EU SPACE WEEK 2022

#EUSpace

Floating Offshore Wind.

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European Commission

EUSPA
European Union Agency for the Space Programme

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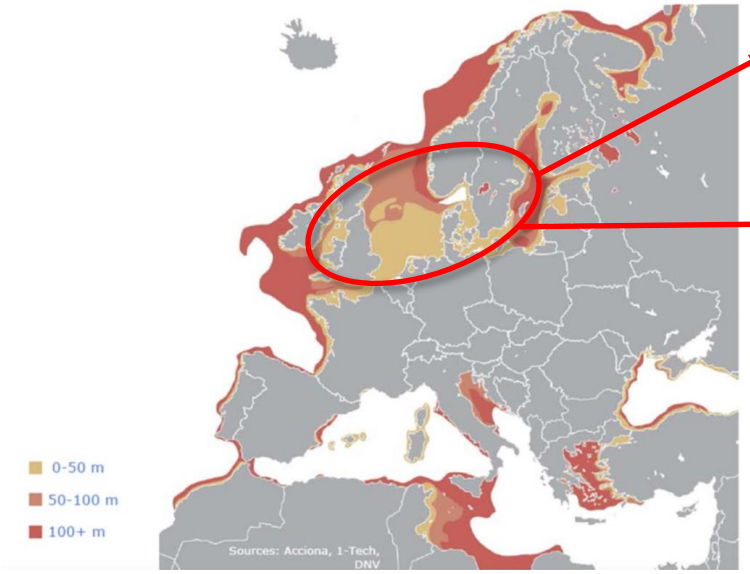
EU2022.CZ
Czech Presidency of the Council of the European Union

PRAHA PRAGUE PRAGA PRAG

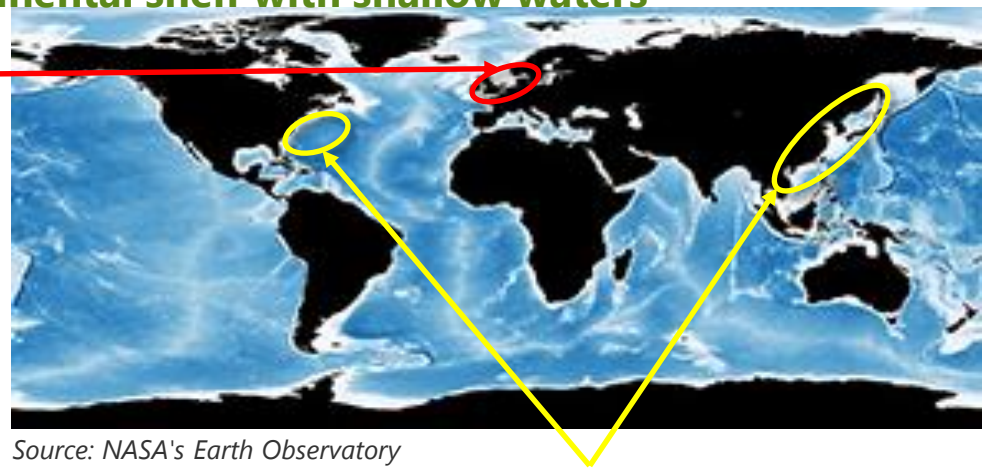
WHY FLOATING



Source DNV-GL, 2014 via Carbon Trust

Most of current Offshore Wind Farms are in this geographic "anomaly":

European Continental shelf with shallow waters



Source: NASA's Earth Observatory

Global Floating Wind Market is huge. We want to be a major player.

- BETTER CAPACITY FACTOR
- NEW AREAS where bottom fix cannot reaches
- POTENTIAL COST REDUCTIONS.
  Most assembly activities at port, minimizing expensive offshore activities.

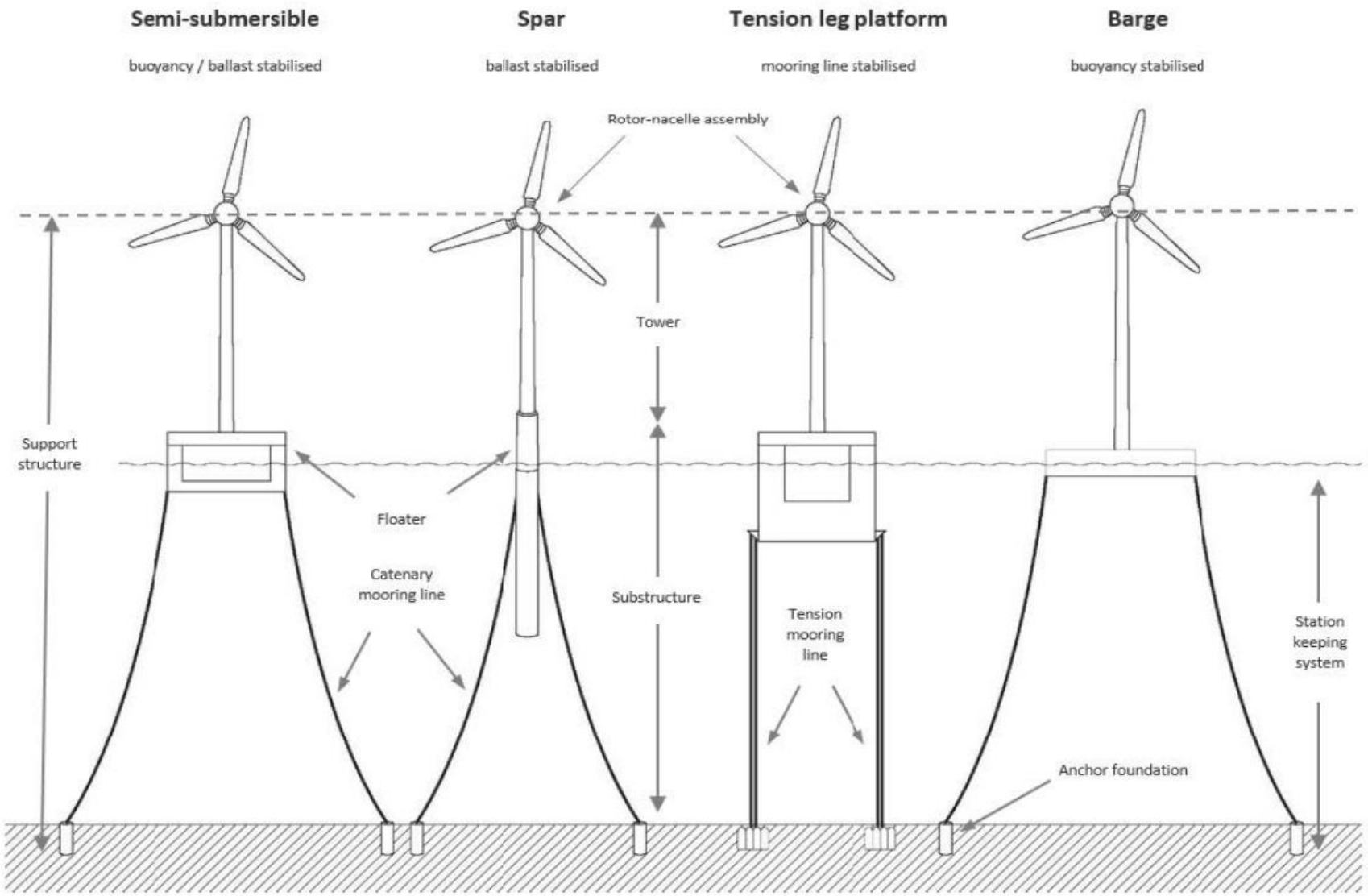
Rest of the world has few locations with similar shallow waters conditions:

Next Offshore Wind Projects shall go deeper → FLOATING TECHNOLOGIES

WE ARE KEY FOR THE DE-CARBONIZATION OF THE ENERGY SECTOR AND FOR SECURING ENERGY SUPPLY

Basic Concepts

4 basic common floating platforms types

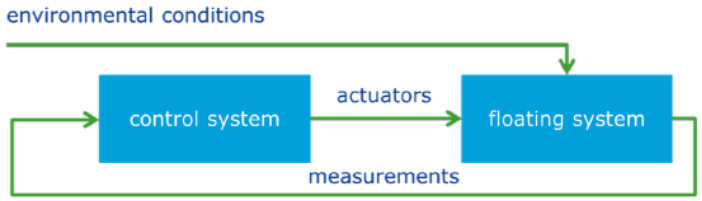


Source: DNV-RP-0286 Coupled Analysis of Floating Wind Turbine Structures 2021

Basic Concepts

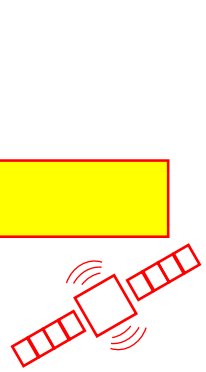
Dynamic conditions →

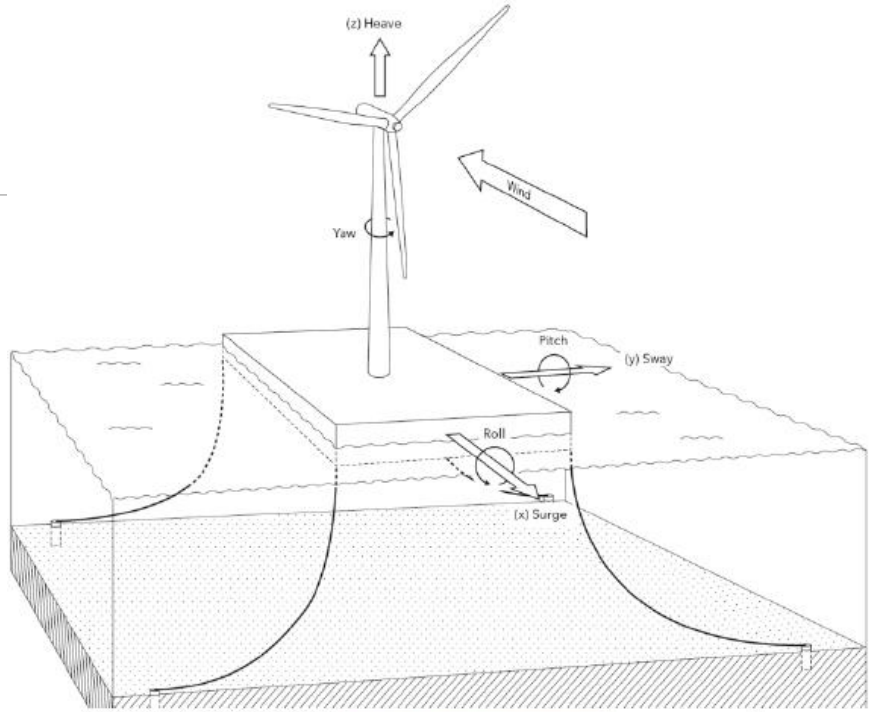
→ aero-hydro-elastic coupled analysis

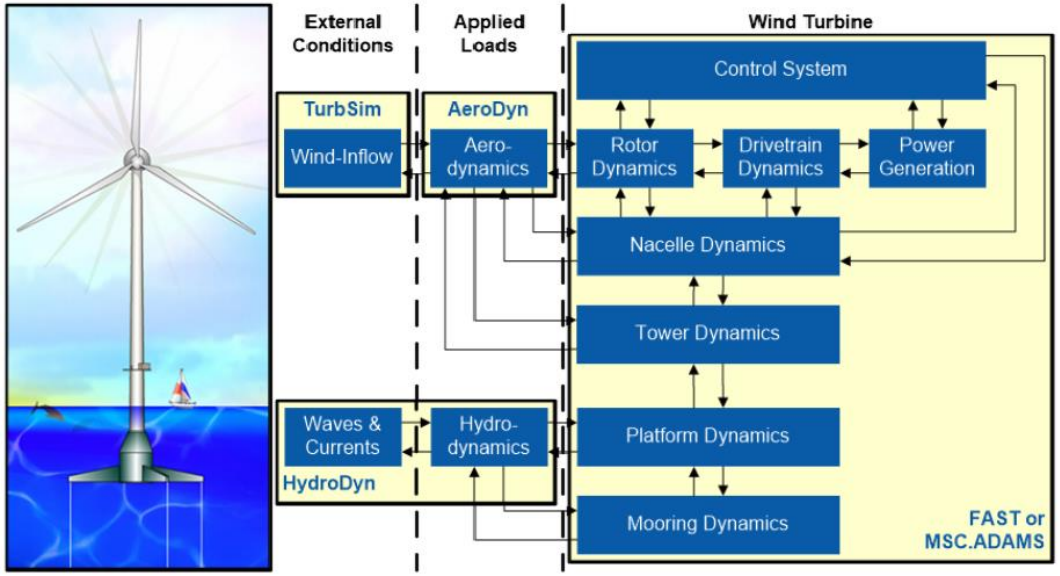


INTERFACING:

- **Meteocean Characterisation.**
- **WTG Modeling.**
- **Seabed Characterisation.**





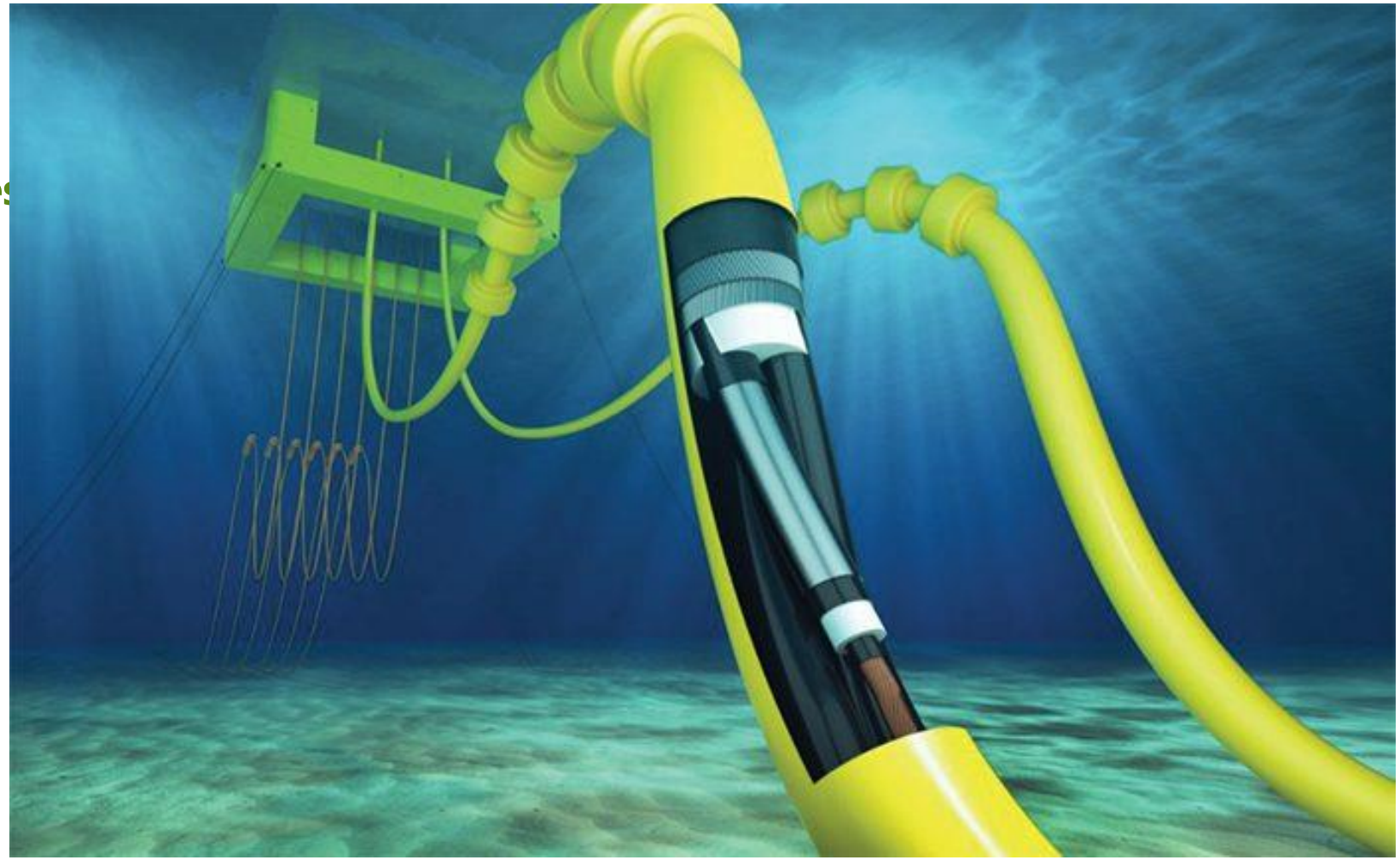


Source: DNV-RP-0286 Coupled Analysis of Floating Wind Turbine Structures 2021

Basic Concepts

Dynamic conditions →

→ New amours dynamic cables
→ New materials



Source: Power Magazine. Oct. 2021

INTERFACING:

- **Cable mechanical loads.**
- **Electrical studies.**
- **Cable layout conditions.**

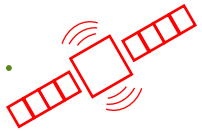
Basic Concepts

Key differences Floating Wind Farm vs bottom fixed

No OEM is designing bespoken WTGs for floating. FOWT shall work with WTGs from the shelf.

FOWT shall match WTG conditions for guarantying power curve:

- Maximum tilting angle ± 5º (operation), ± 10º (survival).
- Maximum acceleration 0.3G (operation), 0.5G (survival).



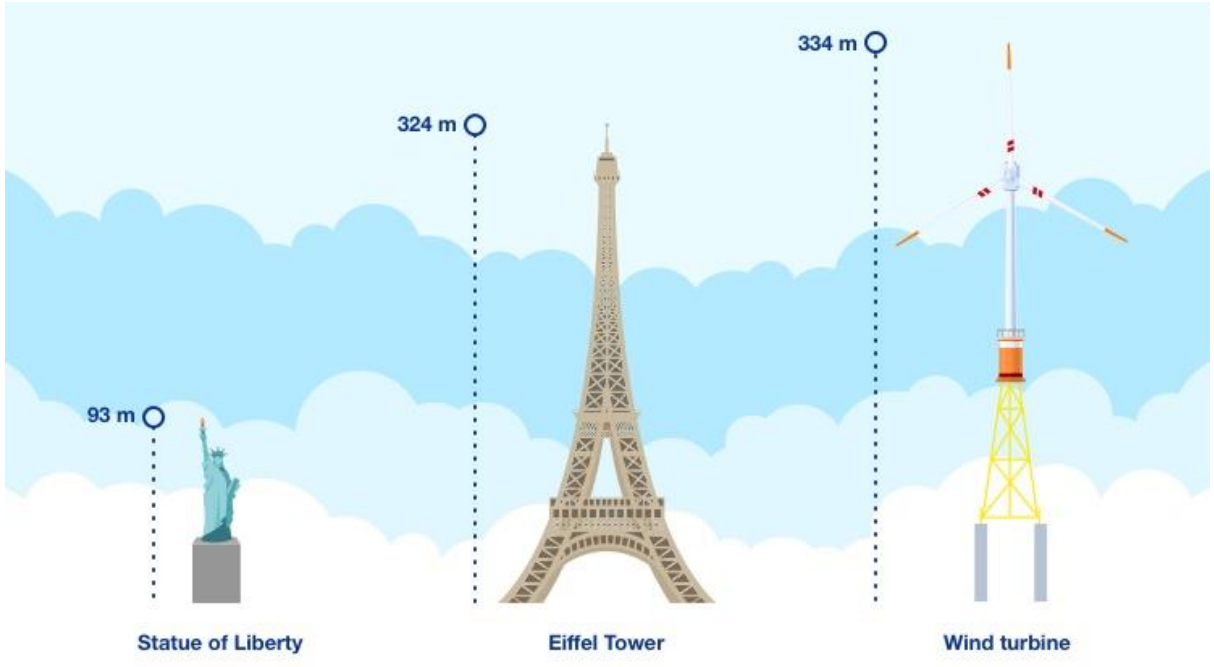
All certified FOWT match the above conditions.

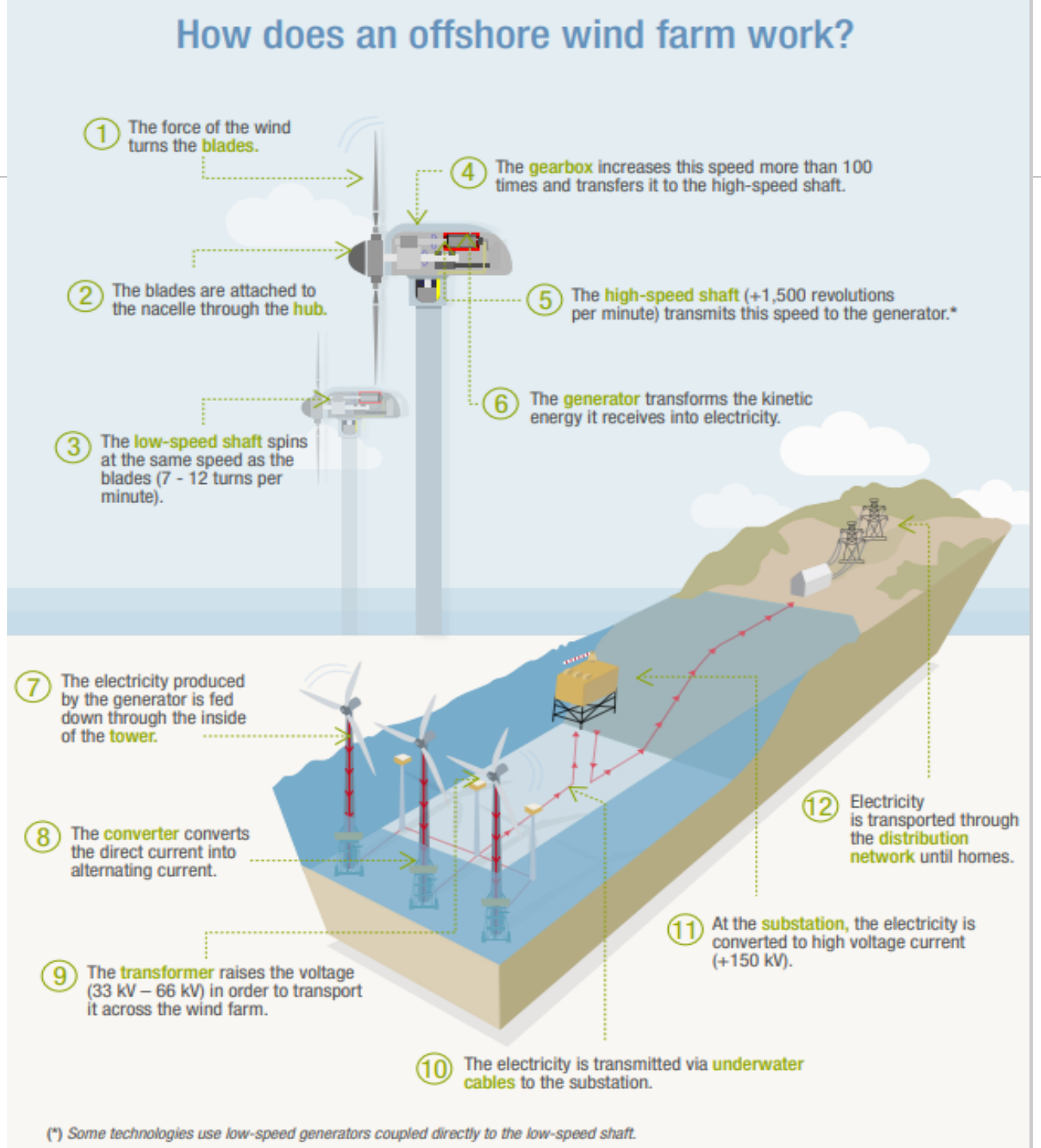
O&M performance:

- Major doubt on accessibility and workability (H&S). We are on G+ working group.
- Effect on components needs more reliable data. Data we have access to shows not significant impact on O&M cost.

Basic Concepts

Items of an Offshore Wind Farm





WHAT are we doing

Demonstration Projects:

- FLAGSHIP Project: concrete semi-sub platform. Turbine 11 MW. Norway.
- Analysing other Demonstrators opportunities

Supporting the Business on building up the pipeline:

- ScotWind 5 GW Floating (JV Shell-SPR)

Preparing offers to commercial auctions:

- South Brittany 250 – 500 MW (France).
- Utsira North (Norway. JV TTE-NH-IBR).

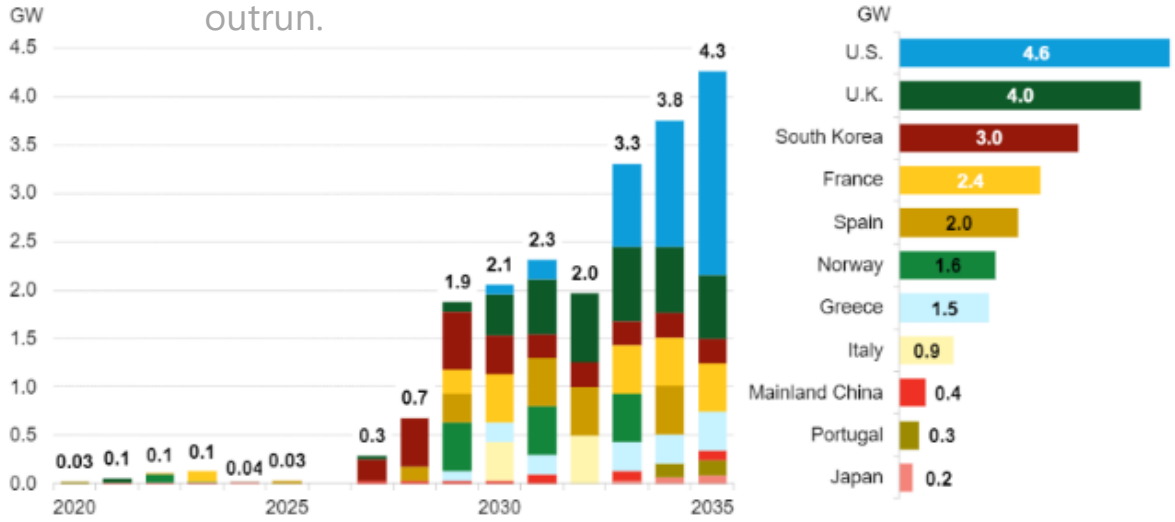
Purchasing Floating Wind pipeline:

- Japan.
- Ireland

New Markets for Floating Wind:

- USA.
- Spain.

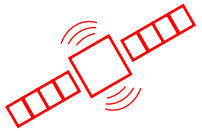
World Potential Floating Offshore Market The key information is the tendency; the actual value already has been outrun.



Source: Offshore floating Market outlook (Source: BloombergNEF 2H21).

CONCLUSIONS

Where we need GNSS:



- **Design phase: location of surveys outputs.**
- **Installation phase:**
  - **Trackability of vessels and assets.**
  - **H&S trackability of crews.**
- **O&M:**
  - **Trackability of vessels and assets.**
  - **H&S trackability of crews.**
  - **Monitoring of floating platforms excursions.**

Thank you for your attention.

Questions

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