Carnegie and Hewlett Packard Enterprise advance CETO Technology

Improving CETO Performance through Reinforcement Learning-based controllers

- Carnegie and HPE advance collaboration to improve CETO performance
- HPE, one of the largest global multinational Information technology companies, represents a key strategic partner for Carnegie
- HPE to display CETO technology at international industry conferences - ISC High Performance 2022, Hamburg, and HPE Discover 2022, Las Vegas
- Strategic partnerships are a means to progress, promote and subsequently commercialise CETO technology

Carnegie Clean Energy Limited (ASX Code: CCE) ("Carnegie" or the "Company") is pleased to provide an update on the progress made on the CETO technology with Hewlett Packard Enterprise Company ("HPE"), multinational Information technology firm with a market cap. of US$20 billion[1].

Carnegie and HPE have been collaborating since 2020, and the work conducted by the two companies has delivered significant improvements in CETO's performance, specifically in relation to the technology's Reinforcement Learning-based controller. Reinforcement Learning is a type of Artificial Intelligence where the system teaches itself how to operate optimally. The Reinforcement Learning controller has the ability to directly learn and apply the optimum response to predicted waves, during operation. In this case, it learns by being rewarded for the electricity it generates from waves, positioning itself to gain more out of each wave. Together, Carnegie and HPE are building on the 20% power gain reached for the Reinforcement Learning controller, as presented by HPE at NeurIPS in December 2021, a global conference on Neural Information Processing Systems (figure 3).



Figure 1 - HPE's CETO Tank at the ISC High Performance Conference in Hamburg, 29 May - 2 June 2022

HPE is currently exhibiting the CETO tank display at the ISC High Performance 2022 conference in Hamburg this week, to be followed at HPE Discover 2022 in Las Vegas on 28-30 June.

HPE Discover is a global business conference unveiling HPE's vision for the future. With conference registrations exceeding 55,000 business and government participants from around the world, this is a significant

[1] https://finance.yahoo.com/quote/HPE/

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opportunity to showcase CETO and the innovative reinforcement learning control being developed collaboratively by the two companies.

Over the next few months, Carnegie will continue to progress CETO via the competitive EuropeWave PCP Programme as a means to validate the technology and support the commercialisation trajectory forward.

Carnegie's CEO, Mr Jonathan Fiévez, commented: *"The teams at Carnegie and HPE have actively joined forces to pursue this exciting innovation in Reinforcement Learning-based controllers. Our partnerships are critical in our pathway to advance and commercialise our technology. HPE is a global multinational company, and for them to be a big supporter of Carnegie, and see what we see in CETO, is a testimony of what we have developed and how together we can revolutionise the control of wave energy converters."*

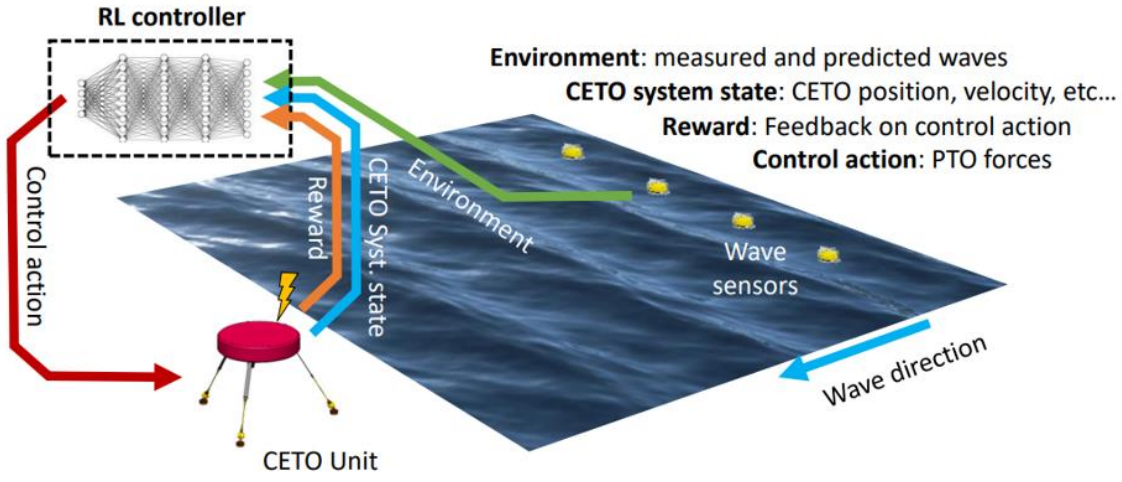

Figure 2 – Reinforcement Learning control applied to CETO.
The RL controller uses input from the environment (predicted waves), the state of the CETO system (how it responds to the environment), and rewards from previous actions, to determine how to optimally control the system

This announcement has been authorised by the Chairman and Company Secretary.

For more information

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Appendix

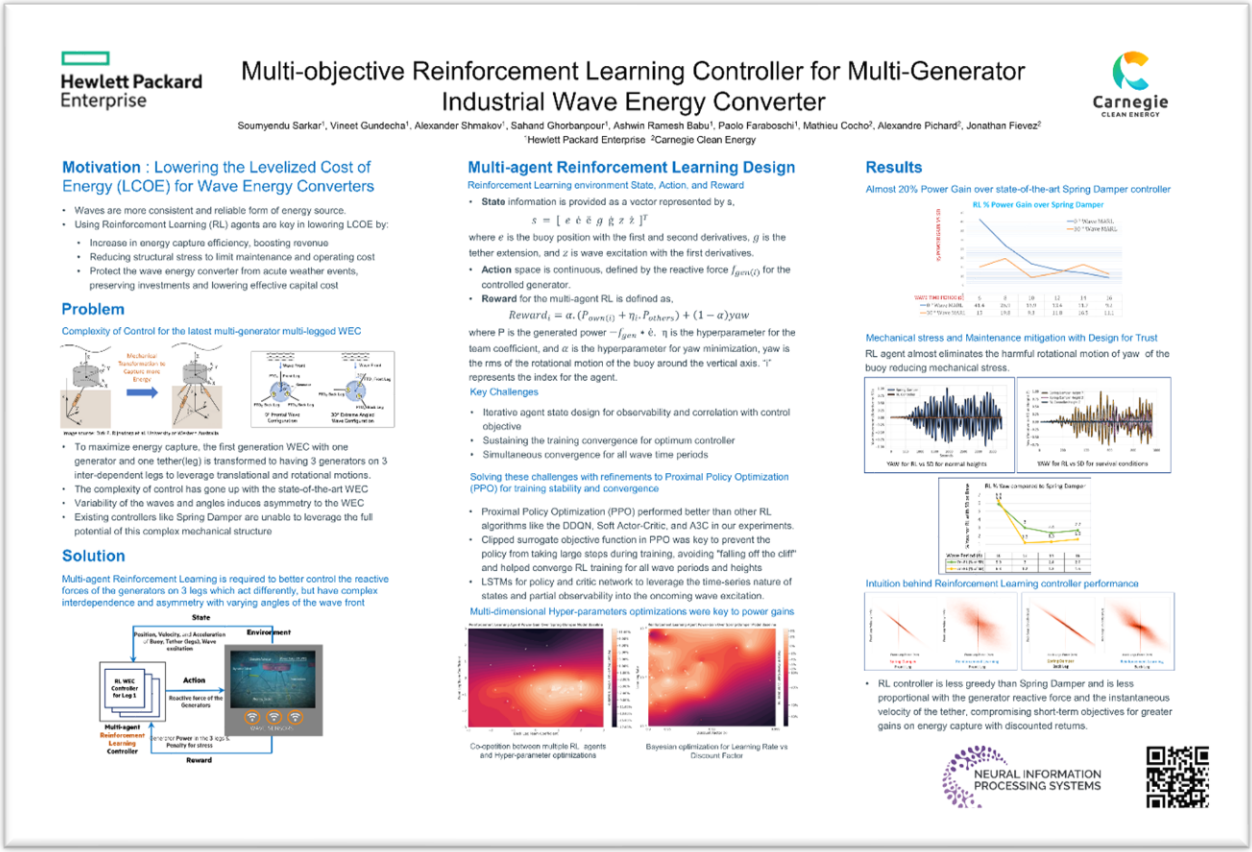

Figure 3 – Neural Information Processing Systems, Poster – HPE & Carnegie

ABOUT CARNEGIE

Carnegie Clean Energy (ASX: CCE) is a technology developer focused on delivering ocean energy technologies to make the world more sustainable. CETO Wave Energy Ireland is a wholly owned subsidiary of Carnegie Clean Energy. Carnegie is the owner and developer of the CETO® and MoorPower™ technologies, which capture energy from ocean waves and convert it into electricity. Using the latest advances in artificial intelligence and electric machines, Carnegie can optimally control our technologies and generate electricity in the most efficient way possible. The Wave Predictor technology developed by Carnegie uses a proprietary machine learning algorithm to improve the performance of our wave technologies and has additional applications beyond the wave energy industry. The company has a long history in ocean energy with a track record of world leading developments.

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