This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 952966.

Reinforcing EU leadership in renewable energy and blue economy

An offshore wind farm is a clean and renewable source of energy that harnesses the power of the wind in high seas, where wind speeds are higher and more constant due to the absence of natural barriers.

Most floating offshore wind turbine technologies are based on steel support platforms and only a few on steel reinforced concrete. Large quantities of steel are needed to build the floating platform as well as the wind turbine. The steel is subject to degradation due to marine corrosion accounting for approximately 60% of offshore maintenance costs.

The main objective of the FIBREGY project is to enable the extensive use of Fibre Reinforced Polymer (FRP) materials in the structure of the next generation offshore wind and tidal turbine platforms. FRP-based offshore platforms can be a game changer in the current total cost of building and operating a lifetime power generating facility. A paradigm shift with enormous potential added value for the European clean energy sector.

Offshore wind and tidal energies are essential for the European Union to meet its energy efficiency and renewable energy 2030 and 2050 targets[1]. FIBREGY will strengthen the EU's leadership in renewable energy and blue economy. The output of the global ocean economy is estimated at €1.3 trillion today and this could more than double by 2030[2]. The European Commission has reiterated that Europe must not miss the opportunity to become a major player on the international market and home to successful clean ocean energy companies.

Due to the reduction of the maintenance and production costs, FIBREGY expects to increase the target market by 10-15% and the profit margin by 20-25% at the end of the project. Offshore wind and tidal energies play a key role in achieving the European Greenhouse Gas Emissions 2030 and 2050 targets.

The European marine sector employs more than 5 million jobs generating almost €500 billion per year, with potential to create many more jobs[3]. Today, explosive growth in the installation of offshore wind farms means that the offshore renewable energy is now a major contributor to employment, accounting for 150,000 jobs. If we look at the ecosystem around small and medium-sized shipyards, the technology to be developed in the project will increase their opportunities and competitiveness in the renewable energy market.

Within FIBREGY, the investment needed to adapt existing shipyards to the new market will be assessed. It will also analyze how shipbuilding and the European FRP industry must work together to implement optimal strategies to lead this new global market.

The readiness for automated production of FRP materials and strategies such as the production facility sharing can further increase the competitiveness of the sector. The direct increase in jobs

[1] https://ec.europa.eu/clima/eu-action/european-green-deal/2030-climate-target-plan_en
[2] https://www.oecd.org/ocean/topics/ocean-economy/
[3] Report on the Blue Growth Strategy Towards more sustainable growth and jobs in the blue economy

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in the marine sector in this decade as a result of the increased competitiveness created by FIBREGY is estimated to be 15%.

The European target for 2050 is that offshore power generation (wind and tidal) will account for 25% of total electricity generation. To keep up with the pace of the new players (China and United States) and reach the ambitious targets for 2030 and 2050, wind and tidal farm developers must have more competitive concepts and acquire know-how to optimize their procedures. These conditions make the European market suitable to lead the development of new FRP-based offshore wind and tidal energy platforms.

Europe's goal is to quadruple its offshore wind capacity in 10 years. To this end, it will set aside €26 billion for the development of new technologies and the commissioning of new offshore wind farms[4] (€3.2 billion/GW).

According to statistics published by Ocean Energy Europe, Europe remains the world leader in tidal power installations, with European tidal stream projects generating 50% more electricity in 2019 than the previous year[5].

Significant cost reduction and decrease of the environmental impact of OWTP platforms.

FIBREGY will allow an important reduction of the Levelized Cost of Energy (LCoE) and of the Capital Expenditure (CapEx). The project estimates a CapEx reduction of 8.5% for tidal energy and up to 10.3% for offshore wind energy. FIBREGY will impact the CapEx in the following aspects:

- Reduction of the development time, validation and demonstration testing.
- Significant reduction in transportation and installation costs, and platform mooring costs by using lightweight materials and components that will reduce the weight of the structure by 50%.
- Optimized processes that will reduce production and construction times.
- The development and validation of advanced computational models for strength and fatigue/degradation assessment and their application in the design phase.
- Use of advanced FRP materials with high strength which significantly increase the life of the structures.
- Corrosion immunity of FRP materials that today represents 60% of the maintenance cost.
- Dirt release. The use of the most efficient fouling release micro-texture and more effective paint.
- Predictive maintenance. The project will implement procedures that can accurately forecast the behavior of the critical structural components.

[4] https://windeurope.org/policy/topics/offshore-wind-energy/
[5] Ocean Energy: key trends and statistics 2020

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- Risk reduction. FIBREGY will reduce investors' perception of risk. Thanks to the development and implementation of a structural digital twin, uncertainty about the lifetime of the structure will be reduced and its reliability will be increased.
- Accelerate certification. During the FIBREGY project, categorization, auditing and testing actions will be carried out with the aim of obtaining certification by a classification society. The engineers' work will always be supervised and guided by Bureau Veritas and will be reviewed by the standardization committee composed of DNV-GL, LR and Bureau Veritas.

Offshore wind technology has the lowest life cycle emissions of all existing power generation technologies and FIBREGY will enable additional reductions in the carbon footprint of OWTP platforms, mainly due to the following aspects: the production of FRP-based structures emits between 18% and 29% less of the Greenhouse Gases emitted by equivalent steel structures; and the use of dry coatings instead of traditional liquid paints which reduces waste and eliminates the release of chemicals into the environment. In addition, FIBREGY will use "passive" scale-release films to replace antifouling paints, which contain harmful biocides.

FIBREGY will pay particular attention to the recyclability rate and proper waste management. In addition, it will study the use of recycled carbon fibers for non-critical components and the use of reversible structural adhesive that will allow easy disassembly of the elements at the end of their useful life and reuse the parts and facilitate the recycling of the components.

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12 partners from 7 countries, with more than 40 researchers.

The strong belief in the relevance of the FIBREGY proposal, its innovation potential and the business opportunities that can be generated, have led to an outstanding alliance. The FIBREGY consortium, led by the International Center for Numerical Methods in Engineering (CIMNE, Spain), includes relevant offshore wind and tidal turbine platform concept developers (ENEROCEN and TIDETEC), specialized FRP shipyards (IXBLUE and TUCO), a reference classification society (BV), prestigious research organizations selected according to their experience and experimental capabilities (ULIM, INEGI and CIMNE), two engineering offices with complementary expertise in offshore engineering, CAE software and monitoring solutions (TSI and COMPASSIS), a company specialized in the design and manufacture of flexible paint films and coatings with integrated technological functions (CORSO) and an EU association representing interests of more than 250 reinforced/composite plastics producers and processors (AVK).

The consortium is composed of a network of 12 research, engineering and industrial organizations from 7 European countries with a proven track record in research and technological innovation, creating a fertile ground for the dissemination and exploitation of results.

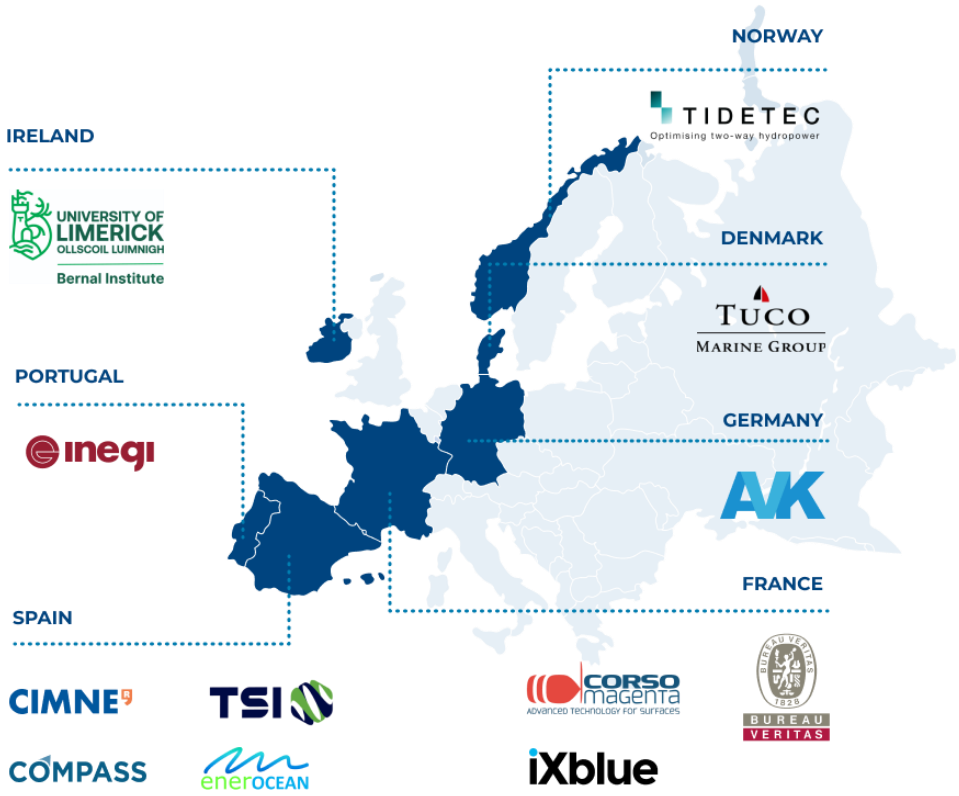

Figure 1: Fibregy's consortium

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