



Development, engineering, production and life-cycle management of improved FIBRE-based material solutions for structure and functional components of large offshore wind energy and tidal power platform

An introduction to FIBREGY

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SUMMARY

- FIBREGY's main goal is to enable the extensive use of FRP materials in the structure of the next generation of large offshore platforms .
- The project will develop and qualify FRP materials for offshore applications, elaborate new design procedures and guidelines, generate efficient production, monitoring methodologies, and validate and demonstrate advanced software analysis tools.
- To ensure the industrial relevance of the project outcomes, the different activities will be focused on two promising offshore energy concepts, which will be re-engineered.
- The different technologies to be developed in FIBREGY will be demonstrated by using advanced simulation techniques and building a real-scale prototype.
- Different LCA studies will be carried out to evaluate the impact of the proposed options.



FIBREGY

8.0 M€

TOTAL BUDGET

12 **PARTNERS FROM 7 COUNTRIES**

CONSORTIUM

- Concept developers:
 - ENEROCEN and TIDETEC
- FRP shipyards:
 - IXBLUE and TUCO
- Classification society:
 - BV
- Research centers:
 - ULIM, INEGI and CIMNE
- Engineering offices:
 - TSI, COMPASSIS
- Dry painting solutions:
 - CORSO
- Association of plastics industry:
 - AVK



 **FIBREGY**
COMMUNITY



MOTIVATION

- The open sea is a very aggressive environment, which largely affect the maintenance costs of installations.
- A massive amount of steel goes into offshore assets, which explains why corrosion accounts for approximately 60% of offshore maintenance costs.
- Despite the convenient immunity to corrosion and superior fatigue performance of FRP, none of the structures of the Floating Offshore Wind Turbine concepts that have reached a high TRL are based on FRP.
- If we look at the field of tidal power generators, the use of FRP materials for rotor blades is common but, with rare exceptions, the platform structure -the major cost item- is made of steel.
- Technical reasons: lack of design and assessment (certification) guidelines, different technology gaps that have to be filled to demonstrate the full feasibility of using FRP materials in the offshore industry, prove a significant lower life cycle reduction.





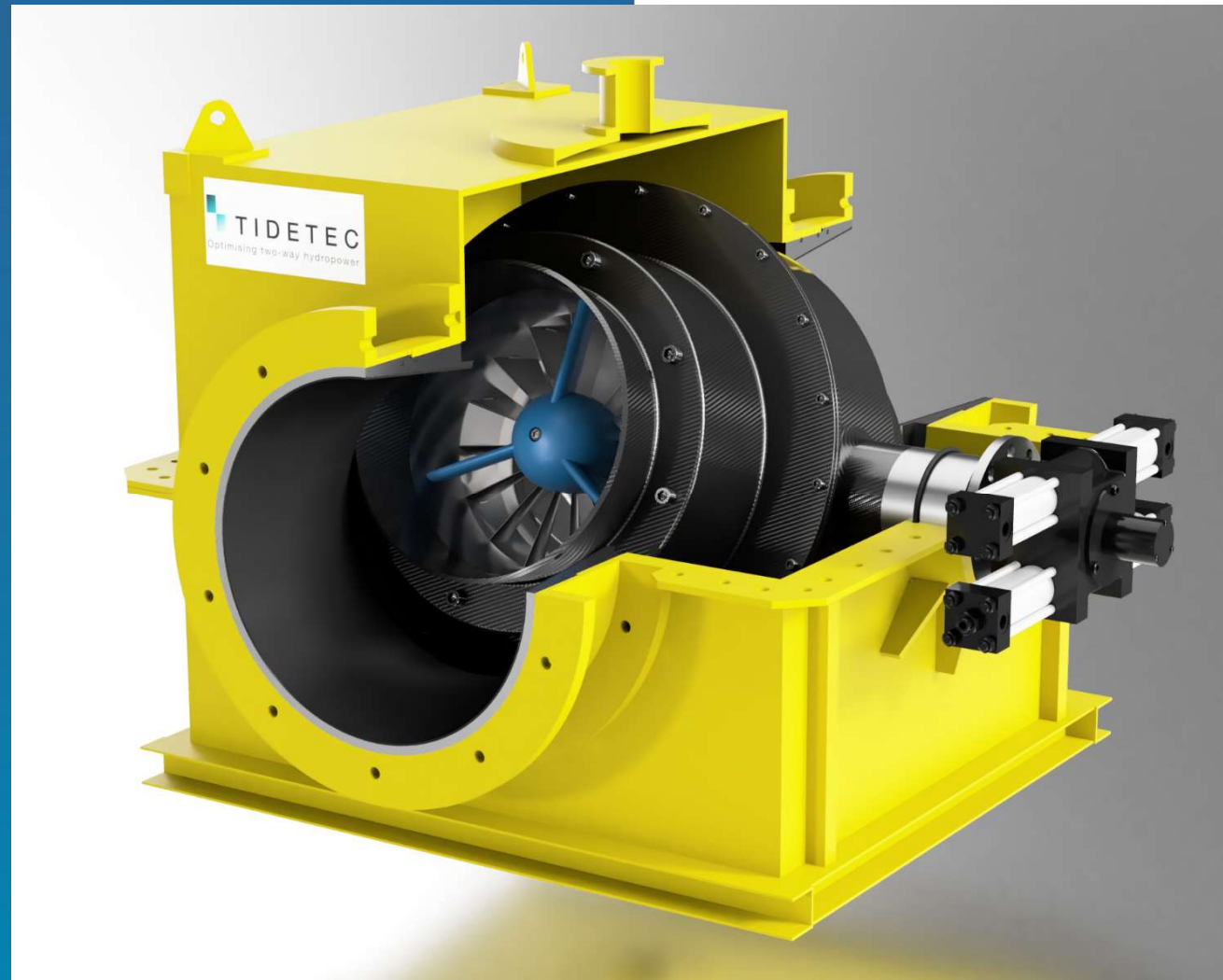
W2POWER

- W2POWER is a twin semi-submergible platform concept developed by ENEROCEAN.
- It enables a rated of 12 MW on one simple floating platform.
- W2POWER is currently one of the most advanced multi wind turbine designs, and the only one with a 1/6 prototype already deployed at the Canary Islands.
- It is also one of the most promising, with an expected LCoE reduction versus conventional semisubmersible wind turbines of 20%, according to the conclusions of the DEMOWIND project.

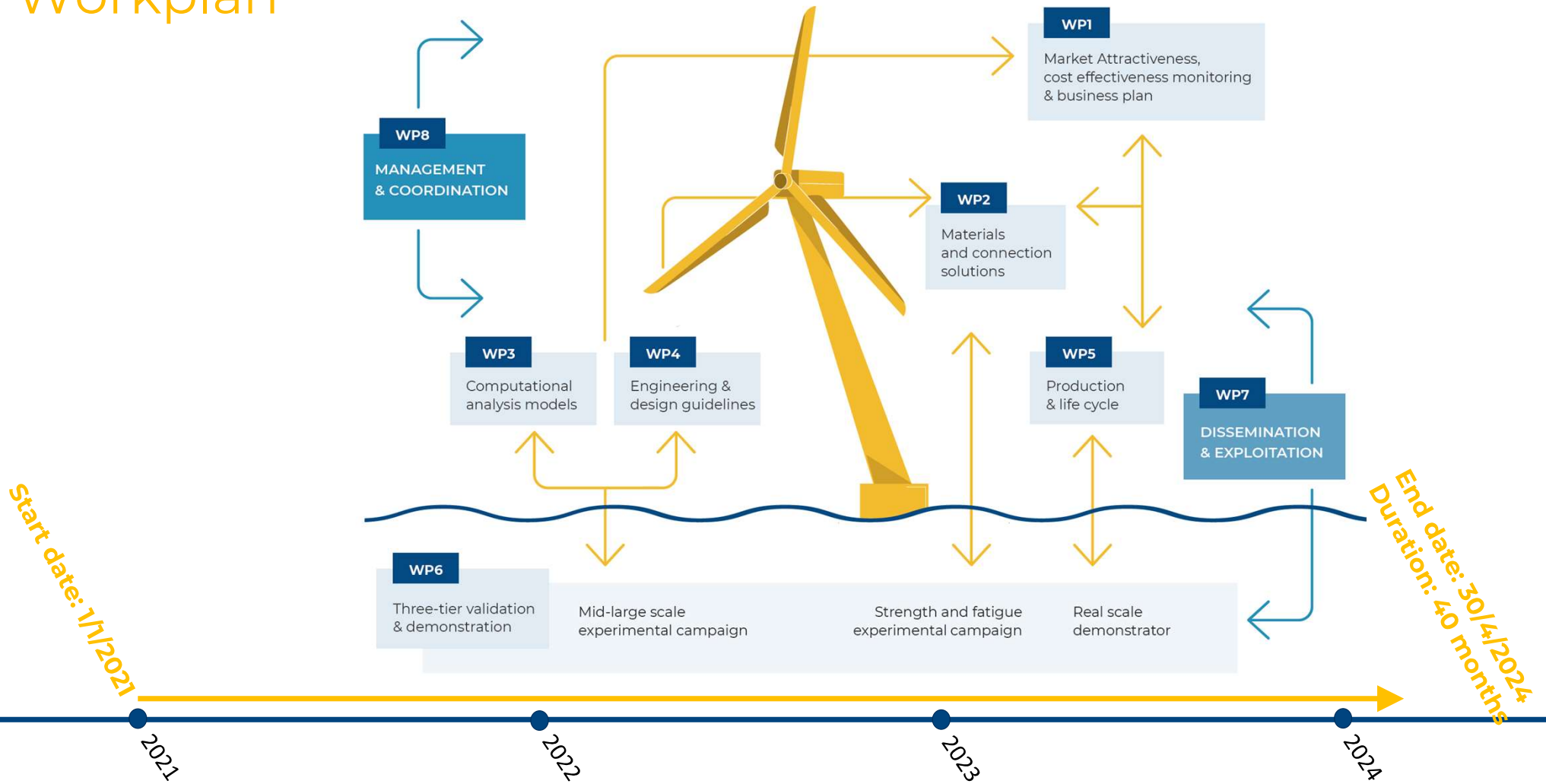


TIDETEC's tidal turbine

- TIDETEC's tidal power generator is likely to be the most cost effective technology to harness tidal power.
- The rotating turret is the core of the TIDETEC's concept, enabling optimal bi-directional functionality (compared to standard technology that only utilizes 60% of streams flowing back)
- Furthermore, the cost of the complete 20 MW turbine will not be larger than the systems planned today. The increase in the turret cost (10%) is balanced out due to the simpler turbine design.
- TIDETEC's LCoE estimate for its current technology are within the range of 45-75 €/MWh.

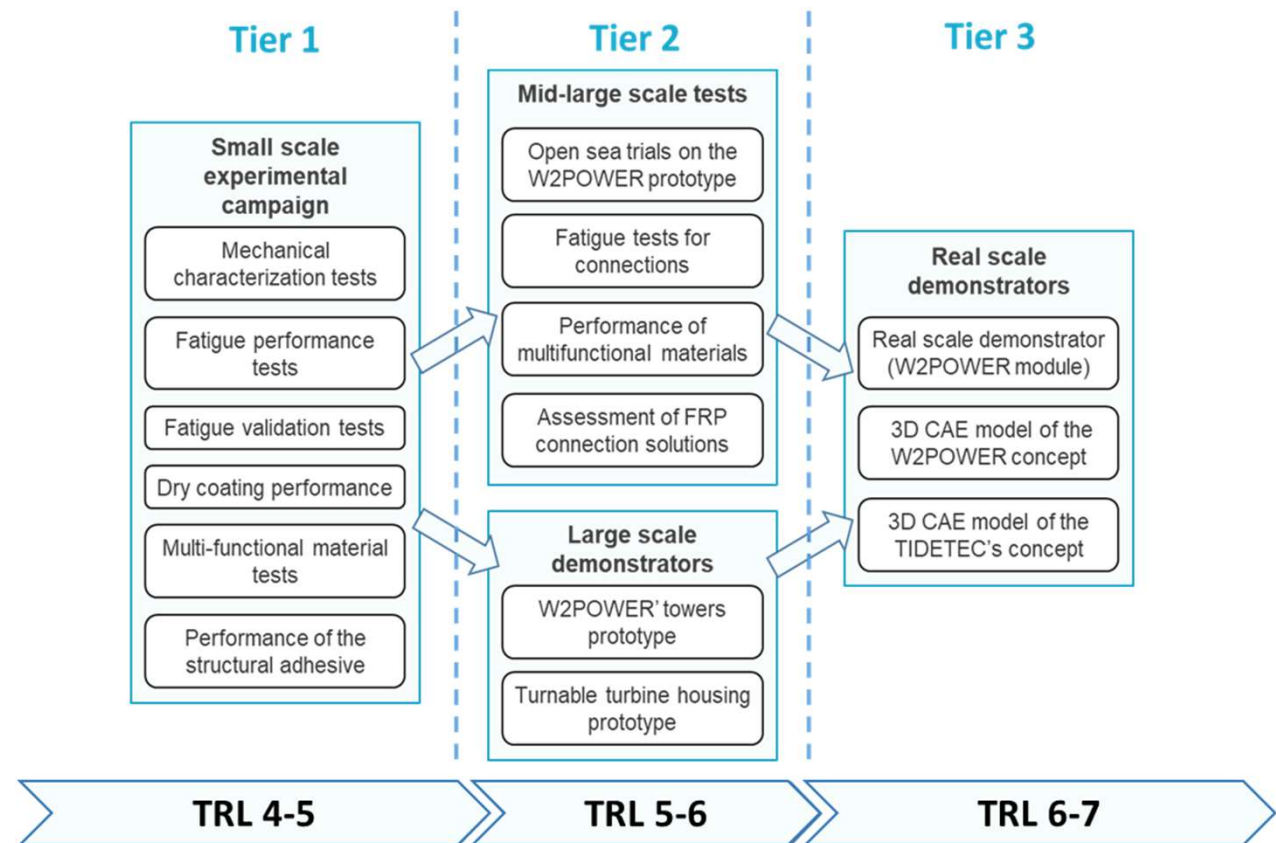


Workplan



Validation and Demonstration plan

- FIBREGY conceived an extensive three-tier testing, validation and demonstration plan, which included a comprehensive 'coupon level' and mid-scale experimental campaign, the testing of different large-scale prototypes and the building of a real-scale demonstrator.
- The validation and demonstration plan of FIBREGY was aimed at ensuring that a TRL 6-7 is achieved by the end of the project

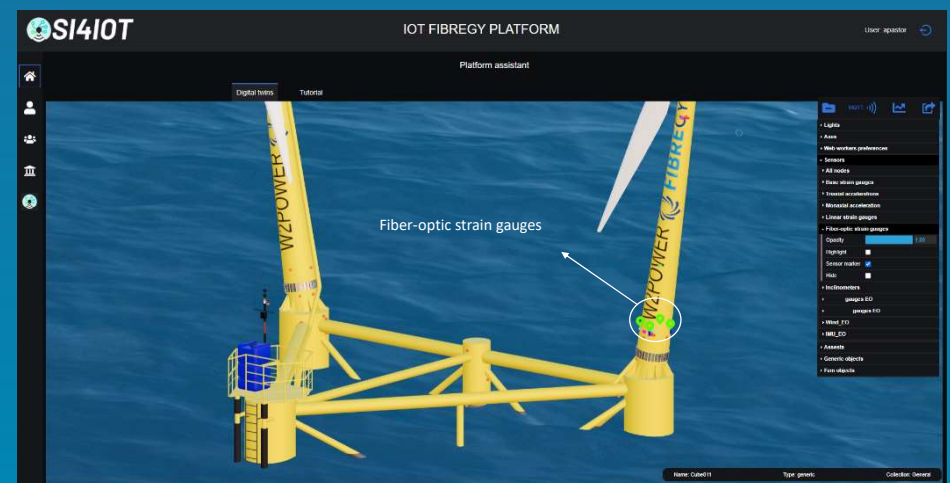
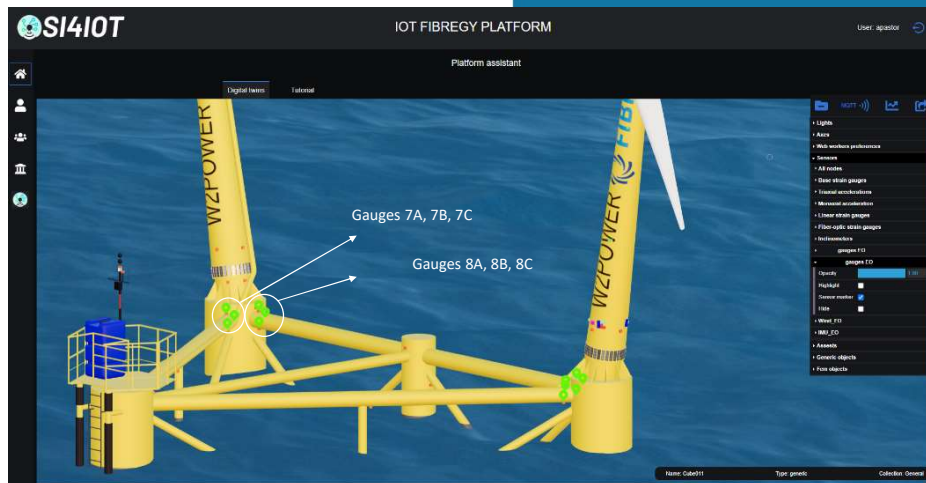
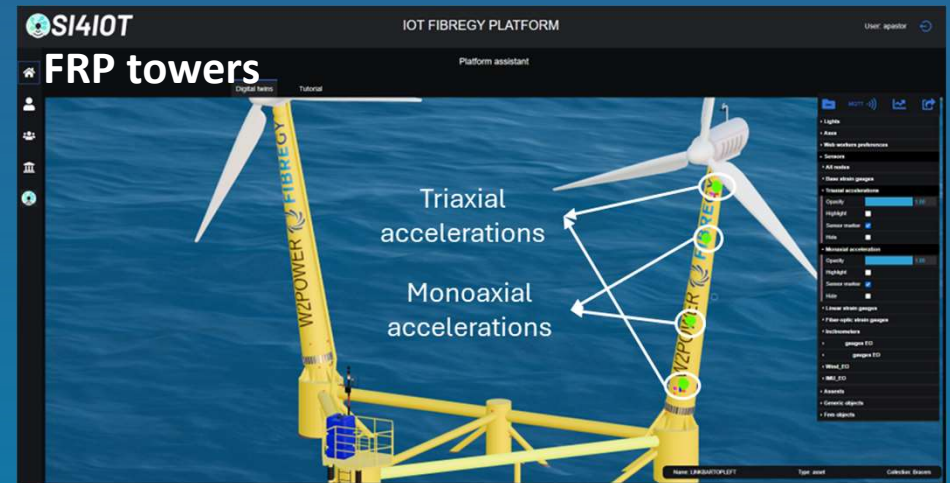
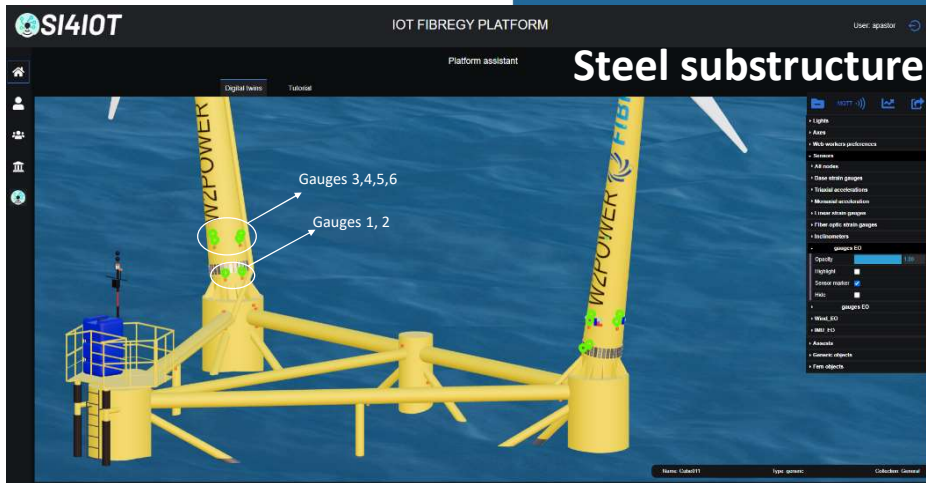




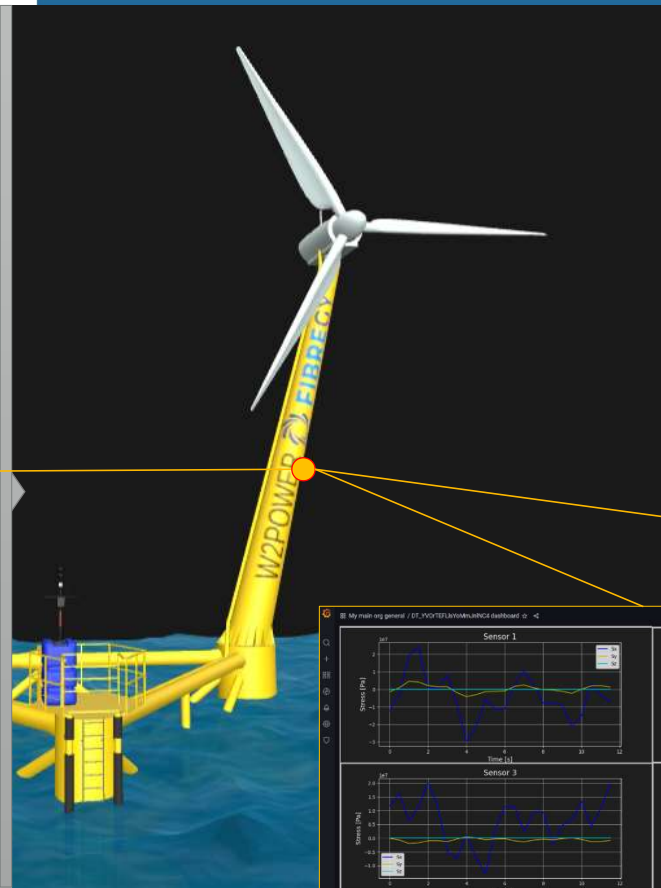
Demonstrators: W2POWER's carbon towers + sea trials



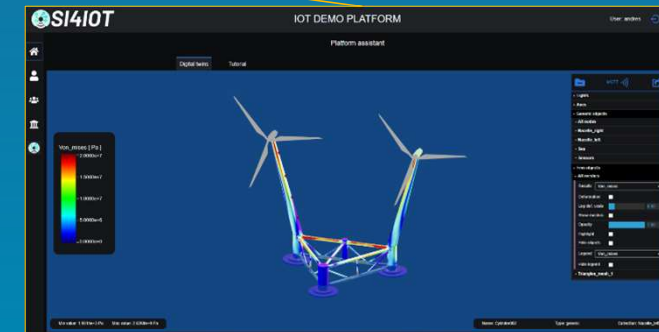
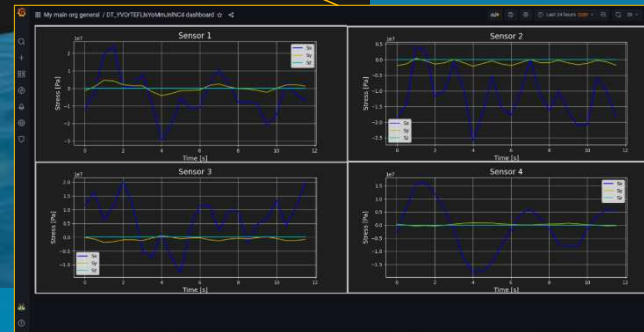
FIBREGY's Demonstrators: W2POWER's prototype SHM



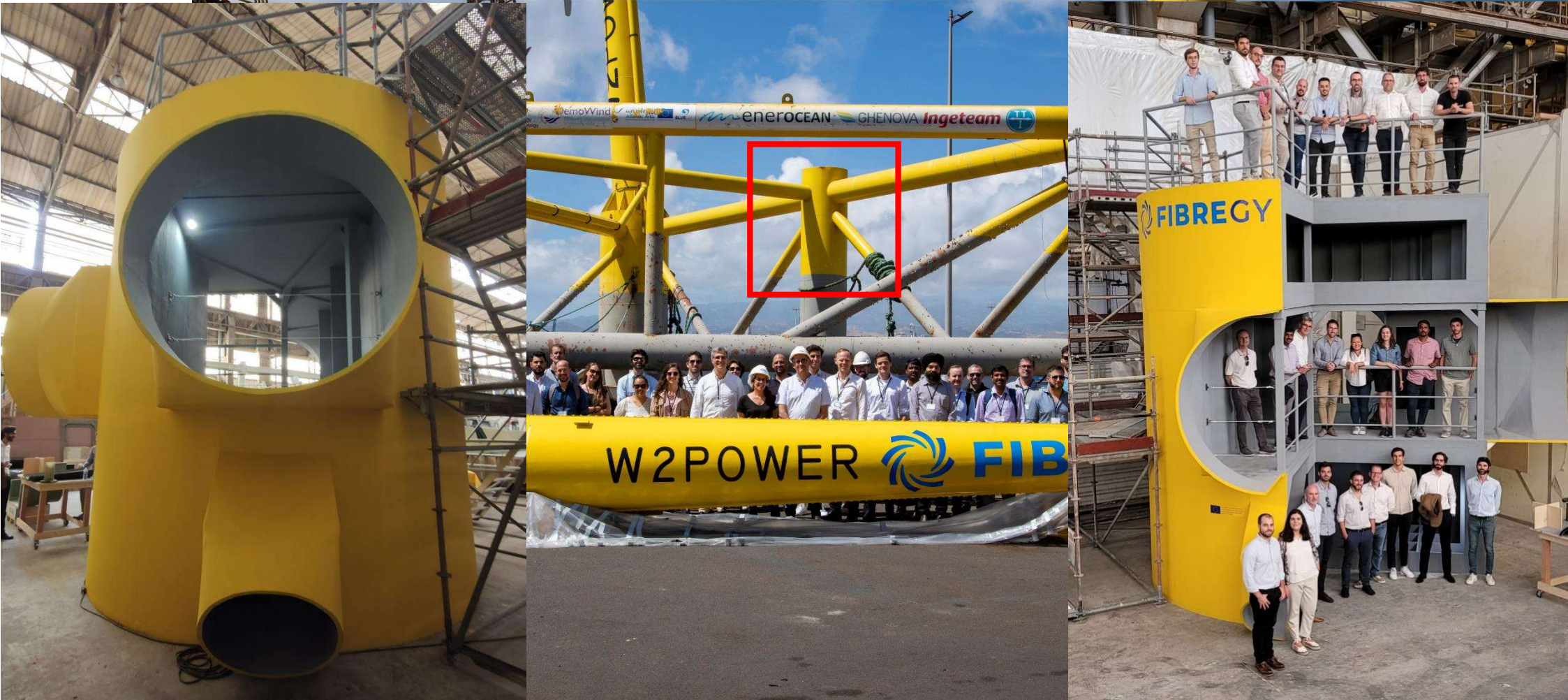
FIBREGY's Demonstrators: W2POWER's digital twin and sea trials



- Digital twin based on aero-servo-hydro-elastic model
 - Rotor (aero-elastic) + rotor & drivetrain dynamics + control + power generation (OpenFAST)
 - Mooring (linear)
 - Tower (elastic + fatigue)
 - Substructure (hydro-elastic + fatigue)
 - Seakeeping (radiation-diffraction) + dynamics (SeaFEM)
- IoT platform (OSI4IOT) integrating digital twin + monitoring data + weather forecast
- Sea-trials ongoing

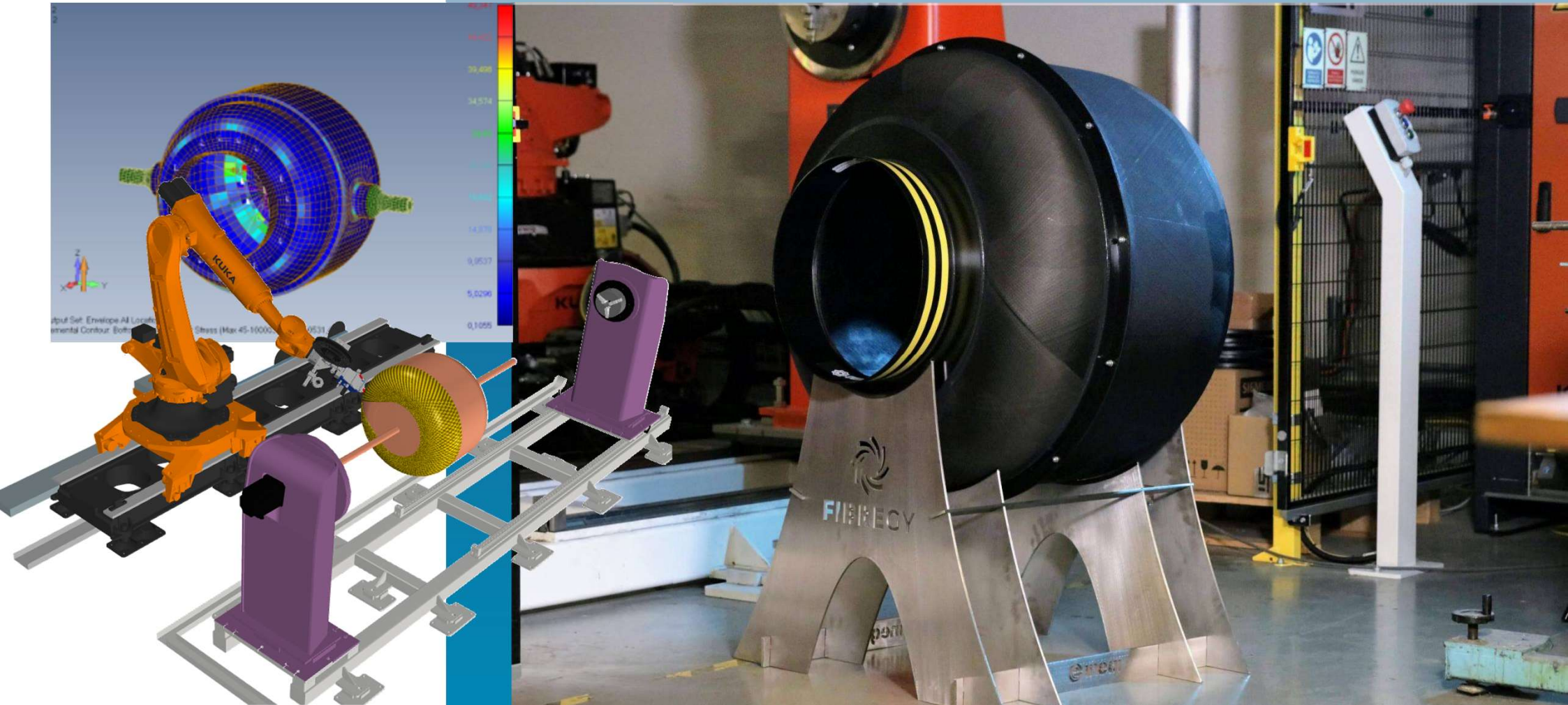


FIBREGY's Demonstrators: W2POWER's column (real scale)





FIBREGY's Demonstrators: TIDETEC's turbine housing (AFP)





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**THANKS
FOR YOUR ATTENTION**