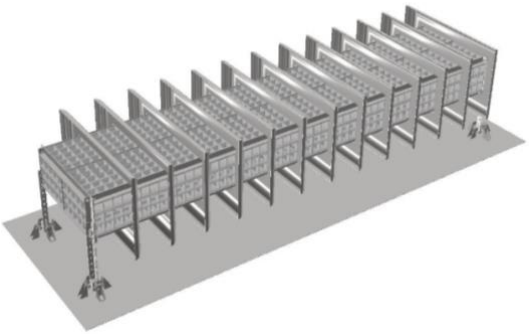
Technology Offer

REEFS: Renewable Electric Energy From Sea

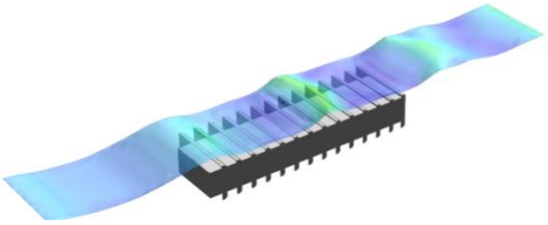
KEYWORDS: Artificial Reef; Coastal Protection; Low-Head Hydropower; Renewable Electric Energy From Sea (REEFS); Submerged Nearshore WECs; Wave Energy Converter (WEC).

The REEFS WEC is a nearshore submerged device installed on the seabed at low depth (15 - 20 m), just behind wave breaker zone. Unlike other devices, it can be built by combining off-the-shelf maritime technologies and fish friendly low-head hydropower technologies. It is provided with an exterior array of curved stay vanes that concentrate the kinetic energy in the wave crest. In the wave trough, the stay vanes make use of the kinetic energy to create a suction Venturi effect that extracts the water from inside the device.



3D view of REEFS wave energy converter

The device is also equiped with an enveloping sy stem of composite low-cost check valves that originate wave crest water entrance and wave trought water exit. The joint effect of stay vanes and check valves creates a continuous flow that drives a fish friendly low-head hydropower turbine located inside the device. Unlike other devices the REEFS dual harnessing of pressure and kinetic energy ensures a high power production that was estimated in 3.6 MWh per installed MW.



CFD simulations for REEFS optimization

The device shows some similarities with natural reefs and detached submerged breakwaters, giving it the particular multipurpose functionality of coastal protectiong because it will induce some premature storm waves breaking. This externality ia a differentiating positive aspect that can be rather significant for the environmental licencing procedure.

ADVANTAGES	APPLICATIONS
• Invisible at sea surface level ensuring high aesthetical acceptance. • Storm resistant due to total submergence. • Coastal protection because it originates premature wave breaking like natural reefs. • High renewable electricity production because it harnesses the two forms of wave energy: the pressure energy plus the kinetic energy. • Easy access for maintenance and short electric submarine cable because it is installed nearshore. • Easy to build because it is based in off-the-shelf technologies.	• Electricity production for coastal cities and communities where are concentrated about 40% of world population. • Electricity production for desalination plants which are located onshore. • Electricity production for nearshore aquaculture farms. • Electricity production for island communities. • Combined coastal protection and electricity production for littoral communities.

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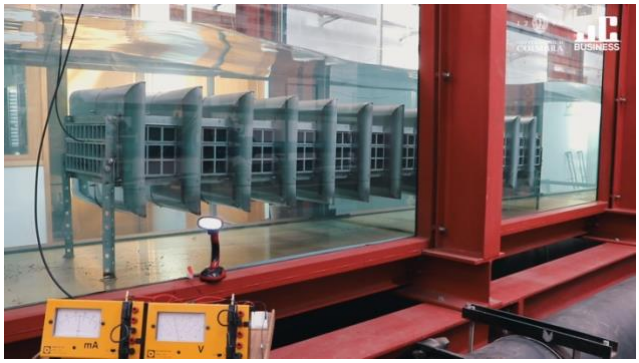

Wave-to-Wire electricity production demonstration

Wave breaking demonstration

VIDEO (QR Code or YouTube):

STAGE OF DEVELOPMENT: TRL 4

IPR LEGAL STATUS: Patent Granted n.° EP3078844.

OWNERSHIP: The rights to the technology are held by the University of Coimbra.

COLLABORATION SOUGHT: The University of Coimbra is seeking commercial partners interested in further developing the technology under a collaboration and license agreement or acquiring the existing rights.

CONTACTS:

- **Innovation Manager: Luís Silva** luis.s.silva@uc.pt | +351 239 247 741
- **IP Manager: Laura Alho** lauraalho@uc.pt | +351 239 247 815

Cofinanciado por: