

The RUL-ET project advances the estimation of remaining useful life of moorings and umbilicals using Artificial Intelligence, key components for the future of offshore renewable energy.

The consortium, led by Tecniaia, focuses on developing new solutions based on Artificial Intelligence (AI) to improve the reliability and efficiency of floating technologies in renewable energy, addressing challenges such as extreme marine conditions and the optimisation of operational costs at large scale.

The increase in the power of devices used in offshore renewable energy poses the challenge of withstanding significantly higher structural loads. This challenge is further intensified by the installation of wind farms at increasingly greater distances from the shore and in deeper areas, which requires the development of floating technologies capable of adapting to extreme conditions. These difficulties are compounded by the high costs of accessing assets in marine environments and the significant economic impact of any failure that interrupts energy production.

In this context, AI emerges as a promising tool for modelling the degradation of components, although its effectiveness depends on the availability of extensive data, such as time series of up to 20 years, necessary to estimate their useful life. Moreover, data-driven approaches often lack generality and are applicable to specific projects. Even in the renewable energy sector, decision-making not only considers economic factors but also the reliability and performance of critical components.

To address this challenge, the partners of the RUL-ET project "Remaining Useful Life of Moorings and Umbilicals for Offshore Renewables" will develop new approaches based on artificial intelligence and the creation of specialised datasets to estimate the useful life of moorings and umbilical cables in offshore renewable technologies. The main objectives of this approach are to reduce uncertainty in failure prediction and the estimation of the remaining life of these components, design more accurate predictive maintenance strategies, and thereby generate significant savings in operational costs.

As a result of the project, it is expected that a useful data library will be developed for estimating the remaining useful life of moorings and umbilicals, as well as a software library for structural health diagnosis. In addition, three software models will be created, focused on useful life prediction, uncertainty management, and support for maintenance decision-making. Finally, four application examples will be developed, including the full definition of two use cases: moorings and umbilicals, along with a comprehensive characterisation of two operational contexts: a base site and a derived one.

RUL-ET represents an opportunity for the Basque Country, highlighting the strengths of the entities within the Basque Network of Science, Technology, and Innovation (RVCTI). The consortium is made up of six entities: a multi-location centre: TECNALIA (coordinator); a centre of basic research and excellence: BASQUE CENTER FOR APPLIED MATHEMATICS (BCAM); two universities: MONDRAGON GOI ESKOLA POLITEKNIKO and UPV/EHU (with the departments of energy engineering and mathematics); a business R&D unit: VICINAY MARINE INNOVACIÓN and a supply-demand intermediary: the BASQUE ENERGY CLUSTER.

The project partners also benefits from the support of 8 Basque entities that are part of the Advisory Board: CORE MARINE, a marine engineering company specialised in operational and maritime analysis; DITREL, developer of electrical connectors for floating platforms; IBERDROLA, involved in the development, construction, and operation of offshore wind farms; IDOM, engineering and

development of wave energy converters; INALIA, developer of integrated monitoring systems and structural health analysis; and engineering companies developing floating platforms: NAUTILUS FLOATING SOLUTIONS, SAITEC OFFSHORE TECHNOLOGIES, and SENER.

The project has a duration of two years (2024-2025) and is funded by the Department of Industry, Energy Transition and Sustainability of the Basque Government (ELKARTEK 2024 Programme)

Interested entities can find more information and stay updated on the progress on the project's LinkedIn page: [@RUL-ET PROJECT](#).

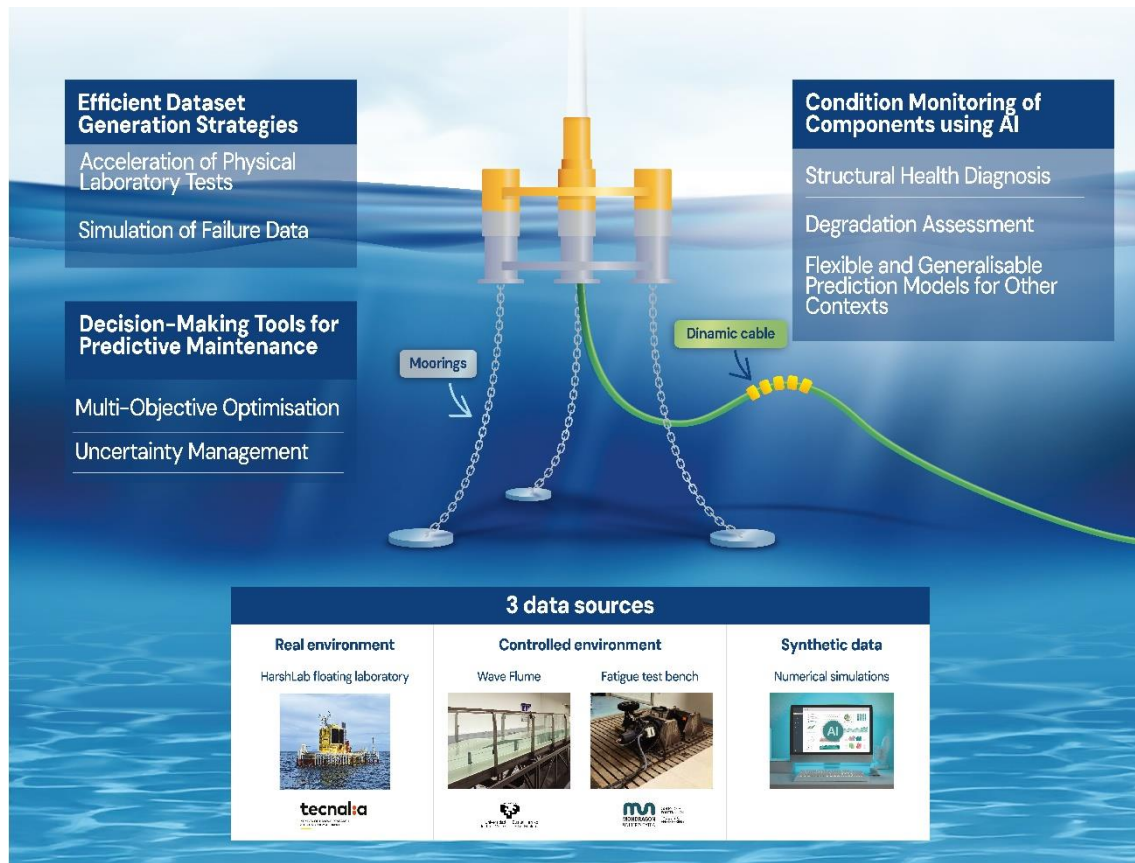


Illustration 1- Research areas of the project.