wave energy

BASQUE COUNTRY

Industry for the future waves

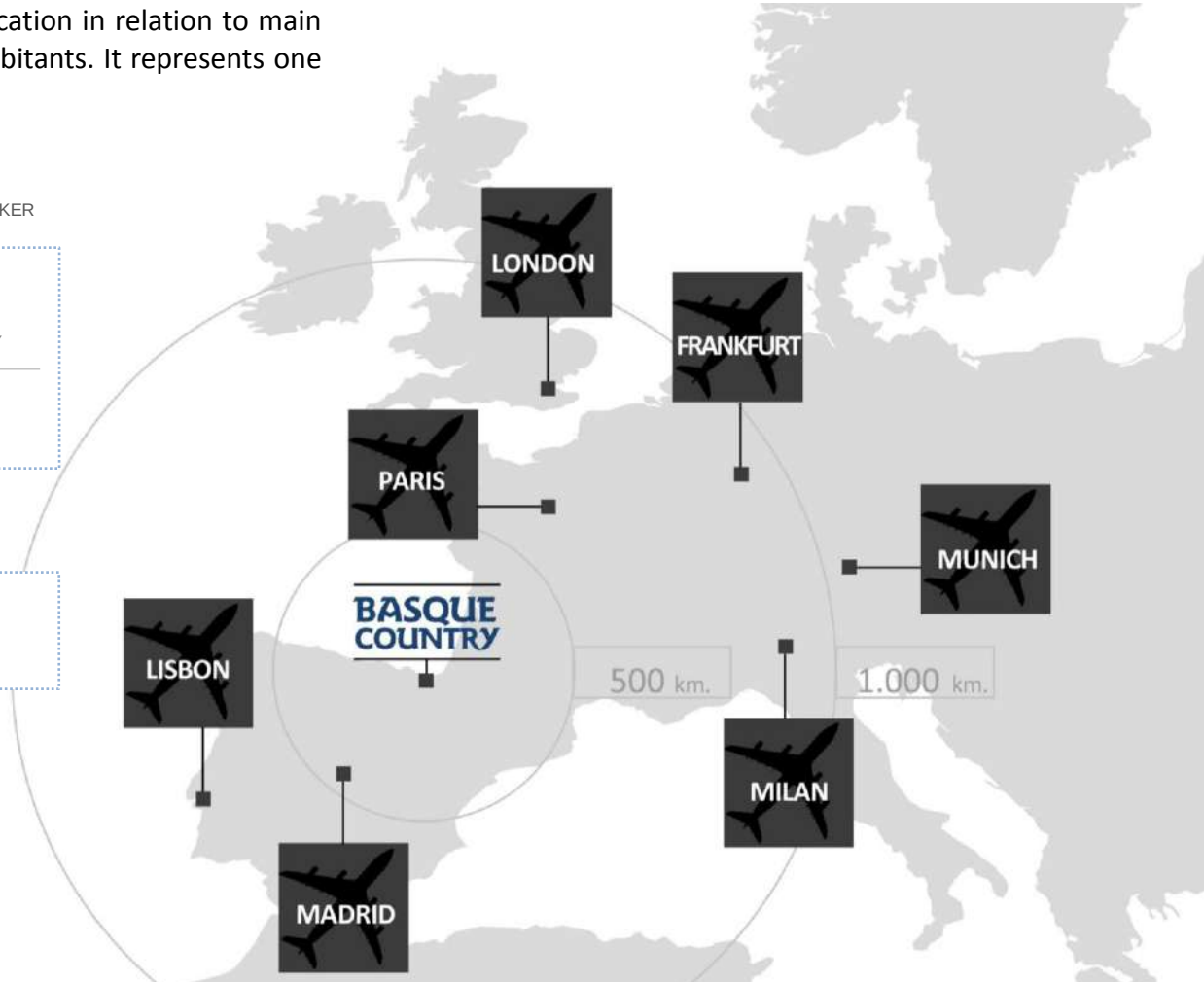
The Basque country is a worldwide leading region in energy sectors, thanks to the mix of its industrial concentration and technological intensity, …

Located in the north of Spain, the Basque Country is in a central location in relation to main European cities, covering an area of 7,000 km^2 with 2.2 million inhabitants. It represents one of the largest industrial concentrations in Europe.

GDP PER CAPITA	INDUSTRIAL GDP	PRODUCTIVITY PER WORKER
€33,896 BASQUE COUNTRY	24.6% BASQUE COUNTRY	124% BASQUE COUNTRY
100% EU-28	19.6% EU-28	100% EU-28

R&D INVESTMENT TO GDP RATIO	EXPORTS TO GDP RATIO
1.88%	36.4%

The Basque Country is the Autonomous Community with the highest intensity in R&D in Spain



Source: SPRI – Invest in Basque Country

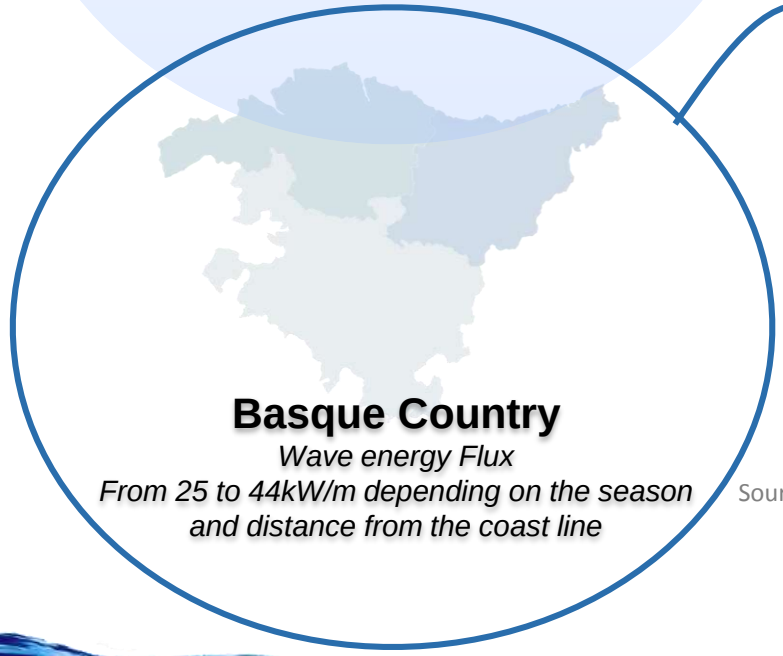
… with the presence of a wave resource that makes the Basque coast ideally located for developing and testing wave power generating devices

AN EXCEPTIONAL SITE

With its excellent marine resource, the Basque coast is in a unique position to benefit from wave energy and to develop and test wave power generating devices.

Regions located between 30 and 60 degrees latitude in both hemispheres present the greatest wave energy flows, varying between 20 and 70 kW/m.

The Basque coast , with a medium-high potential, allows devices and new technologies to be tested in a less aggressive environment than other locations.

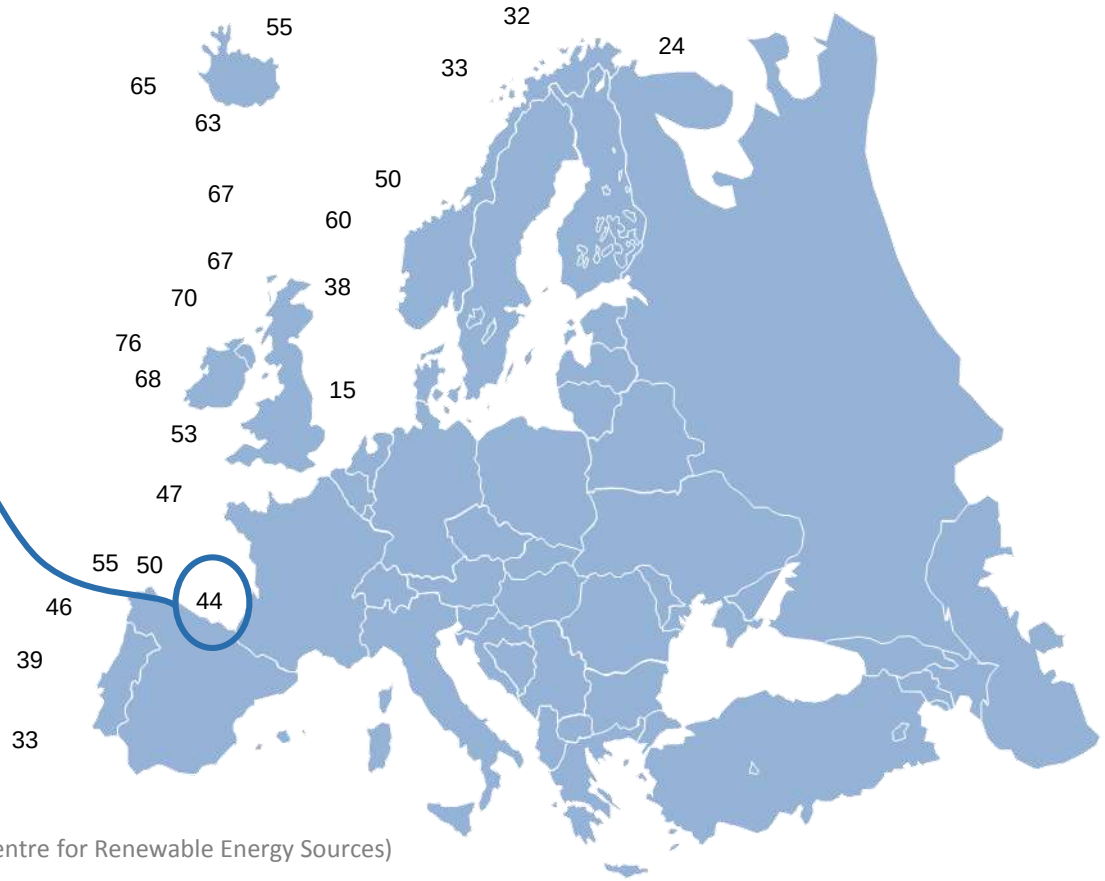


Basque Country

Wave energy Flux

From 25 to 44kW/m depending on the season and distance from the coast line

Wave energy resources in Europe



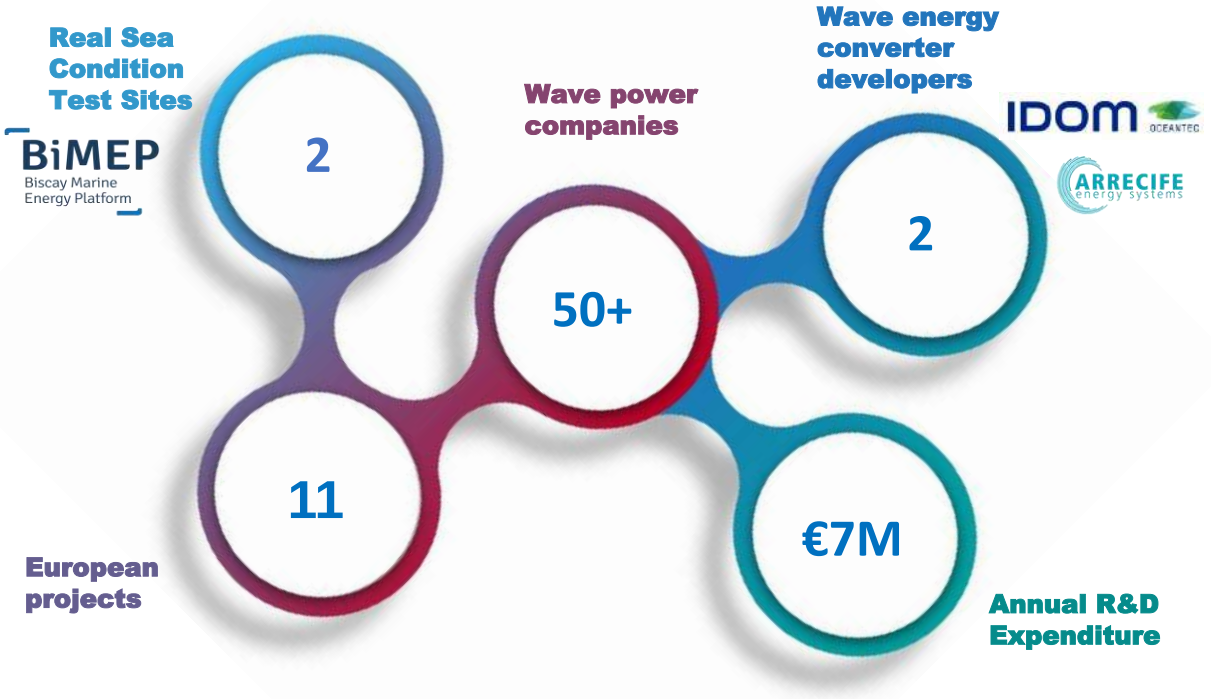
Source: CRES (Centre for Renewable Energy Sources)

Currently, the Basque Country is one of the few regions in the world with key stakeholders in every segment of the value chain, …

The Basque Country has a complete value chain led by several converter developers and a unique set of R&D infrastructures for testing and validation of marine energy components and systems.

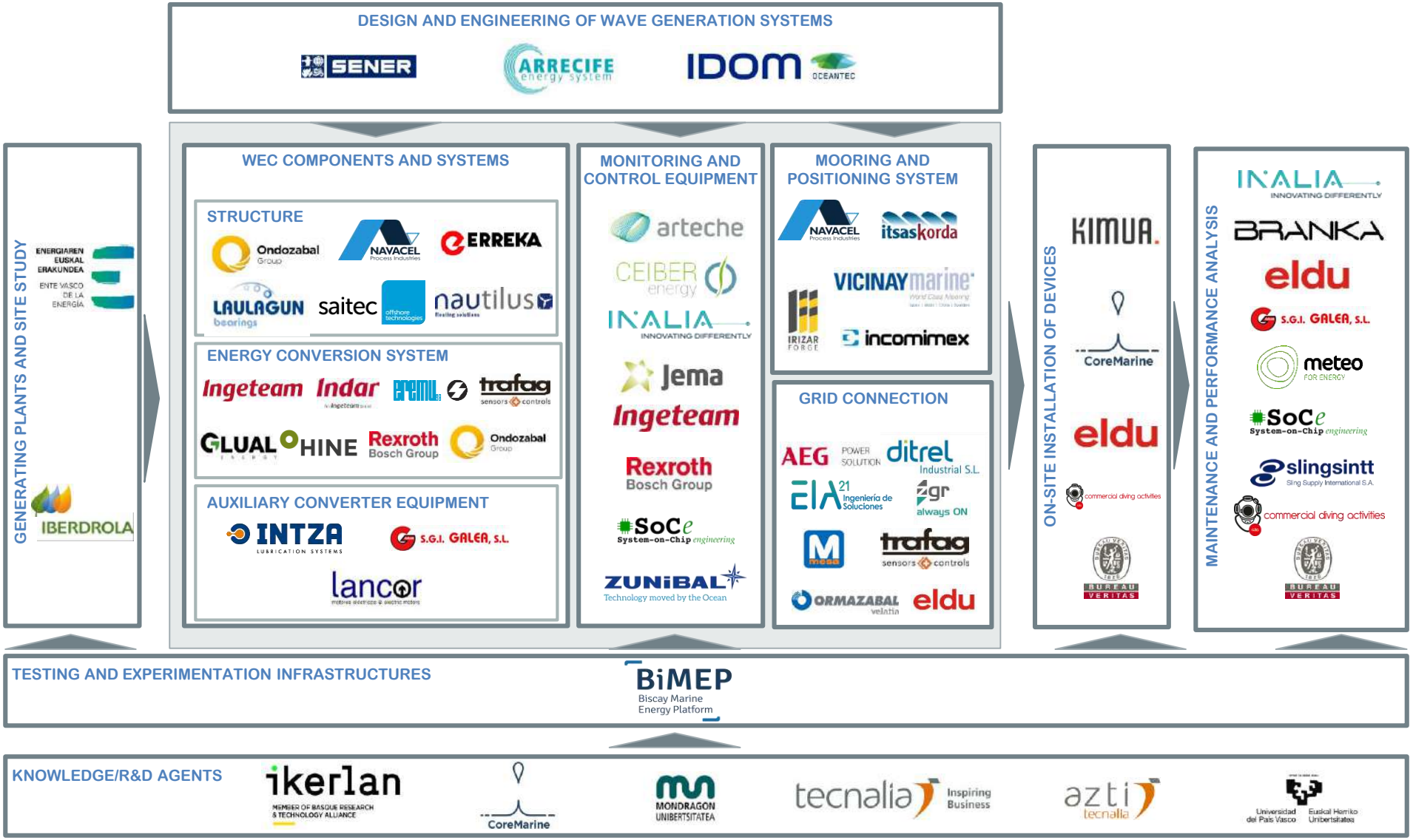
The overall industrial and technological positioning of Basque companies in this field has allowed the region to become a worldwide reference in driving the wave energy alternative.

Key figures of wave power activity in the Basque Country (2021)



Source: Basque Energy Cluster

… boasting over 50 companies with activity in wave energy development



OCEANTEC - IDOM and ARRECIFE ENERGY SYSTEMS are two reference companies in the development of wave energy converter

OCEANTEC project, as part of IDOM, focuses its efforts on the creation of technologies to obtain electric power from the oceans. Their development is based on the principle of the oscillating water column OWC.

At present, an offshore wave energy converter connected to the electricity grid is placed at sea (BiMEP platform), which allows obtaining operating data in real conditions. This converter, called MARMOK-A-5, is a device of low power (30kW) of dimensions of five meters in diameter, forty-two meters high and weighing approximately 80 tons.

Installation of MARMOK-A-5 in BiMEP

Arrecife is a startup that has patented its own wave energy converter based on the analysis of energy absorption by living corals. The device contains several direct action turbines placed in series, with many blades simulating a coral reef. It has developed a total of three commercial devices (75kW, 440kW and 2MW)

Arrecife is designed to work with the most common waves (1 to 5m high), which means more efficiency both in the manufacturing and in the energy production.

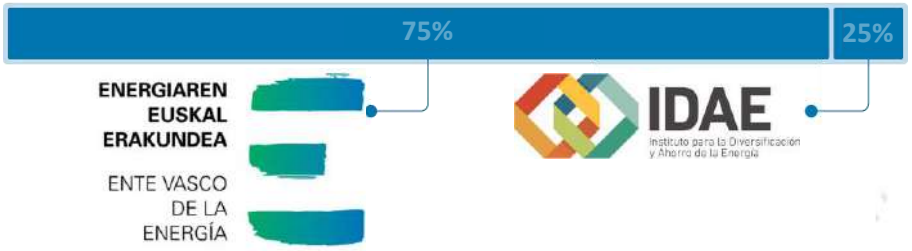
Arrecife system

The Basque Country is also the location of two world reference infrastructures in the field of wave energy

Biscay Marine Energy Platform, S.A., or BiMEP, is an infrastructure operating in real marine conditions for the research, demonstration and operation of marine energy collector devices.

BiMEP
Biscay Marine Energy Platform

Biscay Marine Energy Platform, S.A.



BiMEP has two sites

Mutriku site: Wave energy generating and testing plant with Oscillating Water Column technology. Offers a unique opportunity for testing new concepts in air turbines, control strategies and auxiliary equipment.

BiMEP site: Open sea test site with grid connection for demonstrating and validating wave energy collectors and floating wind platforms.

Mutriku OWC is the plant that most wave energy electricity has poured into the grid in the world…

Mutriku Area

1.8 GWh of electricity supplied to the grid

Developer: EVE Basque Energy Agency

16 turbines with total capacity of 296kW

World's first commercial wave plant (2011)

Investment: €2.3m

Uses OWC technology

The wave-based power generation facility is located inside the seawall of Mutriku

Key Characteristics

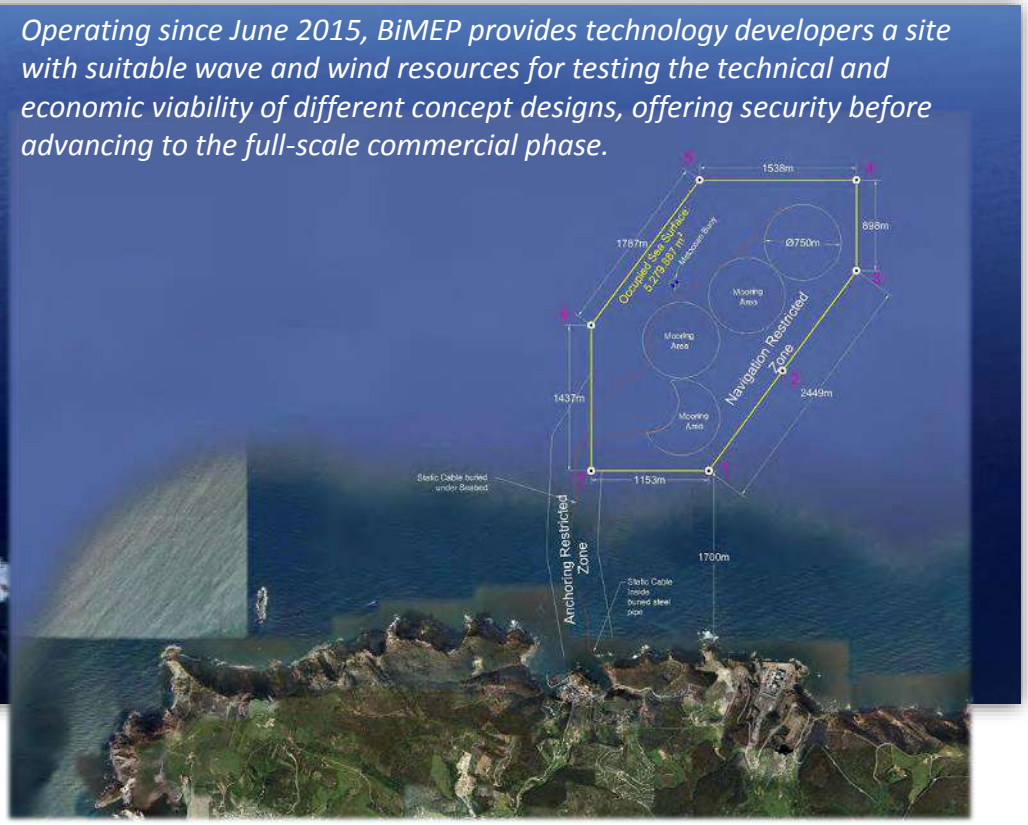
- Air chamber attached to the breakwater. Dimensions: 4.5 m wide; 3.1 m long; 9.7 m above mean low water springs (MLWS).
- Connection to local distribution grid through a 460 V/13.2 kV transformer.
- Available data from sensors: water level and pressure in the chamber, environmental humidity and temperature in the gallery.
- Circular opening of 750 mm diameter connecting the air chamber to the turbine.
- Power connector for fast generator connection.
- Easy road access to wave plant.

Mutriku: pioneering wave-based power generation facility and up-and-running test site for new concepts in air turbines, generators, control strategies and auxiliary equipment; first grid-connected wave energy plant in Europe (mainland)

… and BiMEP area, a singular open infrastructure for real-scale testing and validation of marine energy components and systems, developed and operated by EVE, the Basque Energy Agency

Bimep Area

Operating since June 2015, BiMEP provides technology developers a site with suitable wave and wind resources for testing the technical and economic viability of different concept designs, offering security before advancing to the full-scale commercial phase.



Key Characteristics

- Onshore substation fitted with 25 MVA 13.2/132 kV transformers.
- Four 13.2 kV/5MW subsea cables fitted with optic fibre.
- Facilities for installation, trials, tests and operation
- Resource measurement using an oceanographic buoy and floating Lidar system.
- Dry mate subsea connectors.
- Possibility of feeding in low voltage power (690 V).
- Area restricted to the shipping with perimeter beacons.
- Depth: 50m-90m

BiMEP area is located off the coast at Lemoiz-Armintza. It occupies a surface area of 5.3 km2and stands at a distance of 1.7 km from the coast. It is located 15 km from Bilbao Port, one of the most important logistical centres on the European Atlantic axis.

Basque entities participate in practically all relevant European collaborative R&D projects in the field of wave energy …

Examples of R&D initiatives with agents from the Basque Country

WESE is focused on overcoming the non-technological barriers that could obstruct the future development of wave energy projects in the EU, and particularly in Spain and Portugal.

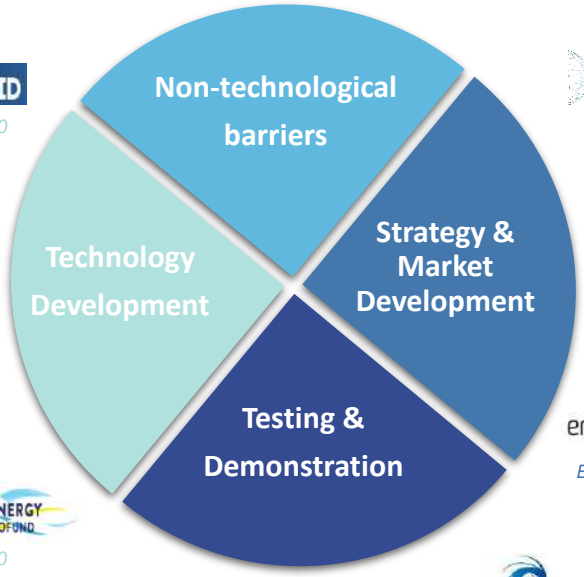
WESE
EMFF

SAFE WAVE
EMFF

SAFEWAVE aims to overcome the non-technological barriers that obstruct the future development of wave energy by focusing on three objectives: investigation and environmental demonstration, planification and authorization, education and public participation

VALID will develop a hybrid test platform for accelerated testing of maritime energy devices with the objective of integrating reliability and survivability test methods together with relevant data on component failure.

VALID
H2020



ELBE+
COSME

ELBE+ aims to position Europe as the world technological and industrial leader in Blue Energy, focusing on floating offshore wind, wave and tidal energy. The goal is to support and reinforce internationalisation of European SMEs, while also identifying new potential markets.

THE BLUE GROWTH FARM aims to develop and demonstrate an automated, modular and environmentally friendly multi functional platform for open sea farm installations of the Blue Growth Industry.

theBlueGrowthfarm
H2020

OceanSET
H2020

OCEANSET supports the implementation of the European Strategic Energy Technology Plan (SET Plan) and promote coordination and collaboration between the parties.

DTOCEAN+ provides design tools for deploying the first generation of wave and tidal energy converter arrays.

DTOcean+
H2020

energiBasque
EnergiBasque

ENERGIBASQUE is the strategy for the technological and industrial development of the Basque Country in Energy. The main objective is to convert the Basque Country into a knowledge hub and industrial development benchmark in the energy sector worldwide.

OCEAN Energy ERA-NET Cofund is an initiative of eight national and regional government agencies that aims to coordinate support for R&D in ocean energy.

OCEAN ENERGY ERA-NET COFUND
H2020

EUROPEWAVE is a collaboration project between Scotland and the Basque Country to lead the research and development of wave energy capture devices, in order to promote the purchase of technologies that demonstrate ability to move forward.

EuropeWave
H2020

MaRINET2
H2020

BLUEGIFT
Interreg Atlantic Area

BLUEGIFT is a coordinated ocean energy technology demonstration programme that aims to support a minimum of eight floating wind, wave or tidal demonstration related projects across the Atlantic Area region.

MARINET2 is a network of research centres and organisations that ensures the integration and enhancement of leading European research infrastructures specialised in research, development and testing of Offshore Renewable Energy (ORE) systems.

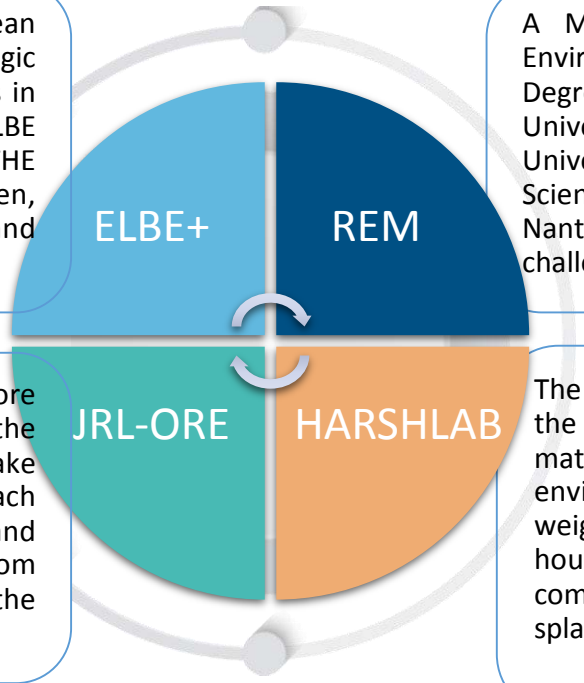
… and in other initiatives regarding training, testing or international reach, where the Basque Country is an active partner with other leading European regions

ELBE+
EUROPEAN LEADERS OF BLUE ENERGY

ELBE will focus on consolidating the European alliance with the aim to develop strategic collaborations with companies and R&D entities in other leading countries throughout the world. ELBE gathers the most advanced regions in THE EUROPEAN Blue Energy SECTORS: Aberdeen, Denmark, Flanders, Sweden, France, Norway and The Basque Country (leader).

MASTER IN RENEWABLE ENERGY IN THE MARINE ENVIRONMENT
REM

A Master in Renewable Energy in the Marine Environment is an Erasmus Mundus Joint Master Degree (EMJMD) offered by four universities: University of the Basque Country (coordinator), University of Strathclyde, Norwegian University of Science and Technology and École Centrale de Nantes. It trains the student to face the technological challenges that harsh conditions offshore require.



A Joint Research Laboratory on Offshore Renewable Energy that seeks to strengthen the research links between the parties in order to take advantage of synergies between them and to reach critical masses in the agreed scientific and technological areas. Reference researchers from UPV / EHU, BCAM and TECNALIA shape the scientific committee of the laboratory.

The first floating laboratory in Europe dedicated to the research of new anti-corrosive and antifouling materials and solutions for the offshore environment. With a diameter of 5 metres and weighing 10 tonnes, this infrastructure is capable of housing up to 765 samples of materials and components in three exposure areas (atmospheric, splash and immersion).

JRL-ORE
Joint Research Laboratory on OFFSHORE RENEWABLE ENERGY

with the support of:
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HARSH LAB

wave energy
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