



MAREWIND - MAterials solutions for cost Reduction and Extended service life on WIND off-shore facilities

EU H2020 Project Grant Agreement n° 952960

CONTEXT: Importance and challenges of offshore wind energy

European wind energy sector:

- 2020-scenario: Installed capacity of 220 GW (onshore + offshore), 16% of EU electricity demand.
- 2025-scenario: +105 GW installations.

Offshore wind energy:

- Challenges: Damage on materials and coatings due to wetness, UV-radiation, abrasion, erosion and corrosion, and lack of efficient predictive modelling and monitoring system;
- Consequences: 4-20% reduction in energy production, O&M costs up to 25% of total costs.

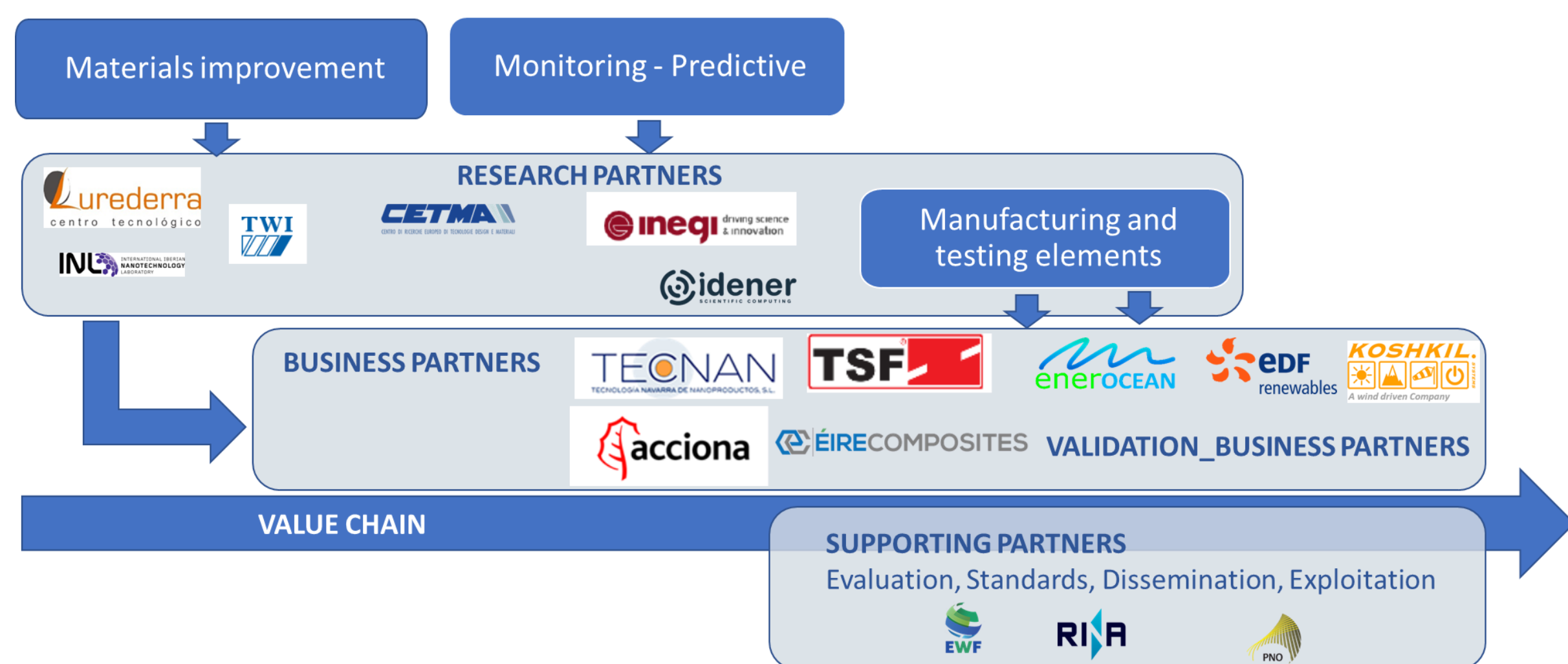
End-of-life stage: Expected 800 kt/year of waste wind turbine blades by 2050.

Objectives of the MAREWIND Project

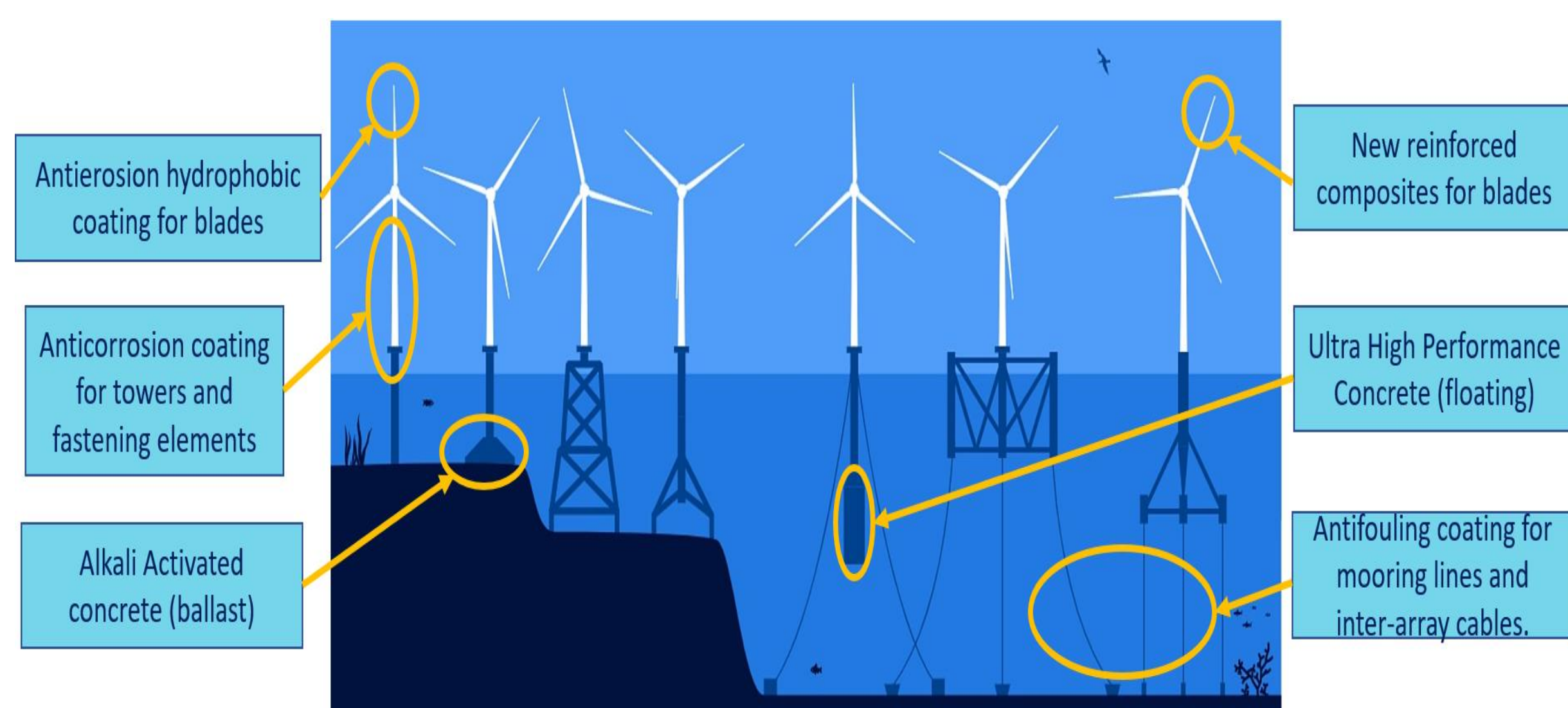
Provide technological solutions to help build a next generation of large offshore wind energy power plants by tackling the current challenges related to materials, coatings and multi-material architectural performance.

- The project will contribute to a more economical and sustainable offshore wind sector by developing durable materials and recyclable solutions for the offshore wind industry, while extending the service life of the wind facilities and reducing the maintenance of the offshore structures.
- The project will also contribute to meeting the EU climate targets and create new job opportunities within the wind industry.

Organization:



MAREWIND technical challenges

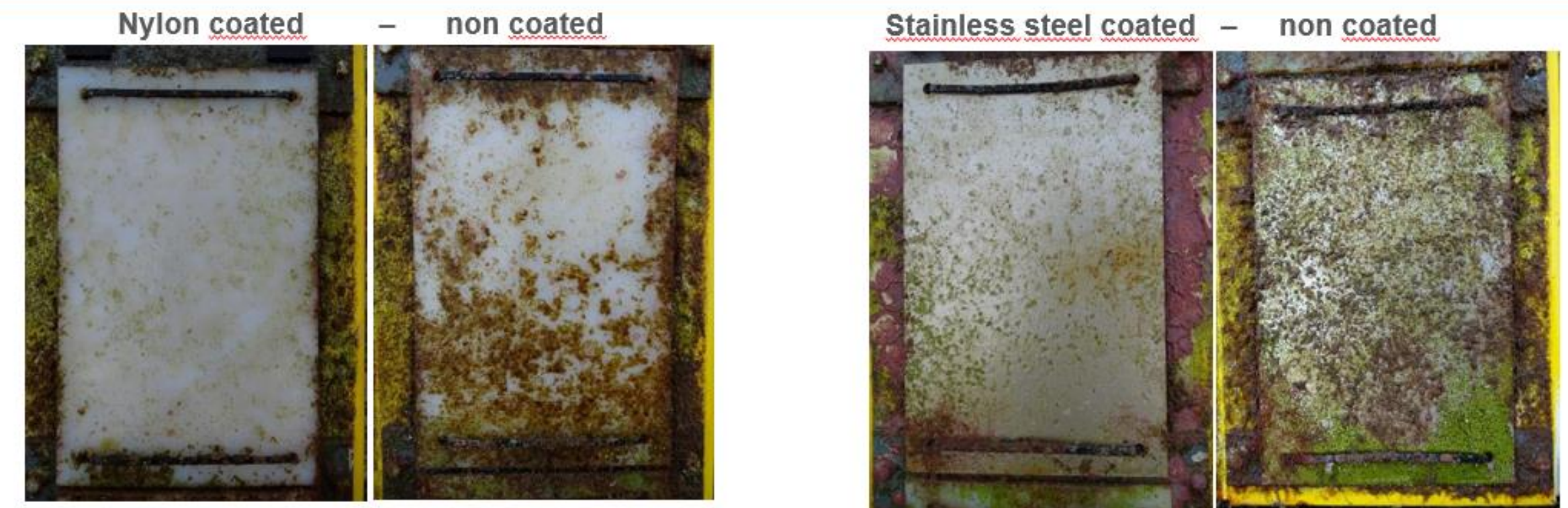


CONSORTIUM



Some of MAREWIND solutions

MAREWIND ANTIFOULING SOLUTION SUCCESSFULLY TESTED IN REAL EXPOSURE IMMERSED IN THE SEA



Samples tested by ENEROCEAN in PLOCAN facilities (PLataforma Oceánica de CAñarias) according to ASTM 3623 regulation, in conditions of full immersion after 2 months.

EFFICIENCY OF THE MAREWIND ANTICORROSION SOLUTION IN REAL FASTENING ELEMENTS, manufactured by TSF



The anticorrosion system developed has been tested based on specific conditions from ISO 12944-9 (Protective paint systems and laboratory performance test methods for offshore and marine related structures)

Easy and direct application of the coating by spray gun



MAREWIND HIGH AND ULTRA-HIGH CONCRETE SOLUTION SUCCESSFULLY REACHED PROJECT OBJECTIVES

- Greener solutions with CO2 footprint reduction.
- Improved durability performance than traditional solution.
- Raw material consumption reduction.

Floating Prototype to test at EUMER Lab Offshore real exposure at ACCIONA'S HARBOUR DEMOSITE

Mechanical and durability characterization tests at ACCIONA and CETMA facilities according to the corresponding standards

Buoyancy tests at lab scale for design purposes

Example of sample location at ACCIONA HARBOUR DEMOSITE

FULL-FIELD TECHNIQUES SUCCESSFULLY DEMONSTRATED AT LAB SCALE

Full-field measuring techniques of wind blade working conditions: hardware, measurements and algorithms

Digital Image Correlation

- GNSS Trigger and Synchronized Control solution development
- Moving camera and blade laboratory setup execution
- DIC displacement measurements with rotating blade was performed

Thermographic Analysis

- IR Defect detection algorithm development and optimization
- Performance of thermographic analyses on a damaged composite plates used for testing - Glass fibre wind turbine sections

RECYCLABLE ELIUM 5 m DEMONSTRATOR AND 13 m BLADE PROTOTYPE

- Blade manufacturing solutions to help avoid the 'Expected 800 kt/year of waste wind turbine blades by 2050'



CONCLUSION

Among the results obtained in MAREWIND, it is worth mentioning the following which will impact directly offshore wind project sustainability and reduce its O&M Costs:

- **Antifouling coatings:** MAREWIND experiments showed a significant delay in fouling cumulation after several months immersed in the sea.
- **Anticorrosion coatings:** the resistance achieved in the laboratory testing would correspond to CX corrosivity category, implying extreme resistance of more than 25 years. Easy and direct application of the coating by spray gun has been demonstrated and the production of 100 l is envisaged to validate its upscaling.
- **UHPC developed presents** a more sustainable solution than standard UHPC and shows a 90% durability improvement compared to a standard C60 at same age.
- Successful testing of **sensors** on concrete and composites for blades for SHM.

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