



HR Wallingford  
*Working with water*

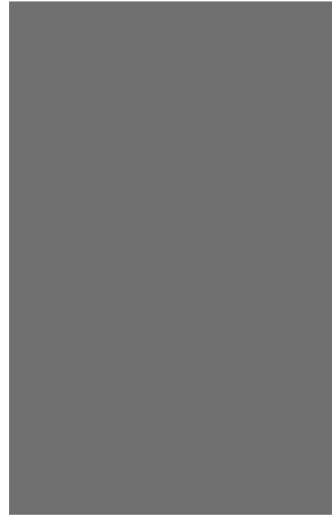


## Offshore wind services

Project optimisation



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## Reducing Levelised Cost of Energy (LCoE) Project and construction optimisation

Developing offshore windfarms in the UK comes with considerable risks even after a project has been consented. To win in the competitive CFD auctions, developers have to look holistically at the lifetime costs and performance of their assets to identify opportunities to really drive down the LCoE (Levelised Cost of Energy).

HR Wallingford has worked on over 90% of the UK's offshore windfarms and is recognized by industry as world-leading experts in the field. Our unique range of focussed marine-based services, state-of-the-art physical modelling laboratories, a full range of numerical modelling tools and, above all, our dedicated and enthusiastic experts can help reduce LCoE by optimising design through the entire project lifecycle.



## HR Wallingford specialises in the following marine-based services:

- > **Global seabed mobility, morphodynamics.**  
HR Wallingford is a world-leader in the fields of seabed morphology and scour, with unparalleled knowledge and expertise in assessing scour in non-uniform soils. This can assist from the site selection process, layout design to scour protection design and monitoring.
- > **Metocean.**  
HR Wallingford has decades of experience in Metocean data analysis and wind, wave and tidal current modelling. This is used by developers to assist with the selection of appropriate turbine units, the design of a suitable turbine foundations and to inform energy resource assessments.
- > **Foundations.**  
HR Wallingford is a world leader in the physical model testing of foundation designs, dynamic loading, stability & scour protection for design certification. Foundations can be tested under extreme wave and current and scour conditions in our unique Fast Flow Facility (see cover image).
- > **Marine cables.**  
HR Wallingford are experts in cable crossing design, scour assessment, protection design and cable support solutions for free-spanning cables.

## > Construction execution planning and optimisation.

PortOps is an event simulation model which was originally developed by HR Wallingford for the LNG industry. With an extensive track record spanning over a decade of successful application on complex LNG projects, it now provides an innovative tool for the optimisation of wind farm construction. It can be used to enhance the planning and execution of complex installation sequences with multiple interfaces and dependencies, and also to support the undertaking of those installation sequences as a decision support tool.

PortOps helps to ensure safe and efficient marine operations protecting offshore personnel and vessel assets by accounting for wind farm service vessel thresholds of operation in harbours and open seas, and the operability of vessels such as jack-up barges, which are susceptible to currents and mobile beds.

## > Port selection and design.

Linking with PortOps we also have extensive experience in port selection, port design validation (including physical model testing) and port operations advisory services. We have three state of the art navigation simulators which can be used to plan and optimise detailed port operations and vessel movements.





## Innovation

### Offshore wind research and development



A British company located in the UK, HR Wallingford has a reputation for excellence and innovation, which we sustain by re-investing profits from our operations into programmes of strategic research and development.

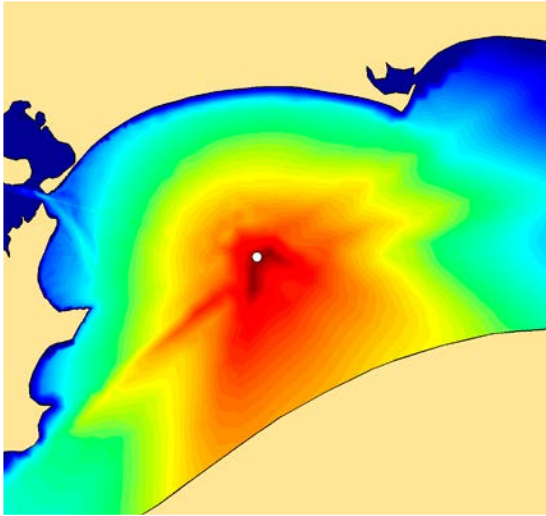
HR Wallingford has Scientific Research Association status and as such we can act as UK innovation partners with developers supporting UK content input into supply chain plans for CFD auctions.

We frequently work on collaborative R&D projects with offshore developers, academic institutions and contractors to provide innovative solutions to complex problems.



### Recent examples include:

- > **Borkum Riffgrund 2 offshore wind farm**, for which construction has begun in the German North Sea, will have 56 8MW turbines, including 20 next-generation suction bucket foundations. HR Wallingford worked with Ørsted to help to refine the design of the suction bucket foundation, as part of a research project investigating scour effects, and the most suitable scour protection for the novel foundation structures.
- > **East Anglia ONE Offshore Windfarm (EA ONE)**, working with Scottish Power Renewables and Seabed Scour Control Systems, HR Wallingford carried out physical modelling in its Fast Flow Facility to test the effectiveness of innovative frond mattress scour protection systems. Investigating scour development and the protection performance for jacket pile foundations.
- > **Rampion Offshore Windfarm**, E.ON was in the process of installing monopiles on the Rampion Offshore Wind Farm project from an offshore jack-up barge. Certain wind/wave conditions were causing significant oscillations in the monopile which were affecting installation. HR Wallingford in collaboration with Oxford University investigated the metocean conditions for allowable installation windows and through a series of physical model tests investigated the residual risk of pile oscillation as the pile is lowered by crane into the water through the gripper unit on the jack-up.
- > **UXO (Unexploded Ordnance)** can be a big headache for offshore windfarms. Working with German grid operator TenneT and the University of Rostok we undertook physical model testing in the Fast Flow Facility to develop and validate a UXO migration model to replicate the scour, self-burial and mobilisation process of bombs on the seabed to better understand the movement of UXO in the elapsed time following a UXO survey.



## Reducing consenting risk

### DCO support services

World class research is at the core of our business. Robust, evidence based science is in our DNA and filters through all aspects of our work. This is recognised and respected by the SNCBs (Statutory Nature Regulation Bodies) and sets us apart from conventional environmental consultancy firms.

HR Wallingford is a name recognised and trusted by marine regulators from our decades of experience in nuclear, oil and gas and offshore wind industries. Our independent ownership, and freedom from any direct regulatory role, means our advice is trusted by stakeholders and industry to be impartial and evidence-based thus de-risking the consents process.

Having worked on over 90% of the UK's offshore wind fleet we have built an enormous wealth of knowledge of the UK's seabed including numerous, validated, hydrodynamic and ecological models.







## HR Wallingford specialises in marine environmental support services:

- > **Gap analysis** of marine ecological data leading to intelligent, cost effective survey planning
- > **Marine survey coordination.** HR Wallingford routinely manages marine ecological surveys including intertidal and subtidal benthic ecology; pelagic ecology; phytoplankton and zooplankton; benthic invertebrates; algae; intertidal and subtidal angiosperms; fish; mammals and reptiles; coastal waterbirds and seabirds
- > **Managing oceanographic surveys** (geotech and geophys), metocean and tidal data collection and interpretation.
- > **Hydrodynamic modelling** - sediment movement & seabed morphodynamics, coastal process modelling.
- > **Ecological modelling** including IBM models of larval dispersion and fish movements.
- > **Underwater noise modelling.** HR Wallingford has developed state of the art modelling tools to model underwater noise propagation and potential effects on marine life from construction, maintenance and operation.
- > **Sediment plume modelling** from dredging/ cable burial, impacts on ecological receptors.
- > **Marine water quality modelling.** Hydrodynamic marine water quality modelling in 2D/3D.
- > **Navigation assessments.** Decades of experience of navigation with state of the art ship simulators and work with all of the UK's main port operators.
- > **Coastal protection and flood risk** assessments and modelling for inshore and terrestrial works
- > **Marine ES integration.** Acting as the "marine mind" integrating all the marine inputs into the ES, the Habitats Regulations Assessment (HRA), Water Framework Directive (WFD) assessment and Marine Licence Application. This ensures that's each application and each ES chapter speaks with a single voice avoiding conflicting data and messaging.





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HR Wallingford has a 70 year track record of achievement in providing world-leading analysis, advice and support in engineering and environmental hydraulics, and in the management of water and the water environment. We have a unique mix of know-how, assets and facilities including state of the art physical modelling laboratories, a full range of computational modelling tools and, above all expert staff with world-renowned skills and experience.

