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Poster n°2

Basic design of a 2 GW floating offshore substation

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Context and objective

As offshore wind farms move into deeper waters, the use of floating offshore substations (FOSS) becomes essential. At the same time, the increase in installed capacity and the greater distance from shore make direct current export almost unavoidable. Together, these developments introduce significant challenges in terms of design, construction, and installation. The AFOSS-DC R&D project (2022-2025) was set up to explore the feasibility of such a system and to get a basic design of 2 floater technologies.

Methodology

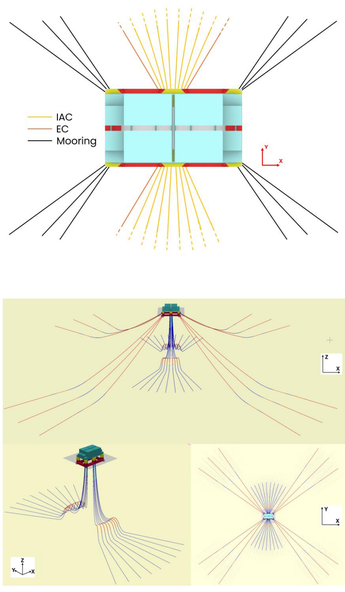
Market analysis → Identification of sites of interest → Metocean analysis → Choice of South Brittany for harsh conditions → Gathering requirement into FOSS specifications

Design and analysis

Semi-submersible floater

Definition of **topside** electrical architecture and modular general arrangement

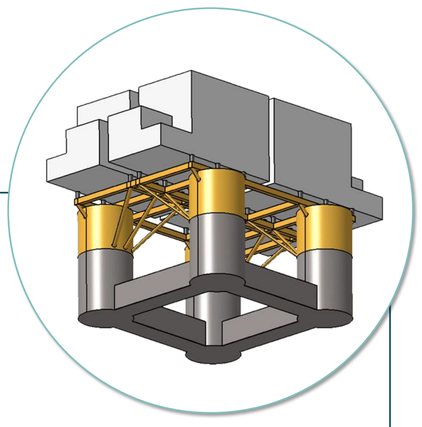
Design of **inter-array cables** (132 kV AC) and **export cable** (525 kV DC) cross sections



Design of semi-submersible **dynamical cables** configurations

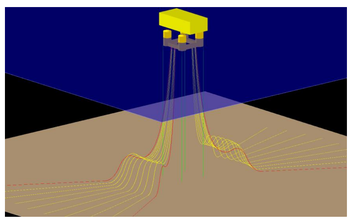
Floater design, hydrodynamical simulations, **mooring** system design based on ULS conditions (100 y RP)

Tension-leg platform (TLP)



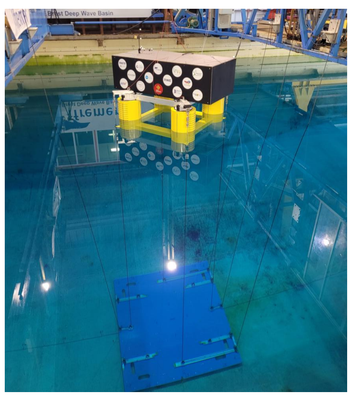
Definition of **topside** electrical architecture and modular general arrangement

Design of **inter-array** cables (132 kV AC) **and export cable** (525 kV DC) cross sections



Design of TLP **dynamical cables** configurations

Floater design, hydrodynamical simulations, **tether** system design based on ULS conditions (100 y RP)



Structural analysis of the floater (both static and dynamic loads)

Wave basin 100-test campaign on 1/50th mock-up for specific non-linear phenomena (springing, ringing)

Conclusion and outlook

Each technology has been proved to be suitable for such floating offshore substation. Even if the TLP tends to have smaller displacements and accelerations, the semi-submersible floater seems easier to build and to install which makes it probably a cheaper solution.

New projects will continue to challenge key hypothesis, to go further into the design (especially the ones of critical electrical components) and to set up the industrial capacity to produce such FOSS.

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