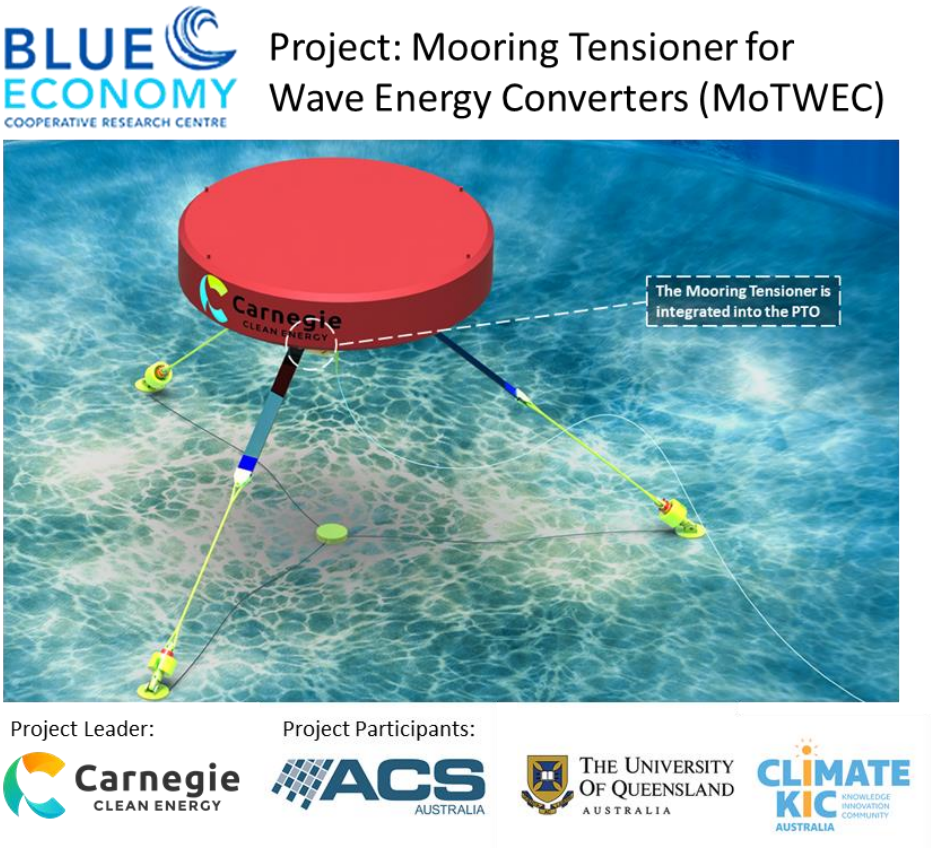
ASX ANNOUNCEMENT

1 October 2020

Carnegie led Mooring Tensioner project awarded funding

- Blue Economy CRC awards $850,000 to Mooring Tensioner project
- $1.6m project will deliver a product that supports cost reduction for CETO and could offer benefits for aquaculture and other marine industries
- Test-rig to be operated at Carnegie's North Fremantle facility

Carnegie Clean Energy Limited (Carnegie or the Company) is pleased to announce that the Blue Economy Cooperative Research Centre (BE CRC) has awarded $850,000 of grant funding to support the Mooring Tensioner for Wave Energy Converters (MoTWEC) Project, a $1.6 million project led by Carnegie with partners Advanced Composite Structures Australia (ACS-A), University of Queensland (UQ) and ClimateKIC representing the Australian Ocean Energy Group (AOEG). This Project will develop the novel Mooring Tensioner, a key component that will support the use of rotary power take-off systems and associated cost reductions for wave energy converters.



Mooring Tensioner for WECs (MoTWEC) Project

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What will the Project deliver?

The Project will develop a Mooring Tensioner, a critical subsystem that will support cost-effective wave energy converters. The wave energy industry has fundamentally demonstrated that it is possible to capture wave energy and convert it to electricity. The task now is to reduce cost and improve performance. Wave energy converters (WECs) are targeting a significant portion of the energy market while continuing to leverage the unique properties of predictability and consistency provided by waves. The wave energy industry is in its infancy and, as an untapped renewable energy resource, has significant market potential around the world. Ocean Energy Europe (OEE) has forecast a €653 billion market potential by 2050.

A wave energy converter's power take-off system (PTO) converts the kinetic energy captured from the waves into electrical energy. The PTO represents a significant portion of the overall cost of a wave energy converter making it a prime target for system cost reductions. Many wave energy converters are converging towards rotary electric PTOs which can leverage emerging innovations from wind power and the worldwide trend towards electric vehicles. Wave energy converters can redeploy these innovations to reduce the cost and increase the performance of the PTO. To unlock cost reductions associated with the use of a rotary electric PTO, wave energy converters need a way to balance the rotary mechanical energy storage and mooring line pretension. This Project will develop a Mooring Tensioner to address this technical gap and unlock cost reductions for Carnegie and other wave energy developers.

Carnegie has already completed initial work to develop the concept and explore the benefits provided by an advanced composite material Mooring Tensioner. The Mooring Tensioner will be constructed using high performance, light weight and durable fibre reinforced composites, allowing easier integration to the space constrained WEC environment.

Lay-up of multi-axial composite material (Image Courtesy of ACS-A)

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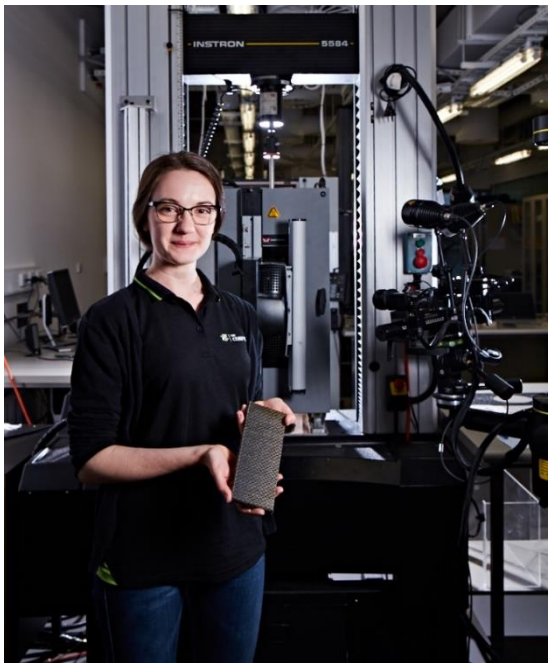
The project will include investigations into additional applications for the Mooring Tensioner. The Mooring Tensioner can offer an attractive alternative to current mooring systems for various marine applications, for example to anchor fish cages and service vessels employed in the offshore aquaculture industry. This innovation has the potential to offer improved station keeping of the moored systems in energetic wave environments where long mooring chains that hold the vessel in place typically allow large excursions from the desired location. Ultimately, the balance of Carnegie's PTO technology can be employed to generate energy for the operation. Successful deployment of the proposed Mooring Tensioner is also expected to reduce the environmental impact of the mooring systems by limiting contact with the seabed. The Project will further explore the other market opportunities for the Mooring Tensioner.

Key Project Activities?

Over the next two years, the project will follow a prototype design, development and testing approach in which the project participants will work together to:

- Define requirements
- Select composite materials
- Develop prototype designs and models
- Test composite materials
- Manufacture a scale prototype Mooring Tensioner
- Build a bespoke test rig, and
- Undertake a test program on the Mooring Tensioner assembly and other connected components at Carnegie's Rous Head research facility in North Fremantle.



Characterising composite materials in the mechanical testing laboratory at the University of Queensland using digital image correlation to identify localised damage (Image courtesy of DMTC Limited)

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In addition, a new PhD student at UQ will be appointed and will be engaged on the Project working closely with Carnegie and ACS-A throughout the design, manufacture and testing phases. The student will continue into a third year which will include activities such as further investigations of alternative applications for the Mooring Tensioner product developed.

Who is involved in the Project?

- Carnegie will lead the Project, driving the work as a leading wave energy developer and representing the initial wave energy industry customers. The Project will develop and test a prototype Mooring Tensioner to be integrated into Carnegie's CETO wave energy converter. Carnegie will undertake the prototype testing at Carnegie's research facility in North Fremantle.
- ACS-Australia (ACS-A) is a spin-out company from the long running and highly successful Cooperative Research Centre for Advanced Composite Structures. An award-winning engineering and manufacturing organisation with a globally recognised team having over 30 years of experience using advanced composites, ACS-A will provide a great deal of composite knowledge and capability to the team.
- The University of Queensland's School of Mechanical and Mining Engineering and the Centre for Advanced Materials Processing and Manufacturing (AMPAM) is renowned for its expertise in composite materials including manufacturing processes for advanced composite structures, high temperature composite materials, wear and durability of composite materials as well as joining of dissimilar materials. The team at UQ also brings expertise and world-class research facilities for materials characterisation and non-destructive testing. The project will utilise UQ's suite of mechanical testing machines and advanced data acquisition hardware, including 3D optical full-field strain measurement and environmental conditioning equipment.
- Climate KIC Australia represents the Australian Ocean Energy Group (AOEG), an industry led cluster formed to facilitate collaboration of the ocean energy industry to create significant value for Australia. AOEG's primary aim is to accelerate the addition of ocean energy to Australia's energy mix. AOEG's focus in this project will be on knowledge dissemination and industry engagement activities.

To undertake this $1.6m project, all the participants have committed to provide in-kind staff and non-staff resources valued at a combined $626,801. The rest of the work undertaken by the participants will be paid for by $1,003,382 of cash funding for the Project, of which the BE CRC will contribute $853,382 and Carnegie will contribute $150,000.

Carnegie is grateful for the support of the Commonwealth and the Blue Economy CRC for this Project which will develop an important product to support the development of cost-efficient wave energy converters (WECs). It is expected that successful delivery of the Mooring Tensioner design and testing will lead to a step-change in WEC levelised cost of energy (LCOE), supporting lower cost of energy supply to land based electricity grids, offshore platforms and the offshore aquaculture industry. As such the objectives of this Project are well aligned with

the mission and activities of the Blue Economy CRC, notably Research Program 3 which aims to support offshore aquaculture through supplies of lower cost energy.

With the Project Agreement executed by all project participants, the Project will now formally commence. Carnegie looks forward to updating shareholders on the progress of this exciting project which feeds into the overall CETO development plan, the Digital Development Pathway.

About the Blue Economy Cooperative Research Centre

The Blue Economy CRC brings together national and international expertise in aquaculture, marine renewable energy and marine engineering, as part of a single, collaborative project. Through integration of the knowledge and expertise across these sectors, this CRC paves the way for innovative, commercially viable and sustainable offshore developments that will see significant changes in marine renewable energy output and seafood production.

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