



EXPERIENCE MATTERS

SBM Floating Wind developments

Kivi presentation 21 September 2017





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Welcome

- Smoking is not permitted inside the building and parking areas, except for the designated smoking area



- Safety plans are posted on the walls near the emergency exits and elevators



In the event of a Fire

- An audible alarm will be broadcasted
- Head for the emergency exits following the emergency signs into the staircases. Do not use the elevator
- Report to the muster point in front of the Metro station
- Follow the instructions given by the emergency services personnel
- If you discover a fire, activate the fire alarm pull station
- Only fight a fire if you know the type of fire extinguishers and their intended use and if it is safe to do so



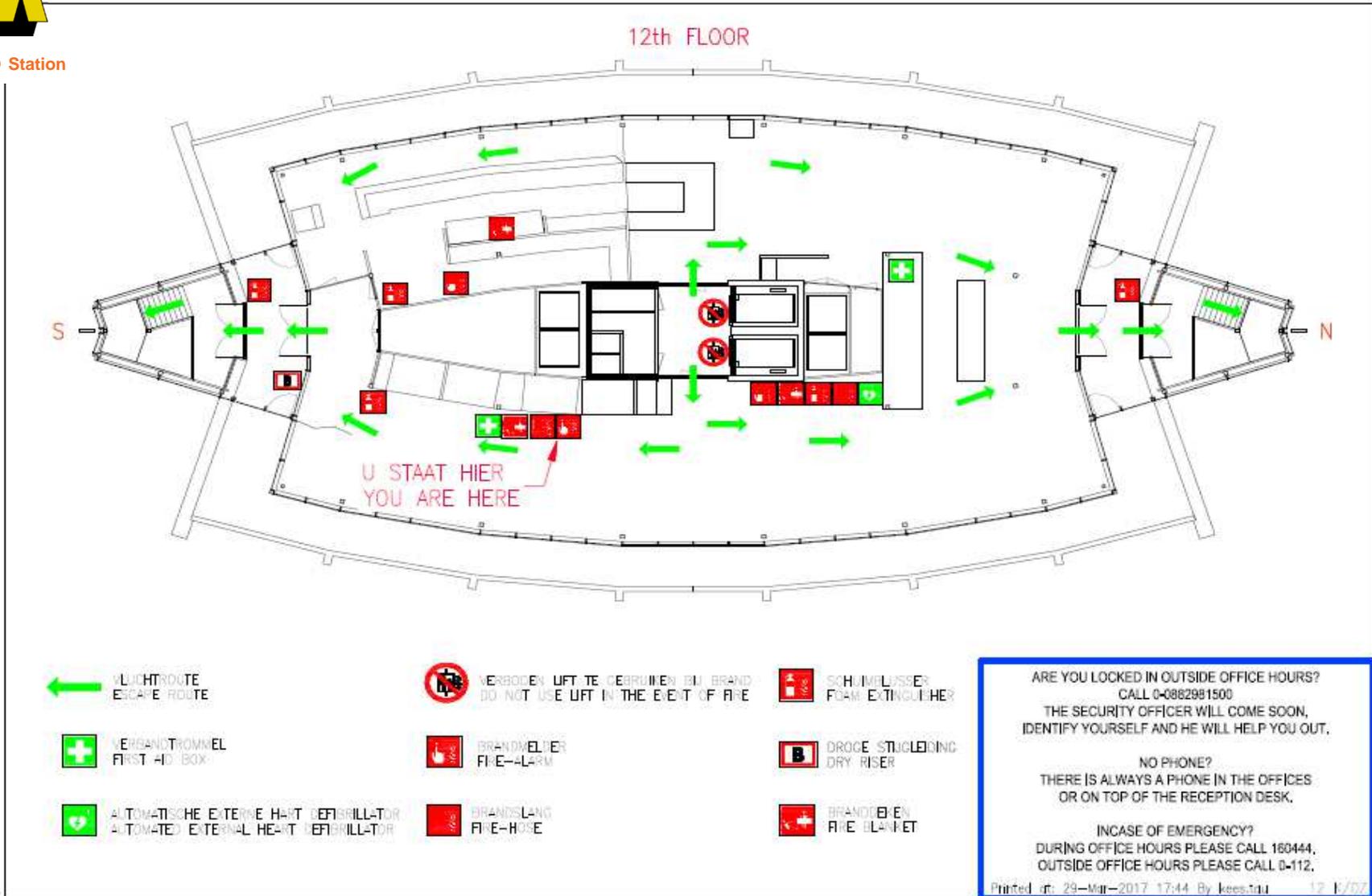


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FLOORPLAN



METRO Station





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Safety Moment

Safety days improve awareness

At SBM we call them



days

We do workshops and exercises

Very relevant exercise: How to reach the emergency exit in case of fire and smoke

Exercise at home

Blindfolded

Stay low (crawl on your knees)



www.clipartof.com · 433591

Exercise at Home





“Rules of the game”

KIVI Offshore Technology offers:
Innovative Technology

Respect the proprietary rights on the slides
presented.

Contact the presenter if any of you would want to
publish about the content of this presentation



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Joost Heemskerk





- Safety moment and introductions

- Introduction to SBM Offshore



SBM Introduction

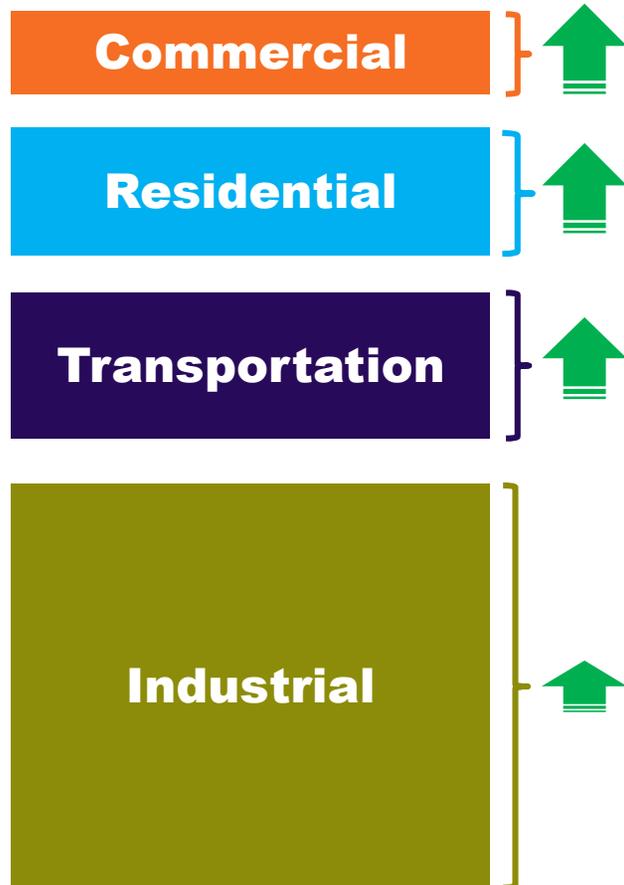
- Floating wind – global view
- SBM's floating wind developments
- Break
- French pilot project – Provence Grand Large
- Discussion & questions



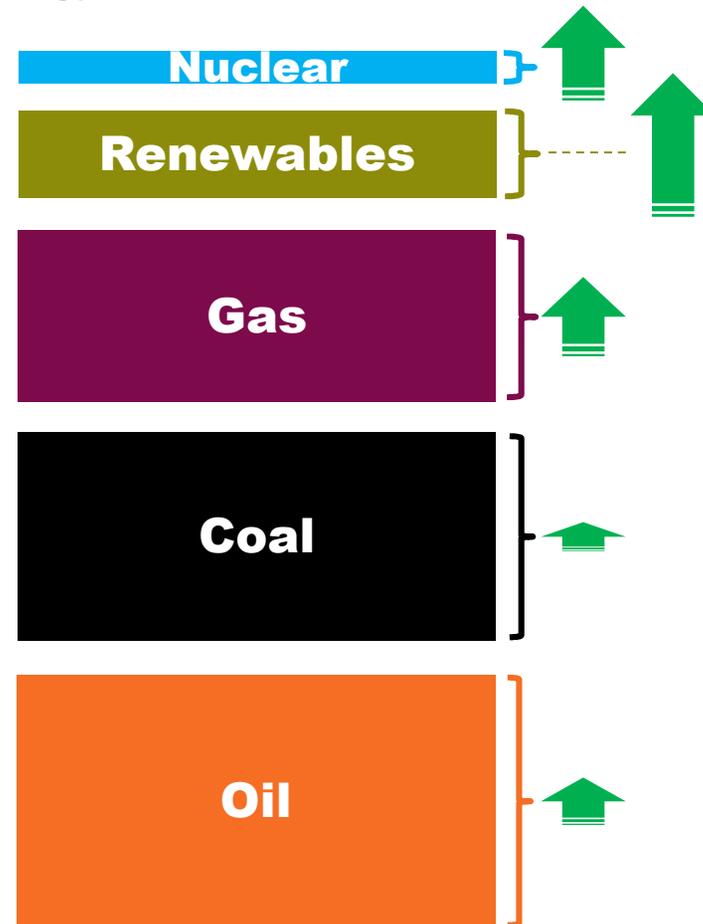
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What energy is used for:



Energy sources:



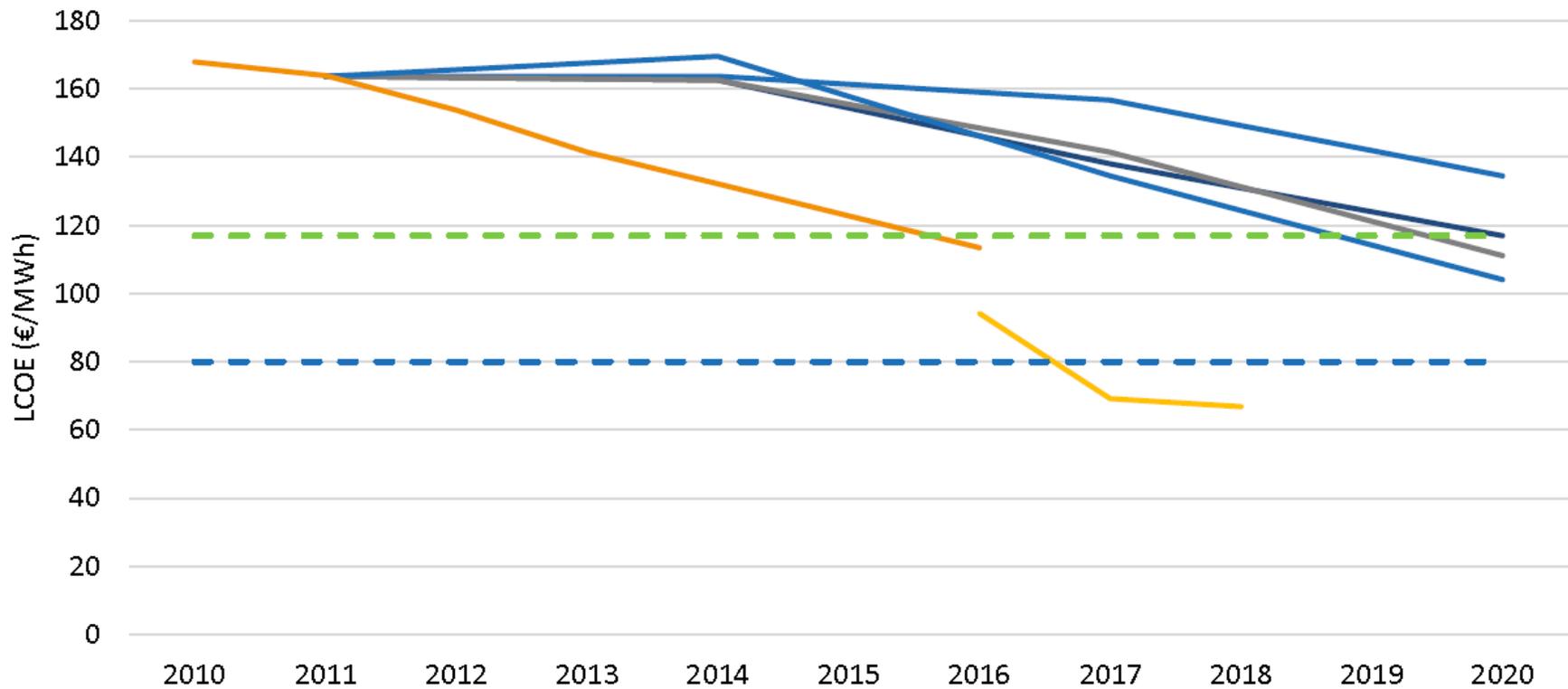
Total expected percentage growth to 2040

Source: EIA (includes period 2012 – 2040 reference case)



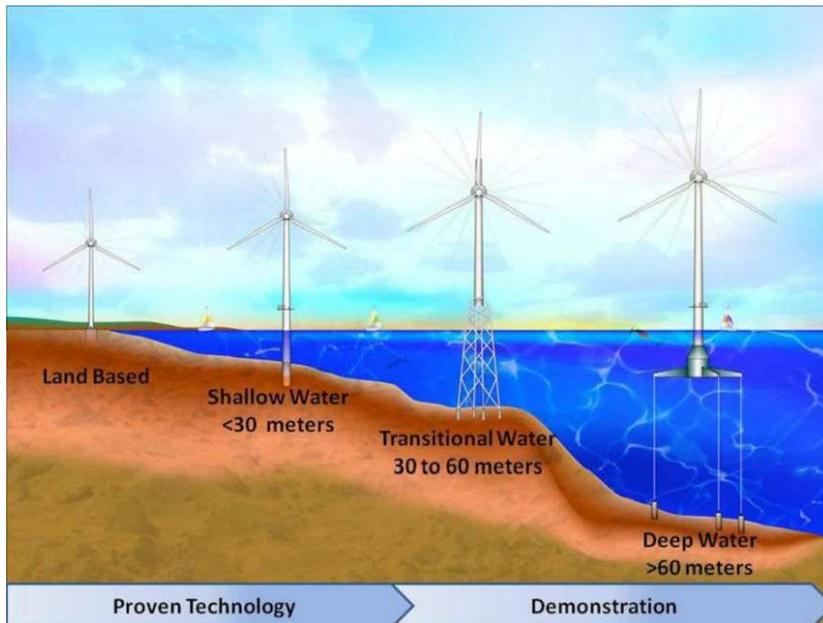
Offshore wind growing, prices are falling and markets outside Europe emerge

Figure 5. Offshore wind cost trends in Europe¹⁶





From fixed to floating wind - a natural evolution like oil & gas?



- Most technically available wind resource in deep water.
- Fields located farther from shore in deeper seas
- Many countries have no shallow water
- Better capacity factor > 50%
- Foundation standardization etc

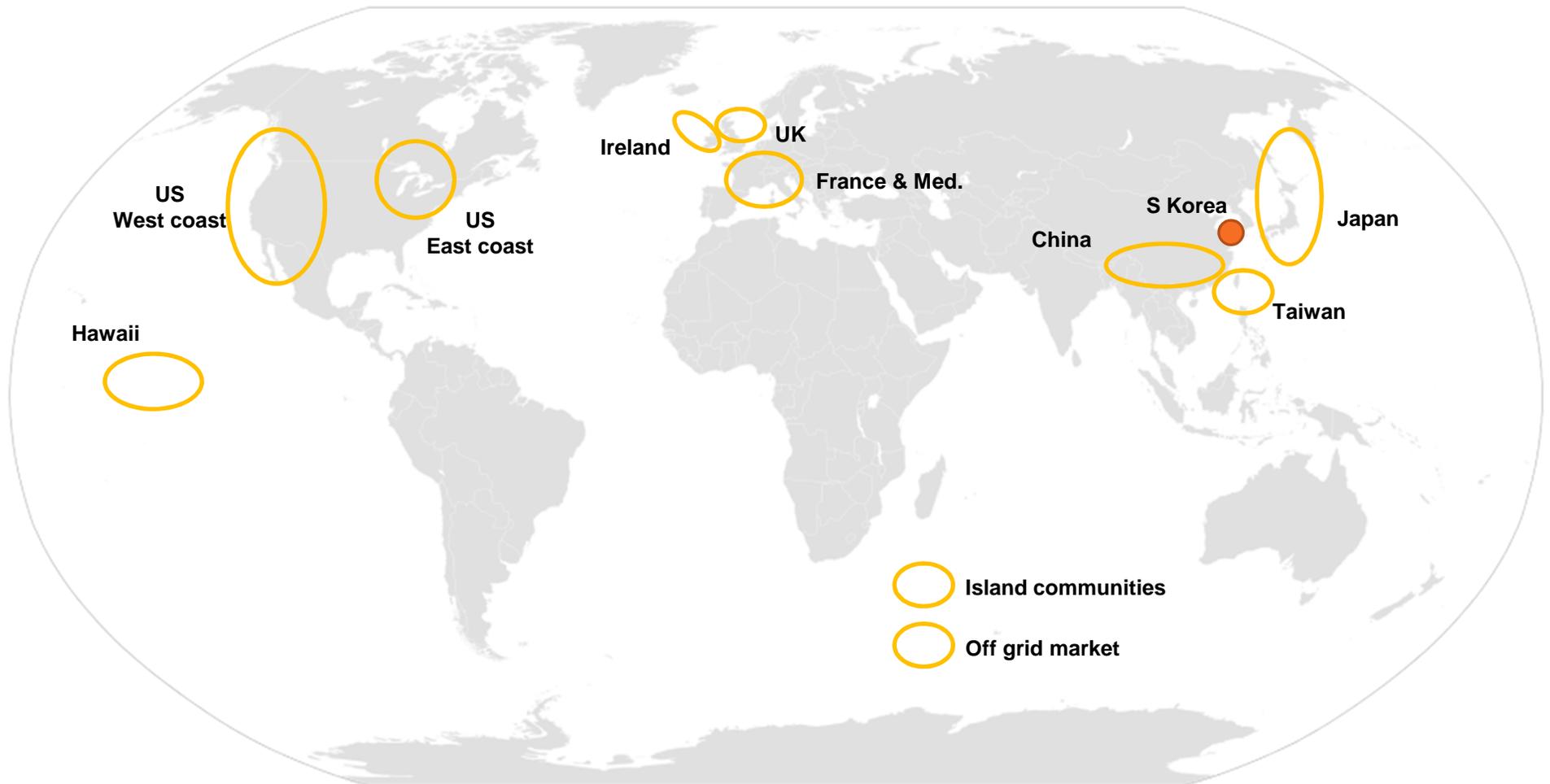
Country/Region	Share of offshore wind resource in +60m depth	Potential for floating wind capacity
Europe	80%	4,000 GW
USA	60%	2,450 GW
Japan	80%	500 GW
Taiwan	-	90 GW

Source: Wind Europe



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We see global interest and activity in floating wind





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Several demonstrators and pre-commercial farms deployed & in planning – costs are still high

Hywind



WindFloat



Fukushima



Etc...



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And many more are being developed

By concept, business model and company type with wide range of maturity

Semi - submersible



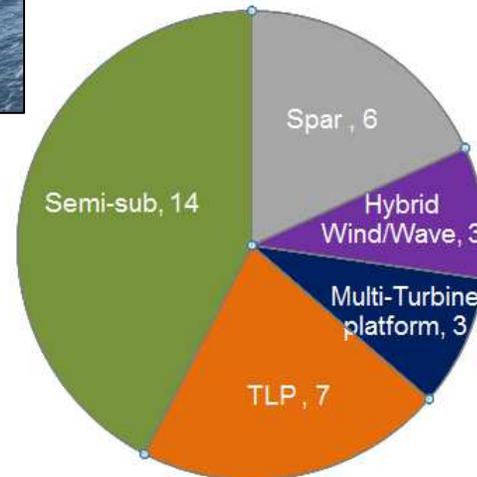
SPAR



TLP



Barge





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Commercial size floating wind farms are large offshore / industrial projects

Commercial size FOW power plants

> 50 units



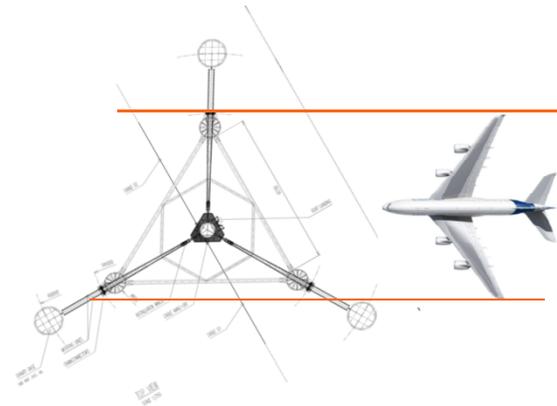
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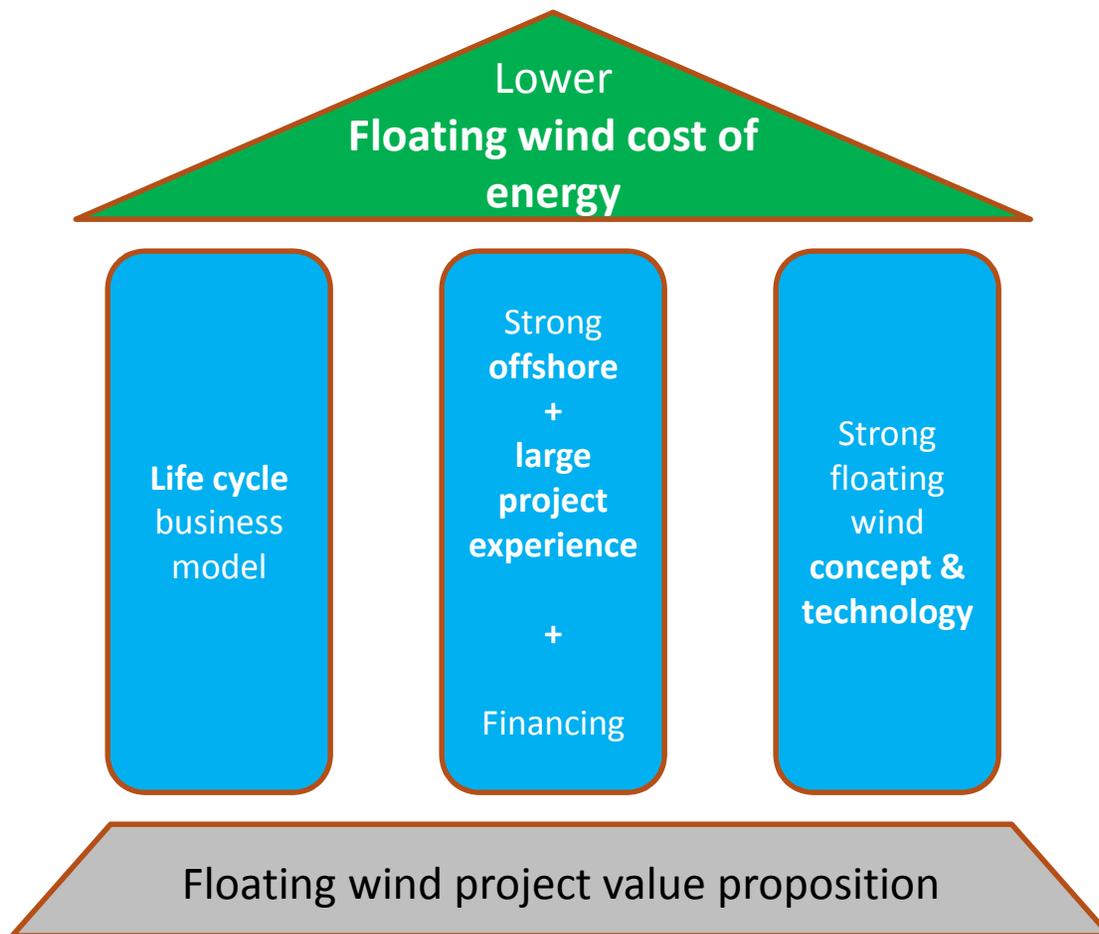
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A380



Vision





- Safety moment and introductions
- Introduction to SBM Offshore
- Floating wind – global view
- **SBM's floating wind developments**
- Break
- French pilot project – Provence Grand Large
- Discussion & questions



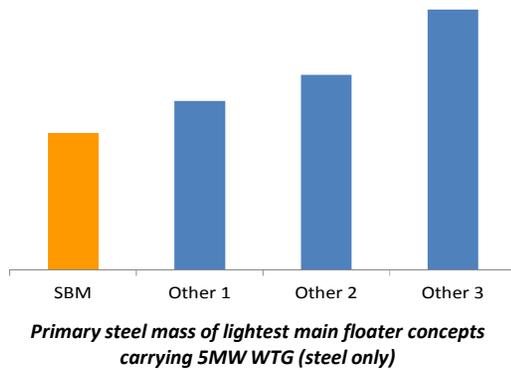
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SBM wind floater – concept and main principles

Adapted TLP – the benefits but not the downsides



© SBM Offshore 2017



Three design principles



- Low accelerations / motions at nacelle
- Light = cheap
- Transparent structure to minimize wave action
- Catenary cable
- Field proven components
- Mass ratio decreases with larger WTGs
- No active ballast
- Limited footprint

- Catenary installation
- Small draft for WTG installation @quay
- Wet tow to site with WTG integrated & with conventional means
- Use of conventional anchors

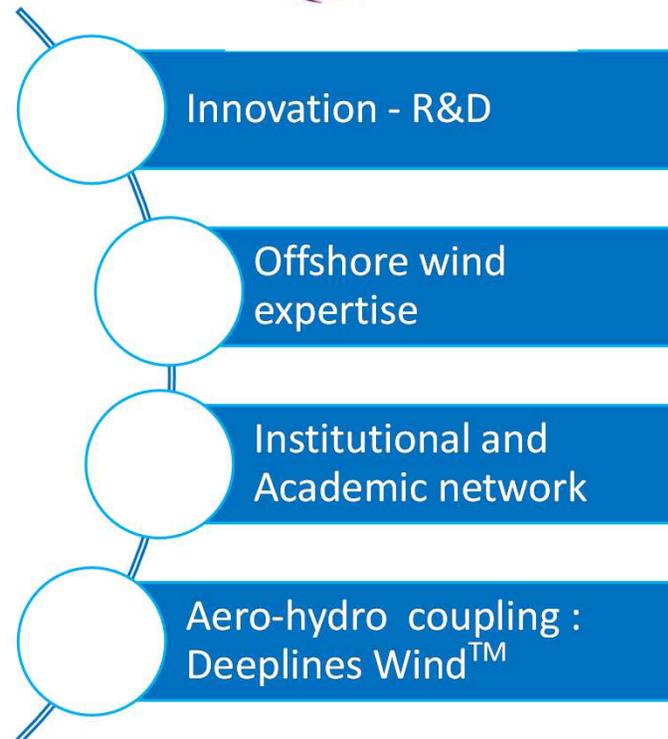
- Modularity and low complexity components for supply chain based and flexible assembly
- No dry-dock
- Assembly with standard yard means

Strong coupled design capabilities



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Development of coupled aero-hydro-servo design capabilities in technical collaboration with IFPEN

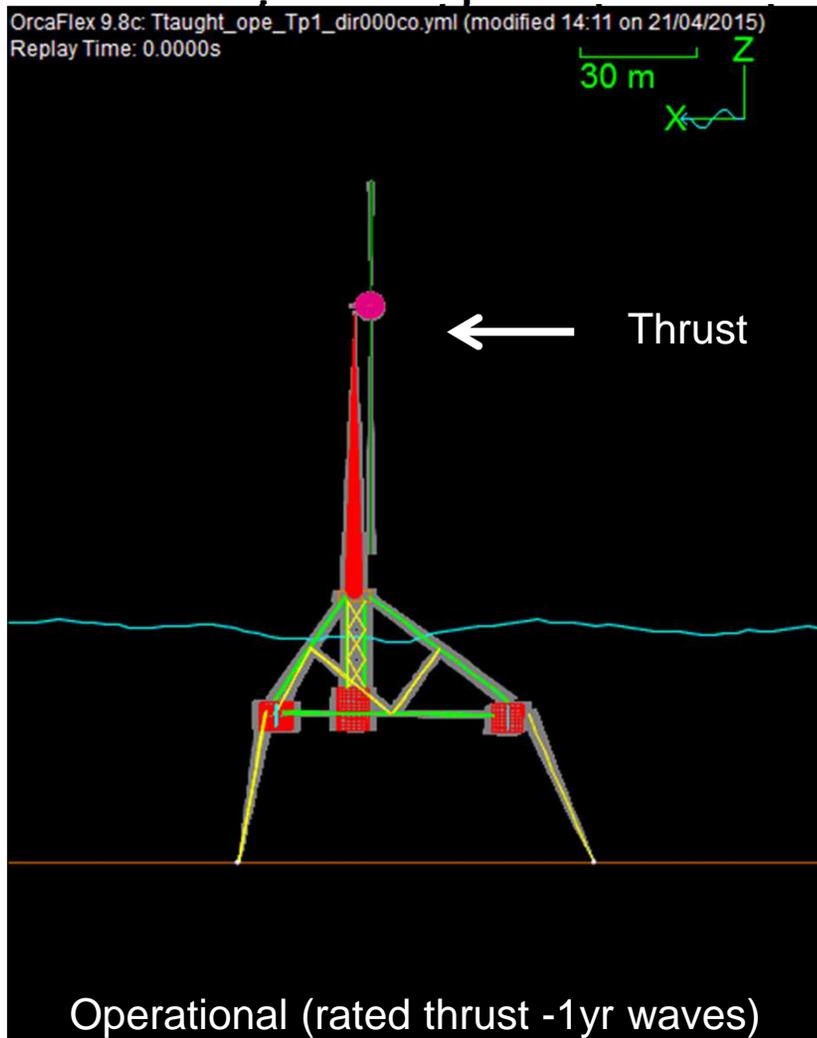


+ Resource assessment – WiSE™ LIDAR
+ WiSE™ Control



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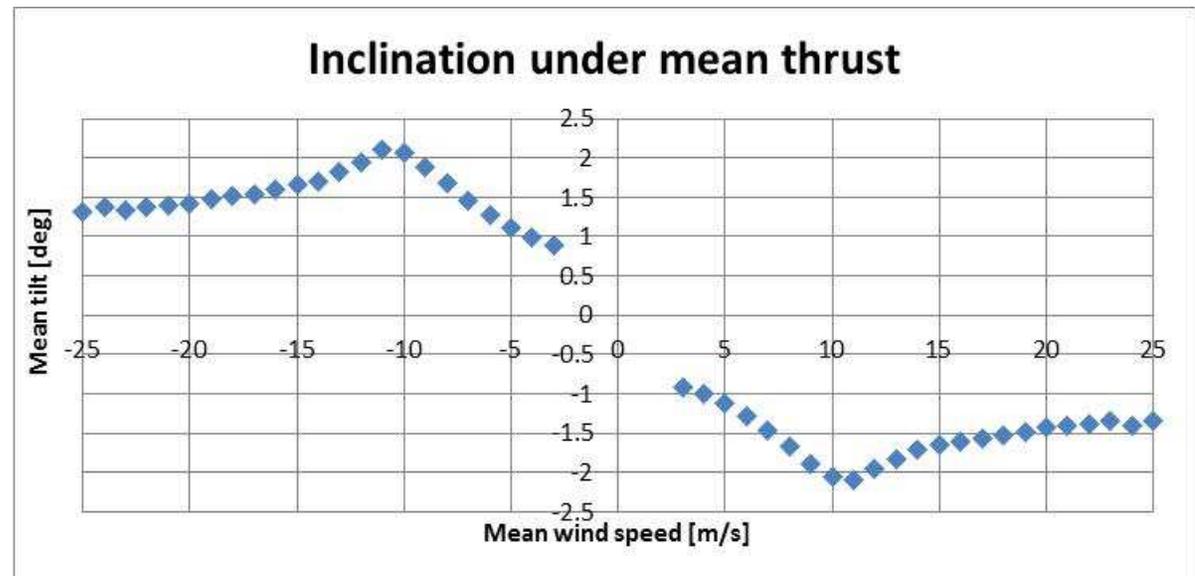
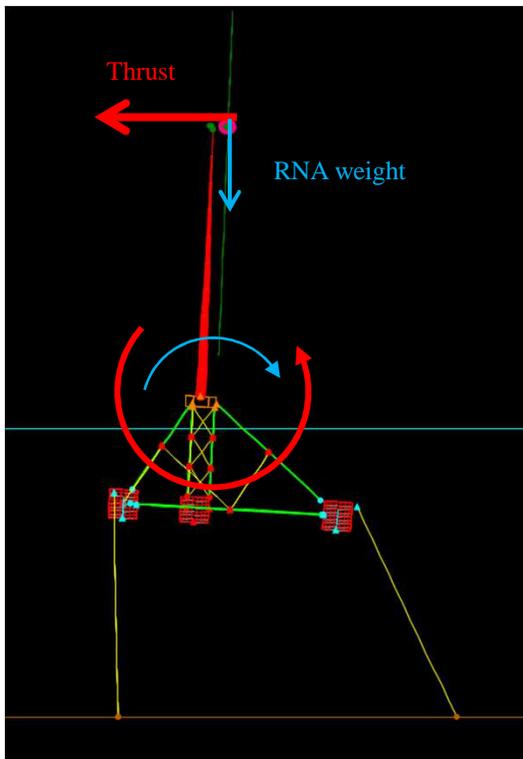
Special mooring configuration – adapting TLP to wind turbine loading





Counter pitching effects and benefits

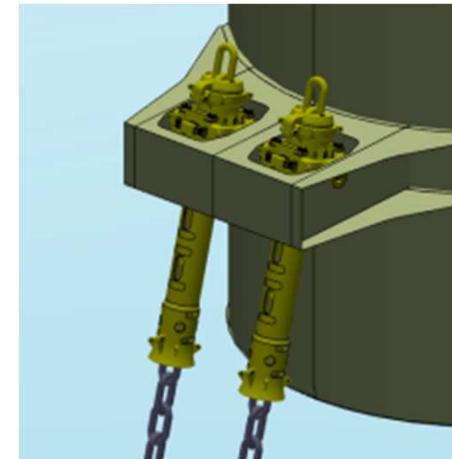
- Decreases tower base moments
- Realigns the plane of rotor to vertical



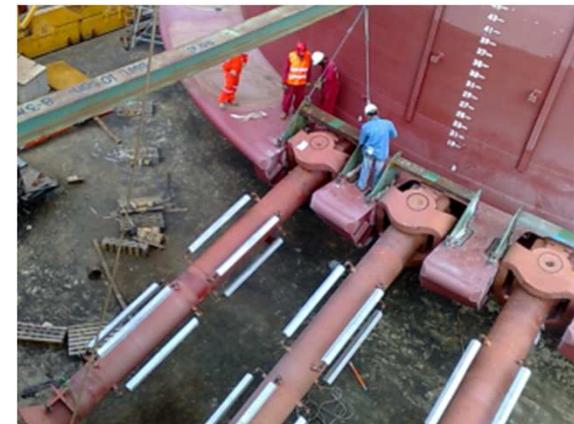


Mooring system with truly tested components

- Mooring system arranges in 3 bundles of 2 lines
- Use of conventional mooring components (chains, wire ropes) thanks to the low level of tensions
- Use of field proven accessories to limit OPB fatigue in mooring chains
- Extensive experience of mooring system design



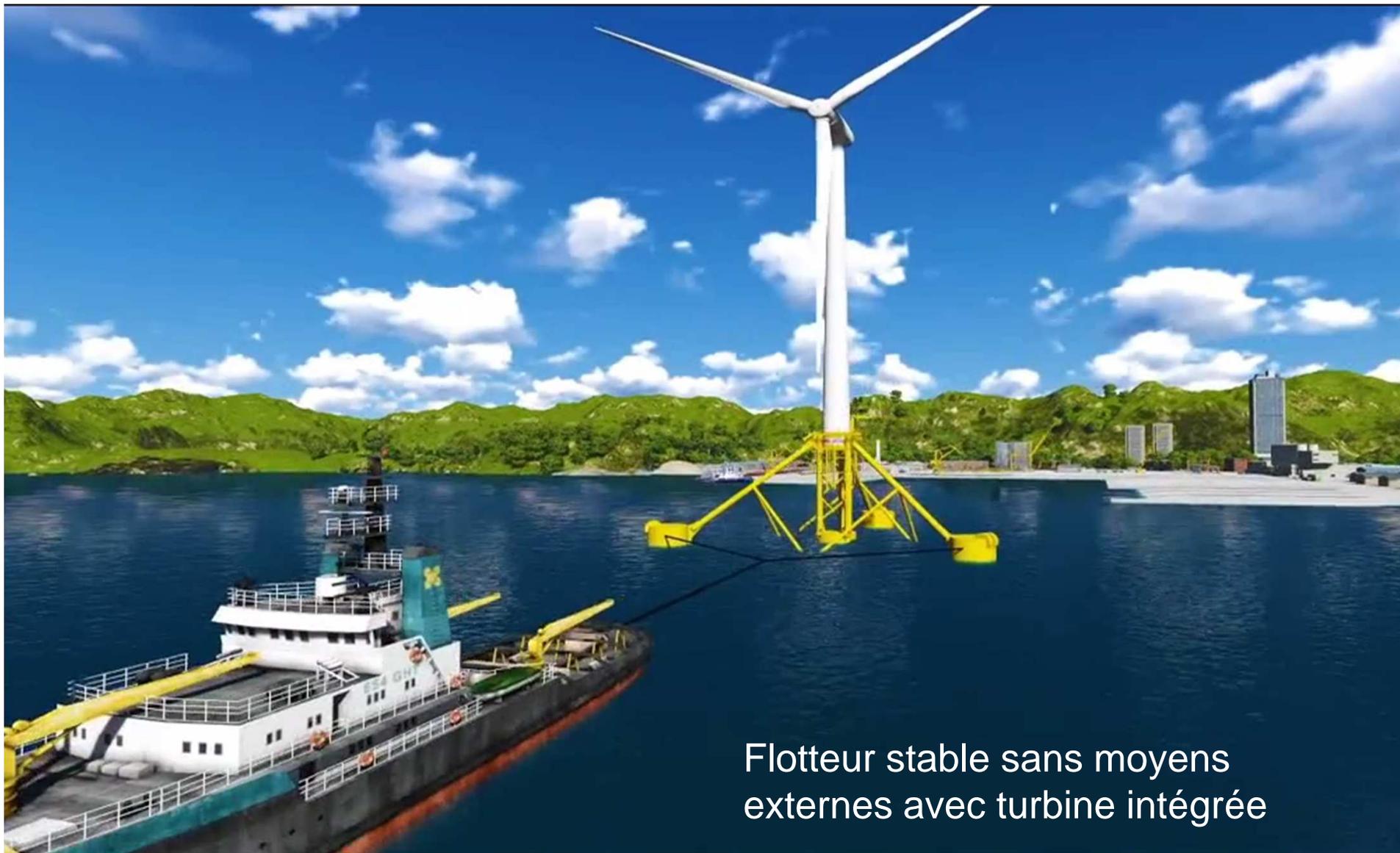
Component	SBM Experience (years)
Cylindrical floating bodies	50
Bracings / jackets	30
Chain connectors and ratchets	50
Mooring accessories	50
Gravity anchors	50
Suction piles	30
Transition pieces with turbines	30





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Thought for large scale fabrication, assembly and installation [\(hyperlink\)](#)



Flotteur stable sans moyens
externes avec turbine intégrée



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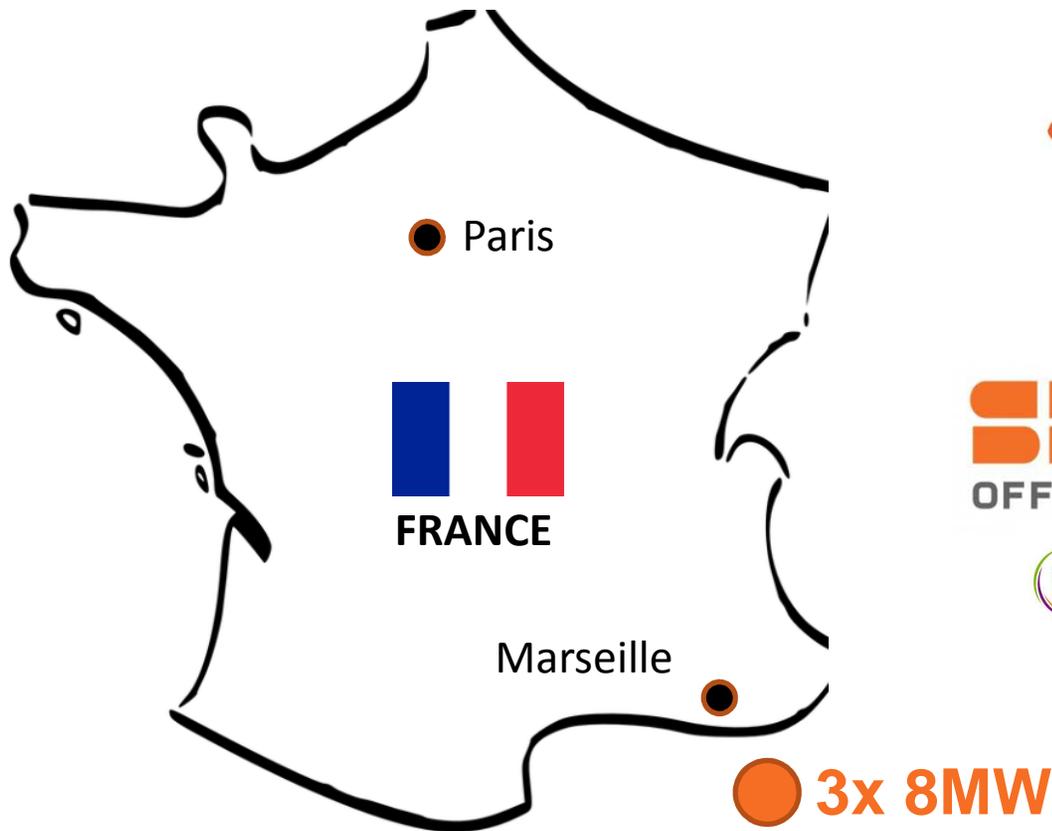


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SBM Offshore selected provider of wind floaters for the Provence Grand Large pilot project offshore France



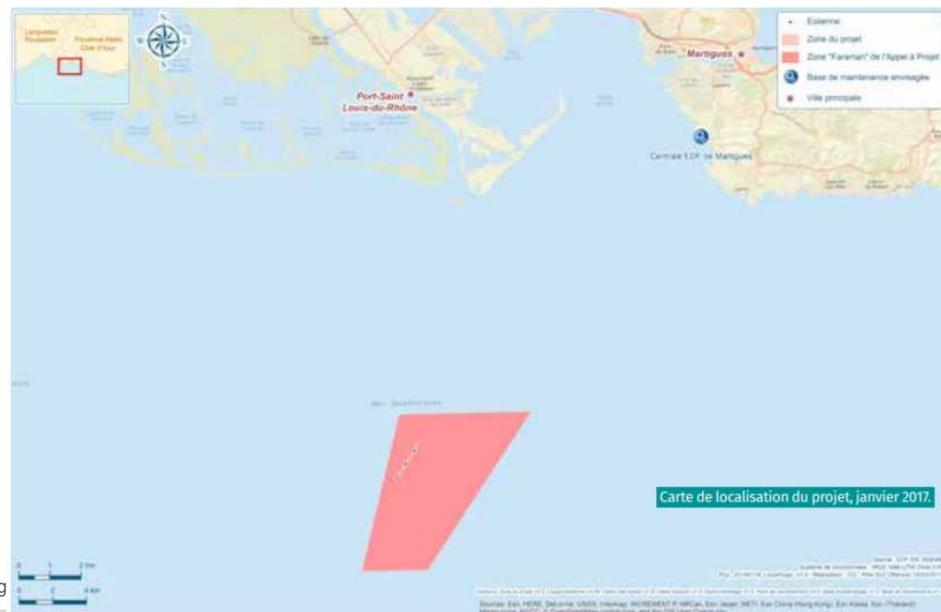


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Overview

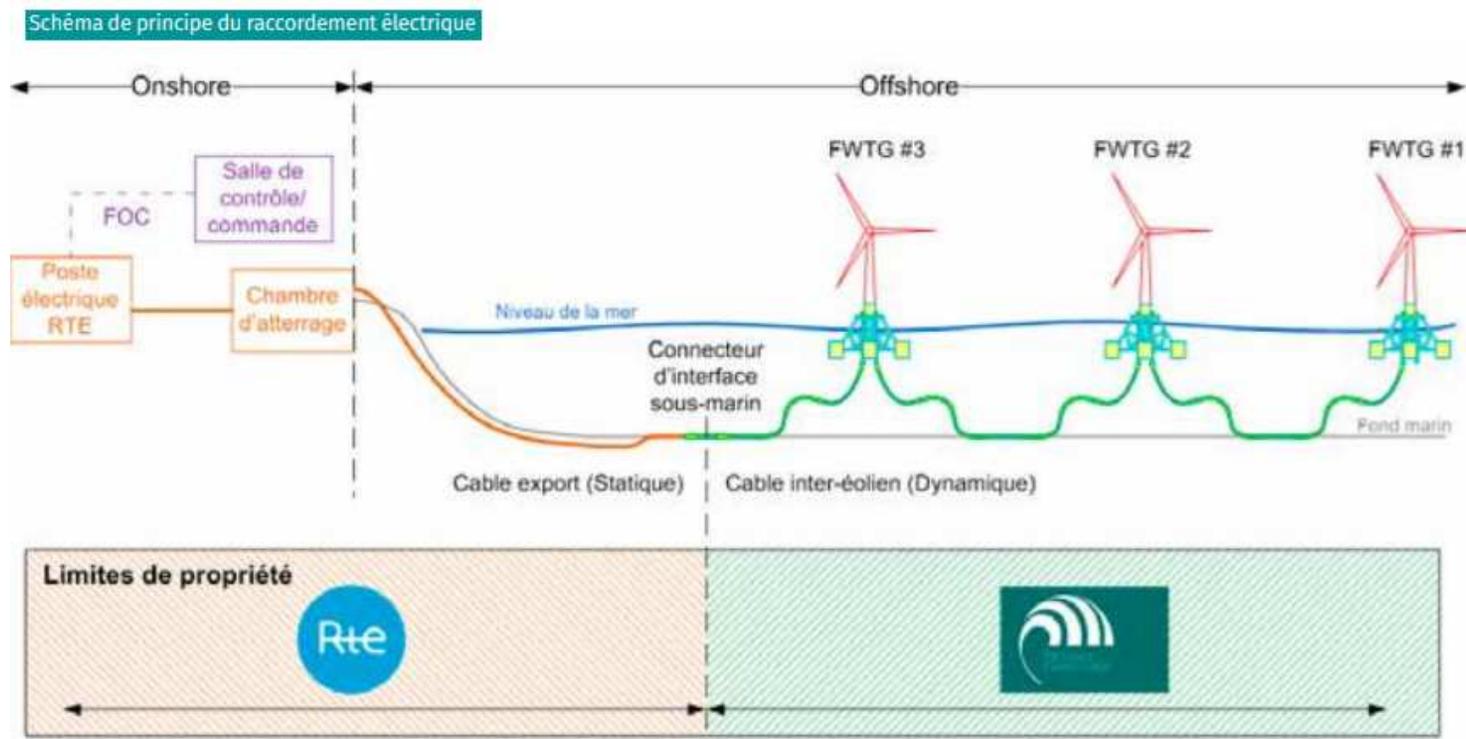


- 3x8 MW Siemens
- Electricity production for 40,000 residents
- 20 years operations
- First electron foreseen 2020





- Consenting, French government support framework, contracting
- Engineering & execution studies ongoing
- EPCI of wind floater & moorings
- Subject to committed financing





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THANK YOU

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