring and inspection of large numbers of mooring lines, cables and foundation structures.

Monitoring and inspection is time consuming and costly. Current technology and approaches - like the use of divers or Remotely Operated Vehicles (ROVs) - are not feasible considering the large number of assets that require monitoring.

We are looking for technology that allows cost effective, safe and reliable monitoring and inspection for offshore wind farms.

Challenge 4: Cost effective manufacturing, installation and maintenance of the large volume of mooring lines and anchors required in floating wind farms, often in challenging offshore conditions.

Mooring systems and their installations are important cost contributors, particularly given the large volume of mooring lines and anchors that must be installed and maintained in floating wind farms, often in challenging offshore conditions. There is considerable experience in this field from the oil and gas sector, however, the large number of mooring systems mean new innovations are needed to reduce cost.

We need methods, materials or technologies that allow for easier and safer installation, reduce maintenance requirements and lower the overall cost of mooring systems.

Miscellaneous: We are also looking for technologies that will reduce the cost of floating offshore wind, such as reducing installation times, improving ancillary hardware used with export cables, enabling serial fabrication or reducing maintenance requirements. Entries submitted under this category should provide details of the challenge their technology is overcoming.

It should be noted that while this competition will support projects to improve the design of existing floating wind platforms and/or turbines, the competition **will not fund** projects to develop new floating wind platform or turbine designs. Similarly, this project will support projects related to export cable ancillary hardware, but **will not fund** the design of dynamic export cables themselves. Finally, this competition **will not fund** projects primarily aimed at supporting fixed-bottom offshore wind turbines.

The Opportunity

1. Funding

This competition is funded by the Scottish Government and supported by the Floating Wind Joint Industry Project (Floating Wind JIP). £1m of grant funding is available in total, with up to £250k available for a single project. The Carbon Trust expects to support between four and ten projects through this competition. Please note that match funding according to State Aid regulations is required. For further details see Section 5.

2. Market opportunity

In Europe, offshore wind is now cheaper than new build coal or natural gas fired power generation and nuclear. Floating offshore wind, as an infant technology, still needs to achieve further cost reductions but the sector is developing fast. The 30MW Hywind wind farm off the coast of Aberdeenshire, Scotland became the first commercial scale floating wind farm when it started operating in October 2017. By 2030, Carbon Trust estimates that a further 12GW of floating wind capacity could be built globally, requiring around £32.4bn of capital investment.

3. Industry collaboration

This competition provides the opportunity to work with leading offshore wind farm developers. The Floating Wind JIP is a collaborative research and development initiative between the Carbon Trust and 14 leading international offshore wind developers: EnBW, ENGIE, Eolfi, E.ON, Equinor, Innogy, Kyuden Mirai Energy, Ørsted, ScottishPower Renewables, Shell, SSE, TEPCO, Vattenfall, and Wpd. Participating in this competition provides the opportunity to work with these leading developers and ensure that innovations will meet the needs of the market.

Key eligibility criteria

The competition is open to private companies, not-for-profit organisations and academic institutions, both in the UK and internationally, and we welcome entries from single companies and consortia. Members of the Floating Wind JIP and their subsidiaries may apply for funding under this competition but, if they do so, will not participate in the evaluation of entries. They must also demonstrate how they would manage any conflicts of interest throughout the competition.

The funding can be used to support technologies under any of the key challenge areas across a range of Technology Readiness Levels (TRLs)[1] from early stage proof of

[1] Offshore Wind Innovation Hub (2018): https://offshorewindinnovationhub.com/wp-content/uploads/2018/02/TRL-PDF.pdf

concept or lab testing (TRL 3-4) to supporting the delivery of an operational prototype (TRL 7).

The funding will be provided in the form of a grant and recipients will need to comply with State Aid rules. More details on State Aid requirements are provided in Sections 5 and Annex C.

Intellectual Property (IP)

Any IP generated during the project will remain the ownership of the project applicant(s). Following completion of the project, applicants have an obligation to try to exploit any IP generated during the project, and to protect it as required.

The Carbon Trust would require a (sub-licensable) licence to use arising IP (and any background IP as necessary), for the purposes of:

- **Review and compliance**: successful applicants must provide a sub-licensable license to the Carbon Trust, to allow them to review the deliverables submitted during the course of the project and comply with the terms of the grant agreement between Carbon Trust and Scottish Government
- **Use of IP by the Floating Wind JIP developers:** Carbon trust will sublicense the IPR generated to the Floating Wind JIP developers for the purposes of:
    - Reviewing the project deliverables.
    - Educational purposes (internal knowledge building)
    - Further research purposes and for the purposes of supporting commercial decisions. This includes using the project results for:
        - assessing the compatibility of a grant-funded technology with offshore wind assets owned by an offshore wind developer; and
        - assessing whether to invest in or collaborate with the Contractor to further develop the results);

    but not for the purposes of commercially exploiting the results.
- **Publication:** We will publish a short description of successful entries and a summary of the project outcomes at the end of the competition. Any further information published will be agreed with project applicants.

Application deadlines and project timelines

Application forms can be downloaded from the Carbon Trust's competition website. Competition entries must be received by 09:00 (UK time) on Tuesday 5th November, and sent via email to: FloatingWind@carbontrust.com. Further details on the application process are provided in the application form and in Section 9.

We expect projects to be able to start in December 2019 or January 2020. Projects **must** be completed by the end of January 2021.

Further information

Any questions about this competition should be sent to floatingwind@carbontrust.com
Clarification questions must be received before 09:00 (UK time) on Tuesday 29th October.

2 Context

2.1 The Floating Wind JIP

The Floating Wind Joint Industry Project (**Floating Wind JIP**) is a collaborative research and development initiative between the Carbon Trust and participating industry partners (collectively known as the **Floating Wind JIP developers**):

	EnBW (Energie Baden-Wurttemberg AG)		Ørsted
	ENGIE		Scottish Power Renewables
	Eolfi		Shell
	E.On Climate & Renewables GmbH		SSE plc
	Equinor ASA		TEPCO
	Innogy SE		Vattenfall Wind Power Ltd
	Kyuden Mirai Energy Co		Wpd (UK) Wind Power Limited

Supported by the Scottish Government, the JIP aims to investigate the challenges of, and opportunities for, developing commercial-scale floating wind farms. The Floating Wind JIP commissions projects to develop and de-risk technologies relevant to the construction, operation and maintenance of floating offshore wind.

Details of current projects supported by the Floating Wind JIP that are relevant to this competition are provided in Section 14 (Annex A).

2.2 Floating Wind JIP developers' role in the competition

The Floating Wind JIP developers will be involved in the competition throughout the evaluation and delivery stages. This will provide opportunities for applicants to engage with

the developers and understand the challenges they face in commercialising floating offshore wind, as well as provide visibility of future supply chain opportunities.

The Floating Wind JIP developers will support the evaluation of competition entries, together with Carbon Trust and an independent technical consultant(s). Further details on the evaluation process and criteria are provided in Section 11.

As part of the evaluation process, shortlisted applicants will be invited to present their project proposal to Floating Wind JIP developers on **Tuesday 3rd December, Wednesday 4th December or Thursday 5th December 2019.**

During the project, Floating Wind JIP developers will review and comment on project deliverables. Where Floating Wind JIP developers have a particular interest in a project, they may offer additional (non-financial) support and advice to project applicants, for example providing insights on the challenges they face and the technical requirements of solutions they use. This support will be at the sole discretion of each developer. Floating Wind JIP developers may talk to a number of project applicants during the course of the project.

There is no restriction on competition applicants working with Floating Wind JIP developers on a commercial basis following the completion of any projects funded under this competition.

Similarly, provided any conflicts of interest are appropriately managed, the Floating Wind JIP developers will not be restricted in their commercial operations due to their involvement in the competition and may also engage in other internal/external activities within the same topics areas as this competition before, during and after the competition.

3 Competition scope

3.1 Objective

The objective of this competition is to accelerate the development and de-risking of floating wind technology with a particular emphasis on mooring systems and operations and maintenance (O&M).

The Carbon Trust is looking for project proposals across four key challenge areas and one miscellaneous category

Challenge 1: Safe and cost-effective exchange of large turbine components offshore when floating foundation structures are moving due to wave motion.

Challenge 2: Safe and cost-effective disconnection and re-connection of offshore foundation structures when they are removed from the wind farm and towed to port for major maintenance.

Challenge 3: Cost effective monitoring and inspection of large numbers of mooring lines, cables and foundation structures.

Challenge 4: Cost effective manufacturing, installation and maintenance of the large volume of mooring lines and anchors required in floating wind farms, often in challenging offshore conditions.

Miscellaneous: Other technologies related to floating wind O&M (including port and logistical requirements).

It should be noted that while this competition will support projects to improve the design of existing floating wind platforms and/or turbine, the competition **will not fund** projects to develop new floating wind platform or turbine designs. Similarly, this project will support projects related to export cable ancillary hardware but **will not fund** the design of dynamic export cables themselves. Finally, the competition **will not fund** projects that are primarily intended to benefit fixed-bottom offshore wind.

Three of these challenge areas overlap with the ongoing research commissions by the Floating Wind JIP and described in Section 14 (Annex A). In addition, we are interested in receiving project proposals related to offshore wind monitoring and inspection, or any other technology related to floating wind O&M.

Key innovation needs within each technology challenge area have been identified and summarized below. These are for information only - the scope of each challenge area is not limited to these innovation needs, nor will applicants automatically be scored more highly if their technology addresses one of the innovation needs identified in this document. In the application form, applicants must describe the challenge that they have identified within the floating offshore wind sector and how their technology addresses this challenge.

Further information on the application process and scoring criteria are available in Sections 9 and 11 and in the application form.

3.2 Type of projects supported

The competition funding can be used to support a new technology development project under any of the key challenge areas (or the miscellaneous category) across a range of Technology Readiness Levels (TRLs)[2] - from early stage proof of concept or lab testing (TRL 3-4) to supporting the delivery of an operational prototype (TRL 7).

Successful applicants will each be expected to develop a technology concept in relation to one of the four key technology challenge areas defined below, or under the Miscellaneous category. The technology concept submissions should be designed to have the potential to be deployed cost effectively on commercial-scale wind farms. The Carbon Trust defines a commercial scale wind farm as one with a minimum capacity of 500MW, with a turbine size in the range of 10-15MW. Further details of the characteristics of a commercial scale floating offshore wind farm are provided in Section 15 (Annex B). We are particularly interested in technologies which are interoperable with several different floating wind platform and turbine designs.

3.3 Technology challenge areas

Challenges 1 and 2: Floating wind turbine and foundation maintenance

Considering the size of future floating wind farms, with around 50 foundation structures installed offshore, the Operations & Maintenance (O&M) requirements are considerable. In particular, the exchange of major turbine components - including blades, gearboxes, transformers, main bearings and power convertors - is a necessary part of offshore wind O&M. For fixed-bottom foundations (foundations in water depth of up to 60m that are installed on the seabed), processes for heavy maintenance are well-understood and carried out at scale on commercial wind farms. These operations make use of readily available jack-up vessels (a barge fitted with supporting legs which can be lowered onto the seabed to provide a stable platform during maintenance operations) and crane technology.

However, the use of these vessels is limited by water depth and they are therefore not suitable for use on floating turbines as these are typically installed in deep water locations. In addition, floating offshore wind turbines move more than their fixed-bottom counterparts, meaning that adjustments are required to existing maintenance methods to compensate for this movement.

[2] Offshore Wind Innovation Hub (2018): https://offshorewindinnovationhub.com/wp-content/uploads/2018/02/TRL-PDF.pdf

There are two proposed methods for floating wind maintenance:

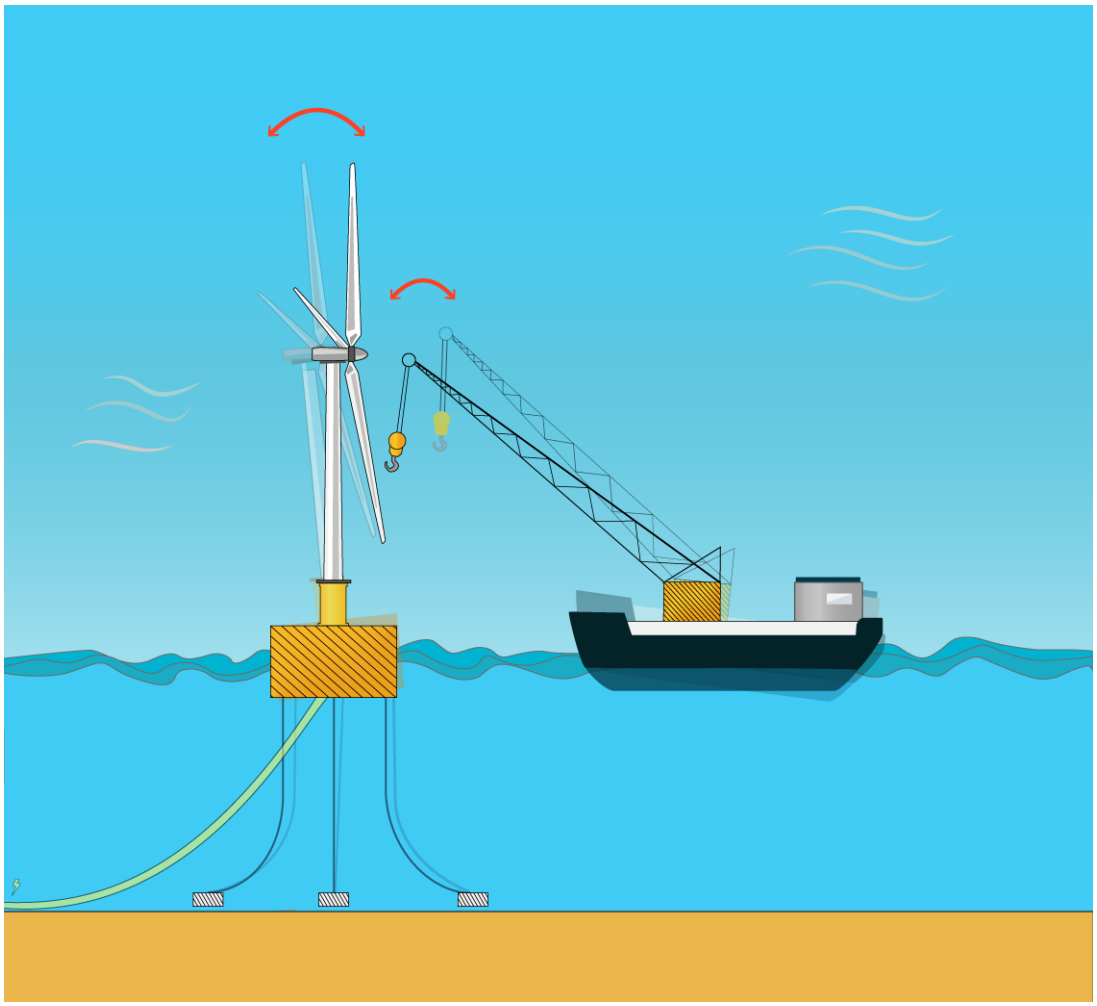
- Heavy lift offshore maintenance – developing solutions which can maintain floating wind turbines in-situ.
- Tow-to-port maintenance - developing solutions for temporarily removing a floating wind turbine, towing it to a port, carrying out maintenance at a port, and reinstalling the wind turbine offshore. Whilst the wind turbine is undergoing maintenance, the remaining infrastructure (namely the mooring lines attaching the floating wind turbine platform to the seabed, and the electrical inter-array cables exporting power from the turbine to the convertor station) must be made safe and accessible for when the turbine is reattached.

The Floating Wind JIP believes that there is merit in continuing to develop both solutions. The Carbon Trust's 2015 review of the floating wind sector[3] concluded that tow-to-port maintenance may be more cost-effective in the near term, and for windfarms close to ports, but that in-situ repairs may be preferable if cost-effective floating-to-floating heavy lift operations can be demonstrated. Offshore maintenance would also broaden the geographical range of economically viable floating offshore wind sites.

We are therefore, looking to address the following two challenges in relation to O&M:

[3] Carbon Trust (2015). Floating Wind Market and Technology Review: https://www.carbontrust.com/offshore-wind/floating/floating-wind-market-and-technology-review/

Challenge 1: Safe and cost-effective exchange of large turbine components offshore when floating foundation structures are moving due to wave motion.



Challenges

When performing heavy lifts from a floating vessel to a floating substructure, the relative motion between the lift vessel and substructure will result in high demands on the vessel's dynamic positioning system, restricting their operating conditions. The required accuracy of the cranes on these vessels will be very high – approximately < 5cm tolerance at a lift height of 120m. This accuracy is currently achieved by compensating or anticipating motions using:

- Three degrees of freedom (3DoF) motion compensated cranes at either the pedestal (base) of the crane or at the lift head; and
- Vessel motion tracking technologies, which aim to match crane movements to the floating platform movements.

However, as turbine sizes, and therefore hub[4] heights increases, there will be a requirement for either:

- cranes with a higher reach than the currently available; or
- craneless technologies, such as taut-wire systems or climbing cranes (cranes attached to a wind turbine tower which move up the tower as it is constructed), to undertake large component exchange and maintenance at nacelle level.

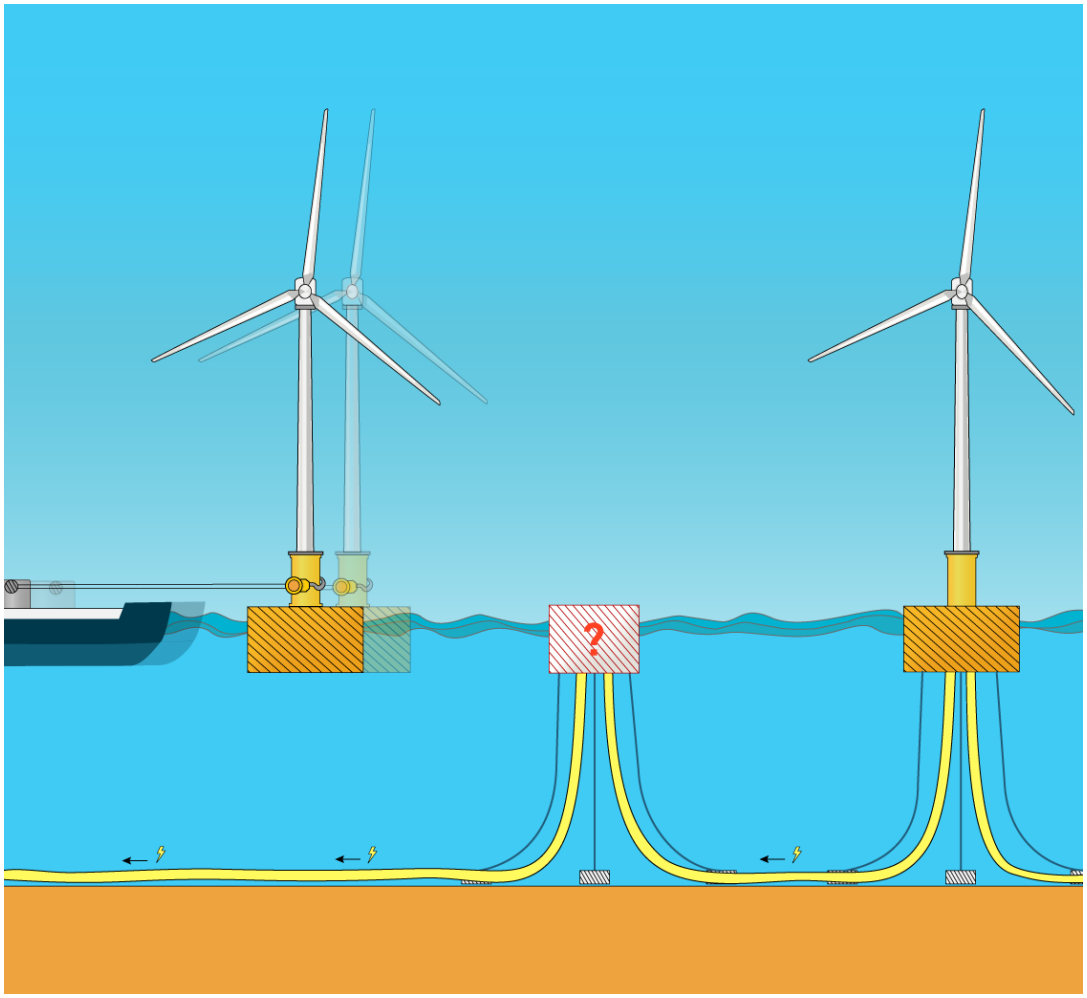
Key innovation needs

This competition welcomes any technology ideas that support the cost effective and safe development of heavy lift offshore maintenance processes. This could include, but is not limited to:

- Floating crane vessel solutions which can safely carry out a range of component replacements (in terms of size and weight). This could be achieved through 3DoF motion compensation, local load control and/or vessel motion tracking.
- Mobile crane solutions, such as climbing cranes.
- Crane-free solutions, such as guyed taut-wire systems and other enabling technologies.
- Supporting technologies and components, such as bumpers and guiding systems, that can enable lifts to be carried out safely in challenging weather conditions (e.g. nacelle cranes - small cranes located within a wind turbine nacelle - which can aid the operation of a climbing crane by lowering a guide rope which is attached to the climbing crane).

[4] The component connecting the wind turbine blades to the main tower.

Challenge 2: Safe and cost-effective disconnection and re-connection of offshore foundation structures when they are removed from the wind farm and towed to port for major maintenance.



Challenges

Tow-to-port maintenance comprises three main stages:

- Uncoupling (and recoupling) the wind turbine and wind turbine platform from both the mooring lines attaching the turbine to the seabed, and the electrical array cables (66kV) which feed power generated from each offshore turbine to the offshore convertor platform. The complexity of disconnection means that this process could take several hours and may be limited by weather windows.
- Towing offshore wind turbines to and from port, where the maintenance activity takes place.
- Managing remaining infrastructure while the turbine and platform have been removed (an out-of-service arrangement). For example, a dummy buoy, daisy-

chain 66 kV array cable connector (to ensure linked turbines stay connected and generation can still be exported from remaining turbines) or a replacement platform to keep the mooring lines and array cables in position to allow reconnection.

Some mooring systems, such as tension leg platforms (TLP), semi-taut and taut-leg moorings require tensioning prior to platform (re)coupling. Any out of service arrangement would need to have the capacity to restore this mooring line tension when the floating platform is recoupled.

In addition, any technology concepts must be able to withstand being submerged for extended durations (potentially the entire lifespan of the floating platform) both in and out of use, whilst still maintaining full functionality when required.

Technologies developed to enable tow-to-port maintenance must be cognisant of the O&M strategy of the wind farm developer and the impact this has on the cost-benefit of tow-to-port maintenance relative to offshore heavy lift maintenance. If a technology enabling tow-to-port maintenance (e.g. a quick release system) must remain in situ for the duration of the project lifetime, it will only be used a limited number of times. Consideration must also be given to the maintenance requirements and reliability of the tow-to-port enabling technology itself.

Key innovation needs

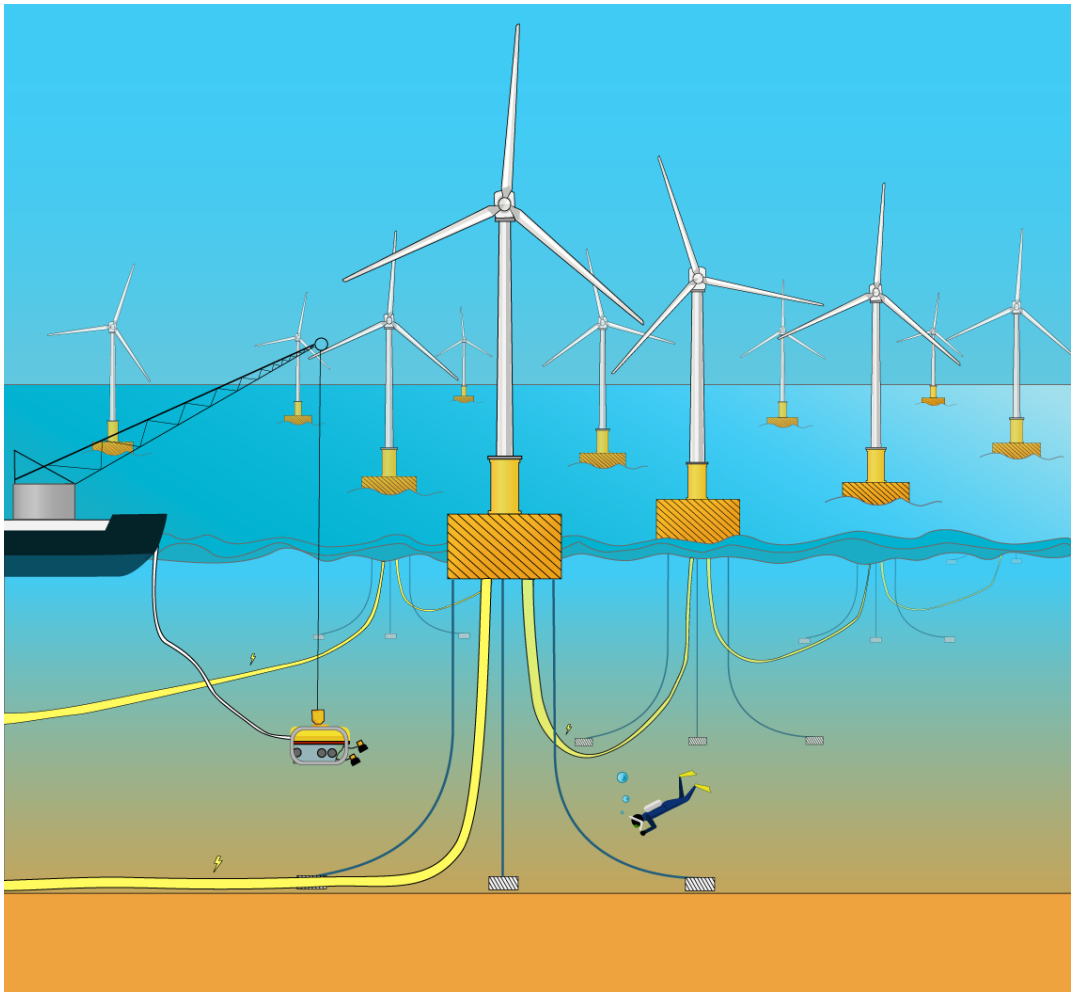
This competition welcomes any technology ideas that support the cost effective development of tow to port maintenance processes. This could include, but is not limited to:

- Cable connectors for 66kV dynamic cable, including electrical circuitry and out of service arrangements.
- Mooring connectors, to allow for platforms to be disconnected and reconnected efficiently.
- Logistics and operations of the disconnect and reconnect process within a large scale offshore wind farm - such as systems to improve the recovery and deployment of mooring systems, and the handling of floating platforms, as well as solutions for temporary anchoring and storage.

Challenge 3: Monitoring and Inspection

In addition to the exchange of major turbine components, ensuring the integrity of assets in an offshore wind farm over the full lifetime is an integral part of O&M activities.

Challenge 3: Cost-effective monitoring and inspection of large numbers of mooring lines, cables and foundation structures.



The challenge

Ensuring the integrity of assets in an offshore wind farm over the full lifetime of the project is vital to maximising the economic value for its owners. While monitoring and inspection technologies exist in both the fixed offshore wind and offshore oil and gas industries, the associated cost and risk profile will differ for floating wind farms. They may require alternative technologies and methodologies to monitor, inspect, and maintain a large number of assets across the wind farm. There is, therefore, a need to identify technology innovations that could reduce requirements and associated costs. In addition, these monitoring and inspection technologies must themselves be reliable, cost efficient and not require extensive maintenance over the lifetime of the wind farm.

Current guidance on monitoring and inspection is largely based on experience with vessels and oil and gas infrastructure where there are a small number of high-value assets. These advocate relatively frequent inspections of each structures. Following these same guidelines for offshore wind farms is likely to add cost to a project and not be a cost effective means of monitoring the site. The development of new monitoring techniques could also add to a cross-sector body of evidence on monitoring requirements for offshore wind farms.

Key innovation needs

This competition welcomes any technology ideas that support the cost effective development of monitoring and inspection technologies. This could include, but is not limited to:

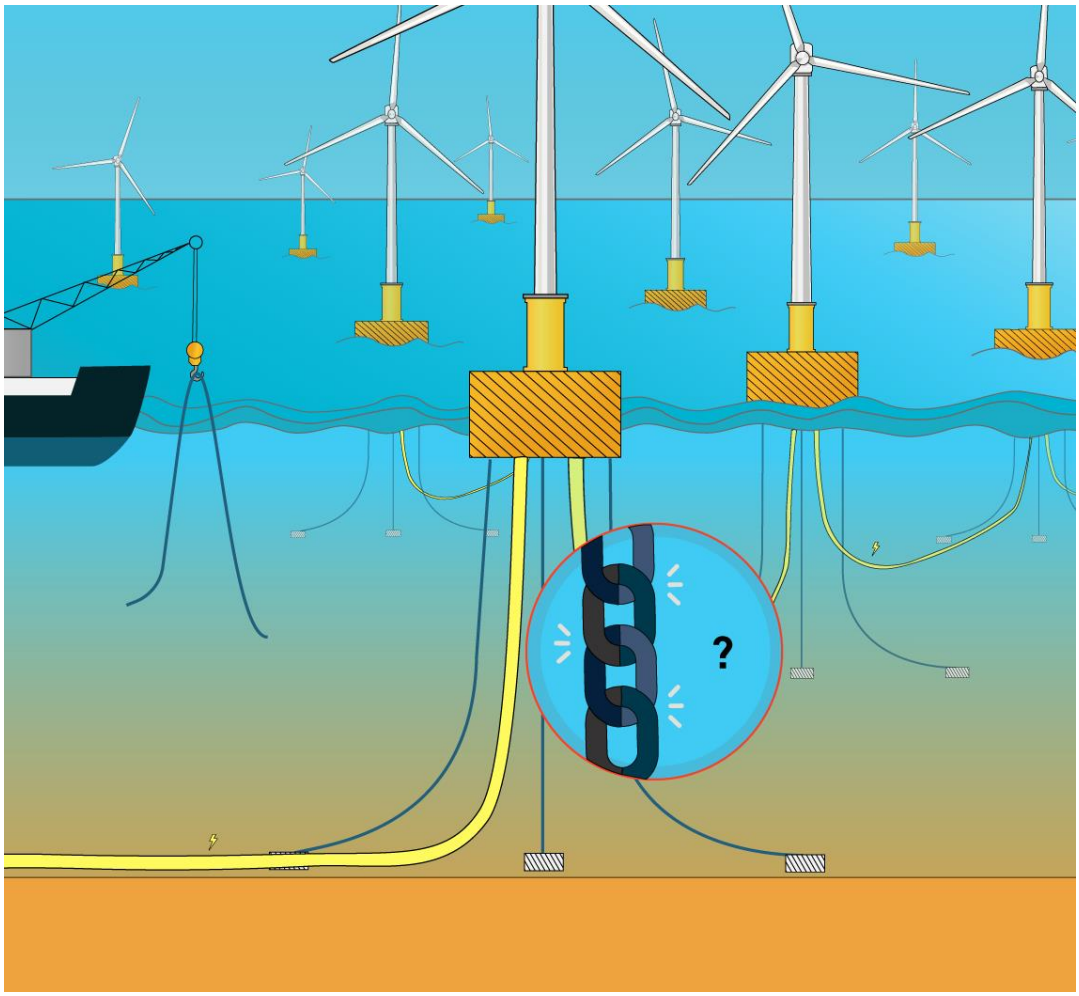
- Cost-efficient technologies to monitor, inspect, and maintain key assets, many of which are unique to a floating wind farm (namely: hull, ballast system, mooring lines, anchors and cabling). Technologies could also take a holistic approach to monitoring across the turbine, floating platform and mooring system. These technologies could include unmanned surface and subsea vessels.
- Monitoring techniques that enable better understanding of operational loads. These findings could inform future design requirements that could be less conservative without reducing asset integrity. This could include embedded sensors or digital twins (a digital replica of an offshore structure).
- Software to streamline the post-processing and analysis of the vast quantities of data from sensors and inspection technologies and to support decision making. Automation of the monitoring process could lower costs to developers.

The project proposal could include liaison with certification agencies to define and develop new or improved standards for floating wind related to safety factors consequence classes, etc.

Challenge 4: Mooring systems

Mooring systems and their installations are important cost contributors, particularly given the large volume of mooring lines and anchors that must be installed and maintained.

Challenge 4: Cost effective manufacturing, installation and maintenance of the large volume of mooring lines and anchors required in floating wind farms, often in challenging offshore conditions.



Key challenges

The mooring and anchoring system is a critical component of floating wind devices. While there is considerable experience in this field from the oil and gas sector, there are some key differences with the floating wind sector which present key economic and technical challenges:

Cost. In the oil and gas industry, mooring systems are often part of single, high value assets (such as Floating Production, Storage and Offloading (FPSO) vessels). As a result, initial mooring costs are a relatively small percentage of total capital. A floating wind farm will

require a much larger number of mooring systems (between 150-200 mooring lines for a 50 turbine commercial scale wind farm), representing a larger percentage of total capital expenditure. As such, developing mooring systems with both lower production and installation costs could deliver important cost reductions to floating offshore wind.

Understanding load characteristics. While considerable experience and expertise exists from the oil and gas sector, the behaviour of floating offshore wind turbines introduces new load characteristics that require further research in order to reduce fatigue and failure probabilities. Indeed, statistics from oil and gas suggest that mooring line failures are not just possible but likely to occur across a fleet of floating wind assets. However, their occurrence and impact can be reduced with adequate design redundancy and appropriate planning.

Increasing generation. A well-tuned mooring system can increase the yield of a floating offshore wind turbine by maintaining dynamic stability during increased wind and wave loads.

Reliability: Mooring systems have relatively high failure rates considering experience from the oil and gas industry. Reliable mooring systems without the need for redundant systems are vital for the floating offshore wind industry.

Key innovation needs

A wide variety of systems are being implemented and the Carbon Trust recognises that there are a number of different mooring and anchoring solutions available to technology developers with limited convergence towards a single solution;. Therefore, this competition welcomes any technology ideas that support the cost-effective development of mooring systems. This could include, but is not limited to:

- Low cost production, installation and maintenance methods for mooring systems, including the use of new material and designs (particularly those suitable for high volume production and which are compatible with a number of platform designs). Examples include using synthetic mooring line materials instead of conventional steel chain and wire moorings. Ways of demonstrating their behaviour over the long term (25-30 yeas) would also be beneficial. These new designs should consider the trade-off between redundancy and reliability – ideally delivering reliable mooring systems without requiring further redundancy requirements.
- Novel developments in top connectors to improve ease of connection, including required bollard pull, connection time, and met-ocean limitations.
- Novel developments in anchor to reduce installation time, improve placement precision and minimise piling requirements. Technologies which enable shared anchors or mooring arrangements would also be of interest.

- Technologies to improve the response between mooring lines and the platform to optimise movement (reducing pitch and roll) and increase generation (e.g. tuning systems).
- Technologies to improve reliability and robustness of mooring systems without significant cost increases or need for duplicate systems.
- Linked to the monitoring and inspection technology challenge (Challenge 3), robust sensor and monitoring systems for mooring systems.

3.4 Other technologies related to floating offshore wind

This final category covers other floating wind technologies that will reduce the cost of floating offshore wind such as: reducing installation times, improving ancillary hardware used with export cables, enabling serial fabrication or reducing maintenance requirements. This could include novel technologies or approaches related to ports, infrastructure and logistics used in the floating wind sector.

Out of scope

It should be noted that while this competition will support projects to improve the design of existing floating wind platforms and/or turbine, the competition **will not fund** projects to develop new floating wind platform or turbine designs. Similarly, this project will support projects related to export cable ancillary hardware but **will not fund** the design of dynamic export cables themselves. Finally, the competition **will not fund** projects that are primarily intended to benefit fixed-bottom offshore wind.

Other innovation needs

- For ports, the ability to fabricate, assemble, install, maintain and decommission offshore wind turbines using lower cost and optimised infrastructure is a fundamental part of the business case for floating wind technology. The infrastructure and logistics requirements should consider the size and weights of components for the larger future turbines (10MW+), and the requirement in the case of systemic failure when components from several turbines may need to be changed.
- Technologies enabling serial production methods for floating wind structures during both the construction and O&M, particularly in the case of systemic failure.
- Solutions for the commercial-scale serial production and assembly line of floating platforms.
- Solutions improving ancillary hardware related to dynamic cables, including the design and installation of, for example:

- bend stiffeners (to prevent cable damage as a result of cables bending too much);
- buoyancy modules (to keep cables at an appropriate depth of water);
- ballast modules (to provide additional weight to cables to ensure the shape of the cable is correct);
- touchdown point protection (cable protection at the point the cable reaches the seabed); and
- connection/combination of mooring lines and dynamic cables

4 Funding

The Scottish Government has provided a total of £1m of grant funding for this competition, with up to £250k available for a single project. The Carbon Trust expects to support between five and ten projects through this competition.

As the funding is a grant, successful applicants **must** ensure that their project is compliant with State Aid. More details on State Aid requirements are provided in the following Sections 5 and Annex C.

As stated in Section 2, applicants will also have the opportunity to discuss their projects with the Floating Wind JIP developers during both the evaluation and delivery stages. Floating Wind JIP developers can also provide technical advice during the project and may continue to work with successful applicants following the completion of the competition projects.

The Carbon Trust reserves the right not to award any grant funds and to terminate the competition at any stage, without any liability to applicants.

5 Eligibility requirements

5.1 State Aid

Grant funding under this competition is offered within the remit of Article 25 of the GBER: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02014R0651-20170710

Further information concerning State Aid funding is provided in Annex C. Applicants are individually responsible for compliance with State Aid law and are therefore strongly advised to review State Aid guidance in full and seek independent legal advice if appropriate.

Maximum state aid funding intensities towards eligible costs are shown below

EU State Aid guidance	Small enterprise	Medium enterprise	Large enterprise
Industrial research	70%	60%	50%
Industrial research with collaboration uplift	80%	75%	65%
Experimental development	45%	35%	25%

EU State Aid guidance	Small enterprise	Medium enterprise	Large enterprise
Experimental development with collaboration uplift	60%	50%	40%

Guidance on the definitions of small and medium enterprise can be found here: https://ec.europa.eu/regional_policy/sources/conferences/state-aid/sme/smedefinitionguide_en.pdf

Where consortium partners are universities and not for profit research and technology organisations, activities they carry out may be funded at up to 80% of full economic costs, as long as the activities are considered to be 'non-economic' activity i.e. activities which couldn't be tendered and delivered by private sector organisations, and where the results will be disseminated widely.

During the application process, applicants will be required to declare the percentage of grant funding they require through this competition and provide assurances that suitable funding has been or can be accessed for the remainder of the project costs[5]. Applicants should note that State Aid provided under the General Block Exemption Regulation (GBER) cannot be cumulated with State Aid from other public sources and therefore applicants must ensure that total public funding for the project does not exceed aid intensity thresholds. If applicants are shortlisted to present at the meeting on December 3rd, 4th or 5th they will be expected to provide additional details of their proposed funding arrangements at, or in advance of, that meeting. Small and medium enterprises will also need to confirm their eligibility to be classed as such.

As part of the application process, the applicant must provide a breakdown of eligible costs under each of the cost categories set out Article 25(3) of the GBER. Further details on the application process are provided in Section 9.

The UK may leave the EU during the course of running this competition or the delivery of projects funded by this competition. The UK Government's guidance on State Aid in the case of a 'no-deal' Brexit[6] is that current State Aid rules will be transposed into UK domestic legislation under the European Union (Withdrawal) Act. Applicants should assume that

[5] This can be a monetary or in-kind contribution, such as provision of equipment to be used in testing, or provision of currently employed staff members' time for the project. Note that when using staff members, ensure that only the time that is actually allocated to the project can be accounted for.

[6] HM Government (2019). State Aid if there's no Brexit deal. https://www.gov.uk/government/publications/state-aid-if-theres-no-brexit-deal/state-aid-if-theres-no-brexit-deal

they would be required to comply with current State Aid rules for the duration of their proposed projects.

5.2 Financial due diligence

Developing innovative technologies always carries an element of risk and this competition is open to a wide range of organisations, from SMEs to large established firms.

When issuing grant funding, the Carbon Trust must make an assessment of the risk associated with funding a project. Conducting due diligence on the financial management of organisations we fund is an important part of the evaluation process.

As part of the evaluation process, the Carbon Trust will make an assessment of the financial viability of each applicant and ensure that the information provided in this application matches publically available information (e.g. through Companies House). We may also obtain a credit check on the financial health of organisations.

As part of the application process we therefore request that each organisation within an application provides the following information:

- Registered company name and number
- Names of company directors
- Summary accounts from the previous two financial years.

Where concerns are raised during the due diligence process, the Carbon Trust may request further information from applicants and/or discuss how risks identified could be mitigated.

The Carbon Trust reserves the right not to award any grant funds to organisation(s) where financial risks cannot be adequately mitigated.

5.3 Eligible organisations

This competition is open to public, private and not-for-profit companies and academic institutions, both in the UK and internationally, and we welcome entries from single companies and consortia. Where applications are received from consortia, the applicant must nominate a lead contractor who will receive the aid. All other co-contractors must be listed in the application.

Members of the Floating Wind JIP and their subsidiaries may apply for funding under this competition but will not participate in the evaluation of entries if they do so. During the delivery of the competition, they must also demonstrate how they would manage any conflicts of interest.

5.4 Eligible project types

The funding can be used to support technologies under any of the key challenge areas across a range of Technology Readiness Levels (TRLs)[7] from early stage proof of concept or lab testing (TRL 3-4) to supporting the delivery of an operational prototype (TRL 7).

5.5 Conflicts of interest

All applicants must confirm whether their participation in this competition poses a conflict of interest. Where a conflict is identified, appropriate mitigation measures must be outlined in the application form. Applications which cannot demonstrate adequate protocols for managing conflicts of interest will not be selected.

6 Terms and conditions

A draft grant agreement between the Carbon Trust and successful applicants has been provided alongside this document. Applicants should review this document and provide any comments on the terms and conditions of the grant agreement as part of their application. **If applicants do not provide any comments on the grant agreement, it will be assumed that that applicants accept the terms and conditions in full.**

Given the tight timescales for delivering projects using the grant funding, please be aware that we will be unable to make significant changes to the terms and conditions.

The Carbon Trust retains the right to terminate negotiations on the terms of the grant offer letter if protracted contract negotiations make it unlikely that the project will be delivered within the project timescales.

7 Intellectual Property Rights

Details of Intellectual Property Rights (IPR) are detailed the draft grant agreement provided alongside this document (Appendix E). The main points of this draft are summarized below. If there is any discrepancy between the draft grant agreement and the wording in this document, the wording in the grant agreement will take precedence.

- **Ownership of IPR generated during the project:** any results from the project will remain the ownership of the successful applicant.
- **Exploitation of IPR generated during the project:** successful applicants must use all reasonable endeavors to exploit the results from their project (the IPR generated). Applicants must ensure their IPR is suitably protected.

[7] Offshore Wind Innovation Hub (2018): https://offshorewindinnovationhub.com/wp-content/uploads/2018/02/TRL-PDF.pdf

- **Sharing IPR with the Carbon Trust**: successful applicants must provide a sub-licensable licence to the Carbon Trust, to allow them to review the deliverables submitted during the course of the project and comply with the terms of the grant agreement between Carbon Trust and Scottish Government
- **Use of IP by the Floating Wind JIP developers:** Carbon trust will sublicense the IPR generated to the Floating Wind JIP developers for the purposes of:
    - Reviewing the project deliverables.
    - Educational purposes (internal knowledge building)
    - Further research purposes and for the purposes of supporting commercial decisions. This includes using the project results for:
        - assessing the compatibility of a grant-funded technology with offshore wind assets owned by an offshore wind developer; and
        - assessing whether to invest in or collaborate with the Contractor to further develop the results);

    but not for the purposes of commercially exploiting the results.
- **Publication:** We will publish a short description of successful entries and a summary of the project outcomes at the end of the competition. Any further information published will be agreed with project applicants.

8 Competition and project timelines

The key dates for competition submissions, evaluation and delivery are set out in the table below.

Item	Date
Competition launched	Wednesday 11th September 2019
Deadline for clarifications	09:00 (UK time) Tuesday 29th October 2019
Deadline for applications	09:00 (UK Time) Tuesday 5th November 2019
Shortlisted applicants notified	By Tuesday 26th November
Presentation of shortlisted entries to Floating Wind JIP Developers	Tuesday 3rd, Wednesday 4th December or Thursday 5th December
Expected notification of successful entries	Friday 6th December
Contracts signed by	Thursday 19th December
Projects start	December 2019/January 2020
Projects completed (at the latest)*	31st January 2021

**All project activity must be completed by 31st January 2021 to allow for final deliverable review and acceptance by the end of the financial year. Therefore it is recommended to plan for completion by December 2020, to allow for any unforeseeable delays.*

9 Submitting an application

This section provides specific guidance on completing each of the application form sections. Applicants should read this guidance prior to completing the application form (Word) and cost template (Excel) from the Carbon Trust website. If applicants need any further guidance or have questions on completing the form, they are encouraged to contact the Carbon Trust at floatingwind@carbontrust.com.

The structure of this section follows the application form. For information regarding State Aid rules please refer to Annex C. Applicants are reminded they are responsible for ensuring compliance of their project and partnership with State Aid Rules.

9.1 Eligibility Criteria and Document Checklist

This section is not marked but must be completed in order for an application to be deemed eligible. Please complete the checklists and provide copies of supporting documentation alongside your submission of the application form to floatingwind@carbontrust.com

9.2 Understanding of technology challenge (Section 1)

In accordance with the Assessment Criteria, there is a 5% weighting to this section and allowance of 1 page A4 at size 11 Calibri font.

This section is intended to provide an introduction to the challenge(s) in the floating offshore wind sector your technology intends to address. Please provide a brief summary of these challenges and the impact they are having on deployment of floating offshore wind. These impacts could include (amongst others) high costs, safety concerns and technical performance of the wind farm.

9.3 Description of the proposed technology concept and how it addresses identified challenges (Section 2)

In accordance with the Assessment Criteria, there is a 25% weighting to this section and allowance of 5 pages A4 at size 11 Calibri font. Supporting Evidence can be provided in a separate document. These should be listed in the introduction of the application form.

The questions in this section are split into two sub-sections – Technical Overview and Operational Constraints. An overall score will be given to the answers in this section – there is no fixed allocation of marks between each sub-section

Technical Overview

The intention of this section is to understand the technology or process that you are looking to develop and how it will address challenges faced by the offshore wind industry. In this section:

- Please describe your technology and how it operates. This could include a description of the sequence of operations and the timescales for these. Pictures or diagrams of the technology should be provided where they support the description of the technology.
- Linking back to your response in Section 1 (Understanding of Technology Challenge), please describe how your technology will address these challenges. This could be a qualitative description. Where quantitative data on the impact of the technology is available (e.g. capital cost reduction or improvement in operational efficiency), please state this along with the key assumptions behind this calculation.
- Please describe the innovative aspects of your technology. This could include the use of a novel material, process or adaptation of an existing technology.

Operational constraints

The intention of this section is to understand the environments in which you technology could operate. The application form lists a number of constraints. Where data for these constraints are available, please include it in the application form. Where data is unavailable, or the information is not relevant to your technology, please note this under the relevant heading in the application form.

Please note that the technology concept submissions should be designed to have the potential to be deployed cost effectively on commercial-scale wind farms. Key parameters of a commercial scale wind farm and 10MW and 15 MW turbines are included in Annex B operational

9.4 Interoperability with floating wind turbines and designs (Section 3)

In accordance with the Assessment Criteria, there is a 15% weighting to this section and allowance of 1 page A4 at size 11 Calibri font.

The intention of this section is to understand the extent to which your technology is compatible with different floating wind turbine and platform designs. A design which is compatible with a number of different turbine/platform designs will score more highly in this section.

Please comments on the extent to which any modifications to floating platforms or wind turbine are required in order to use your technology. Please also comment on whether your technology is critically dependent on other systems. Supporting information, such as a FMECA (failure mode, effects and criticality analysis) can be provided as supporting evidence in addition to this section. However, please note that we cannot guarantee to review all supporting evidence, therefore any key points should be included in the application form.

9.5 Commercialisation Plan (Section 4)

In accordance with the Assessment Criteria, there is a 15% weighting to this section and allowance of 3 pages A4 at size 11 Calibri font.

The intention of this section is to understand the current development stage of the technology, the extent to which it will be progressed as a result of the grant funding, and the next steps required to commercialise the technology.

This competition is open to a wide range of TRLs (3-7). Technologies will not be scored on their starting TRL. The assessment in this section is on the clarity and robustness of the proposed steps to commercialisation, and the extent to which Intellectual Property (IP) is appropriately managed.

In this section, please provide information on:

- The current TRL of the technology (and any evidence supporting this assessment)
- The expected TRL at the end of the grant-funded project
- The next steps towards commercialisation following the grant project and details of any preferred business models you have identified.
- Current IP associated with the technology and how this is protected.
- The type of IP that is likely to be generated as part of the project and how this will be protected.

9.6 Project Plan and Deliverables (Section 5)

In accordance with the Assessment Criteria, there is a 15% weighting to this section and allowance of 3 pages A4 at size 11 Calibri font.

The purpose of this section is to understand how the grant funding will be used to develop the technology proposed, and to assess whether the project plan is robust and deliverable. The purpose of this section is also to assess whether the deliverables proposed will provide a clear and comprehensive overview of the project, its methodology and results.

In this section, please give a summary of the proposed project covering the following topics:

- Description of the what will be delivered and demonstrated during the project
- Overview of key activities during the project

Please also provide a summary of the aims and objectives of the project and the criteria you will use to judge the success of the project.

In section 5.3 of the application form, please provide an overview of each work package and the deliverables you will produce as part of these deliverables. These deliverables should provide sufficient detail to enable the Carbon Trust and Floating Wind JIP developers to understand the objectives of the project, the methodology that has been followed, the results generated and the implication of these results for the development of the technology.

Alongside the application form, please also provide a Gantt Chart detailing the duration of each work package and the dates of key deliverables. No template for the Gantt chart is provided – please use your own.

9.7 Project team and approach to risk management

In accordance with the Assessment Criteria, there is a 15% weighting to this section and allowance of 5 pages A4 at size 11 Calibri font. This page limit excludes the space taken to list the details of each project participant.

As part of the project participant details, please state whether the organisation is a small, medium or large enterprise according to State Aid criteria. Further information on these definitions can be found here: https://ec.europa.eu/regional_policy/sources/conferences/state-aid/sme/smedefinitionguide_en.pdf

The purpose of this section is to assess the strength of the team involved in the project and how they will work together. This section also assesses how the team approach risk management from both a project and health and safety perspective.

In sections 6.1 and 6.2 of the application form, please provide details of team members who will be working directly on the project, their role in the project and how they will be organised. CVs for core team members should be provided alongside the application form.

Any previous experience of the project team working together should be provided in section 6.2.

In sections 6.3 and 6.4 please describe how you will approach project and health and safety risks. Please also provide a table of risks and mitigation actions, for key project and health and safety risks. This can be provided as part of the application form, or as a separate document.

9.8 Project costs and value for money (Section 7)

In accordance with the Assessment Criteria, there is a 10% weighting to this section and allowance of 5 pages A4 at size 11 Calibri font.

The purpose of this section is to assess the total cost of the project, and the proportion of grant funding the applicant is seeking. These details should be included in the table in this section of the application form.

Details of any other public funding which have/are being used to develop the technology should also be listed here.

A detailed cost breakdown should be provided by completing the Excel Cost Template provided along with the application form. Further details on calculating day rates are provided in Section 10, below.

A letter of commitment (following the template provided along with the application form) should be provided on company headed paper. This should set out the additional sources of funding/in-kind contributions which will be used to support this project. This letter can also comment on the financial status of one or more of the project participants if useful.

9.9 Terms and Conditions (Section 8)

This section is not marked. However, please note that due to the tight timescales for the project, we will not be able to enter into protracted negotiations with successful applicants.

The draft grant agreement is provided alongside the application form. In this section please note any changes you would need to make to the grant agreement. If you wish, you can also provide a marked up copy of the agreement.

If you have no comments on the grant agreement please confirm this by checking the appropriate box.

9.10 Conflict of Interest (Section 9)

Please use this section to identify any conflicts of interest as a result of your participation in the project, and proposed mitigation steps. This section is not marked, but we will only be able to provide funding to applicants who can appropriately manage any conflicts of interest.

9.11 Due diligence (Section 10)

Please use this section to:

- Provide details of any ongoing or pending legal actions against any project participants
- Confirm that you have provided a statement of insurances along with the application form and confirmed that you will keep these valid for the duration of the project

- Confirm that you have provided a summary of the last two years of accounts for each project participant along with the application form

9.12 Final document checklist

Please submit your completed application, along with the following documents and any additional supporting information to floatingwind@carbontrust.com by 09:00 (UK time) on Tuesday 5th November.

- Gantt Chart
- CVs for core project team members
- Risk register – project (if applicable)
- Risk register – HSE (if applicable)
- Cost template (Excel)
- Letter of Commitment (using template provided)
- Statement of insurance
- Two years of Company Accounts for each project participant

10 Completing the Cost Template

The cost template is provided alongside the application form and includes instructions on completing it. Applicants should populate the template with details of the State Aid eligible costs they expect to incur. Costs must be broken down by work package and by the applicant incurring the cost, under the following headings:

- Labour and Overheads
- Capital Equipment, Buildings and Land
- Subcontractor costs
- Other costs

Applicants must also provide details of the percentage of the project costs they wish to apply for as part of this competition, and details of how remaining project costs will be met. The section below provides further details on calculating staff costs.

10.1 Calculating staff costs and day rates

It is essential not to include non-eligible costs as part of your staff cost and day rate calculations.

The day rates you provide in the cost template (which should be submitted alongside the application form) should be the actual direct staff costs for each planned staff member working on the project (e.g. engineers, project managers, technicians, etc.).

Calculate direct (gross) project labour costs based on your PAYE records. These should include gross salary, National Insurance (NI), company pension contribution, life insurance or other non-discretionary package costs.

The following costs are not eligible for inclusion:

- discretionary bonuses or performance related payments of any kind
- time spent not working directly on the project (e.g. sick, non-productive time or training)
- dividend payments
- forecasted pay increases

Day rates should be based on the direct costs of employing staff and should not include overheads. Overheads are listed separately (see section below). Day rates should not include any element of profit. Consultancy charge-out rates should not be used.

To calculate the day rate:

Day rate for particular grade/role = Direct (gross) annual employment cost (salary, NI, pension etc) for that role ÷ number of staff working days per year (usually 260 days minus your organisation's annual leave entitlement and bank holidays)

The Labour & Overheads worksheet in the cost template should then be populated with these data.

Note that only time directly allocated to the competition project can be claimed (at the relevant funding intensity), and staff will need to keep timesheets to record time worked on the project.

A breakdown of claimed overhead costs must be provided. Only overheads that are attributable to the project can be claimed (whether direct or indirect).

11 Competition scoring criteria

All applications will first be assessed on whether they meet the eligibility criteria set out in Section 5.

Eligible applications will be evaluated based on the scoring criteria set out below. All applications will initially be reviewed by the Carbon Trust and a consultant(s) who will be supporting the technical evaluation. A long-list of bids will be shared with Floating Wind JIP developers who will evaluate these bids and be involved in shortlisting the bids for the workshop.

Applications(s) will be shortlisted to attend the workshop on the 3rd, 4th or 5th December based on their marks against the scoring criteria below. The scoring criteria and their relative weighting is shown below.

Criterion	Score [%]
1. Understanding of technology challenge, including specific area of focus	5%
2. Description of the proposed technology concept and how it aims to address the above challenge	25%
3. Extent to which the proposed technology concept is interoperable with a wide range of floating wind turbine/platform designs	15%
4. Plan for the future development of the proposed technology concept, including commercialisation plan where relevant	15%
5. Clear and robust project plan with appropriately detailed deliverables	15%

6. Strength of team and risk management approach (project and health & safety)	15%
7. Value for money	10%

12 Information disclosure

The information that applicants provide in this application form will be treated in the strictest confidence by the Carbon Trust but will not be covered by a formal non-disclosure agreement (NDA) between you (the applicant) and the Carbon Trust at this stage. Should your application be shortlisted for the workshop on DATE], the Carbon Trust would put in place an NDA to cover any further information sharing.

The information in this application (and any supporting information provided) will only be used as follows:

a) For the evaluation of the application for grant funding under the Floating Wind Technology Acceleration Competition. For this purpose, the information will be seen by Floating Wind JIP developers, supporting experts within the Carbon Trust, and the technical consultants LOC. The sharing of information between the Carbon Trust and these external organisations is covered by NDAs.
Where any applicant to the competition, or a Floating Wind JIP Developer identifies a conflict of interest (e.g. a subsidiary of a floating wind JIP Developer decides to apply for this competition), that Floating Wind JIP Developer will not be involved in the evaluation of the applications and must manage any ongoing conflicts of interest throughout the delivery of the grant funding.

b) As part of the Grant Funding Agreement, if the application is successful.

c) To support the Floating Wind JIP's understanding of the innovations that can de-risk the future commercial-scale floating wind farms. To enable this, copies of relevant competition entry submissions will be passed to the lead contractors of three ongoing projects (focusing on Heavy Lift Offshore Maintenance, Tow to Port Maintenance and Mooring Systems) under NDAs with the Carbon Trust. These contractors are LOC, WavEC, Leask Marine, and First Energy Development. Reviews of submitted applications as part of an innovation landscape review within the scope of the above three projects will have no influence on the outcome of the Floating Wind Technology Acceleration Competition.

In the application form, applicants must confirm that they are happy for their information to be used for purpose a) described above. Failure to do so will mean that your application cannot be evaluated for the competition and will be disqualified. If you have any concerns

regarding information sharing under point a) above, please raise your concerns as early as possible by contacting the Carbon Trust at floatingwind@carbontrust.com.

Applicants must also confirm whether they are happy for their information to be used for purpose c) described above. This decision will have no bearing on the evaluation of their application.

13 Clarification questions

Any clarification questions regarding any document relating to the Floating Wind Technology Acceleration Competition should be sent to: floatingwind@carbontrust.com

As set out in Section 0, clarification questions must be received before 09:00 (UK time) on Tuesday 29th October. The Carbon Trust will periodically release a clarification log detailing the clarifications received and our response where these are beneficial to all applicants. We will not publish commercially sensitive questions or responses.

14 Annex A –Summary of ongoing Floating Wind JIP projects

The Floating Wind JIP is currently undertaking three projects relevant to three of the technology challenge areas covered by this competition and set out in Section 3.

- **Heavy lift maintenance** (Delivered by LOC and WavEC) - this project evaluates heavy lift offshore O&M operations for floating wind farms
- **Tow to port maintenance** (Delivered by LOC and WavEC) - this project evaluates tow-to-port maintenance strategies for floating wind farms
- **Mooring systems in challenging environments** (Delivered by Leask Marine, Wood Thilsted, First Energy Development and University of Exeter Consulting). This project evaluates mooring systems for shallow water (~70m), deep water (~1000m), seismic areas and difficult seabed conditions.

This competition will support the Floating Wind JIP's understanding of the innovations that can support the de-risking of the future commercial scale floating wind farms in relation to these three areas.

To enable this, as mentioned in Section 12, copies of competition entry submissions will be passed to the lead contractors of the above three projects under non-disclosure agreements (NDAs), where permission is granted by applicants. These contractors may subsequently request further information from applicants to assist these ongoing research projects. The competition applicants may request a separate NDA to cover the sharing of further information but will be under no obligation to provide such further information.

Review of submitted technologies within the scope of the above three projects will have no influence on the outcome of the Floating Wind Technology Acceleration Competition but will provide a further opportunity to the competition applicants to showcase their technologies to the members of the Floating Wind JIP.

Further information on these three projects is available on the Carbon Trust website: https://www.carbontrust.com/offshore-wind/floating/floating-wind-jip/

15 Annex B – Details of a commercial scale floating offshore wind farm

15.1 Baseline windfarm criteria

The table below summarises the key baseline criteria used by the Floating Wind JIP to define a commercial scale floating offshore wind farm:

Maximum windfarm capacity (MW)	750
Rated capacity of turbines (MW)	10 -15MW
Number of turbines:	50

NB: floater platform size will be assumed to have been scaled in proportion to turbine capacity. Basic scaled platform geometry can be provided to successful applicants on request.

15.2 Baseline water depth criteria

The table below outlines the definition of terms relating to water depth as used by the floating wind JIP. Shallow water is defined as the region where dynamic response of the floater will have a significant effect on mooring design. Deep water is defined as the region where material requirements will have a significant effect on mooring design.

Shallow water (m)	50-100
Median water (m)	100-500
Deep water (m)	500-1200

15.3 Reference turbine specifications

The tables below summarise the key characteristics of a 10MW and 15MW turbine.

Rated capacity:	**10MW**	Rotor diameter:	180 m
Hub height:	112 m	Hub mass:	100,000 kg
Blade length:	88 m	Tower mass:	884,090 kg
Blade mass:	40,000 kg	Tower top diameter:	5.0 m

Blade root diameter	4.0m	Tower bottom diameter:	6.5 m
Nacelle mass:	375,000 kg	Frequency range (soft-stiff):	0.185 – 0.207 Hz
Gearbox mass:	120,000 kg	Frequency range (stiff-stiff):	>0.54 Hz

Rated capacity:	**15MW**	Rotor diameter:	220 m
Hub height:	131 m	Hub mass:	180,000 kg
Blade length:	107 m	Tower mass (including internals):	1,620,430 kg
Blade mass:	65,000 kg	Tower top diameter:	6.0 m
Blade root diameter	5.0 m	Tower bottom diameter:	8.0 m
Nacelle mass:	575,000 kg	Frequency range (soft-stiff):	0.149 – 0.171 Hz
Gearbox mass:	200,000 kg	Frequency range (stiff-stiff):	>0.43 Hz

16 Annex C – State Aid

EU State Aid rules are designed to prevent unfair subsidies. The General Block Exemption Regulation (GBER) define a range of types of State Aid that are approved by the European Commission. Grant funding offered under this competition falls within the remit of Article 25 of the GBER: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02014R0651-20170710

The UK may leave the EU during the course of running this competition or the delivery of projects funded by this competition. The UK Government's guidance on State Aid in the case of a 'no-deal' Brexit[8] is that current State Aid rules will be transposed into UK domestic legislation under the European Union (Withdrawal) Act.

Applicants should assume that they would be required to comply with current State Aid rules for the duration of their proposed projects if successful in this competition.

This annex provides information on State Aid but should not be seen as a substitute for taking legal advice, which remains the responsibility of the applicant.

What costs are eligible to claim under State Aid rules?

The eligible costs of research and development projects are defined in Article 25 of the General Block Exemption Regulation (GBER).

Eligible costs comprise:

- personnel costs;
- costs of instruments and equipment to the extent and for the period used for the project (i.e. the depreciation costs corresponding to the life of the project);
- costs of buildings and land, to the extent and for the period used for the project;
- costs of contractual research, knowledge and patents;
- costs of consultancy; and
- additional overheads and other operating expenses, including costs of materials and supplies.

For full details of eligible costs see Article 25 – paragraph 3 of the GBER:

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02014R0651-20170710

[8] HM Government (2019). State Aid if there's no Brexit deal. https://www.gov.uk/government/publications/state-aid-if-theres-no-brexit-deal/state-aid-if-theres-no-brexit-deal

What level of funding is my organisation entitled to under State Aid rules?

Private sector organisations are eligible for different funding intensities dependent on the type of research and the sizes of organisations involved.

The funding intensity allowed under article 25 of the GBER depends upon the size of organisation and the type of activity undertaken. The maximum allowable funding intensities are shown in the table below:

Table: Allowable funding intensities (EU State Aid Guidance)

	Small Enterprise	Medium Enterprise	Large Enterprise
Industrial research	70%	60%	50%
Industrial research with collaboration uplift	80%	75%	65%
Experimental development	45%	35%	25%
Experimental development with collaboration uplift	60%	50%	40%

The definitions of industrial research, experimental development and collaboration can be found in the GBER document (Article 25, paragraphs 5-7). The definition of conditions that must be fulfilled for collaboration uplift can also be found in Article 25, paragraph (6)(b).

It is possible for a project to include a mixture of both industrial research and experimental development, with the funding intensity calculated on a pro rata basis.

State Aid compliance is a legal requirement and the risk of non-compliance rests with the grant recipient. In the event of non-compliance, there may be a requirement to repay any funding received. The applicants may wish to seek independent advice on compliance with state aid rules.

Universities and research organisations may be funded up to 80% of eligible costs

Where consortium partners are universities or not-for-profit research and technology organisations (RTOs), their activities may be funded at up to 80% of full economic costs, as long as the activities are considered to be 'non-economic' activity. These include

activities which couldn't be tendered and delivered by private sector organisations and where the results will be disseminated widely (e.g. by way of teaching, publication or knowledge transfer).

For further details of what is considered non-economic activity, please see Annex D of this document: https://www.gov.uk/government/publications/state-aid-manual

Where universities and RTOs are undertaking tasks which are not considered to be non-economic activity, then then the normal EU State Aid funding intensities shown above apply, based on the size of organisation and type of research.

Can match funding from my organisation include an 'in kind' contribution?

Match funding needs to be demonstrated by a transfer of money. Staff time is acceptable as the staff are paid for their time and therefore money has changed hands in respect of the staff time.

In-kind match, i.e. where a good or service is gifted to the project, is difficult to assign a value to and this type of match should be avoided.

In a consortium arrangement, how should costs be allocated appropriately between partners?

Cost allocations must be made so that appropriate funding intensities are used.

Where the consortium members are different size organisations, each party must claim an appropriate funding intensity against their costs. Costs are typically allocated to the organisation incurring the cost. The exception to this is for equipment costs, where the funding intensity claimed should normally be based on the eligible funding intensity for the organisation that will retain the equipment at the end of the project.

Can materials and equipment be transferred between consortium partners?

Yes – but not for a profit.

It is not permissible for a consortium partner to profit from supplying equipment or materials or consultancy to any other consortium partner. Such transfers should be at cost.

Equipment, materials and consultancy provided by third party suppliers (i.e., not project participants) can be purchased at market rates. The grant recipient should ensure that the cost is competitive (e.g. through competitive tendering) and good value for money.

How does depreciation affect the costs that can be claimed for capital items?

Grants can only be paid against the amount by which capital items depreciate (during the project)

For capital items purchased during the floating wind competition, the grant is only payable against the depreciation, not the full capital cost. According to the GBER State Aid exemption 'only the depreciation costs corresponding to the life of the project, as calculated on the basis of generally accepted accounting principles, are considered as eligible'.

Different companies will have different approaches to depreciation. For example, in some cases the depreciation over the life of the product could be considered as the purchase price minus the net realisable value (NRV) at the end of project. The NRV could take into account factors such as: how much the equipment could be sold for at the end of the project, costs for decommissioning, and costs of transportation away from the demonstration site etc.

Full details within the regulation can be found here: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02014R0651-20170710&from=EN

Frequently Asked Questions (FAQ) around the regulation can be found here: http://ec.europa.eu/competition/state_aid/legislation/practical_guide_gber_en.pdf

We will normally require the accounting team of the ultimate owner of the equipment to declare the estimated depreciation and expected NRV of the equipment, to confirm the grant funding.

Where the NRV is predicted to be zero or minimal, the applicant should provide a justification for this.