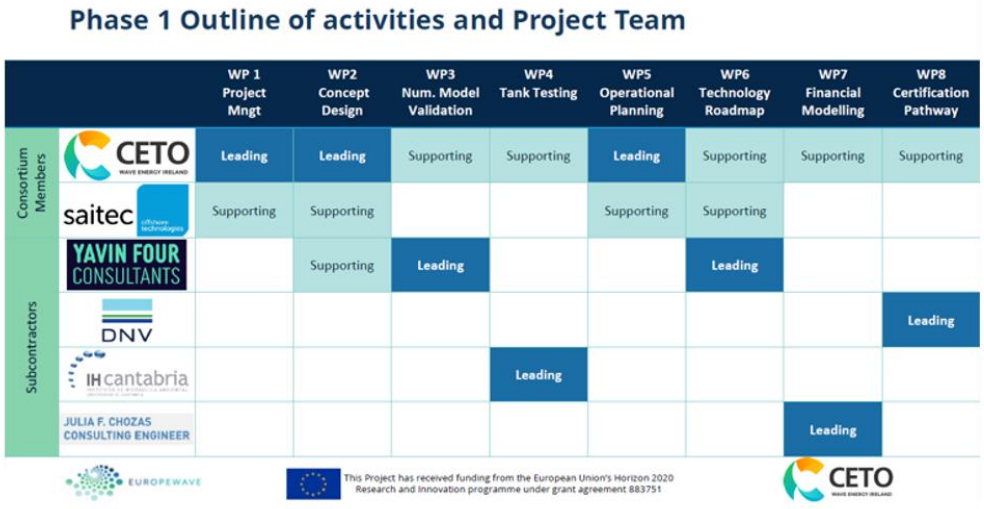
Carnegie Presentation at EuropeWave Conference

Carnegie Clean Energy (ASX: CCE) ("Carnegie" or the "Company") is pleased to announce that it delivered a presentation at the first annual EuropeWave conference (22 February-2 March 2022). The presentation, appended below, outlined the CETO technology, including key features, innovations and an outline of Phase 1 activities under the Programme.

The conference is part of the €20m EuropeWave PCP Programme, where Carnegie, via its wholly owned subsidiary, CETO Wave Energy Ireland Limited, was selected as 1 of 7 finalists to deliver Phase 1 of the Programme. Phase 1 includes delivering the design and tank testing of the new CETO design in Spain. Of the value of €291k (A$463k), this phase commenced on 3rd January 2022 and will run for 7 months.

EuropeWave's first annual conference is an online event, with participants including global renewable energy experts and European Commission officers, to shape the future of the wave energy sector and accelerate its adoption as a leading source of renewable energy.

Carnegie's CEO, Mr Jonathan Fiévez, commented: *"We were extremely pleased to enter the EuropeWave PCP Programme and be part of its first annual conference. EuropeWave is a tremendous opportunity to validate and raise awareness of CETO's performance and reliability. Carnegie is at the table with leading wave energy companies and decision-makers, on a mission to accelerate the commercialisation of this incredible renewable energy."*



Carnegie's Phase 1 Outline of EuropeWave PCP Programme

Following the conclusion of Phase 1, another rigorous selection process will be conducted, with five companies out of the seven selected for Phase 2, and subsequently, three companies selected for the third and final phase. Carnegie will keep shareholders informed of its progress throughout 2022.

This announcement has been authorised by the Chairman and CEO.

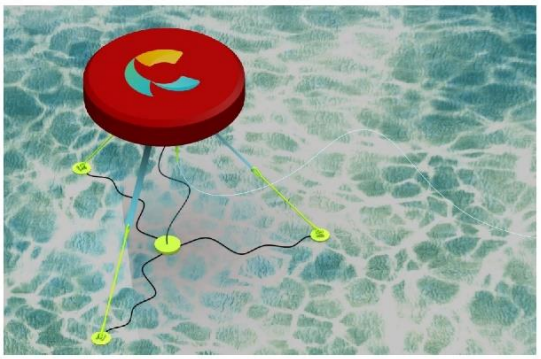
21 North Mole Drive, North Fremantle WA 6159 | PO Box 39, North Fremantle WA 6159
Phone: +61 8 6168 8400 | www.carnegiece.com | ABN 69 009 237 736

For more information

Carnegie Clean Energy Limited
+61 8 6168 8400
enquiries@carnegiece.com
www.carnegiece.com

ABOUT EUROPEWAVE PCP

With almost €20 million in funding for the 3 phases of the programme, which runs from 2022 to 2026, the EuropeWave PCP is a collaboration between Wave Energy Scotland (WES), a subsidiary of the Scottish Government's Highlands and Islands Enterprise, and the Basque Energy Agency (EVE).



This is part of the EuropeWave project that has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No 883751.

https://www.europewave.eu/

ABOUT CARNEGIE & CETO WAVE ENERGY IRELAND

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.

https://www.carnegiece.com/

EUROPEWAVE

ACHIEVE

Ryan Biggs

Project Manager

CWE Ireland

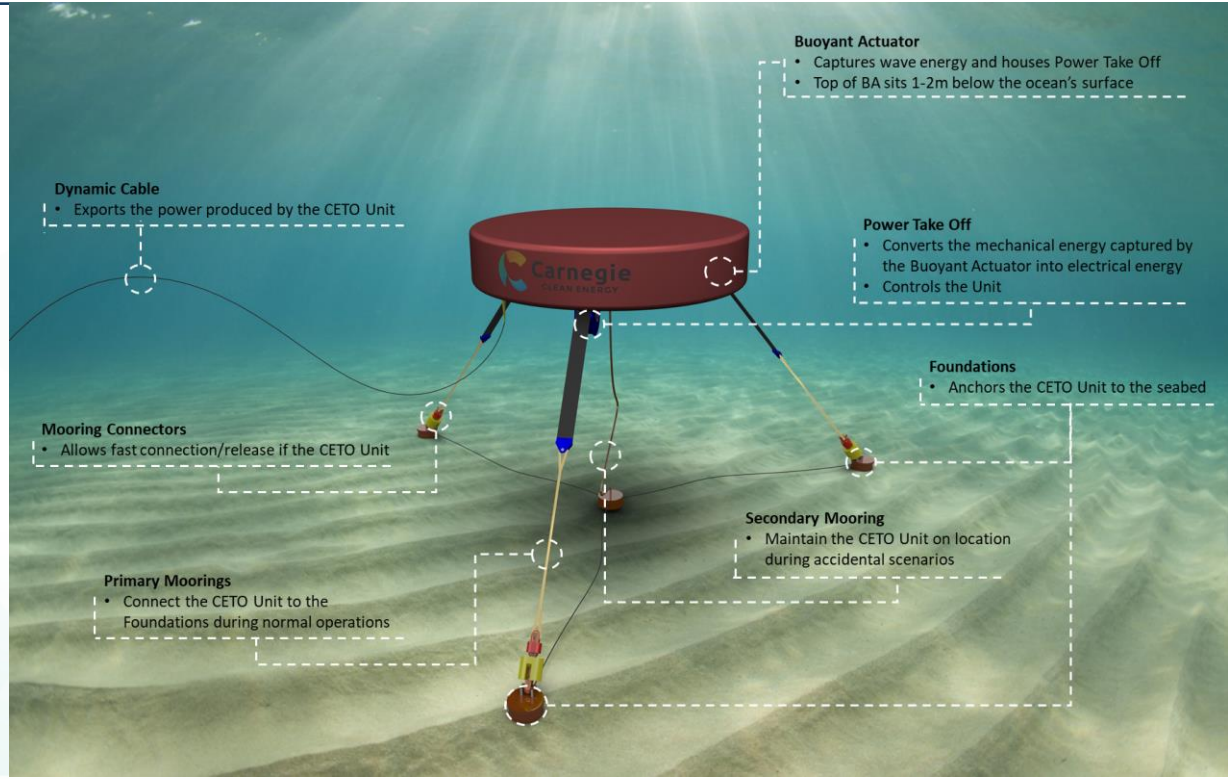
CETO

WAVE ENERGY IRELAND

This project has received funding from the European Union's Horizon 2020 research and Innovation programme under grant agreement 883751.

CETO Technology – Key Features

- Technology type: point absorber
- Axisymmetric
- Multi-moored
- Scalable
- Adapt to various depth
- Submerged
- Optimised for LCOE
- Survivability



EUROPEWAVE

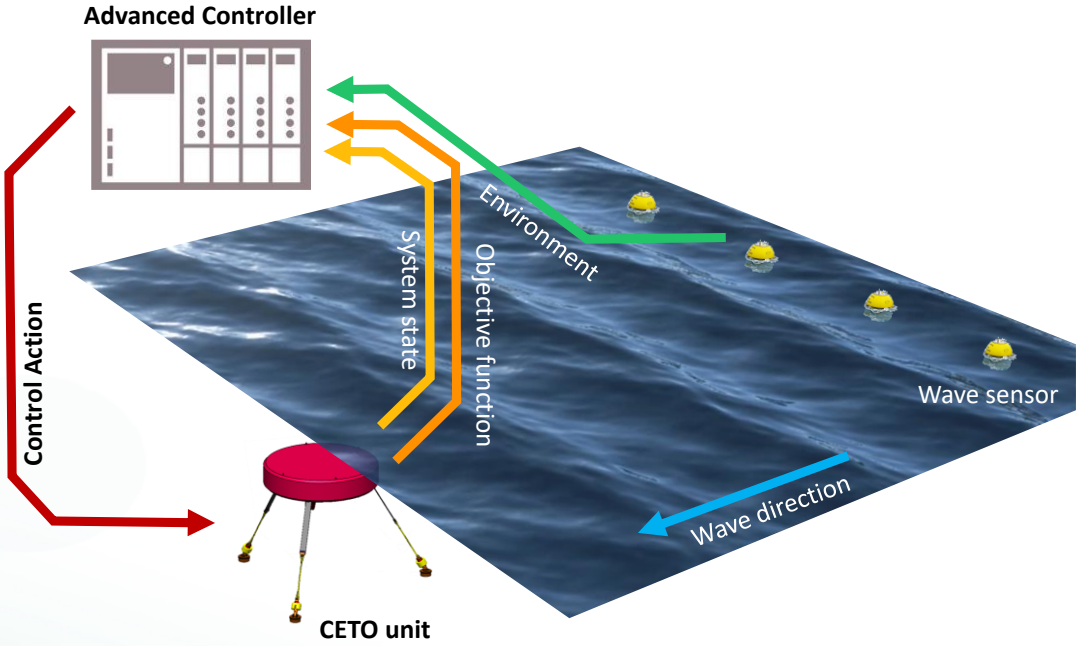
This Project has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement 883751

CETO WAVE ENERGY IRELAND

CETO Technology – Key Innovations

Advanced Controller

- Reinforcement Learning (RL) and Model Predictive Controller (MPC) developed for CETO
- Include wave predictor developed by CWE and tested at IHC
- Yield >20% compared to passive controller
- MPC will be physically test during Phase 1 tank testing



EUROPEWAVE

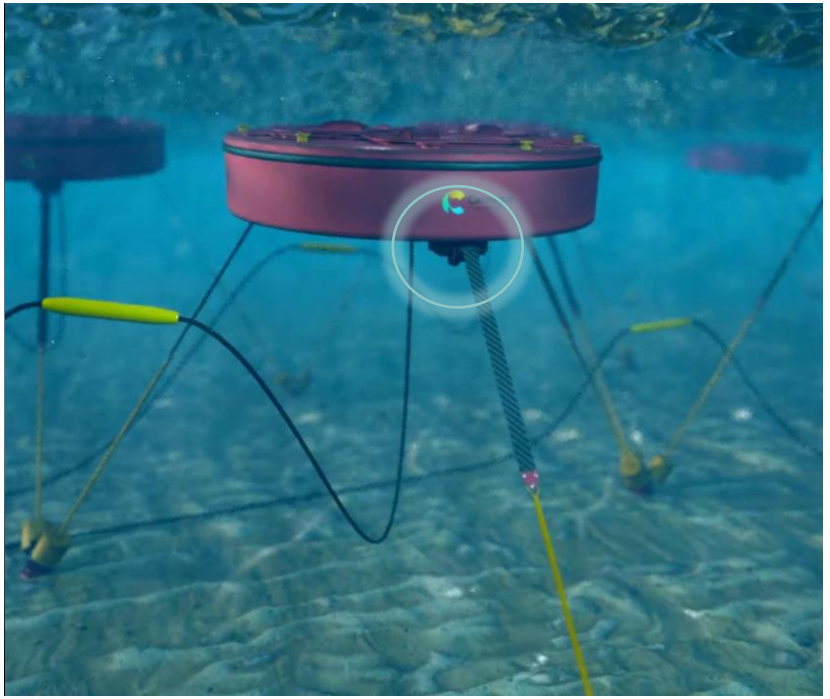
This Project has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement 883751

CETO WAVE ENERGY IRELAND

CETO Technology – Key Innovations

Rotary Electric PTO

- Belt wraps on a drum driving mooring tensioner and electrical drive train
- In comparison to a hydraulic PTO it:
  - allows direct control of the force applied in each mooring enabling advanced controllers
  - offers direct energy conversion, leading to excellent efficiencies
  - is a simple system with low number of part for improved reliability
  - benefits from cost reductions achieved for electrical drive trains in other industries (offshore wind)
  - can accommodate large stroke avoiding to design for end of stroke loads



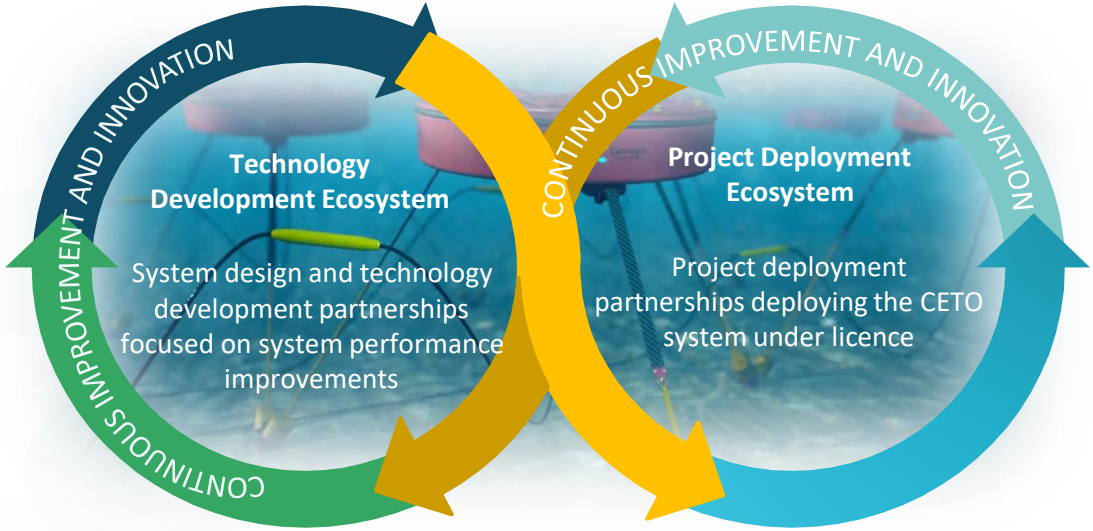
EUROPEWAVE

This Project has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement 883751

CETO WAVE ENERGY IRELAND

Long term vison

- CETO Prototype deployment unlocks roll out of future CETO projects
- GWs of global CETO commercial deployments
- CETO deployed by partners under license agreements
- Positioned as Technology Provider with strategic partners
    - Engaging within our Technology Development and Project Development Ecosystems



EUROPEWAVE

This Project has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement 883751

CETO WAVE ENERGY IRELAND

Target application for technology

- CETO technology is scalable and can be deployed in multiple markets globally

Remote & Islands

Demand Applications

High incumbent tariff
High diesel/carbon intensity
Potential value for additional benefits
Limited land availability
Hybrid systems

Utility Scale

Low incumbent tariff
High competition
Large market size

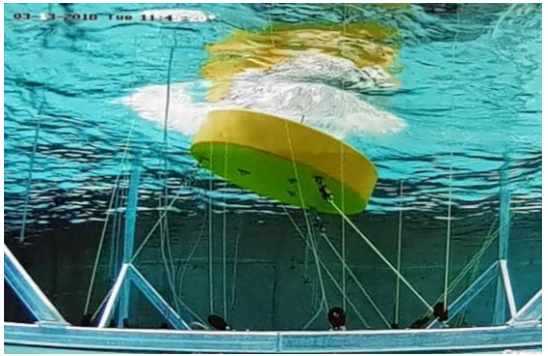
EUROPEWAVE

This Project has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement 883751

CETO WAVE ENERGY IRELAND

Driving factors to participate in EW

- Program and company objectives aligned
- Programme competitive format and management by industry recognized experts (buyers group) provides credibility
- Opportunity to deploy at world renowned site



EUROPEWAVE

This Project has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement 883751

CETO
WAVE ENERGY IRELAND

Phase 1 Outline of activities and Project Team

		WP 1 Project Mngt	WP2 Concept Design	WP3 Num. Model Validation	WP4 Tank Testing	WP5 Operational Planning	WP6 Technology Roadmap	WP7 Financial Modelling	WP8 Certification Pathway
Consortium Members	CETO WAVE ENERGY IRELAND	**Leading**	**Leading**	Supporting	Supporting	**Leading**	Supporting	Supporting	Supporting
	saitec offshore technologies	Supporting	Supporting			Supporting	Supporting		
Subcontractors	YAVIN FOUR CONSULTANTS		Supporting	**Leading**			**Leading**		
	DNV								**Leading**
	IH cantabria INSTITUTO DE HIDRÁULICA AMBIENTAL UNIVERSIDAD DE CANTABRIA				**Leading**				
	JULIA F. CHOZAS CONSULTING ENGINEER							**Leading**	

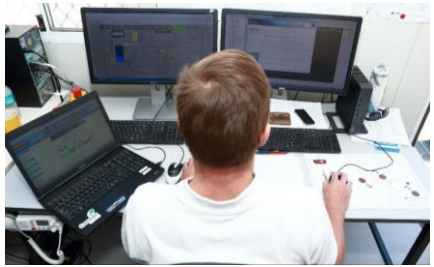
EUROPEWAVE

This Project has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement 883751

CETO WAVE ENERGY IRELAND

Ambition for Phase 3 deployment

- Deploy and operate CETO safely for 12 months
- Validate CETO performance and reliability
- Prove untapped improvement delivered by the advanced controller
- Verify survival strategies
- Demonstrate efficient recovery and maintenance procedures
- Attract future project partners
- Pave the way for a commercial roll-out



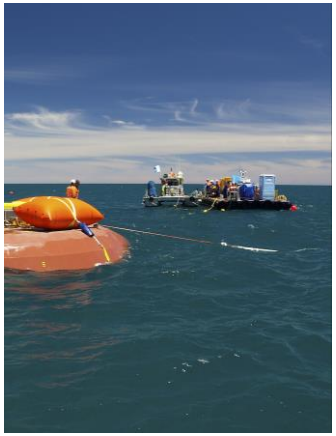
EUROPEWAVE

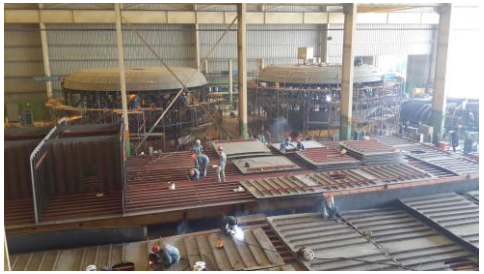
This Project has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement 883751

CETO
WAVE ENERGY IRELAND

Capabilities Needed for Phase 3

- Naval architecture for BA detailed design
- Shipbuilding for BA construction
- Offshore structural engineering for mooring connector detailed design
- Manufacture and supply of components
- Shipyard and associated infrastructure for CETO assembly
- Offshore operation contractor for Foundation installation, CETO installation and ongoing O&M during deployment phase





EUROPEWAVE

This Project has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement 883751

CETO WAVE ENERGY IRELAND

EUROPEWAVE

www.europewave.eu @Europewave_EU info@europewave.eu

This project has received funding from the European Union's Horizon 2020 research and Innovation programme under grant agreement 883751.