HEXAFLLOAT
Innovative Competitive Offshore Energy Production

Jérôme Ribuot
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

**E&C Onshore Division**
- Production and treatment of oil and gas upstream
- Liquefaction and regasification of natural gas (LNG)

**Onshore Drilling Division**
- Services for the drilling of oil and gas exploration, appraisal and production wells
- Large pipeline systems
- Downstream: Crude oil refining, Petro chemistry and monetization of natural gas, Single/combined cycle thermal power plants

**Offshore Drilling Division**
- Deep water and ultra deep water drilling services through the operation of a fleet of 14 vessels
- 100 rigs operated: strong presence in Middle East, Latin America and Caspian

**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

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

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Saipem E&C Business Model
A leading global Energy EPCI Contractor

Feasibility Studies
- Conceptual Design
- Technology / Licenses

Project Definition
- Basic Design
- Front End

Project Execution
- Engineering
- Procurement
- Fabrication
- Installation

Facilities Operation
- Start-up and Commissioning
- Lease and Operate
- Maintenance

Facilities Upgrades
- Revamps and Modernization
- Decommissioning
- Environmental Remediation

Feed Back

Application of Business Model to Offshore Floating Wind Energy Production

Wind Turbine Generator
- Engineering
- Procurement
- Fabrication
- Transportation & Installation

Floating Foundation
- Engineering
- Procurement
- Fabrication
- Transportation & Installation

Control the chain
allow Innovation
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
Hywind Scotland
Mating Operations

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

https://youtu.be/PmkA6hbJ_j8

Credit: equinor
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
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Concept Benchmark

BALLAST

SPAR
PENDULUM
SEMI-SUB
TLP

BUOYANCY

MOORING
Saipem Floating Wind Energy Solution

Typical Design Deep water
Harsh sea

Turbine weight: 480 tons
Mast weight: 410 tons

10 MW Turbine

89 m

78 m

120 m

2,350 T

120 m

2,000 T

130 m WD or more

40 m

67 m
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Fabrication

Modular Fabrication on any Yard
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**Turbine Mating**

Turbine Mating at local quay: 4.5m Draft
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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

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

Basic Properties
(natural periods, flow resistance...)

Stability
Nacelle motions and accelerations

Optimization
Saipem Floating Wind Energy Solution

Full Scale Demonstrator APPROVED FEDER Project
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**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)
Thank you