



INNOVATION IN OFFSHORE H&S; synergies between wind and ocean energy

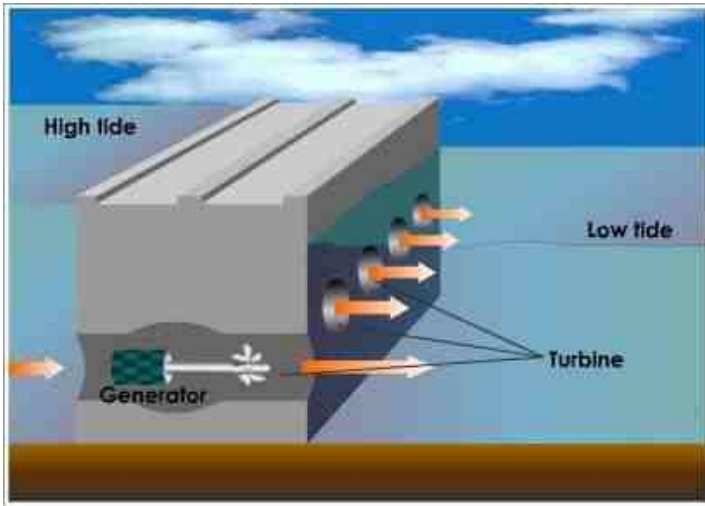
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1. Wind, and Ocean technologies
2. Guidance in H&S
3. Experience

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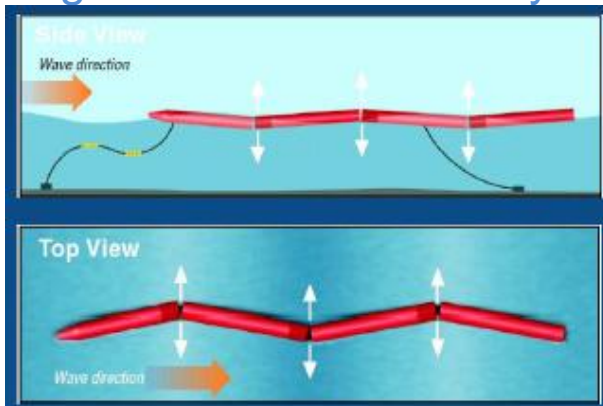
Ocean Technologies

Direct generation, via hydraulics, mechanical rotation, displacement



Ocean Technologies

- PELAMIS – low O&M
- Agucdura wave farm 2.25MW
- Cylindrical sections connected by hinged joints.
- Bending motion into hydraulics leads to generation of electricity



Ocean Technologies

- Loosely moored to ocean floor
- Moves freely up and down with the waves
- Houses a float – acts like a piston moves up and down as wave passes
- Motion of float drives electrical generator
- Low O&M – critical components inside housing

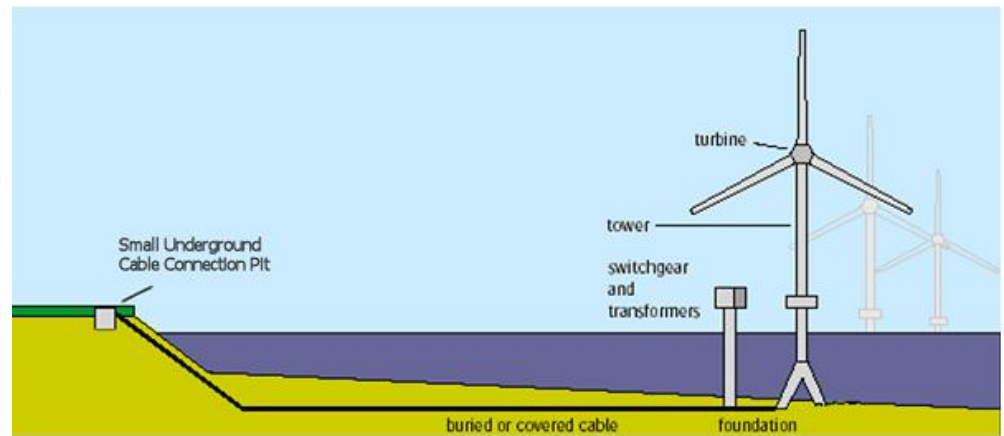
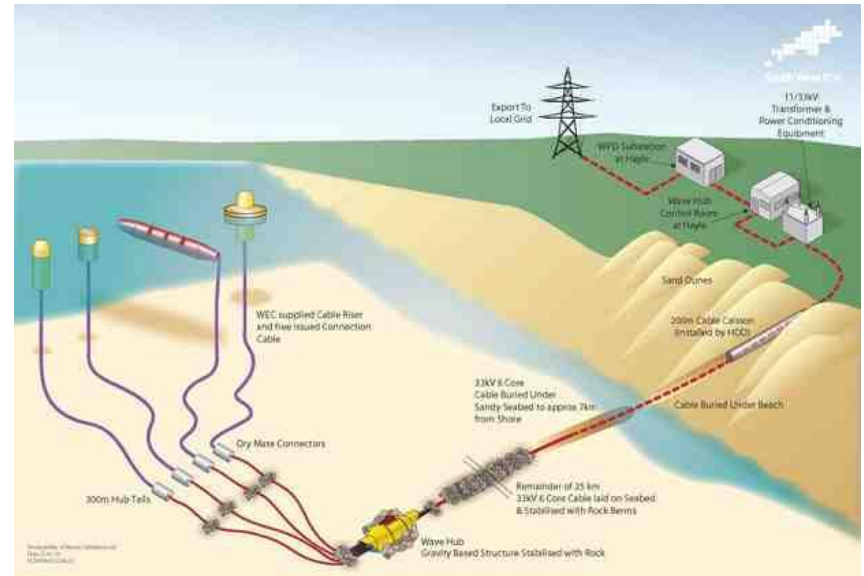
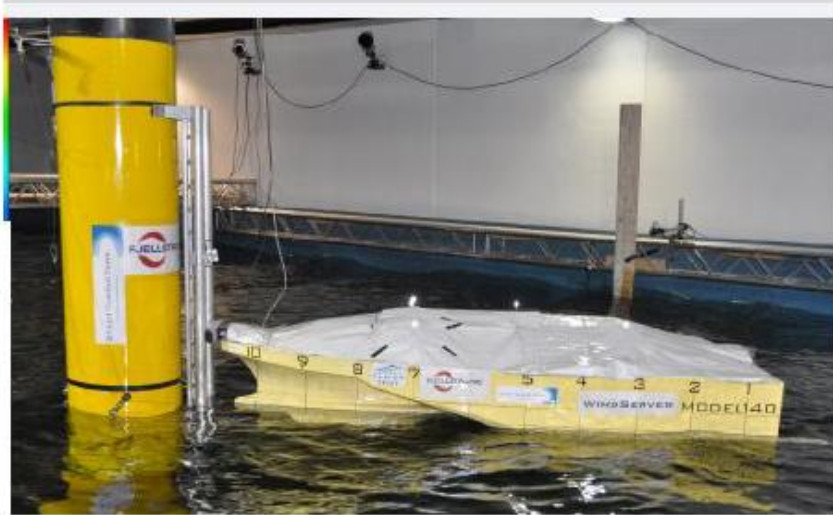


Ocean Technologies

- Turn so floats face waves in sequence
- Submerged hemispherical floats each drives a hydraulic pump
- Compressed oil fed into accumulation system
- Feeds hydraulic motor turns electrical generator
- Poor weather floats piled
- All critical components above water line so O&M low.
- 20 floats = 3MW



Ocean Technologies



Very similar risk profile across the Life Cycle

Guidance

RenewableUK

**Offshore Wind and Marine
Energy Health and Safety
Guidelines Update**

**Part 3: Offshore Hazards
and Activities**

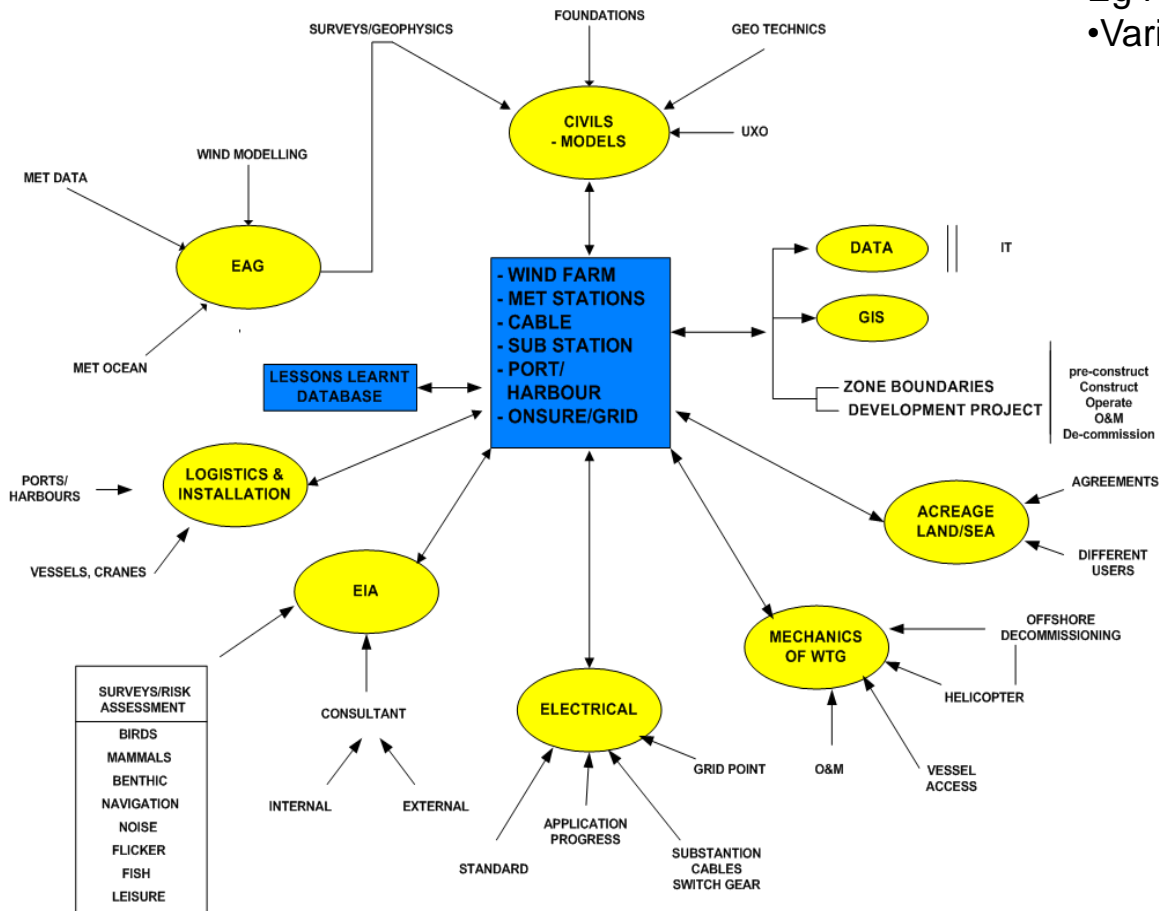
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GLOSSARY

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Complexity

INFORMATION FEED FOR DESIGN RISK ASSESSMENT AND MANAGEMENT



Stochastic modelling – Monte Carlo
Eg replacement of part

•Variables

- Weather window
- Met ocean
- Expertise available
- Logistics; vessel, distance
- Part available, distance, tools
- Working time etc

ASPECT	OFFSHORE WINDFARM	OCEAN, WAVE
1.Vessel, submarine Impact	Structure failure, Passing ships	Plant damage
2.Loss of Structural Integrity	Steel, concrete structures, corrosion, marine growth, Scour, Design	Plant erosion/corrosion
3.Loss of Marine Integrity - Stability	Jack-ups, semi-submersible	N/A
4.Loss of Marine Integrity - Position	Only in deeper waters Mooring,	Break from anchors/failure of parts
5.Loss of Containment	Process fluids, oil, erosion, corrosion, relief hydraulic , transformer fluid(less inventory)	Hydraulic fluids where used as energy transmission medium
6.Loss of Containment - Fire and explosion	N/A	Possible
7.Diving	Cable repair eco checks. . Failure of life support sys, diving bell, detachment	Potentially more. Failure of life support sys, diving bell, detachment
8.Helicopter Crash	Day to day, search and rescue, MOD exercise	Same – extent depends upon O&M and other requirements
9.Non Process Fires and explosions	Accommodation, electrical, cellulosic	Similar
10.Emergency Response	Management, Alarms, rescue, comms, TR	Same
11. Human Factors	Management, Error, design, PTW, Competency	Same
12. Project co-ordination	Windfarm, cabling, onshore grid and harbour/ports	Same