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TiPTORs project delivers improved design processes for tidal turbines

The first phase of the Tidal Turbine Powertrain Reliability Project (TiPTORs), led by the Offshore Renewable Energy (ORE) Catapult, has delivered a 'Design for Reliability' (DfR) methodology which provides a robust and systematic approach to developing tidal turbine drivetrains.

The methodology, developed in partnership with Ricardo and DNV GL, allows designers to understand and control the factors influencing product reliability and hence operational performance, improving the detection of weak links at the design phase and significantly improving design optimisation.

Alongside the DfR methodology, specifications for both a reliability simulation tool and a component database have been produced in preparation for the next phase of the project, which will focus on accurately modelling components. The simulation tool will allow designers to 'plug and play' their designs, looking for any weaknesses at a turbine prototype development stage, enabling them to better predict reliability, degradation, and pinpoint potential failure. This will be linked to a cost model that will enable the quantification of benefit to support the decision making process.

Together, the DfR process and simulation tool will enable turbine designers to confidently select components and system architectures to optimise reliability. The ability to evaluate the overall system availability and reliability early in the design process and linking this to a cost model will establish greater confidence that the turbine will operate within required parameters delivering the predicted LCoE.

ORE Catapult Marine Sector Specialist Simon Cheeseman said: "Improving the reliability of tidal turbine powertrains, and being able to iron out failure at the design stage, will significantly increase investor confidence in tidal turbine technology and ultimately reduce the cost of tidal energy to the consumer.

"The successful completion of Phase 1 of this project is a major step forward in understanding the 'Physics of Failure' in tidal turbines. Applying best practice from automotive, aerospace, wind, offshore oil & gas and defence sectors has enabled us to confidently quantify system reliability issues.

"The next stage of the project will be to test the DfR methodology across a range of tidal technologies. A follow-on programme will validate the methodology, develop the component database, create the prototype simulation tool, and develop a recommended practice. The goal is to ensure alignment and integration with industry and developers' own design

processes. At the same time ORE Catapult will look at advanced sensors application techniques linked to turbine control schemes, in order to boost health monitoring systems.”

Ricardo’s global market sector head for clean energy and power generation, Paul Jordan added “The application of these tools will represent a quantum change to existing design processes, providing turbine developers with greater confidence in achieving availability targets, significantly reducing unplanned maintenance whilst accelerating design optimisation.”

Claudio Bittencourt Ferreira, Business Development Director at DNV GL, said “Reliability is traditionally tackled through the application of experience and statistical data, both of which are extremely limited in the tidal industry. This project takes a new approach to provide a step change in our understanding of reliability and accelerating the learning curve so that the tidal sector moves smoothly into a commercially viable, bankable industry.”

Ends

Notes to Editors

Tidal Turbine Powertrain Reliability Project

Tidal turbines suffer similar operational issues to wind turbines, but the costs associated with retrieving and reinstalling a tidal turbine, and the loss of income from power generation, can be significant, driving up operation and maintenance costs and therefore the cost of marine energy. This project draws on reliability data and generic lessons learnt from many industries including offshore wind, oil and gas, defence, automotive and rail.

The tidal turbine powertrain reliability project, or TiPTORs, aims to improve the reliability of tidal turbine powertrains by addressing the unique issues faced by developers when converting energy to electricity in subsea arrays. Improved reliability will increase energy output and ultimately drive down the cost of marine energy.

About the Offshore Renewable Energy Catapult

ORE Catapult was established in 2013 by the UK Government and is one of seven such Catapults set up by Innovate UK in high growth industries. It is the UK’s flagship technology innovation and research centre for offshore wind, wave and tidal energy.

ORE Catapult delivers prioritised research underpinned by world-class test and demonstration facilities, collaborating with industry, academia and Government to reduce the cost of offshore renewable energy and create UK economic benefit.

The economic opportunity for the UK is immense, with the potential for huge employment, GVA and exports of technology, skills and services, potentially mirroring the success of the oil and gas sector over the past thirty years.

The Catapult programme represents a £1.4bn funding commitment from the public and private sector over five years. Long term, the Catapult will be funded 1:1:1 by central government, the private sector and other sources of funding such as the EU and devolved Governments.

ore.catapult.org.uk

About Ricardo

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