Offshore Wind/Ocean Energy Co-location: A few examples in Belgium

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"R&I needs for co-location of offshore wind and ocean energy", IWG Ocean Energy, IWG Wind Joint Workshop, 18-10-2024, Brussels

Our Activity Groups

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Current Offering in Blue Energy via multidisciplinary approach

Site assessment & Design Basis

LCOE & spatial constrains
Site conditions
- ✓ Metocean and Hydrodynamics
- ✓ Geosciences: Geology and geotechnics
- ✓ Seabed morpho / morphodynamic

Environmental & ecology
- ✓ EIA and permitting
- ✓ Nature Inclusive Design
- ✓ Environmental monitoring (bird, water quality…)
- ✓ Plume modelling
- ✓ Noise modelling
- ✓ ...
- Safety analysis

Fix & floating Offshore wind, Wave &Tidal Converters

- Wind/Wave/Tidal resource assessment
- Layout optimisation
- Energy production
- Electricity output

Subsea cables

- Cable routes
- CBRA & BAT
- FEED design
- Landfall concept & execution
- Electrical & Topside design
- EPC for electrical HV/MV equipment
- Grid connection & stability & behavior
-

Sub-structures and foundations

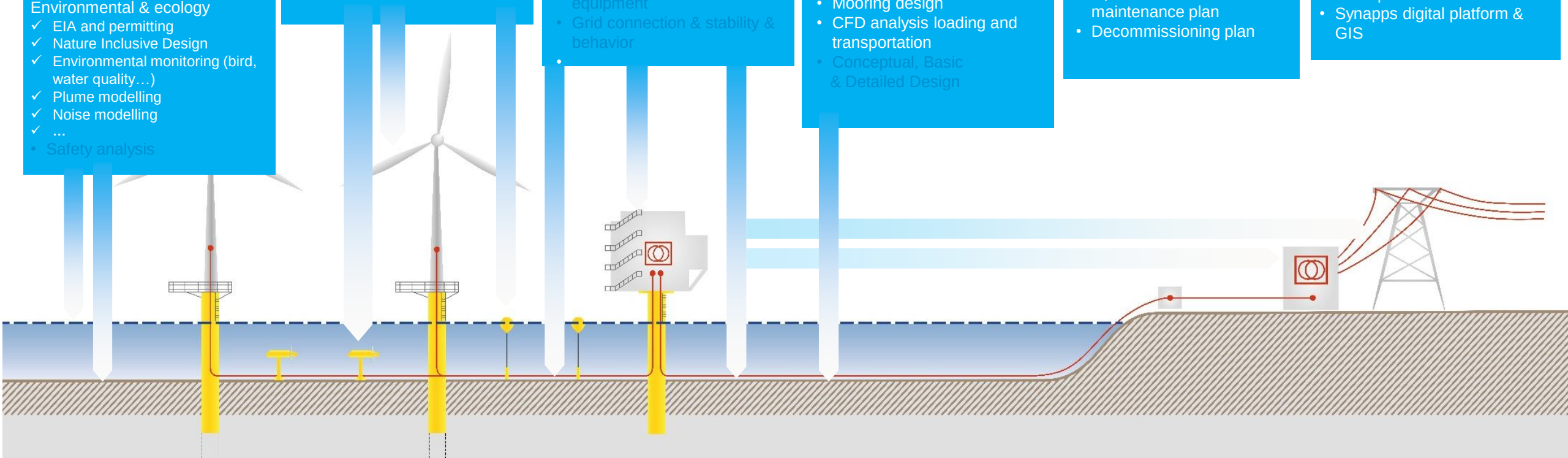
- Geotechnical & geophysical data analysis and soil parameterization
- Scour protection & scour assessment
- Installation techniques
- Mooring design
- CFD analysis loading and transportation
- Conceptual, Basic & Detailed Design

Construction, O&M & decommissioning

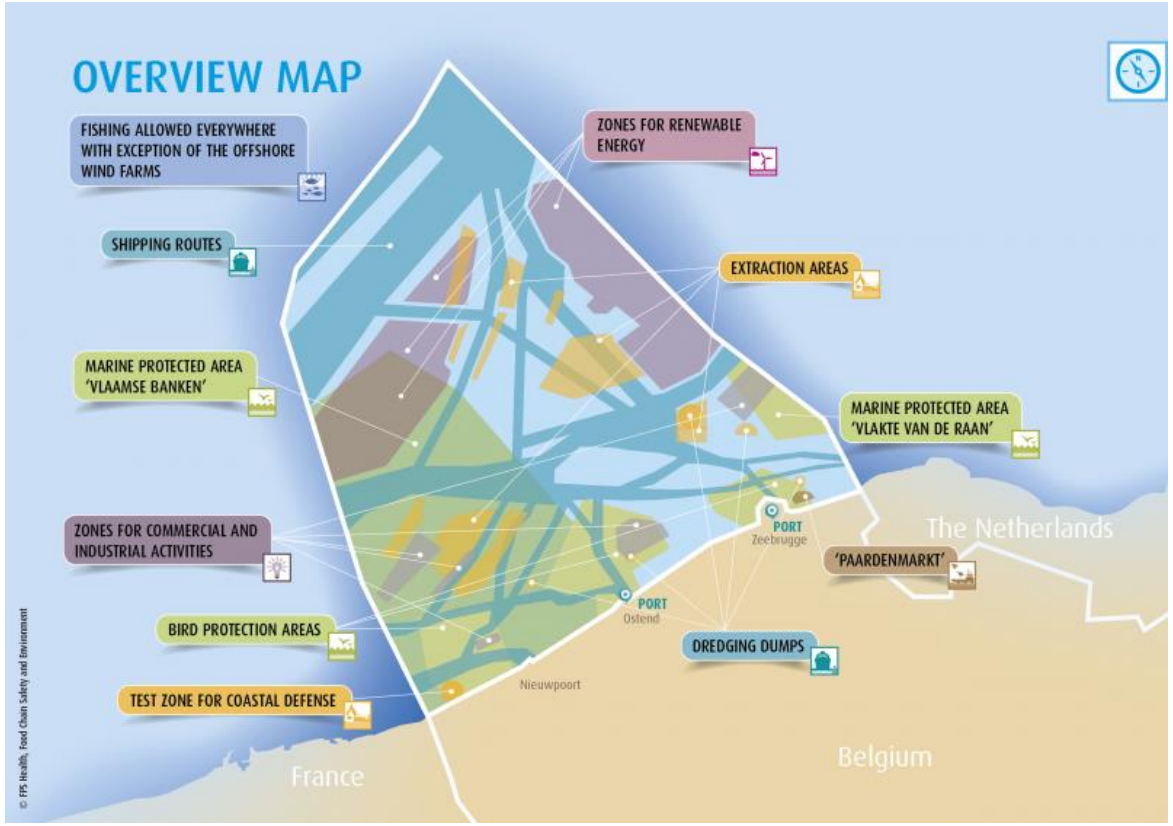
- WDT & workability
- Constructability assessment
- Client representative
- CAPEX & OPEX
- Operational & maintenance plan
- Decommissioning plan

Supporting services

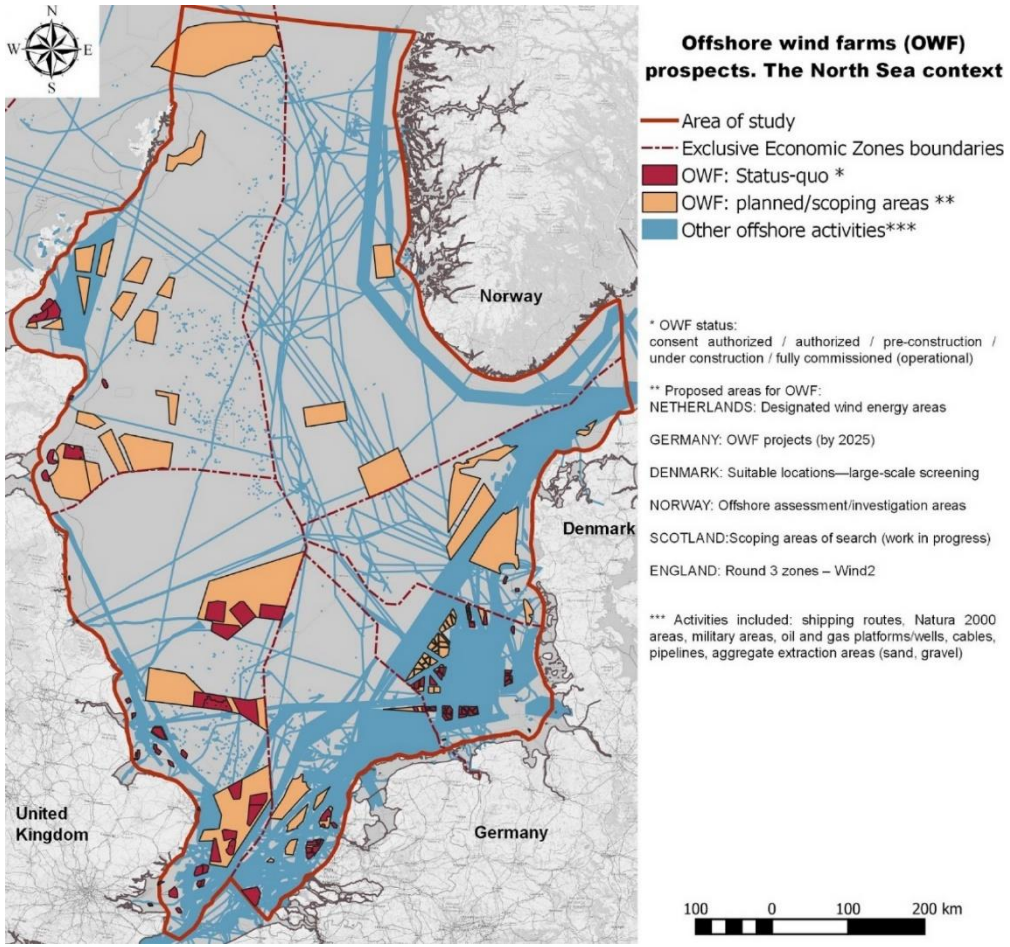
- Owner's engineering and offshore coordinator
- Procurement and Coordination of Field & desktop Studies
- Coordination and technical support on EPCI procurement
- Certification follow-up
- Interface Management
- Environmental & circular criteria for OWF auctions and EPCI procurement
- Synapps digital platform & GIS



Why Co-Location

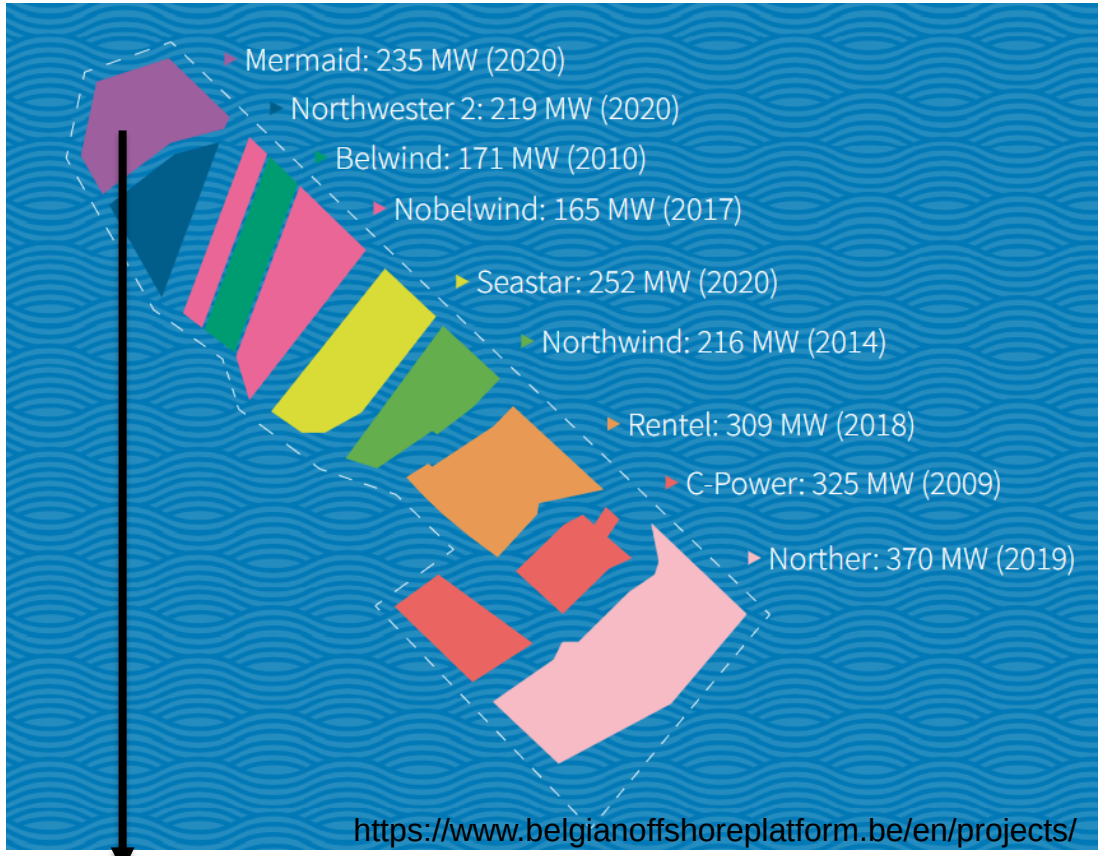


Credit: https://www.health.belgium.be/en/marine-spatial-plan



Gușatu, L.F., Menegon, S., Depellegrin, D. *et al.* Spatial and temporal analysis of cumulative environmental effects of offshore wind farms in the North Sea basin. *Sci Rep* **11**, 10125 (2021). https://doi.org/10.1038/s41598-021-89537-1

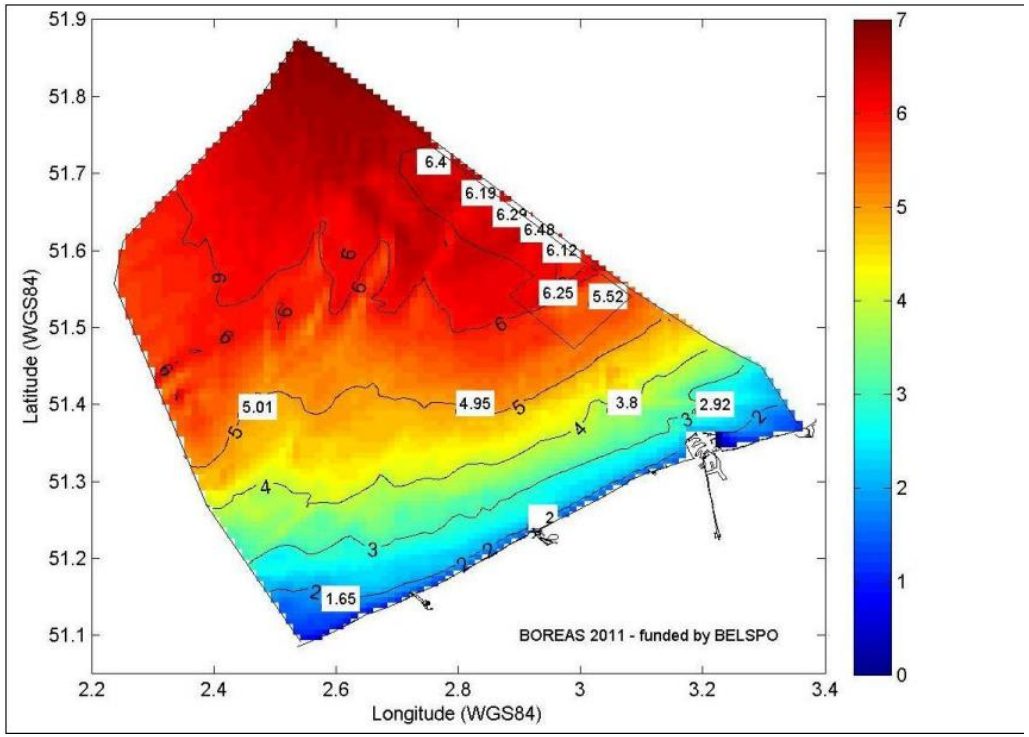
Offshore Wind in Belgium and WECs



Mermaid WF (owned by Otary and co.)
Permit issued in 2015:
With the condition to realize 5MW of WEC within the zone.

BOREAS (Belgian Ocean Energy Assessment) Project (2009-2011)

- UGent
- KU Leuven
- Flanders Hydraulic research
- MUMM



Boreas Final report available at
https://www.belspo.be/belspo/ssd/science/reports/boreas%20finaal_rapport_ml.pdf

Offshore Wind in Belgium and WECs

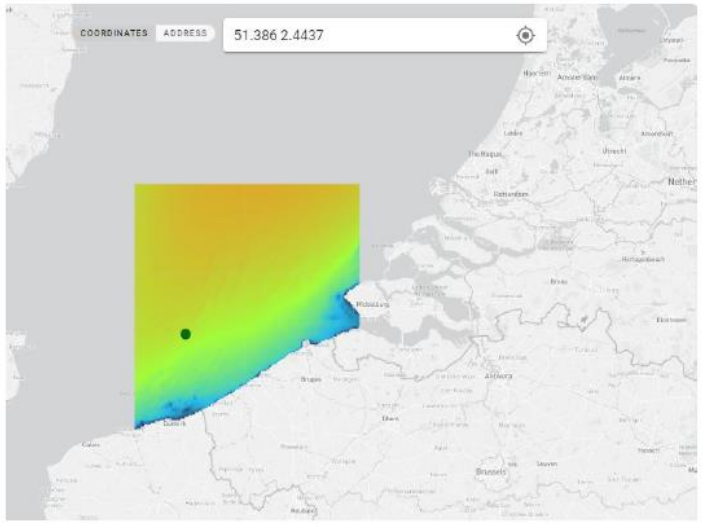
BluERA
(Blue Energy Resource Assessment)
(2020-2022)

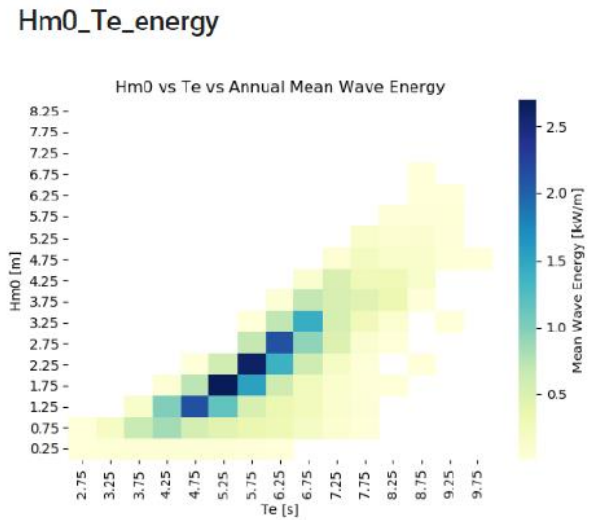
BLAUWE CLUSTER

AGENTSCHAP
INNOVEREN & ONDERNEMEN

How to assess most appropriate technologies confidently for a specific location?

- Wave energy atlas
- Energy yield assessment tool





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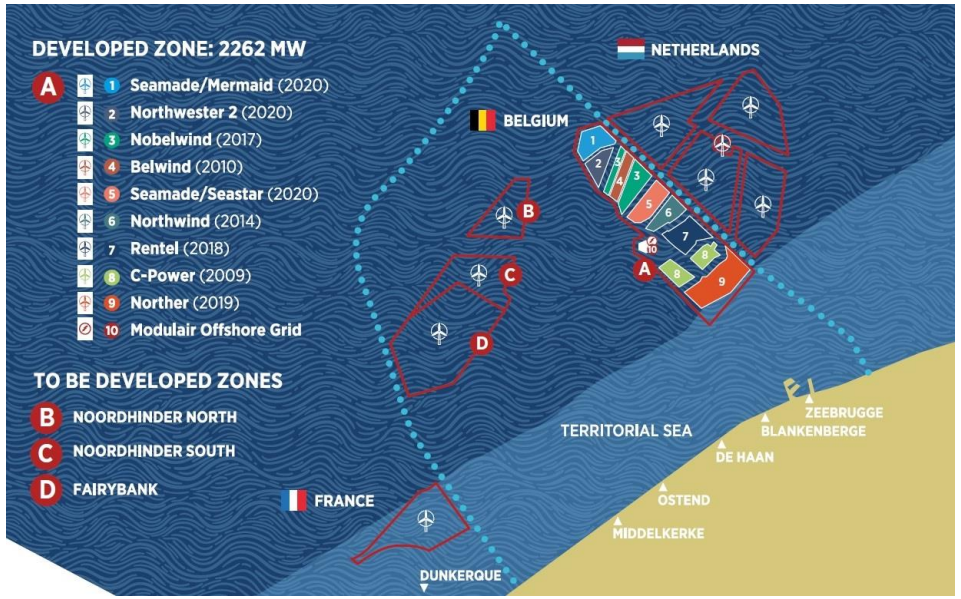
Another example of co-location(?)

MP (Monopile) Multi Use Project (2023-2025)

Can we re-use (some of) MP foundations for ocean energy generation or storage as an alternative for decommissioning?

- Is there a realistic business case for ocean energy devices when built on existing infra.?



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Wavehexapod
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economie
FOD Economie, K.M.O., Middenstand en Energie

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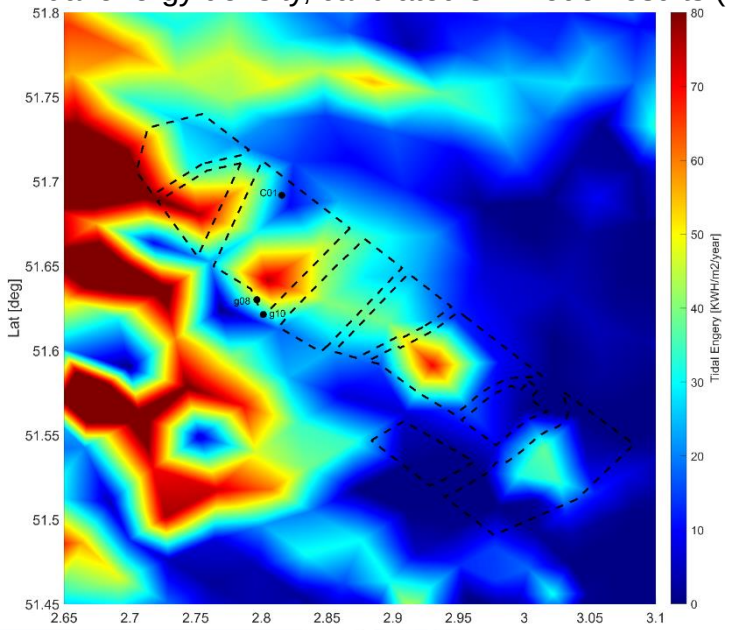
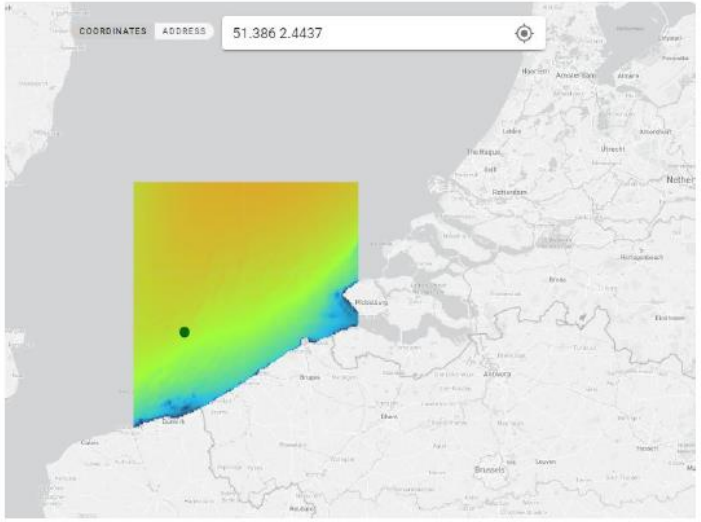
MP Multi-Use Project

- Select suitable devices (2 or 3)
- Assess their feasibility and suitability from various aspects
  - Resource and energy yield
  - Installation and O&M
  - Legal
  - Environmental
  - Financial
- Assess MP suitability structurally
  - Hydrodynamic modelling
  - Structural dynamics and impact on the remaining lifetime*
  - Fatigue assessment of secondary structures

Tidal energy density, calibrated 3D model results (TELEMAC)





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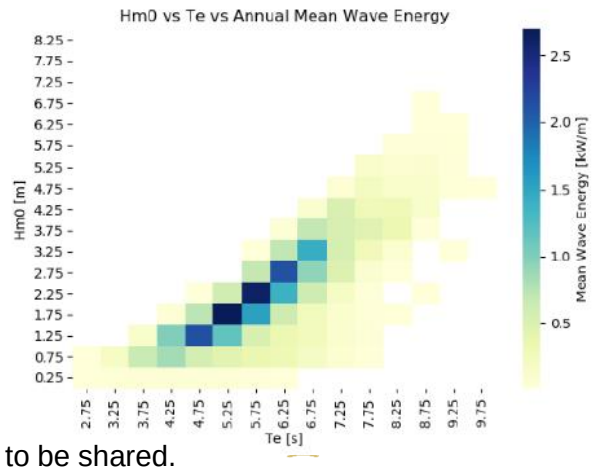
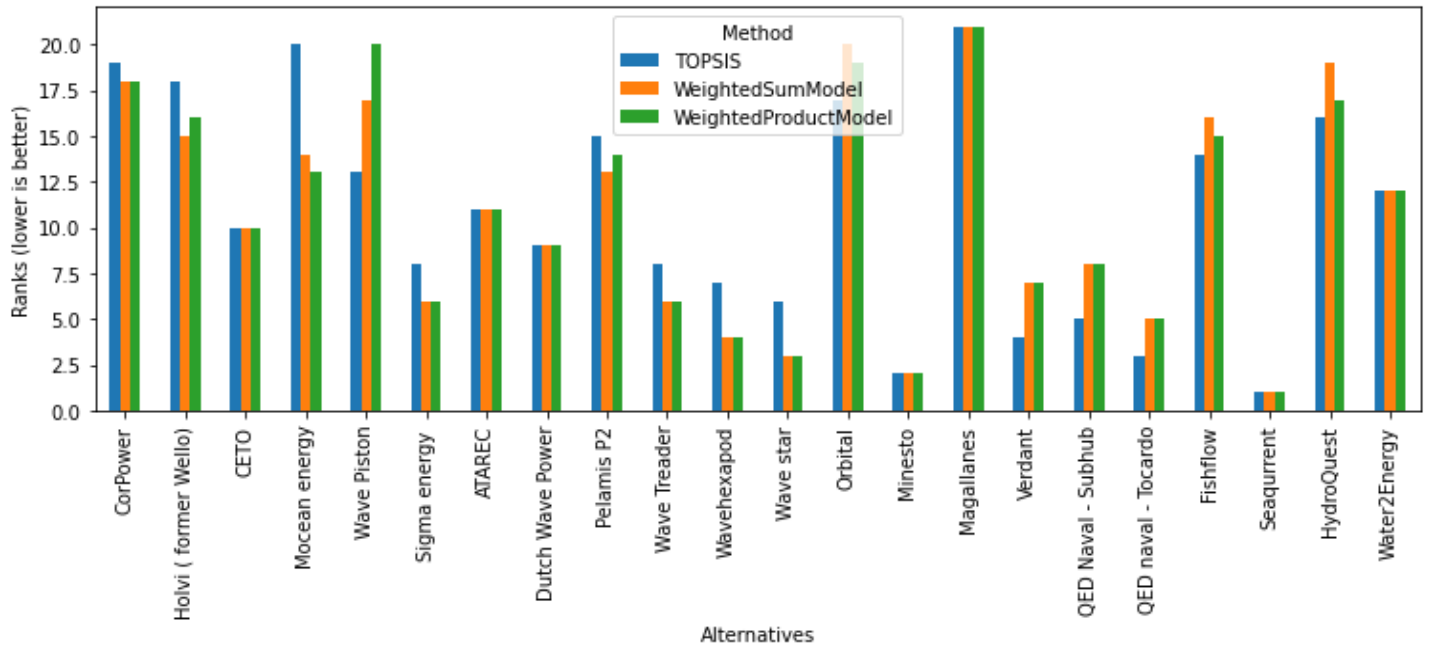


* All MPs are already being monitored since almost their commissioning, Parkwind (owner of Belwind WF) is supporting project by allowing data to be shared.

Concept Selection - MCDA

- In total of 17 Criteria part of 5 main groups (Economics, Energy generation in BPNS, Technical Feas, Env. And Social impact, Business Feas.)
- 22 different energy generation methods→ wave and tidal only.

Criteria	Weighting
Economics	25%
Energy (in Belgium)	25%
Technical feasibility	25%
Environmental, social and legal	15%
Business feasibility	10%



BPNS: Belgian Part of the North Sea

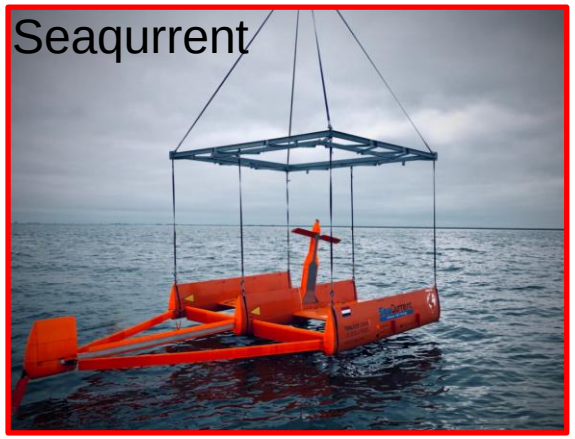
Preferred Solutions

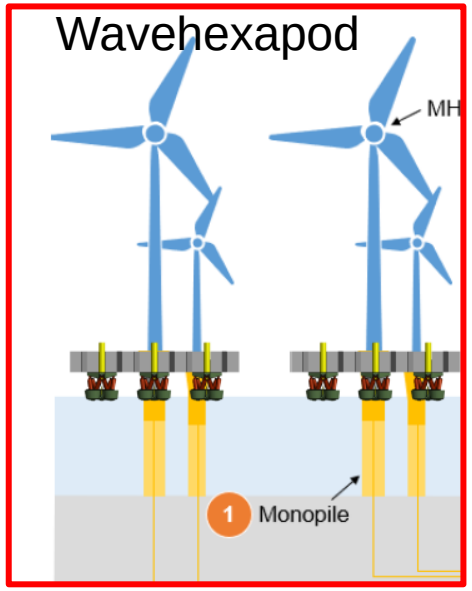
1. Tidal Kite (**Seaqurrent,** Minesto)

2. Attenuator type WECs (**Wavehexapod,** Wave star, wave treader, Sigma Energy)

+ additional technologies co-located to enhance the business case:

- Floating solar
- Energy storage
- *New wind farms after repowering**



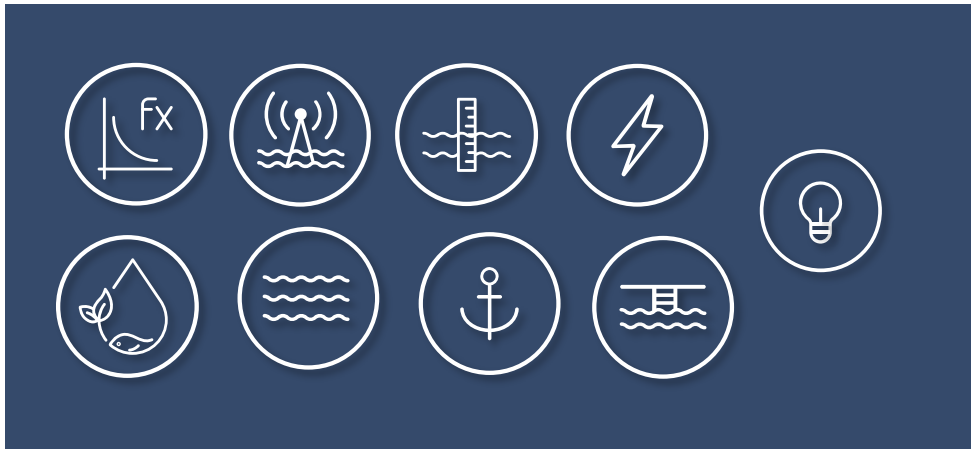


* (New) Wind farms are not included in this project.

Three key take-aways…

- ✓ Offshore co-location in Belgium is inevitable.
- ✓ Policy makers in different levels are supportive.
- ✓ Industry is looking for more certainty and risk reduction to make the next steps.

Thank you!



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