



**The
National
Decommissioning
Centre**

Innovation through Partnership

Renewables Case Studies

Scan for
more info



The NDC is utilising its marine modelling and simulation expertise to support the offshore renewables sector. Through collaboration with companies on projects, it is helping trial and de-risk new technologies while optimising operations and logistics. The NDC's simulator provides a safe, virtual and repeatable environment with the ability to vary the climatic and sea state conditions.

Complex operations can be simulated, ranging from dockside turbine assembly to system change out scenarios for various turbine designs.

Our ability to simulate at a detailed component level has allowed developers to trial unique enabling technologies through a range of scenarios. As well as developing bespoke working models of the technologies themselves, the complexity of these scenarios has required the input of a range of marine vessels and port infrastructure, models of which are all available within the simulator.

The capability to build virtual environments for users that reflects their real world working conditions has developed through close working with project partners. Common to all the work is the confidence that partners have expressed that modelling, and simulation has a positive impact on their design processes, product development and operational workflows.

Case Study 1

Offshore Renewable Energy Catapult

Design optimisation of floating offshore wind turbine (FOWT) mooring systems

Challenge

To make FOWTs economically competitive, it is important to minimise the cost of installation and operations. The procurement, installation and maintenance of the mooring system accounts for 10% of the total FOWT cost. Opportunities to reduce the cost of the moorings could have a favourable impact on the levelised cost of electricity.

What we did

This joint project with ORE Catapult is optimising the design of a mooring system to find a low-cost solution while maintaining the turbine's efficiency, sea holding and lifespan. An optimisation method has been developed and simulations run to identify an optimal design. By incorporating the electrical cable into a FOWT model and setting constraints in the turbine optimiser, the mooring system can be designed to protect the cable, thereby improving the cable's integrity and potentially leading to reduced component insurance cost.

Outcomes and benefits

This new method is being advanced to enable design optimisation of mooring systems for multiple turbines in a wind farm. Longer term, this project will develop an optimisation toolset that can be used by industry to obtain a low-cost solution for a specific site with a chosen turbine design and substructure within a faster timescale.

Case Study 2

Dublin Offshore Technology (DOT) Load reduction device (LRD)

Challenge

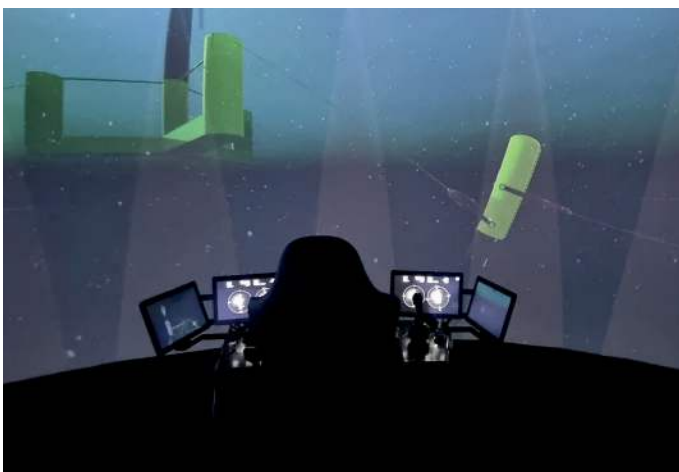
Mitigating shock loads in offshore mooring systems is a challenge for floating offshore wind developments. Excessive wave action can generate high loads within mooring lines, impacting system performance, reliability and longevity. DOT's LRD is connected in-line between the anchor and the floating platform and puts a compliant element in the mooring line which reduces the loads caused by excessive waves.

What we did

A functional model of the LRD was built in the NDC's simulator. This was then used to test deployment scenarios of the system. The detailed modelling allowed the team to develop, test, and comprehensively evaluate through virtual trials, the requirements and complexity of the LRD's deployment from vessels and quaysides and its subsequent site installation on a 15MW wind turbine.

Outcomes and benefits

The modelling produced an operational procedure for optimal deployment of the technology in a port scenario. This work has supported DOT to obtain its DNV Certification of Design for the LRD system.



Dublin Offshore's LRD is modelled in the NDC simulator



NDC simulated image of Peterhead Port

Case Study 3

Peterhead Port Authority - Port Infrastructure

Challenge

All offshore renewable systems require port infrastructure from which they can be deployed. With the huge scale of offshore wind deployment required by the UK there is a challenge, in terms of port capacity with the potential for competition between the twin priorities of decommissioning oil and gas assets and the deployment of renewable energy systems.

What we did

The collaboration with Peterhead Port Authority focused on building a realistic model of Peterhead Port, based on the detailed design and bathymetry data provided by the port. This allowed a virtual functional port model to be created that can be used in the future for modelling of offshore wind deployment, assembly, maintenance and integration and can support current and future offshore wind projects in Scotland.

Outcomes and benefits

Virtual functional models of ports and harbours and their associated infrastructure offer risk-free, low-cost environments to simultaneously trial multiple operations and scenarios. The data and visual evidence generated will assist port operators to optimise their quayside layout to maximise efficiency providing flexibility for a wider range of operations.

Case Study 4

Blackfish Engineering – C-Dart

Challenge

The connection of offshore renewables to their mooring systems is challenging and dangerous with weather and sea states limiting operations. The NDC's expertise in simulation was required to optimise the deployment of the C-Dart quick connection system for mooring wave energy converters.

What we did

The NDC's contribution was instrumental because of the extensive simulation program that helped the team understand the practicalities and limitations of using the C-Dart system in various conditions. The simulations were conducted across a range of sea states, weather conditions and different types of substructures.

Outcomes and benefits

The simulations allowed for problems to be identified and addressed in a safe virtual environment, resulting in an optimised framework for the C-Dart's offshore deployment. The project outputs allowed Blackfish to further improve their system to operate in a wider range of sea states.



Trialling the C-Dart quick connection installation in the NDC simulator



The C-Dart being tested at Loch Linnhe



The marine simulator at the NDC has provided excellent results for the development of our innovative quick mooring connector, C-DART. Detailed simulation of our technology provided a compelling demonstration of our system and was an excellent aid for technology development and demonstration to potential customers.



Tim Warren, Director, Blackfish Engineering Design Ltd

BLACKFISH



The NDC's marine simulation suite

The National Decommissioning Centre
University of Aberdeen
Main Street
Newburgh
Aberdeenshire
AB41 6AA



Email: enquiries@ukndc.com



Tel +44 (0) 1224 274403



www.ukndc.com



Visit NDC website here