

Offshore Renewable Energy



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Offshore Renewable Energy

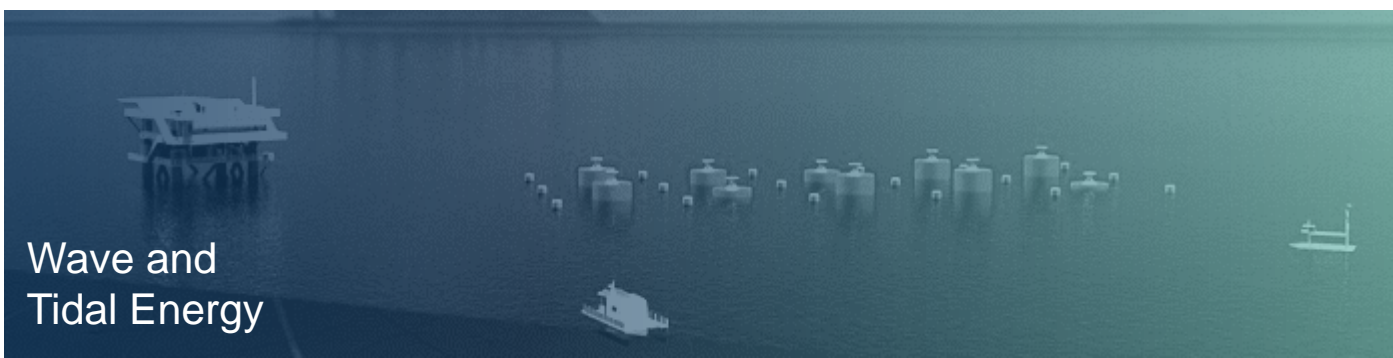
- New solutions for installation and O&M
- Optimised designs for reducing costs of foundations and electrical infrastructure
- Test and analysis of materials and components for harsh environments
- Design tools for floating platforms
- Tank testing and numerical analysis
- Analysis and design of mooring systems and electrical connections
- Design tools for the optimisation of arrays
- Performance assessment
- Optimisation of Power Take-Off and Control systems



Innovations for cost reduction in fixed offshore wind farms



Floating offshore wind turbines



Wave and Tidal Energy

Offshore Renewable Energy at TECNALIA

16

years of experience in
the offshore renewable
energy sector

€42m

worth on
R&D

4

patents transferred
to industry
(including 2 SMEs)



contributing to
numerous
international
committees and
advisory groups



tank and open-sea
**testing of wave
energy** devices

collaborating with the
regional government
on the definition of a
**marine energy
strategy**



organising international and national
events, including ICOE 2010

Offshore Renewable Energy at TECNALIA

2 technology-based
companies created



OCEANTEC

in partnership with
Iberdrola,
development of
wave energy
converters.

Acquired by IDOM
in 2018

nautilus 
floating solutions

a consortium made up of four
industrial companies plus
TECNALIA

aiming at developing cost-
effective floating platforms for
offshore wind in deep waters.



European
Research Projects

20 participation
in

5 led
projects

>€7m funding

>33% success
rate

What we know

Coupled, analytical and multi-physical models, including testing and validation

Physical and virtual sensing

Experimental modelling based on data analytics and deep learning

System engineering and decision tools

Where we apply our knowledge

Testing of components for offshore applications in real conditions

Digital twins of components for offshore applications to support life extension, operation, maintenance and redesign

Design and optimization of offshore structures and systems, including among others foundations, mooring systems, dynamic cables, marine operations and electrical lay-out

Generation, modeling and evaluation of innovative concepts for cost reduction in offshore renewables

Research applied to innovative and integral solutions for foundations, towers and auxiliary systems of high power offshore wind turbines



- Numerical models for the design and evaluation of offshore wind turbines
- Design optimisation of jacket foundations.
- New solutions for join systems not screwed.
- Innovation in transition pieces for both fixed and floating.
- Coatings resistant to corrosion and biofouling.
- Tower design optimisation for large wind turbines.
- Integrated lifting systems in offshore wind turbines
- Connection of dynamic cables to structures.
- New solutions for electrical transformers for large wind turbines



Open Sea Operating Experience to Reduce Wave Energy Cost



- Floating wave energy device (MARMOK-A-5) developed by the Basque company IDOM/Oceantec.
- Grid-connected and tested at BiMEP in two different configurations over three consecutive winters.
- Demonstrated survivability in rough seas up to 14 m maximum wave height and displayed increasing availability reaching 90%.
- The research team gained more than 1,000 man-hours of experience in operation and maintenance as well as confidence in its power performance and mooring system robustness.
- The experimental results confirm that the innovations can improve turbine efficiency by 55%, increase the overall power production by 30% and reduce the peak loads in the mooring lines by 50%.



Qualification of innovative floating substructures for 10MW wind turbines and water depths greater than 50m

nautilus 
floating solutions

- Advanced numerical modelling and experimental testing of floating structures.
- Tools for costs calculation and life cycle analysis of floating wind turbines, developed for concepts assessment.
- Methodology for the risk analysis and application to the design, for the identification of potential design constraints.
- Recommended practice for the design of floating wind turbines.
- Industrialization of NAUTILUS design, considering manufacturing, transport, installation, O&M and decommissioning stages.
- Pre-FEED and FEED designs for different wind turbines and offshore sites across Europe and USA.

Next Evolution in Materials and Models for Ocean energy

Improvement of the design and performance of tidal turbine blades. It will create a larger, lighter and more durable composite blade for floating tidal turbines, enabling devices to reach capacities of over 2 MW. **This will boost the competitiveness of tidal energy by reducing its Levelised Cost of Energy and increasing the yield of tidal turbines.**

- design, model and test blade materials and prototypes
- enable developers to significantly reduce both capital and operational costs
- improve the yield and reliability of tidal turbines
- advance the state-of-the-art of tidal turbine technology



- A novel tidal blade design
- Tailored composites, coatings and appendages
- Models of harsh hydrodynamic and environmental stresses
- Numerical models for the prediction of lifespan and mechanical properties
- A new test rig to evaluate fatigue and cavitation
- Novel testing procedure for bio-fouling and evaluation of marine environments

More Information



Development and demonstration of an automated, modular and environmentally friendly multi-functional platform for open sea farm installations of the Blue Growth Industry



Design of a low-cost, corrosion-resistant, low-maintenance modular concrete floating multi-purpose offshore platform, capable of accommodating aquaculture, wind and wave energy systems and then to test and validate this design through the construction and sea deployment a pilot scale platform.

Laboratory for Experimentation and Validation of Materials, Components and Subsystems in Real Marine Environment.

- Evaluation of materials, components and stand-alone systems in real offshore environment: Atmospheric, splash, immersion, confined and marine bottom zones.
- Trial of solutions to protect against corrosion, fouling, corrosion-fatigue. Corrosion monitoring.
- Training of personnel in offshore operations.

KONEKTA2

Innovative umbilical power connection system specifically designed for offshore renewable energy converters

- TECNALIA defined and patented the innovative umbilical power connection system
- This patent was licensed to DITREL and we are working together to commercialize it.
- DITREL has completed the survivability trials of a prototype after 6 months installed at BIMEP.

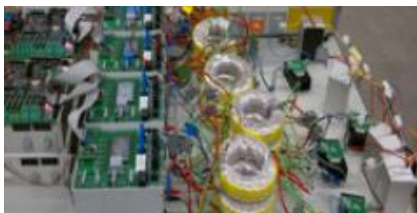
JRL-ORE areas of active basic research in colaboration with



More Information



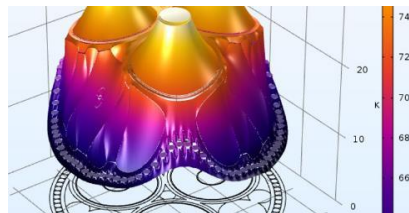
POWER ELECTRONIC CONVERTERS



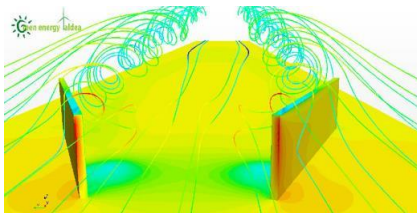
GRID INTEGRATION



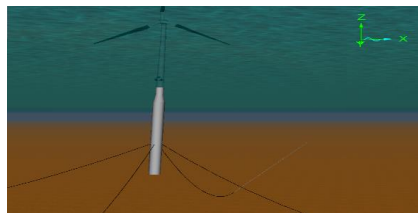
DIGITAL MODELS



CONTROL STRATEGIES



FLUID DYNAMICS



OFFSHORE RENEWABLE ENERGY TECHNOLOGIES



TECHNO-ECONOMIC ANALYSIS



MATERIALS FOR OFFSHORE RENEWABLE ENERGY

Networking



ESKERRIK ASKO
GRACIAS
THANK YOU
MERCI

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