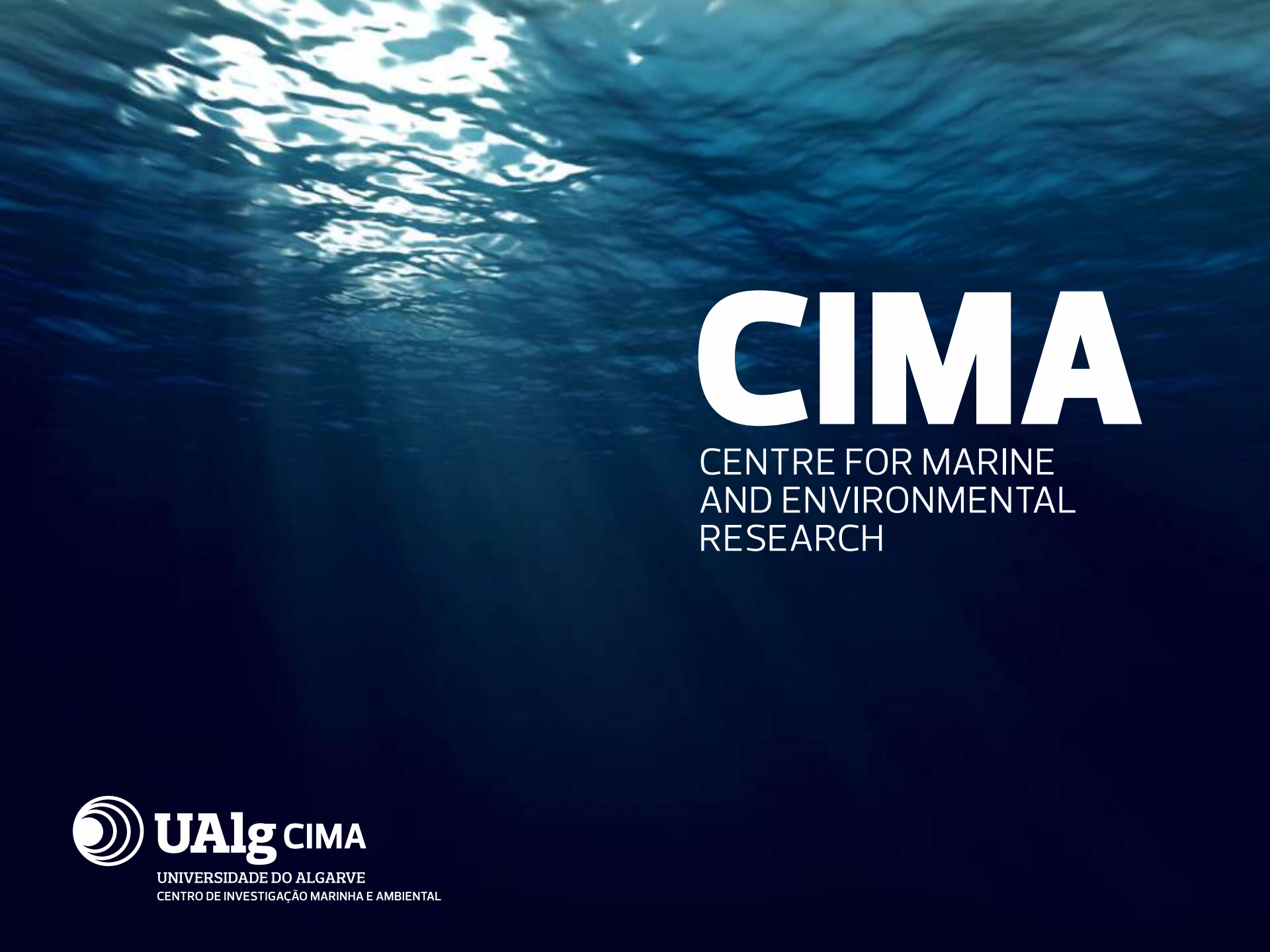


CIMA

CENTRE FOR MARINE AND ENVIRONMENTAL RESEARCH

UAlg CIMA

UNIVERSIDADE DO ALGARVE

CENTRO DE INVESTIGAÇÃO MARINHA E AMBIENTAL

The CIMA

The **Centre for Marine and Environmental Research (CIMA)** is a leading multidisciplinary Research Unit at the University of Algarve through its research, training and environmental monitoring activities.

The transfer of scientific knowledge to the Society is a major team commitment.

CIMA key areas

Climate Change / Ocean Observation / Transition Systems / Environmental Quality and Remediation / Energy and Resources

Energy & Resources

Marine and Wind Energy

Development of new tools and methods to quantify the marine energy resources and studies the effects of exploitation of energy in marine ecosystems, using and testing full-scale prototypes and keeping a strong partnership with the industry.

Conducts vibration, lubricant, ultrasounds and thermography analysis, and also visual inspection of wind power systems towards an optimization of energy production.

Energy & Resources

Research Topic

Exploring new concepts for extracting energy from tides

QUESTIONS

Marine Renewables contribute to satisfy the European electricity demand?

Yes Potential to satisfy approximately 20% of the present European electricity demand and the EU is currently the market leader.

What needs to be done to capitalize it potential?

We need stable and reliable technologies

We need accurate resource assessments and socio-economic studies

We need to clarify medium to long term environmental impacts

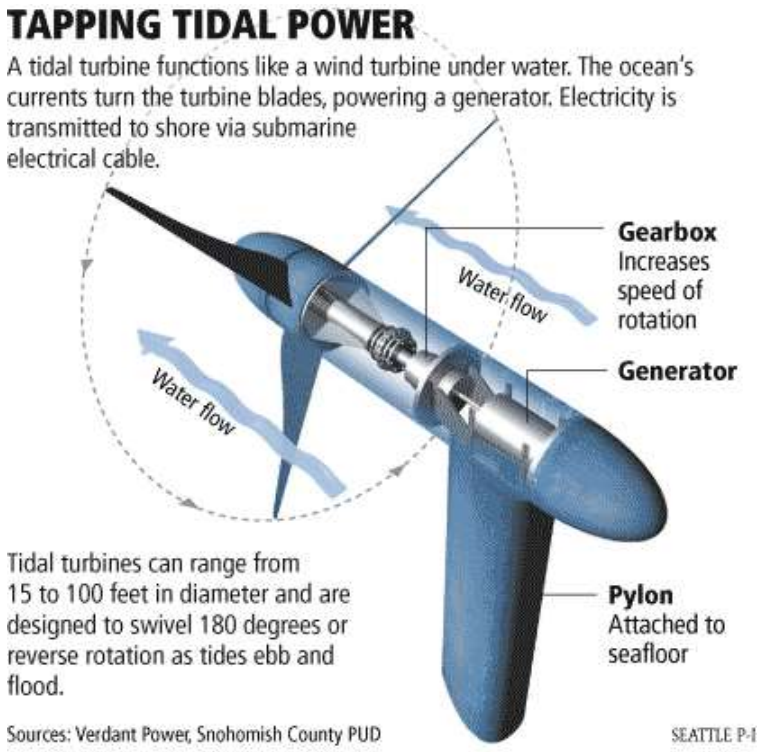
Energy & Resources

CIMA RESEARCH ON TIDAL ENERGY

What is Tidal Energy?
Tidal energy is one of many forms of hydropower generation.

Why Tidal Energy? It is predictable and carbon neutral. Emergent technology positioned to play a key role in supply the World with clean and completely renewable energy.

What is the estimated resource?
~ 16 GW(36,000 GWh/year). Today's EU installed capacity on tidal energy is 241 MW, 1.5% of the resource.



Where it can be extracted?
Sites are located at narrow channels that experience high variation in high/low tides

CIMA RESEARCH ON TIDAL ENERGY

What are our Research Questions?

Q1 Which are the impacts that tidal energy extraction will have on the temporal/spatial changes of flow and sediment transport patterns under different hydrodynamic settings?

Q2 Which are the constrains that the environment can cause on the extraction efficiency of tidal energy?

Q3 How to improve efficiency of tidal converters in energy production?

Q4 How much energy extraction ecosystems can tolerate?

Energy & Resources

CIMA RESEARCH ON TIDAL ENERGY

What are our Objectives?

O1 Validate the models and accurately quantify the long-term environmental impacts related with the extraction of energy (impact: develop mitigation actions);

O2 Contribute for deploying the first TEC prototype on Portuguese waters (impact: incentivize the research on new areas with high potential growth which cross-relate different disciplines);

O3 Contribute to the medium to long term production of green energy increasing the renewable energy portfolio (impact: accelerate blue growth)

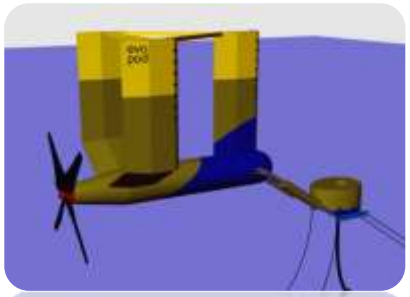
CIMA RESEARCH ON TIDAL ENERGY

How we intend to achieve it?

CIMA is leading two projects on tidal energy

SCORE financed by FCT

WATTAGE financed by Ocean-ERA NET



Energy & Resources

Collaboration with oceanflowenergy

EVOPOD 1 and EVOPOD 35

- Designed for efficient operation in exposed sea areas where waves coexist with tidal current.
- Can be easily disconnected from its mooring system and removed off-site for essential maintenance in safe sheltered non-tidal areas.
- Does not require long duration, expensive and risky installation operations as required for fixed seabed mounted devices.
- Overall improved economics of power production.
- Fewer disturbances to sensitive seabed ecosystems and its single turbine rotates at such low speeds (10–20 rpm).

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CIMA RESEARCH ON TIDAL ENERGY

E1 TEST AT RIA FORMOSA

SCORE - Sustentabilidade de Produção de Energia das Correntes de Maré da Ria Formosa
(http://w3.ualg.pt/~ampacheco/Score/index.html)

CHALLENGE

Design the mooring concept, the umbilical, the control system and the power extraction transform solution to deploy a scale Evopod turbine at Ria Formosa for R&D purposes of a new Marine Renewables Research Group, fostering future collaborations with researchers/industry.

FCT Fundação para a Ciência e a Tecnologia
MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR

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CIMA RESEARCH ON TIDAL ENERGY

E35 TEST AT SANDA SOUND

Workability Aspects of Tidal Turbine Arrays on producing Green Energy
(http://w3.ualg.pt/~ampacheco/Wattage/index.html)



CHALLENGE

Deploy and operate a 1:4 scale Evopod prototype under strong flow and analyse current-wave interaction with energy production. Evaluate the potential performance of a small array scheme of E35 devices, in which regards operation, reliability and survivability.

OCEAN ENERGY ERA-NET oceanflowenergy EMEC ORKNEY THE EUROPEAN MARINE ENERGY CENTRE LTD UAlg CIMA UNIVERSIDADE DO ALGARVE CENTRO DE INVESTIGAÇÃO MARINHA E AMBIENTAL CCMAR

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CIMA RESEARCH ON TIDAL ENERGY

PROJECT ACTIVITIES

Conduct detailed bathymetric surveys and current/wave measurements;

Conduct megafauna surveys and a bentho-pelagic sampling program;

Conduct underwater video surveys of the floating platform and turbine;

Deploy an acoustic array to measure turbine noise level;

Incorporate device arrays on a hydro-morphodynamic model platform and evaluate both energy extraction performance and environmental impacts from operation;

Propose realistic tidal array configurations for floating tidal turbines - size, spacing and layout;

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CIMA RESEARCH ON TIDAL ENERGY

PROJECT ACTIVITIES

Establish indexes of extraction potential using the test case site as an example taking into consideration both the resource and the environmental consequences;

Propose mitigation actions to accelerate the deployment of device arrays enabling developers to reduce over engineering, whilst maintaining reliability and survivability of the equipment;

Propose actions to incorporate the tidal extraction energy into a broad marine spatial planning minimizing conflicts with other human activities such as fishing, tourism and navigation (e.g. Blue Growth Initiative: compatibility, environmental regulations and legal issues).






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