



EUROPEWAVE

## Blue Horizon 250

**Cameron McNatt**

*Co-founder & Managing Director*

**Mocean Energy**



**mocean  
energy**



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



[www.europewave.eu](http://www.europewave.eu)

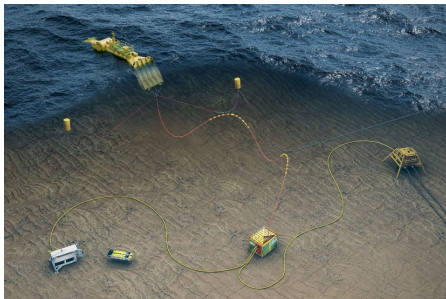


[@Europewave\\_EU](https://twitter.com/Europewave_EU)



[info@europewave.eu](mailto:info@europewave.eu)

# Mocean Energy - Context



blueSTAR



SMALL: 2024

20 kW

O&G; CCS; marine awareness;  
umbilical replacement/remediation

Projects of 1-2 devices



blueHORIZON



MID: EUROPEWAVE TIMELINE

250 kW

Islands; remote communities; CCS;  
aquaculture; early grid

Projects of ~5-40 devices



blueHORIZON



GRID: 2030

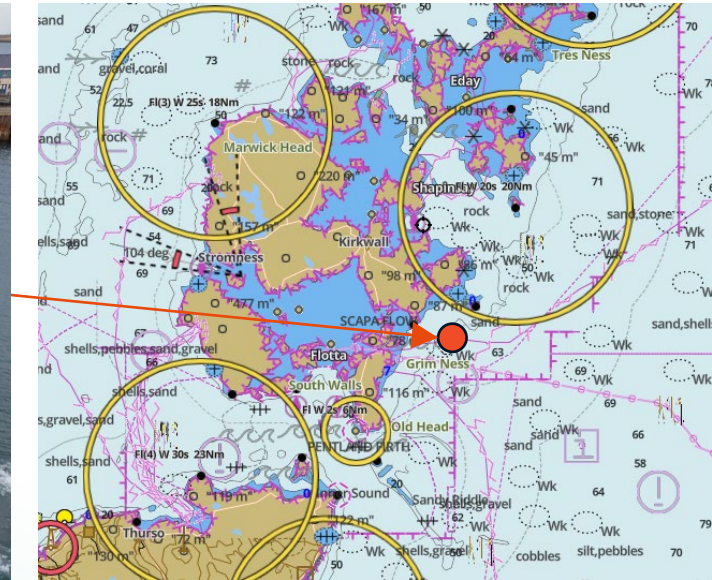
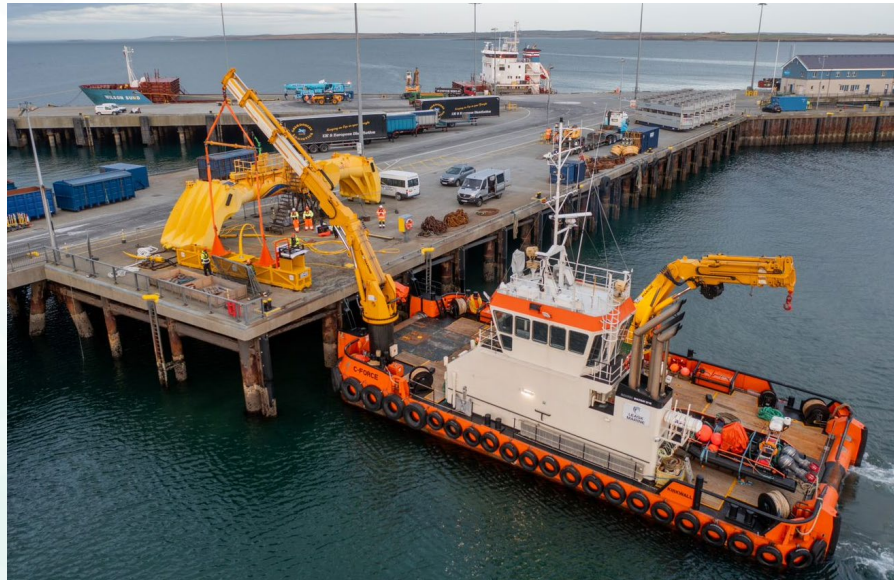
500 kW +

Grid; including wind-wave co-  
location

Projects of 40+ devices

# Mocean Energy - Context

## BlueX Deployment



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



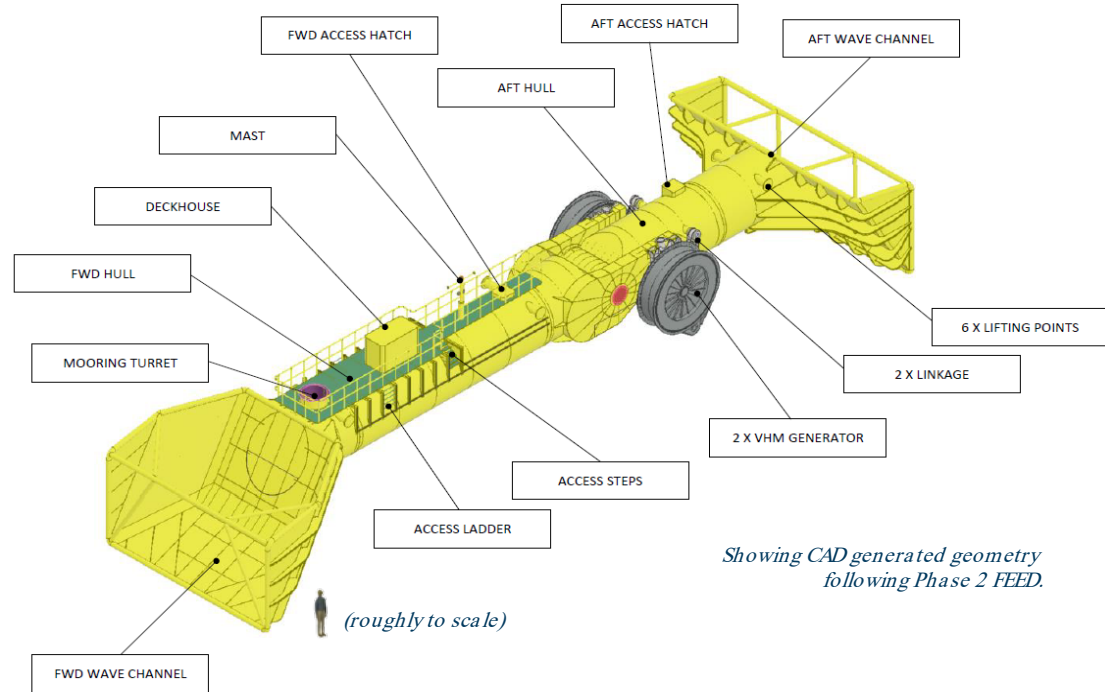


[Survival Video](#)

# Mocean Energy – Blue Horizon 250

- Hinged raft; asymmetry of hulls increases bandwidth
- Wave channels increase power absorption and enable survivability (contouring & steep wave diving)
- Basis of design specified in Ph2

Power rating	250 kW
PTO	Direct-drive electrical
Mass	~ 400 tonnes
Dimensions	50 m x 15 m x 11 m
Mooring	3-line catenary



*Showing CAD generated geometry following Phase 2 FEED.*

# Mocean Energy – Blue Horizon 250

## Target Applications

Current focus on islands & remote coastal communities, where there is early potential for LCOE to be competitive.

Additional markets include O&G, CCS, aquaculture, and early grid projects.

Aims by end of Phase 3:

- A full scale first-of-a-kind 250kW WEC
- Minimum 12 months of at-sea trials at EMEC, Billia Croo
- TRL7 (1-9 scale) by end of 2026
- Healthy pipeline of commercial projects

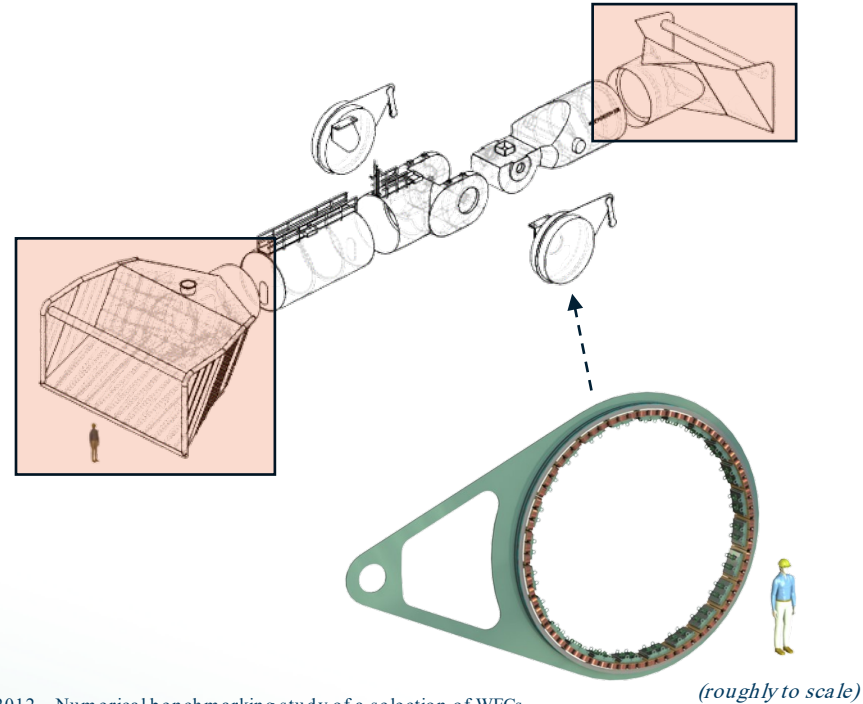


*Showing an earlier indicative double-hulled design.*

# Mocean Energy – Blue Horizon 250

## Innovations across key areas

- **Power capture** - AI-based design to optimise geometry; 2-4x more energy/tonne displacement vs 1st-gen WECs<sup>1</sup>
- **Reliability** – direct-drive Vernier Hybrid Machine (PTO): ideal for high-torque / low-speed reciprocating wave excitation; modularity
- **Power conversion** – PTO linkages that apply effective gearing to convert more power per size of WEC
- **Availability** - Quick Connect System to facilitate (dis)connection; streamline ops & reduce downtime
- **Installability** - Optimisation for array deployments, including shared moorings in WEC ‘clusters’



1- Babarit et al., 2012 – Numerical benchmarking study of a selection of WECs. *Renewable Energy*, 41.

(roughly to scale)

# Contractors Involved

Some of the contractors and suppliers involved so far...



UK  
FMECA & RAM  
Analysis



UK  
Structural &  
Mechanical Design



UK  
CCI System Design



UK  
Generator Design



USA  
Hydrodynamic  
Modelling



UK  
Fabricator



UK  
Mooring Design &  
Operations

Plus  
Others...



# Completed in Phase 2

- FEED level design & FMECA for Blue Horizon 250 ("BHZ-250") including WEC structural & mechanical design, power systems, CCI, moorings & umbilical
- Tank testing of Phase 2 design at 1:25 & 1:50 scale
- Build and testing of scaled (2m diameter) Vernier Hybrid Machine (generator)
- Review of manufacturability of BHZ-250 with Mocean's preferred fabricator and outline plan for manufacture
- Development & review of RAMS for key marine operations
- Commercialisation work including capture of IP, customer engagement and business plan



## Lessons Learnt in Phase 2

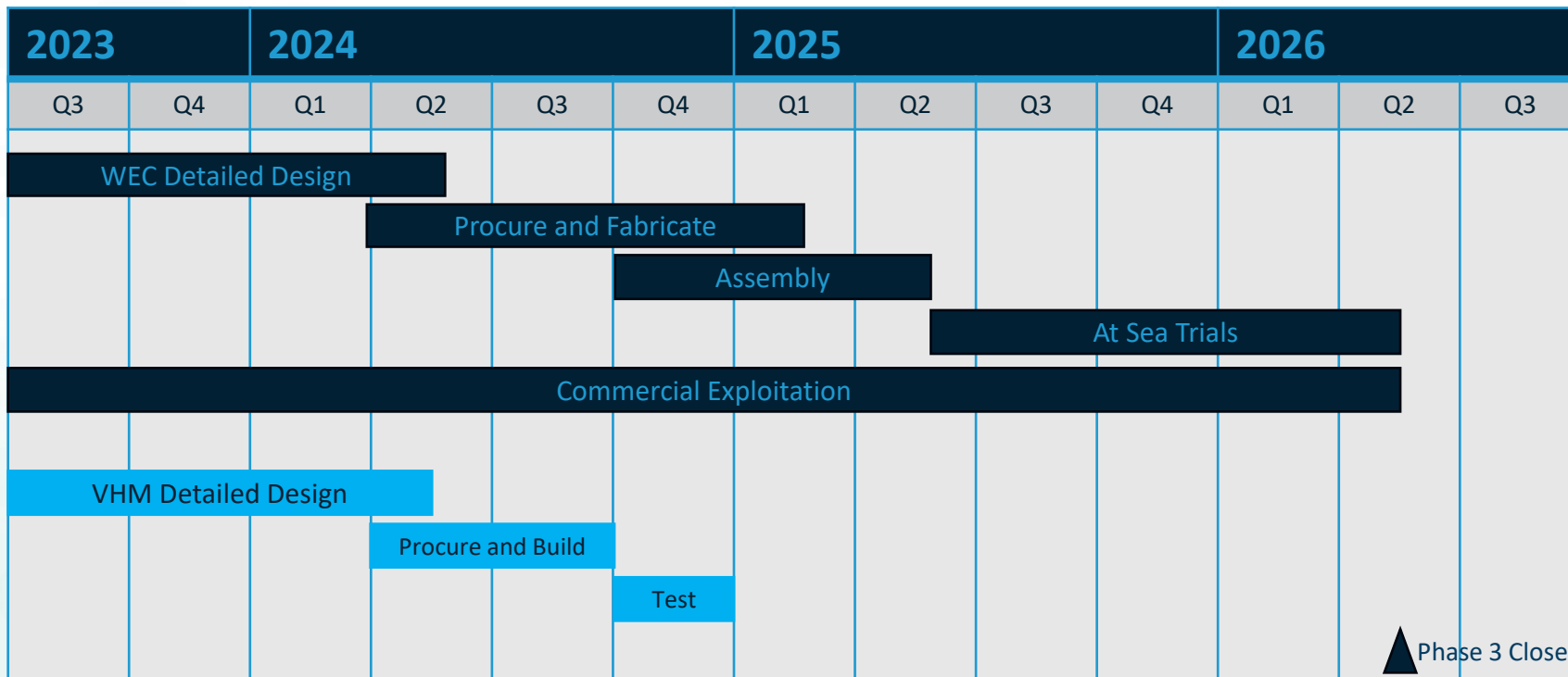
- IEA-OES metrics tracking & pro-actively driving technical development
- Dedicated VHM work-stream has been set up due to novelty and criticality
- Explored possible use of composites in structural design; but concluded these didn't have an advantage for LCOE
- Cost of global transport does have a significant impact on LCOE
- There is strong commercial potential for use of Blue Horizon in island communities where LCOE of local generation (mainly from diesel) is high



*The IEA-OES framework for ocean energy performance evaluation.*

# Phase 3 Top Level Timescales

WEC (EWV Funded)  
VHM (WES Funded)



# Mocean Energy – Blue Horizon 250

## Looking Ahead...

*FOAK build  
@ TEXO*



**EuropeWave:  
Phase 3  
Commences**

2024



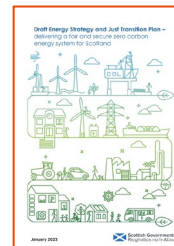
*Grid connected  
@ EMEC Berth 3*

**EuropeWave:  
Phase 3  
Deployment**

2026

**Ambition:  
Pilot Farm  
3-4 x WECS**

2028



*Draft Scottish Energy  
Strategy and Just  
Transition Plan*

**Ambition:  
10MW Farm  
40 x BHZ-250**

2030

# Mocean Energy – Blue Horizon 250

## Industry Advisory Panel



**Sue Barr**  
*Director of Marine  
Energy & Chair*  
Simply Blue Group /  
MEC



**Lara M Santos  
Ayllón**  
*PhD Researcher*  
University of  
Edinburgh / EMEC



**Robin Slater**  
*First Chief Engineer*  
Aker Solutions /  
OneSubsea



**Ian Hutchison**  
*Operations Director*  
Aquatera Ltd



**Jeffrey Steynor**  
*Principal Engineer  
in Sustainability*  
Liberty Group Ltd



**Nathalie Almonacid  
Valenzuela**  
*MRE R&D Coordinator*  
Energía Marina Spa /  
MERIC



**Benjamin  
Williamson**  
*Lead Scientist (Energy  
Research Group)*  
University of  
Highlands & Islands

# Mocean Energy – Blue Horizon 250

---

## What's next in Phase 3?

- Detailed design
- FOAK build at TEXO, Dundee (Scotland)
- Grid-connected testing at EMEC Billia Croo (Berth 3)

## ..Beyond Phase 3?

- Assembling industry/go-to-market consortium to support full program
- Technology Performance Level (TPL) assessment
- Improving performance and lowering costs
- Value proposition(s) across markets & project development



EUROPEWAVE

