



# Report to Shareholders

## Quarter Ended 30 June 2021

### BOARD OF DIRECTORS & CEO

Non-Exec Chairman - Terry Stinson

Non-Exec Director - Grant Mooney

Non-Exec Director - Michael Fitzpatrick

Non-Exec Director - Anthony Shields

Chief Exec Officer - Jonathan Fievez

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### QUARTER HIGHLIGHTS

- CETO Digital Development Programme achieving good progress towards cost reduction and performance targets to support CETO commercial pathway
- Launched new spin-off product vision for a wave powered system for the aquaculture sector and other industries
- Advanced Controllers achieving significant improvements with preparations underway for wave tank testing at the end of the year to validate Advanced Controller performance
- Mooring Tensioner composite material testing commenced
- Power Take-Off (PTO) hardware optimised to leverage new Advanced Controller capabilities
- Carnegie featured as part of Hewlett Packard Enterprise premier business event - HPE Discover 2021
- \$1,000,000 sale of Carnegie's legacy Higginsville gold royalty (post quarter end)
- \$465,000 cash received from the exercise of options
- Reached over 3 GWh of energy generation at Garden Island Microgrid

# CETO DEVELOPMENT

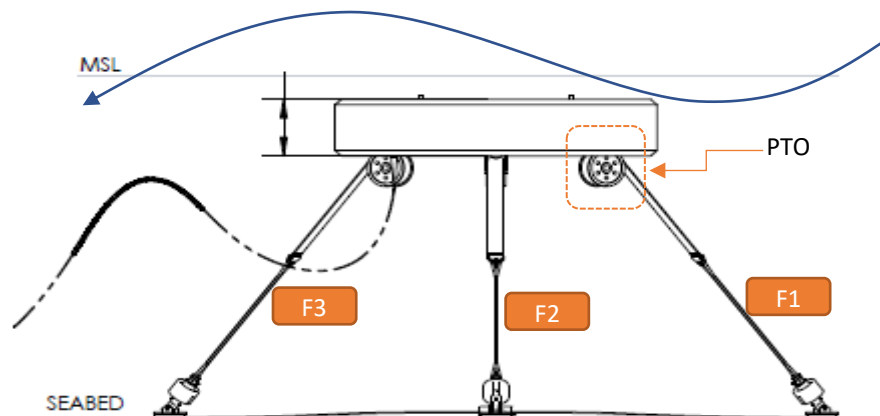
During the quarter, the team continued advancing the key innovation streams of the CETO Digital Development programme delivering significant improvements that progress CETO towards cost reduction and performance targets. The Digital Development programme’s innovation activities are designed to deliver an advanced CETO design that unlocks CETO’s commercial pathway and commercial feasibility.

Some of the recent CETO development highlights this quarter include:

- Advanced Controllers achieved significant improvements with the suite of advanced controllers currently achieving up to 27% more energy than the baseline controller, with further opportunities for improvement being implemented.
- Recent PTO design improvements are closely related to the Advanced Controller development. Techno-economic optimisation of the PTO hardware has delivered significant CAPEX reductions while having minimal impact on performance, thereby supporting reductions in the cost of energy.
- Mooring Tensioner design and test-rig concept design progressing well with coupon/material testing undertaken at University of Queensland as part of the Carnegie-led Mooring Tensioner Project within the Blue Economy Cooperative Research Centre (BE CRC).
- Carnegie’s new spin-off wave powered barge product was launched with concept and development plans progressed.

## Advanced Control

Advanced Control has been one of the core innovation streams pursued by the team over the last 18+ months with multiple advanced controllers being developed internally and with partners. These controllers instruct the Power Take-Offs (PTOs) to set the tension in CETO’s mooring lines which are resisting the wave forces imposed on the buoy. When set optimally, CETO can extract considerably more energy from each wave.



Side view of CETO with tensile mooring forces identified by labels F1-3

This work is delivering significant improvements in CETO performance with recent analysis showing the suite of advanced controllers currently achieving up to 27% more energy than the baseline CETO controller.

The broader goal goes beyond just energy production and that is to reduce the cost of energy overall to make CETO more competitive in a wider array of markets. While improvements in energy performance translate directly to an equivalent reduction in the cost of energy, these controllers can additionally reduce capital equipment costs by capping forces and motions that drive the need for additional strength or travel length. Accordingly, there are promising controllers in development which, while delivering high energy performance improvements, are also delivering high reductions in the overall cost of energy.

Over the next few months, the team will continue to advance the most promising controllers in preparation for a physical tank testing campaign at a major international wave tank towards the end of the year. The tank testing will include the operation of a CETO model using the best advanced controller(s) and will validate the extensive simulations and modelling work done and ultimately verify the performance improvements delivered by advanced control.

This tank testing validation combined with the outcomes of the hydrodynamics and power take-off innovation streams expected in the next 6-9 months will support verification and validation of the outcomes of Carnegie's Digital Development programme – ultimately the delivery of a CETO design with step change improvements in both performance and cost that support the commercial pathway of the technology.

## **PTO**

Recent improvements to the PTO design are closely related to the Advanced Controller development described above. These new control strategies allow limitations of load and power to be delivered by the PTO. To take advantage of that capability, the team has undertaken a techno-economic optimisation of the PTO hardware to deliver cost reductions. Setting the PTO requirements in such a way that the cost of the hardware is reduced while having a minimal impact on CETO performance is key in unlocking lower cost of energy for the technology. If those limits are set too low, it would reduce the cost of the PTO hardware however the impact on the power production would be too detrimental to the overall cost of energy.

This optimisation undertaken by the team required intimate understanding of the different types of PTO hardware that can meet those requirements and their costing. This in-depth knowledge had been built over the past 18+ months and enabled the team to deliver some exciting PTO improvements that support the objectives of the Digital Development programme.

**New Spin-Off Product**

In late March, Carnegie launched its vision for a new wave power product at the Blue Economy Cooperative Research Centre (BE CRC) Annual Participants Workshop in Brisbane. This new product is a spin-off that incorporates aspects of Carnegie’s CETO technology and know-how into a novel wave powered system for use in offshore energy demand applications. The first market for this product is expected to be aquaculture barges and other vessels that require energy for electrical loads operating offshore. As the aquaculture sector moves further offshore into highly energetic conditions, Carnegie’s new wave power product can address the challenge of securing clean and reliable energy and replace the diesel generation that would otherwise be required. This product is an adaptation of Carnegie’s CETO IP and know-how and would be integrated into the barge or other moored vessel types.



**Carnegie’s new wave product vision illustrated on aquaculture feeding barge**

Adapting Carnegie’s CETO power take-off and control systems in this new product will expand the market for Carnegie’s CETO intellectual property and will provide further component innovation and testing which would feedback valuable technical and testing data into Carnegie’s CETO technology delivering improved performance.

During the quarter, the team progressed this product concept and development plans. Carnegie expects to provide shareholders with further updates during the coming quarter.



**Feature on Advancing Australia TV series**

In May, Carnegie was excited to be featured as an Australian innovator on Network 10’s Advancing Australia TV series hosted by Guy Pearce. Carnegie’s episode was aired on 1<sup>st</sup> of May and made available on demand.



**Bengar Films filming Carnegie’s segment for Advancing Australia TV series**

**CETO Collaborations**

**Hewlett Packard Enterprise (HPE)**

Carnegie’s ongoing reinforcement learning control partnership with HPE was recognised at HPE Discover, the global business conference showcasing HPE’s vision for the future. HPE Discover 2021: The Edge-To-Cloud Conference, normally held in Las Vegas, was held virtually on June 22-24, 2021. Carnegie and HPE’s work was highlighted in multiple sessions including:

- HPE’s President and CEO, Antonio Neri, mentions Carnegie in his keynote speech.
- Carnegie’s CEO Jonathan Fiévez was a keynote speaker in *Discover Day 3 Keynote - The Radical Rethink: Unconventional Ways to Unlock the Power of Data*
- At breakout sessions - *Hewlett Packard Labs and Carnegie Clean Energy Revolutionize Wave Energy With Reinforcement Learning*



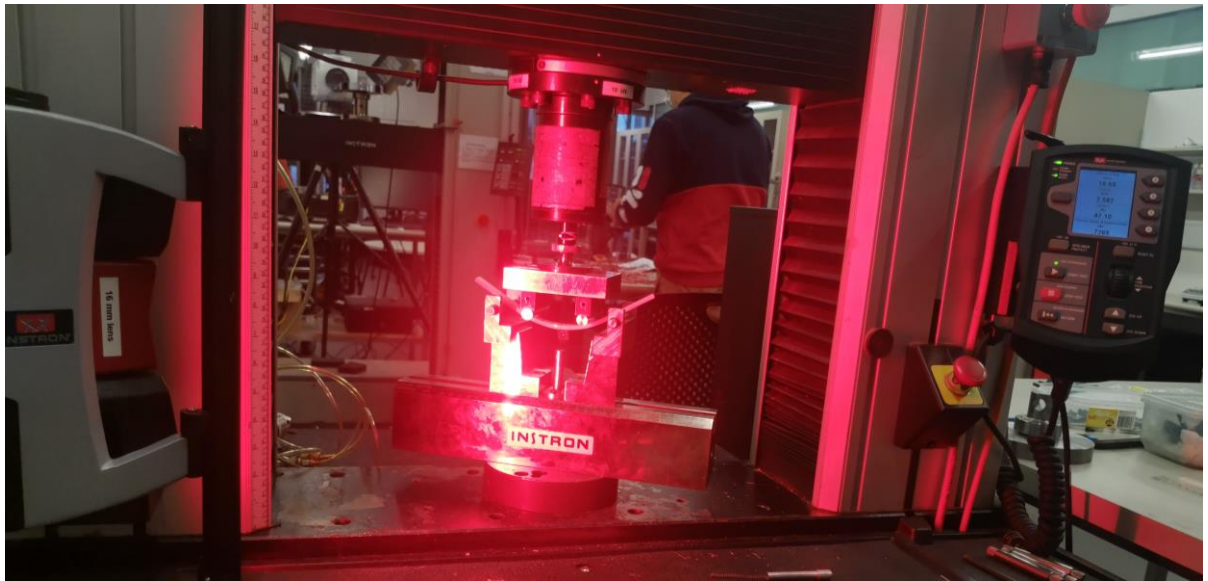
**President and CEO of Hewlett Packard Enterprise, Antonio Neri, highlighting Carnegie in his keynote speech**

With the conference registrations exceeding 55,000 business and government participants from around the world, this was a significant opportunity to showcase Carnegie’s CETO technology and the innovative reinforcement learning control being developed collaboratively by Carnegie and HPE.

**Blue Economy CRC Mooring Tensioner Project**

The Carnegie-led Mooring Tensioner (MoTWEC) Project has progressed well over the past quarter with Advanced Composite Structures Australia (ACS-A) and Carnegie completing the preliminary design for the full-scale Mooring Tensioner. Additional progress has been made on the test scale Mooring Tensioner design and the test-rig development. The test scale Mooring Tensioner will be tested using a purpose-built test-rig to be built at Carnegie’s research facility in North Fremantle, Western Australia. Composite material testing of the selected materials is already underway at University of Queensland with material properties measured consistent with expectations and suitable for the Mooring Tensioner design.

In 2020, the Blue Economy Cooperative Research Centre (BE CRC) 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).



Material testing at the University of Queensland

## GARDEN ISLAND MICROGRID

During the quarter, the Garden Island Microgrid's renewable energy production surpassed 3 GWh with over 2,000 tonnes of carbon abated. This clean renewable energy is being provided to the Department of Defence under Carnegie's Electricity Supply Agreement.



Garden Island solar array

# CORPORATE ACTIVITIES

On July 1, Carnegie sold a gold royalty held by the Company over part of the Higginsville Gold Project in Western Australia back to the project owner, Karora Resources Limited, for \$1 million cash. As this sale and receipt of funds was completed after the end of the quarter, the \$1 million cash received is not shown in the cash position below.

During the quarter, options exercised brought in an additional \$465,000 cash. This additional cash supports the current technology pathway.

## Financial Notes

At the end of the Quarter, the Company had approximately \$3.6 million in cash reserves. The \$1 million payment from the royalty sale was received subsequent to the end of the quarter and is not included in this value.

### **Note 6 to Appendix 4C:**

Payments to related parties of the entity and their associates were made during the quarter. In total, approximately \$65,000 was paid to Directors and associates for salaries, superannuation and contracted services.

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