Session 2. Sustainable Alternative Energy Carriers & Power: changes ahead in operations & logistics

Offshore power supply.

the e-Buoy

Govert Wagenaar

Bluewater **Sustainable** Developments

OFFSHORE

MOORING & OPERATION

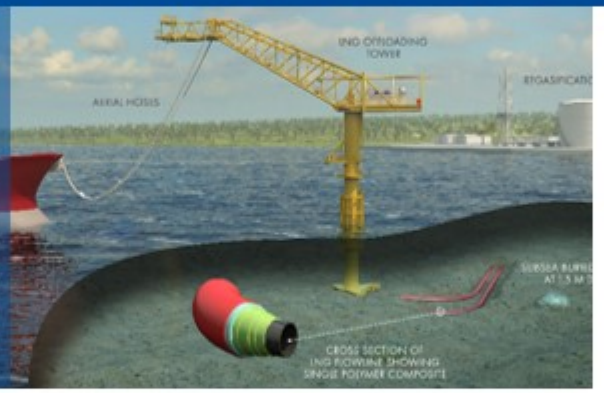
ENERGY

PRODUCTION & TRANSFER

DESIGN & DELIVER, OWN & OPERATE

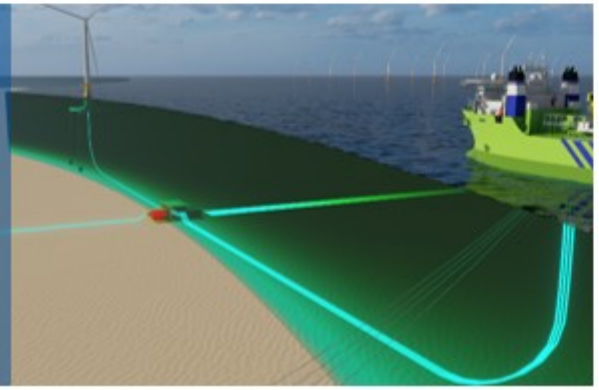
Blue FPSO

New Fluids



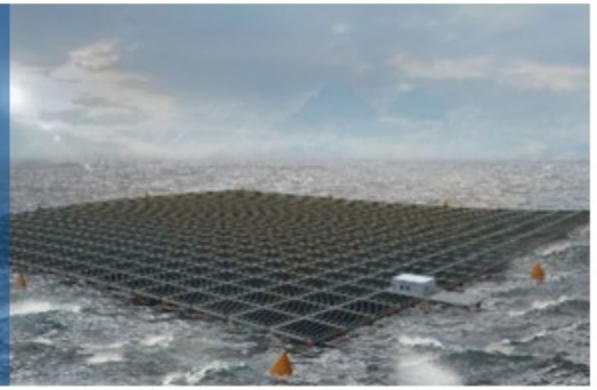
Floating Wind

Green FPSO



Electrification

Floating Solar



Achieving zero emissions with e-Buoys

Battery powered ships	Idle ships	Ships not entering ports
• Wind park support vessels • Guard vessels Short distances Fixed area No frequent port calls Offshore charging	Ships outside ports waiting for ▪ charter ▪ quayside ▪ client instructions	• Large cruise ships at small ports • Large yachts at small ports • Ship to ship transfer

Case 1. e-Buoy for Wind park support vessel

Operational

Battery powered vessels charged via e-Buoy with power from wind park.

Moored at buoy => switch off power.
⇒ Emissions ▼
⇒ Crew comfort ▲

Charging during idle mode, e.g. at night.

Most maintenance at day time to ensure safety and efficiency.

Back up power, e.g. fuel cells, to extend working time when needed.

Of primary interest for wind parks remote (> 20 n.m.) from shore, where service vessels stay permanently in the field.

Tie in to wind park

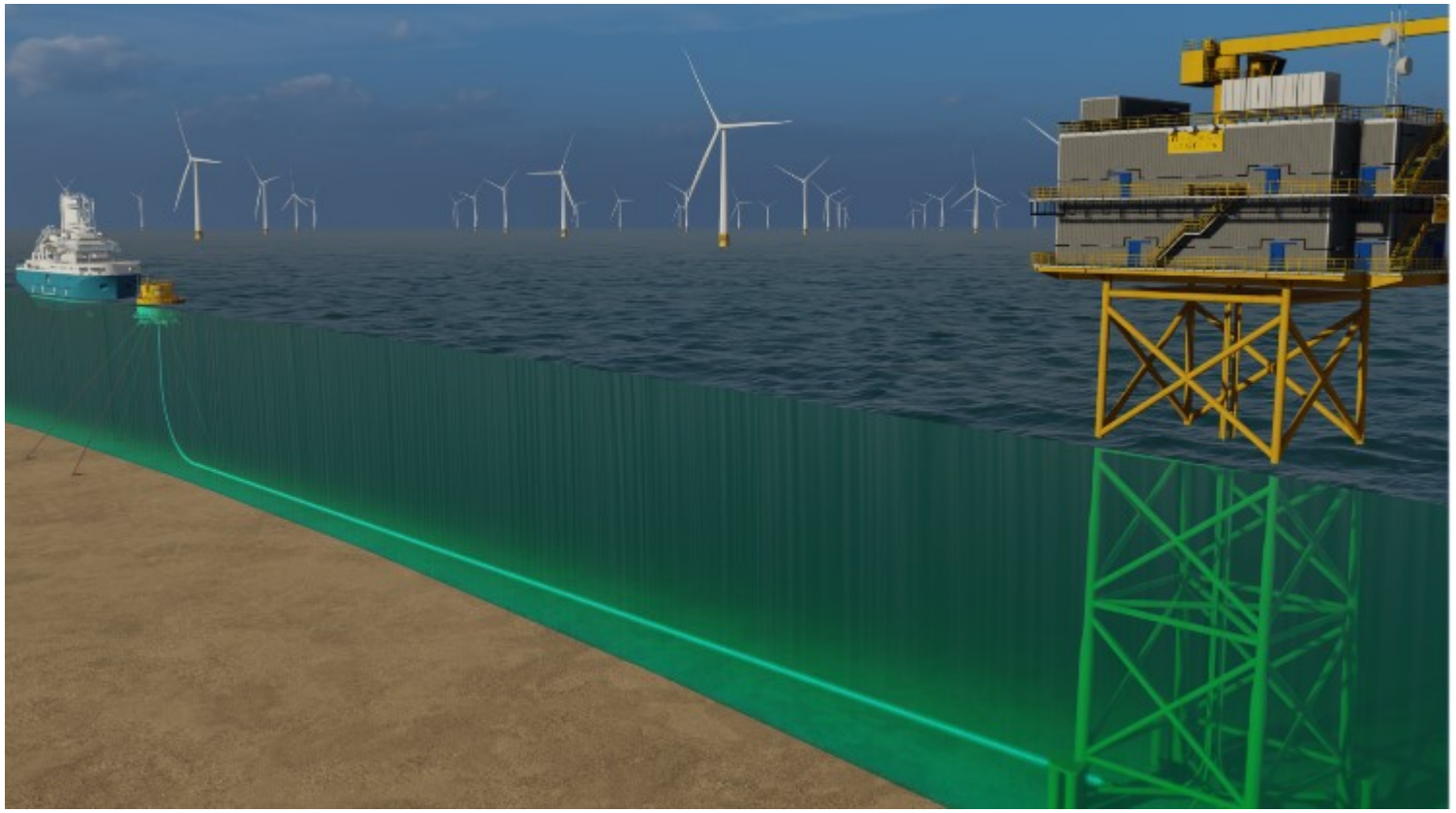
Wind park inter array voltages: 33 - 66 kV

Today 11 kV is applied for efficient and safe power transfer.

►transformer required.

Frequency difference shore/ship 50 / 60 hz is not a problem for battery powered ship.

Battery charger requires DC power anyhow.

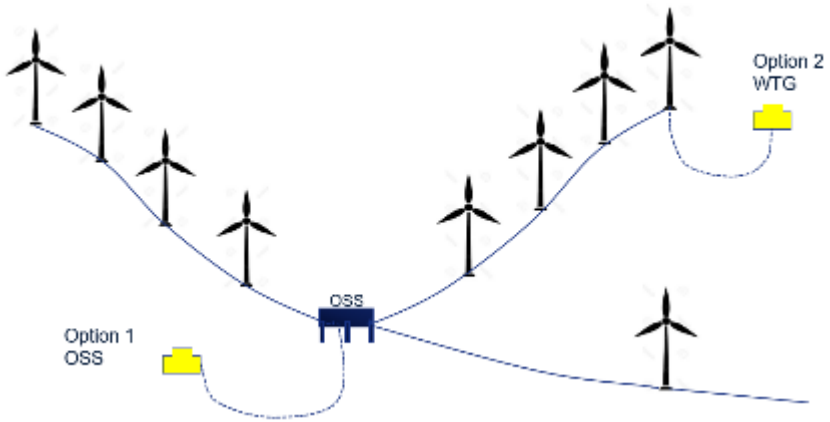


Tie in options

Buoy to be connected to wind park with subsea cable. Options:

- via wind turbine
- via OSS (Offshore Sub-Station).

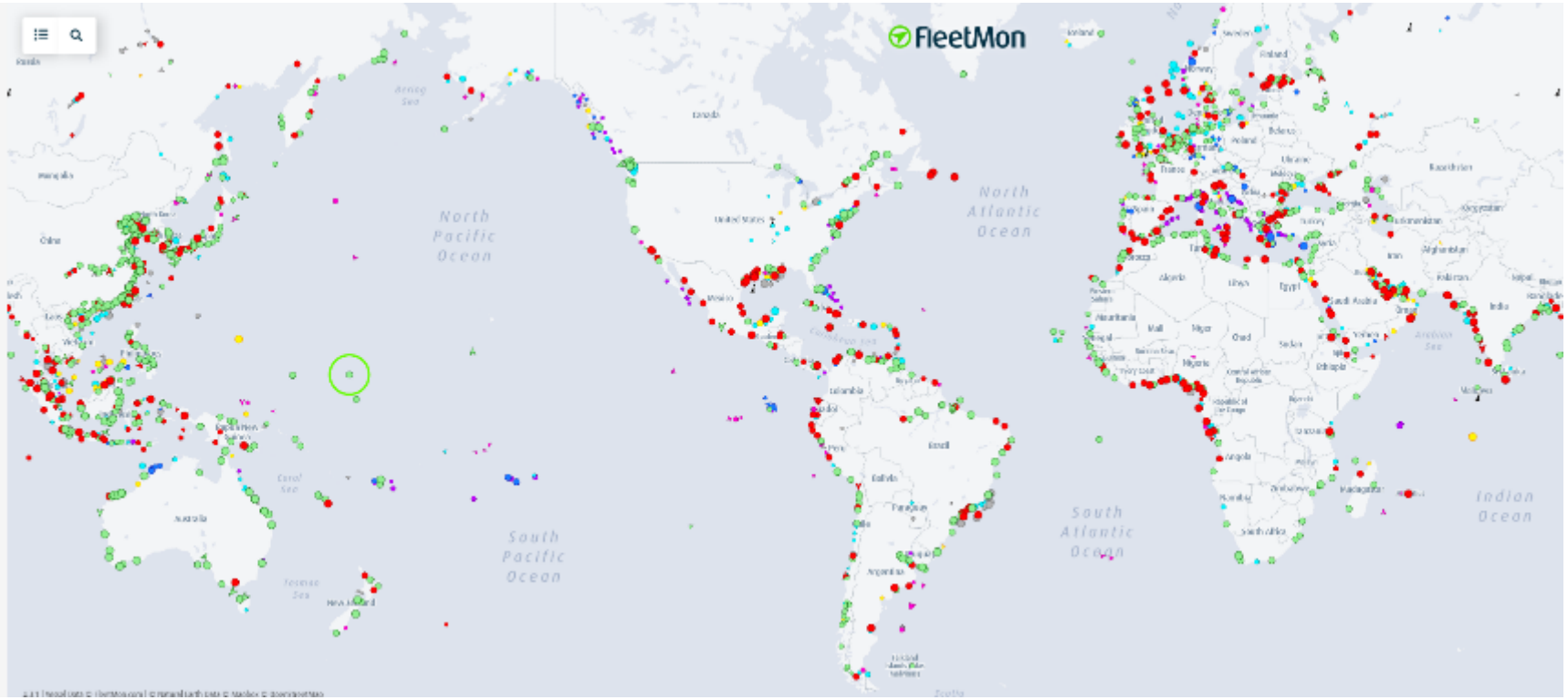
In this location a trafo and breakers to be located.



	Tie in to OSS	Tie in to WTG
+++	Good access for service.	Location outside of field is possible.
- - -		Down time when a string of WTGs is isolated
- - -	Specification OSS to include tie in.	“Special” WTG needed. Impact on delivery and cost

Case 2. e-Buoy for ships in waiting area

- Right now approx. 2000 ships at anchorage (www.fleetmon.nl)
- Estimated emissions: 10 million ton CO2 per year
- Approx. 1% of annual shipping emissions.
- SO2 and NOx emissions near populated area's.



Case 2. e-Buoy for ships in waiting area

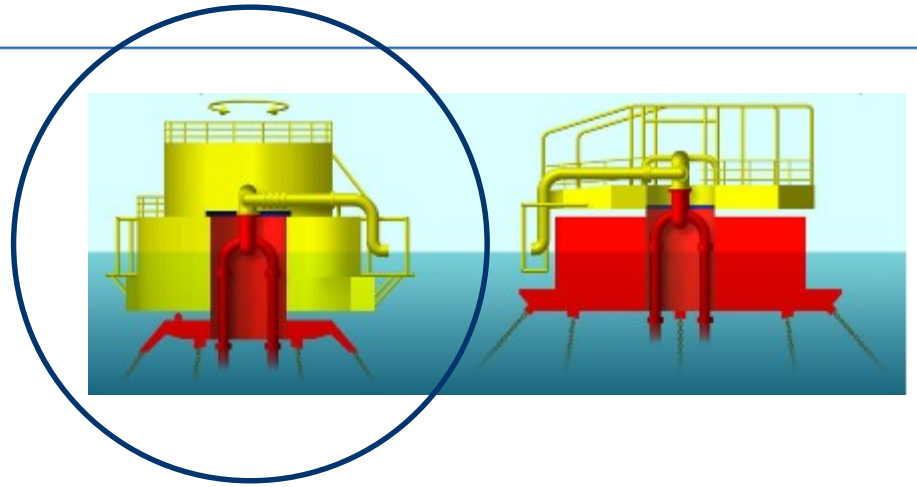
Conditions for success:

- Connection facilities, over bow, to be installed.
- Cluster of buoys foreseen with a tranform hub for power step down
- Power voltage and frequency to suit vessel demand.
- Location to be found for e-Buoys cluster in busy port area
- Clean power to be available.

Case 3. e-buoy for Cruise ships

- Strong growth in cruise shipping
- Growing economic contributor to communities
- In small ports, visual impact can be large => cruise ships to stay offshore in stead of entering port
- Concerns on pollution GHG, SO2, NOX => Cruise ships to moor on e-Buoy

E-Buoy solution



- Turret buoy
  - Field proven concept
  - Unrestricted weathervaning
  - Protection to electrical equipment
  - No supporting vessels required.
- Power supply typically @ 6.6 kV or 11 kV.
- Current up to 500 A
- Supply power up to 9.5 MVA
- Remote controlled and monitored from ship and shore
- Controls and connection following shore power standards

E-Buoy solution

Key elements

- Subsea cable
- Breakers.
- Slip ring
- Reel in deckhouse with floating surface cable
- Connector

Ship side equipment

Partners

MAGPIE. Project executed by multiple ports, companies, and institutions
Goal to shape the green ports of the future.

MAGPIE Demo 5. comprises demonstration of the e-Buoy concept

Demo 5 partners:

Thank you