POWER AT SEA

NAVAL ENERGIES

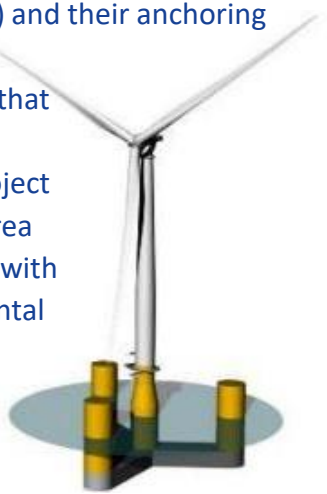
FAID BOSTON

EMMANUEL BROCHARD
MARCH 2019

FLOATING OFFSHORE WIND TURBINES IS A GAME CHANGER

Energy from offshore winds

Naval Energies is specialized in the supply of subassemblies for floating wind projects and Floating Wind Turbines deployment on site: the **semi-submersible floating systems** (steel, concrete or hybrid) and their anchoring system
based on a design that has been mutually optimized with project operators in this area and in compliance with coastal environmental protection needs



On a global scale, the potential offered by the floating wind turbine market is 3 times higher than that for bottom-fixed offshore wind turbines.
Offshore wind will double between 2030 & 2040, floating will shall represent 10% of the total offshore market by 2030 (1.5GW of floating wind shall be commissionned yearly)

3500GW	1200GW	600GW	500GW	50GW
Worldwide	In the USA	In Europe	In Japan	In France

Assets

- High accessible gross resource
- Better efficiency thanks to the regularity and strength of offshore winds
- Limited visual impact due to the distance from the coast

KEY SUCCESS FACTORS OF FLOATING WIND AS A GAME CHANGER IN OFFSHORE

MEET RENEWABLES PROJECT FINANCE'S REQUIREMENTS

- optimized economics & planning (time to market)
- mitigation of the project risks register
- high level of contractual guarantees

BE PROJECT SPECIFIC USING LEAN COMPONENTS

- specific approach to properly meet customers' expectations & projects specificities and constraints : site, turbine, industrial & supply chain, local content, etc…
- one (only) foundation for WW market seems not realistic
- only adaptability of lean foundations will contribute to reach optimum costs,

ADAPT TO SPECIFIC FLOATING ENVIRONMENTAL CONDITIONS

- Floating is not fixed offshore : neither technico-economical optimization nor bankability if stakeholders enforce the fixed offshore standards to floating

BENEFIT FROM R&D AND WORK WITH TURBINE MANUFACTURER

- engineering phase : understand turbines' stakes and provide optimized solutions
- construction phase : significant decrease of integration risks and interfaces risks
- operation phase : optimized solution at system level for increased load factor/AEP)

NAVAL ENERGIES : SOLUTIONS PROVIDER - TIER ONE CONTRACTOR FOR FLOATING WIND PROJECTS

Floating foundations sub-system delivery

- Floating foundation
- Mooring system
- Marine operations, installation
- Balance of plant / electrical infrastructure & equipment

Engineering services for floating foundation integration

- Basic / FEED & detail designs services
- Sub-system & global modelization studies (hydrodynamics & aerodynamics)
- Sub-systems integration / optimization
- Array layout studies (inc. grid connection)

Harbor logistics

- harbor operations and storage before/during/after final assembly and before installation

Site studies services to support the development phase

- Site development / assessment :
  - Metoceanic studies - wind, wave, current, sea state characterisation
  - Geosciences
  - GIS (Geo. Info. Sytem) : spatial analysis – array layout
- Resource assessment :
  - Measurements – Metoceanic studies &resource assessment (ADCP)
- Permitting & outreach : Environmental studies

NAVAL Energies' overall strategy is based on offering cost competitive floating offshore wind solutions suitable whatever the sea environment, **adaptable to site & customers' requirements**

GROIX & BELLE-ILE FLOATING WIND PILOT FARM: VALIDATION IN ATLANTIC CONDITIONS

NAVAL ENERGIES

- semi-sub floating foundations
- Mooring system
- Harbor logistics (harbor operations & storage)
- Marine operations (installation)

Industrial partners

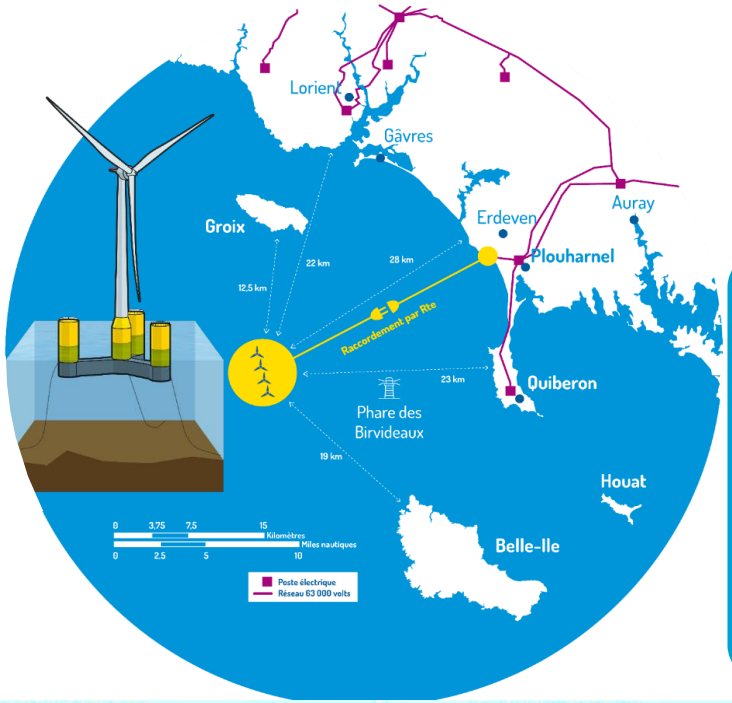
NAVAL ENERGIES, GE, Rte

Public supports

RÉPUBLIQUE FRANÇAISE, INVESTISSEMENTS D'AVENIR, ADEME

Financial partners

GROUPE Caisse des Dépôts, CGN Europe Energy



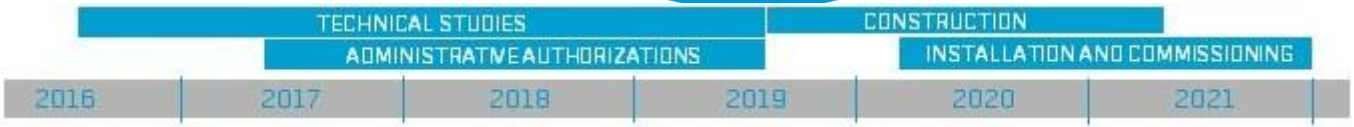
LES EOLIENNES FLOTTANTES DE GROIX & BELLE-ILE

EOLFI Project Owner

14 km² - 22 km to coast
4 x 6MW turbines
24 MW (20000 homes)

Commissioning 2021

20 years operations in oceanic conditions



Crédit: EOLFI / SAdesign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