

# HEXAFLOAT

## Innovative Competitive Offshore Energy Production

Jérôme Ribuot

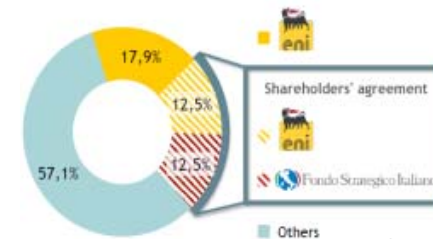


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DEEPWATER DEVELOPMENT

# Saipem today

## A world leader on large Energy projects

- ▶ 9 billion € turnover / 32,000 People / 60 countries
- ▶ Decentralised in 5 divisions



### E&C Offshore Division



Fixed and floating platforms

Subsea oil and gas pipelines

Deep water field development

**Offshore Renewables,  
Decommissioning, Maintenance**

### E&C Onshore Division



Production and treatment of oil and gas upstream

Liquefaction and regasification of natural gas (LNG)

Large pipeline systems

Downstream:

- Crude oil refining
- Petro chemistry and monetization of natural gas
- Single/combined cycle thermal power plants

### Onshore Drilling Division



Services for the drilling of oil and gas exploration, appraisal and production wells

100 rigs operated: strong presence in Middle East, Latin America and Caspian

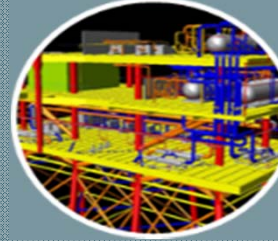
### Offshore Drilling Division



Deep water and ultra deep water drilling services through the operation of a fleet of 14 vessels

Saipem mainly operates in West Africa, the North Sea, the Mediterranean Sea and the Middle East

### XSIGHT



Adding value for clients from early phases of project development

Covering all sectors of the Energy industry: hydrocarbon upstream, midstream and downstream, renewable and green technologies

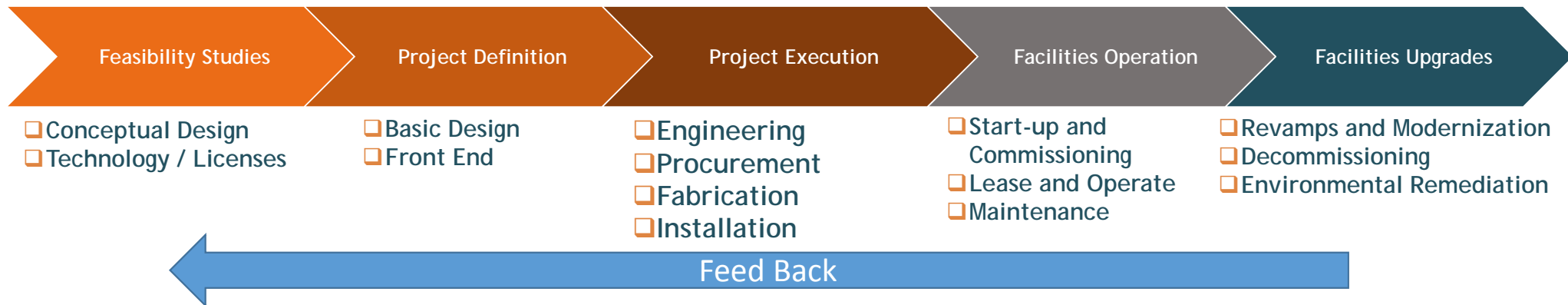
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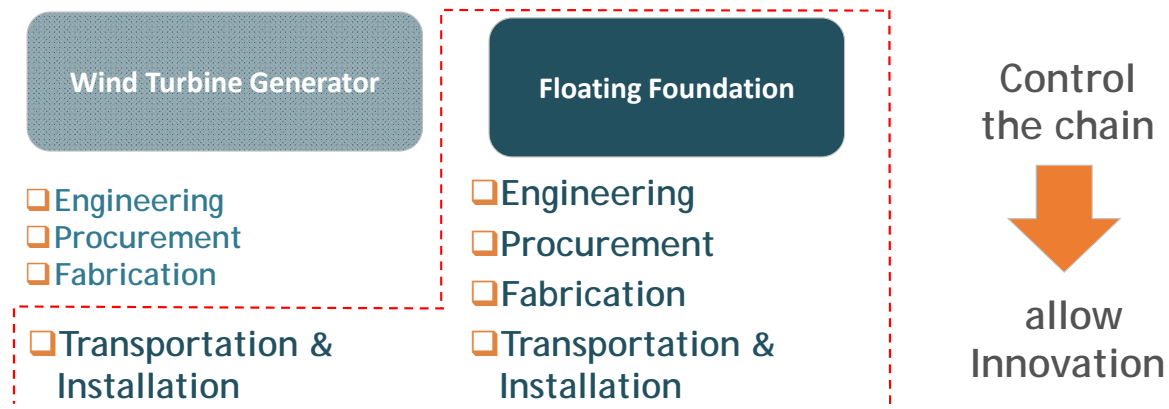


# Saipem E&C Business Model

A leading global Energy EPCI Contractor



## ► Application of Business Model to Offshore Floating Wind Energy Production



# Hywind Scotland

## Saipem Scope

Mating of 5 x 6 MW Wind Turbine Generator (WTG) on Floating substructure

- Floating Substructure temporary mooring
- Lift complete WTG (1,140 t) from Quayside with the S7000 and transit to mating location
- Mate WTG with floating Substructure (3,500 T - 91 m Height)
- Relocate complete FWT (WTG + Substructure) back to the Quay



Credit equinor



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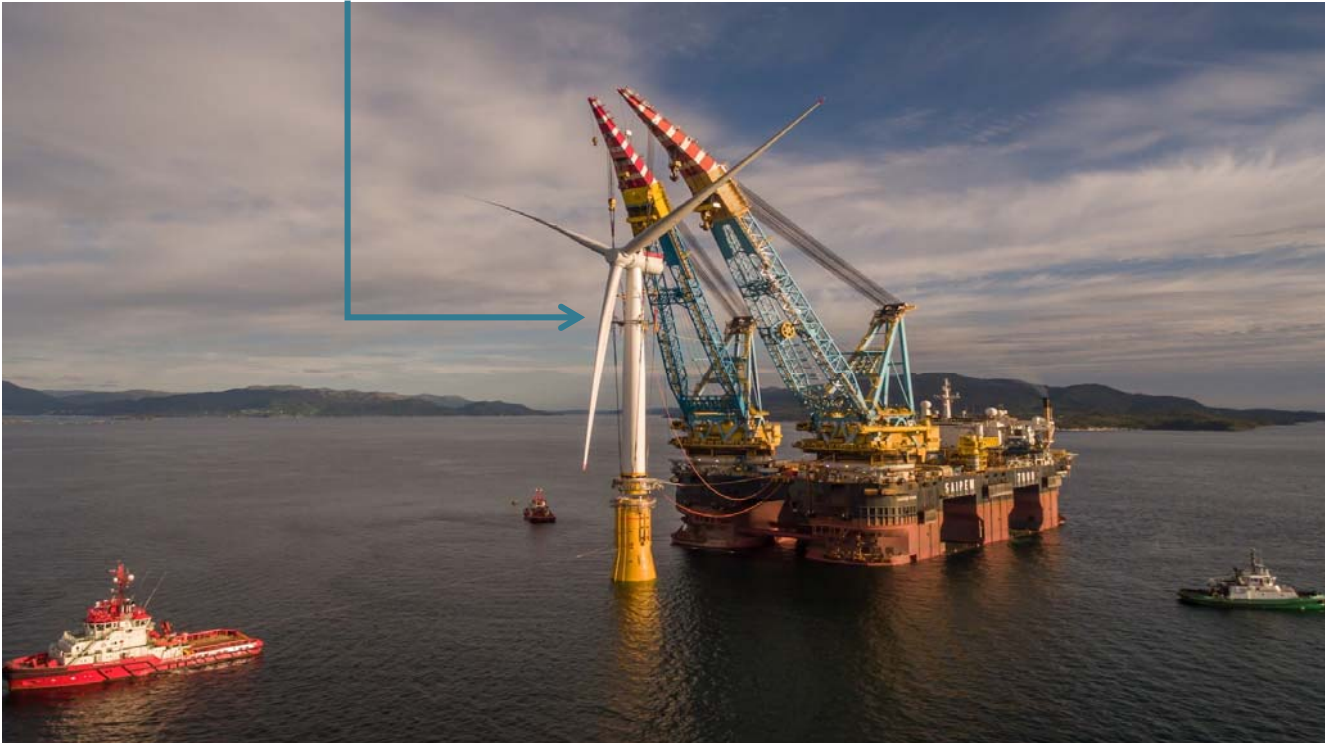




# Hywind Scotland

## Mating Operations

Stability Frame providing stability to the lifting system with a hydraulic clamping



[https://youtu.be/PmkA6hbJ\\_j8](https://youtu.be/PmkA6hbJ_j8)



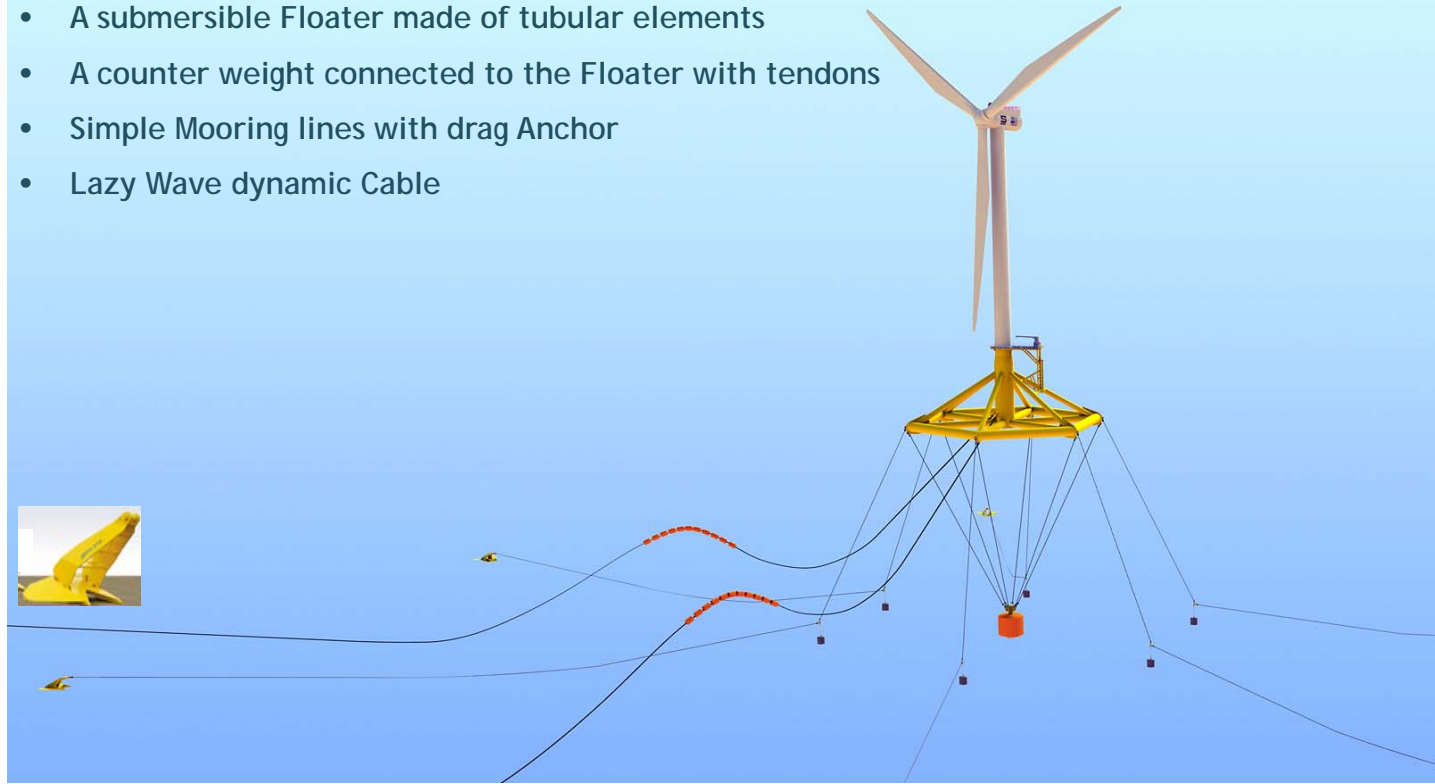
# Saipem Floating Wind Energy Solution

## In house fully developed concept



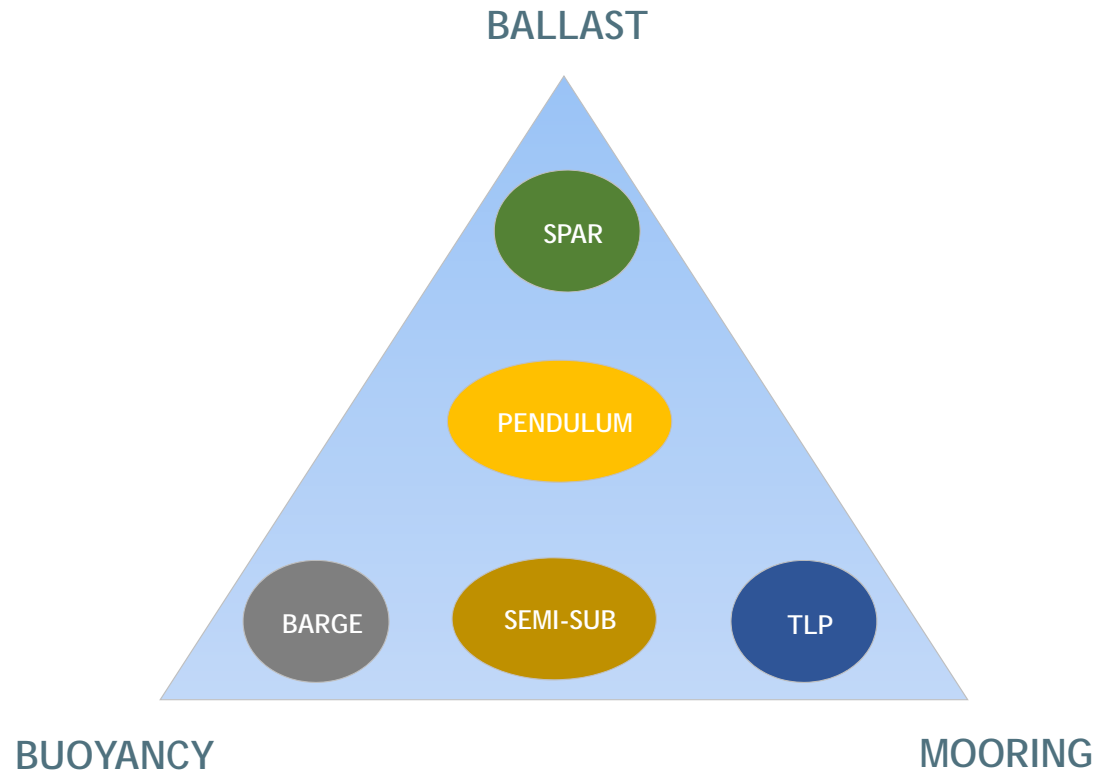
SAIPEM offshore wind floater is a pendulum lightweight structure composed by:

- A submersible Floater made of tubular elements
- A counter weight connected to the Floater with tendons
- Simple Mooring lines with drag Anchor
- Lazy Wave dynamic Cable



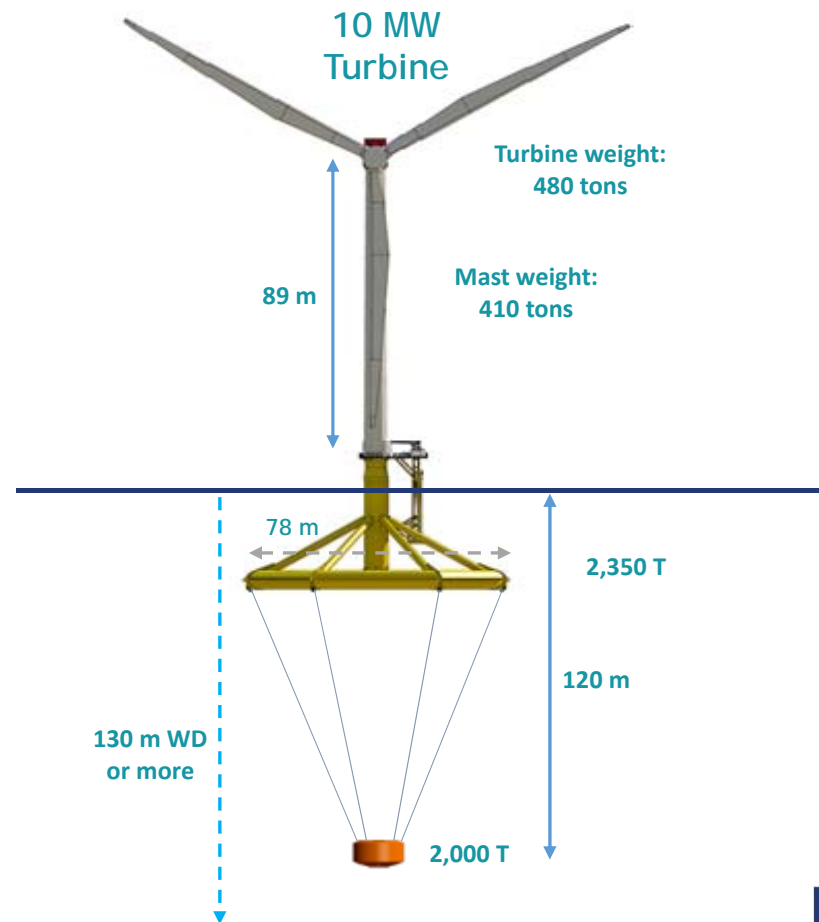
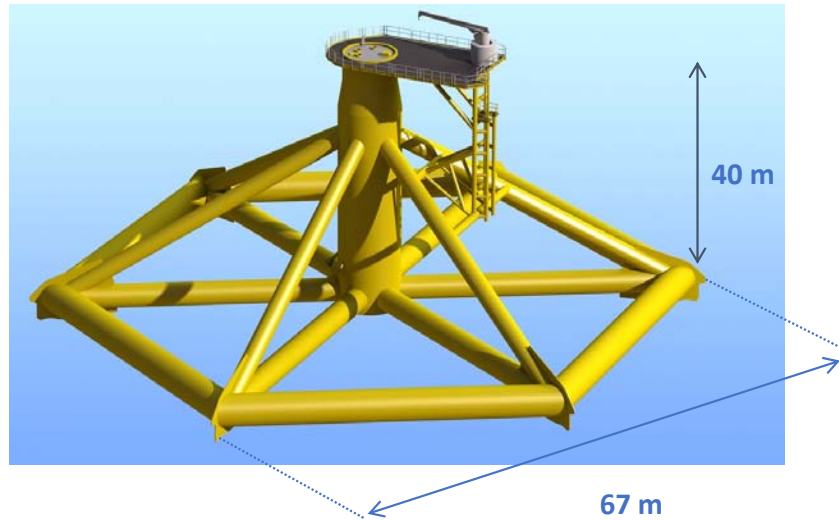
# Saipem Floating Wind Energy Solution

## Concept Benchmark



# Saipem Floating Wind Energy Solution

Typical Design Deep water  
Harsh sea

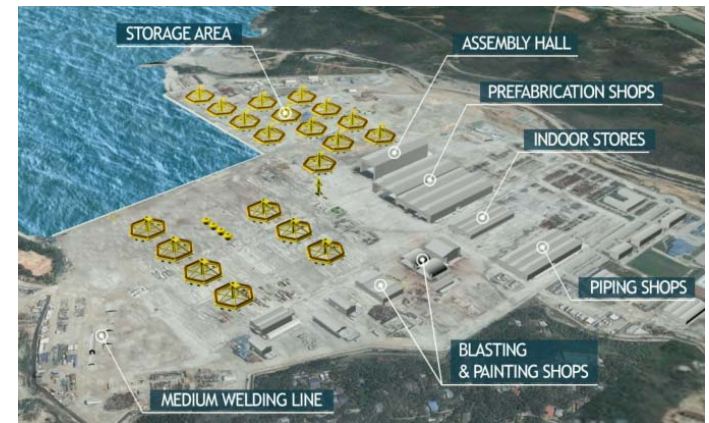
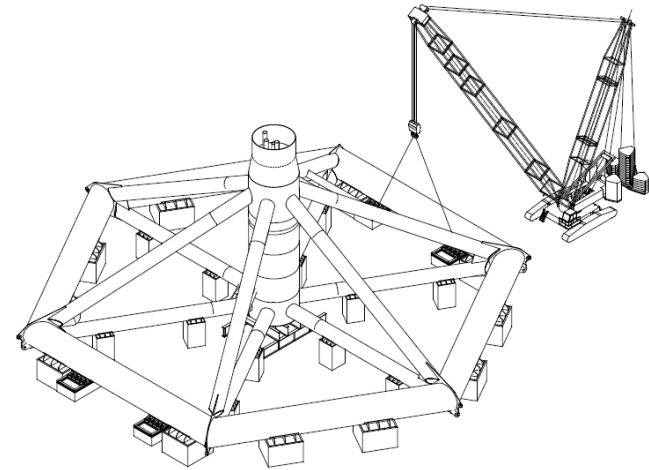
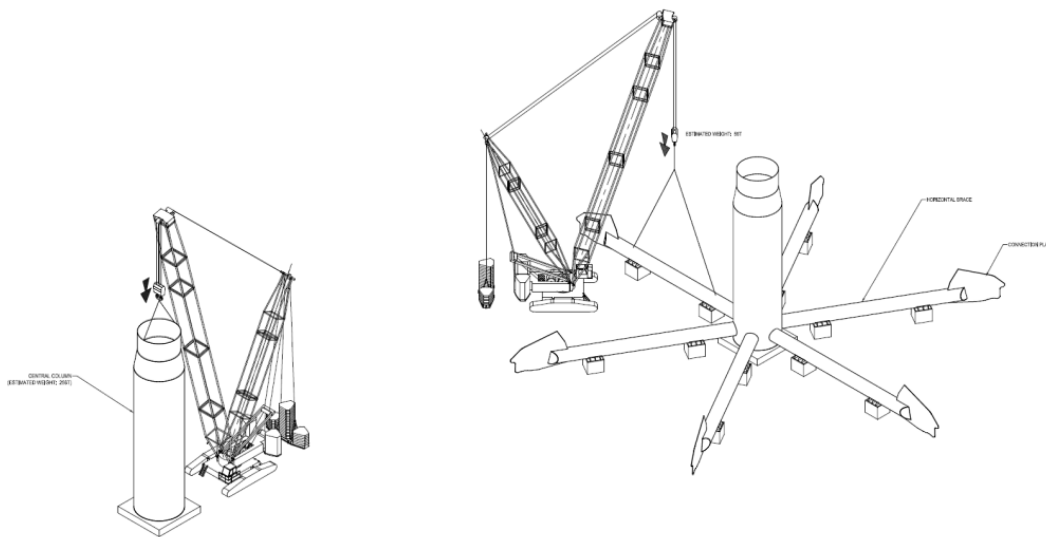




# Saipem Floating Wind Energy Solution

## Fabrication

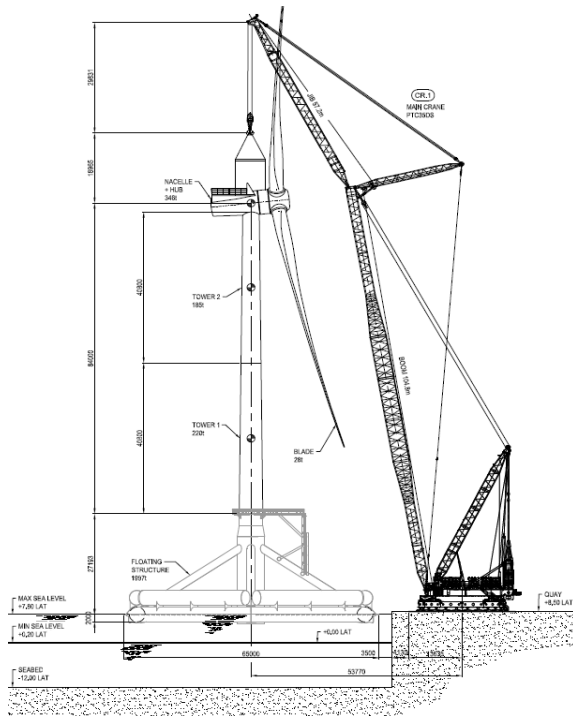
Modular Fabrication on any Yard



# Saipem Floating Wind Energy Solution

## Turbine Mating

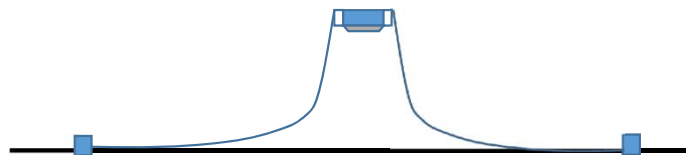
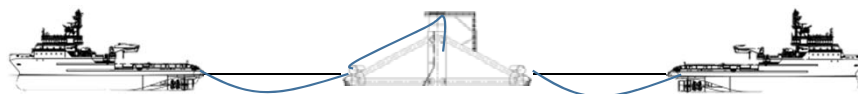
Turbine Mating at local quay: 4,5m Draft



# Saipem Floating Wind Energy Solution

## Installation methodology

- No heavy lift vessels
- Same procedures for heavy maintenance
- Use of field proven offshore installation techniques and means
  - ➔ Anchor Handling Tugs
  - ➔ Towing vessels
  - ➔ Remote Operated Vehicules (ROVs)
  - ➔ Ballast chains
  - ➔ Subsea pressure vessels



# Saipem Floating Wind Energy Solution

## Concept Validation - Basin Test (July 2018)

1. Free-decay tests
2. Towing tests
3. Response amplitude operator tests
4. Irregular waves tests (60 tests in total)
  - Operational conditions
  - Mediterranean sea extreme conditions
  - Atlantic ocean extreme conditions
5. Effect of static wind on performance
6. Sensibility tests

### Basic Properties

(natural periods, flow resistance...)

### Stability

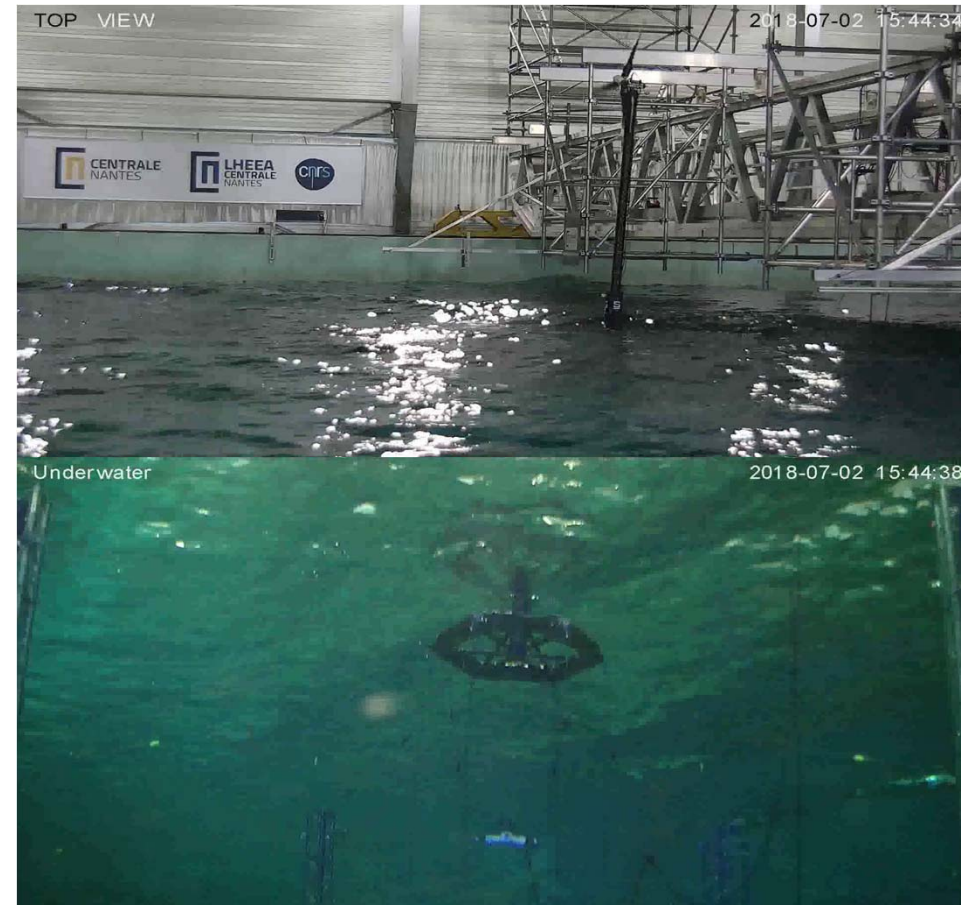
Nacelle motions and accelerations

### Optimization

12MW, 150m WD

Sea State  $H_s = 14m$ ,  $T_p = 16s$

Note : at full-scale, motions are 7 times slower



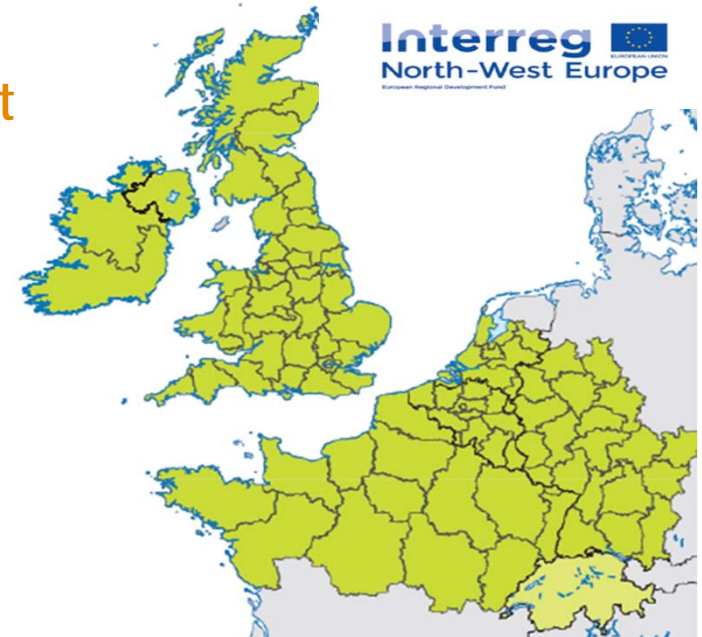
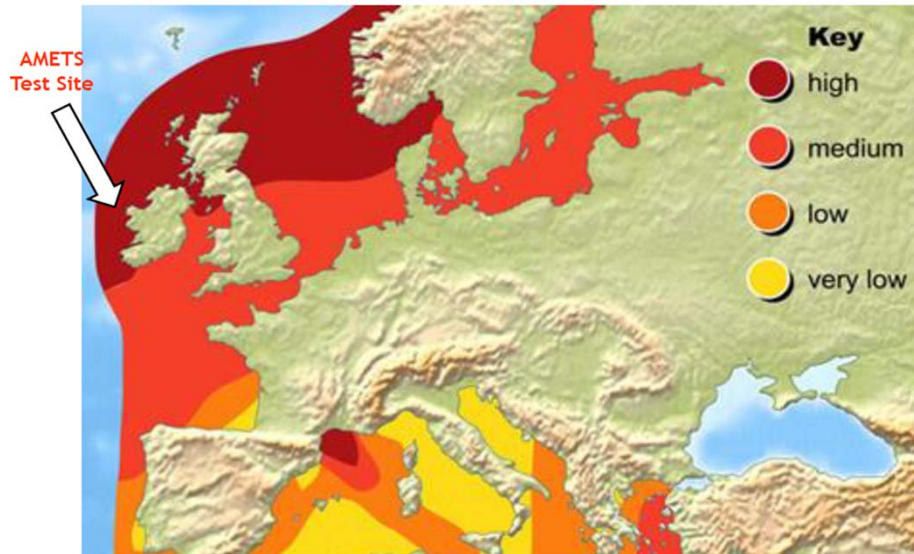
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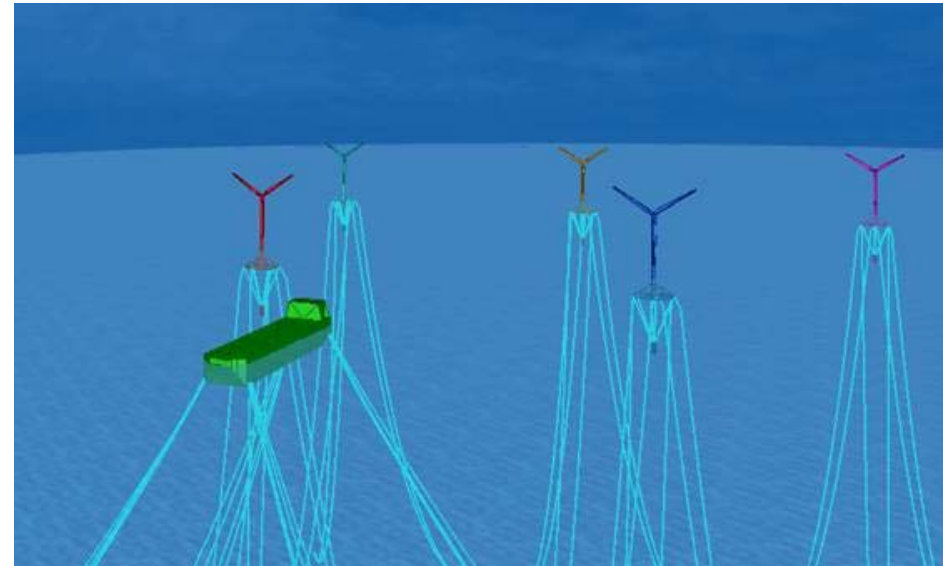
# Saipem Floating Wind Energy Solution

## Full Scale Demonstrator APPROVED FEDER Project



# Saipem Floating Wind Energy Solution

## Offshore Oil & Gas application



50 MW Electrical carbon free Offshore Production for FPSO (5 x 10MW Hexafloat)

2 to 10 MW Long Subsea Tie Back Energy Supply (independant or via existing FPSO )



Olivier Diaz - 2019

Thank you

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