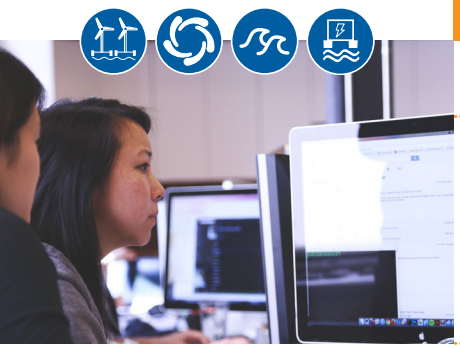
FRANCE ENERGIES MARINES

Research & Expertise Services

# Renewable floating system design and optimisation



## Conceptual studies | Engineering studies | Installation

While many technologies already field-proven in the offshore O&G industry can be transferred to floating offshore renewable energy (ORE), it is crucial for large-scale developments to optimize the designs and use innovative technologies while controlling the risk. **With tens of machines on a single farm and considering that substructure and foundation in a floating wind farm account for almost 40% of the CAPEX (NREL, 2021), there is a large cost reduction potential by improving sea-keeping behaviour of the floater, mooring lines and dynamic cable.**

## OUR OFFER

**Floating unit motion analysis**
- Seakeeping, free-floating analysis of floating units

**Mooring design**
- Full range of mooring design and analysis for conceptual design, third-party verification for FEED and detailed design
- Non-linear modelling of synthetic ropes, in particular nylon, combined with steel chains and wires

**Coupled analysis with FOWT or substation, mooring and dynamic cable**
- FEA, hydrodynamic (1st and 2nd order) and aerodynamic coupled models

**Basin model test and qualification**
- Specifications and tests follow-up
- Modelling choices and adapted calibration

## OUR REFERENCES

**Several collaborative R&D projects on mooring line design and coupled analysis**

**POLYAMOOR and MONAMOOR R&D projects**
- Characterization of the dynamic and long-term behaviour of nylon mooring lines
- Design and at sea deployment of a buoy dedicated to test nylon mooring lines in order to validate the non-linear and dynamic behaviour modelling of nylon mooring lines

**MUTANC R&D project**

Study the LCOE cost reduction potential from mutualised anchors
- Mooring optimisation (chain, nylon, polyester, HMPE)
- Post processing of multidirectional cyclic loading at shared anchors
- 15 MW wind turbine (from IEA reference) + semi-submersible floater + mooring line (FEA) modelling

**FLOWTOM R&D project**
- Multi body modelling (ship, wind turbine) of the floating offshore wind maintenance phase to assess heavy lift offshore maintenance methods

## OUR RESOURCES

**A team with complementary and cross-disciplinary expertise:** naval architecture, hydrodynamics, and mooring with extensive experience, in R&D and industrial projects from the O&G industry

**Dedicated instrumentation**
- 4 buoys in the Atlantic Ocean and Mediterranean Sea, with wind and wave measurement, motion and tension monitoring of mooring line, biofouling observations

**Digital tools**
- Radiation/diffraction software
- OpenFAST, open source floating wind software
- Deeplines™, SIMA™, commercial software for mooring, power cable, and marine operations
- Dynamic cable modeller (in-house tool)
- Generic floating ORE design tool, developed in-house during the DTOcean+ project

**Specific know-how**
- Extensive knowledge of the behaviour of synthetic ropes specifically suited for floating ORE, in particular nylon ropes

## YOUR CONTACT

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