



Dynamic Power Cables Installation by **subsea 7**

Subsea7 in Offshore Wind

We deliver offshore projects & services to energy industry, listed Oslo, headquarter London, operate in 45 Countries

35 vessels, 13,000+ employees
A track-record of 1000+ executed projects at sea

Offshore Fixed Wind

seaway⁷

			
 WTG Foundations Serial fabrication	 installed 1250 WTG Foundations	 35+ Substations	 Laid 3,500+KM Submarine cables

subsea 7

Offshore Floating Wind

			
25+ years' EPC experience complex floating systems	long history of towing large floating units to deep water sites worldwide	>90 mooring's installation projects worldwide	Extensive record of supply & installation of dynamic cables

Hywind Scotland Pilot Park... in 2017 already



5x6MW FWT 110mWD,
26km off Peterhead,
inc. landfall, trenching, dive
survey & crossings

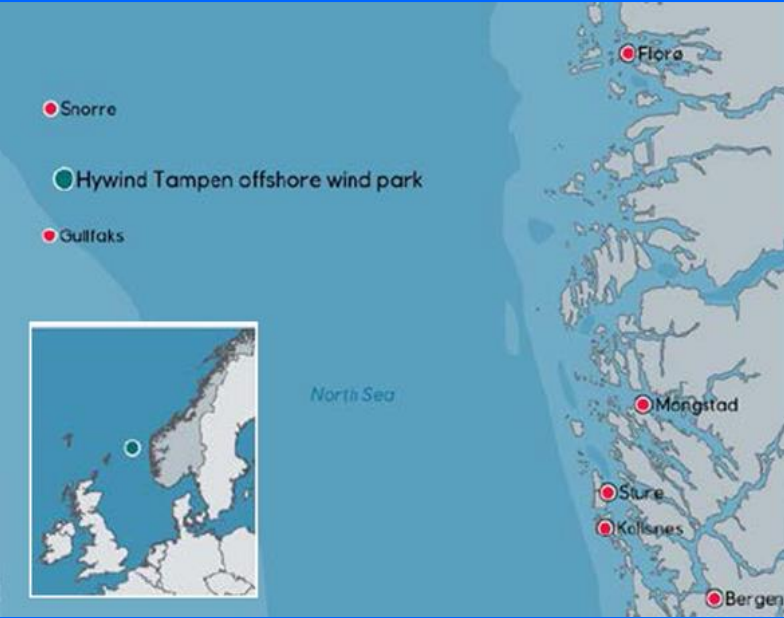
1x25km EXC + 4xIAC 33kV
170mm OD - 270x buoyancies
load @Halden Nexans

Skandi Acergy CLV (VLS)
Seaway Moxie (WTW) +CTV



Hywind Tampen - Power Cables T&I - 7Pacific

Norway, 11x8.6MW Spar-WTG, 160km from Shore, WD 300m
off-grid, ↓ CO₂ & NO_x, mix gas & wind, spar floater,
2xEXC + 11xIAC 190mm OD - 66kV - hexagonal pattern
2020 interface design, 2021 detail engineering, 2022 operations



Hywind Tampen power cables operations in 2022

Transport & Installation engineering, Cable Lay, Pulling/terminations teams on SOV











- Planned duration >2 months (June-July) + some delay related to CPI... finally end October
- 7Pacific operational time: 2 days / IAC to deploy
- Operations on FWT: dry time 3 days / IAC
- WOW ↗ as pushed in Autumn
- SOV operability:
FWT-SOV's works Governs



Hywind Tampen

A world of Interfaces...

Sequence: Mooring → Floater → Turbine → cables = critical path

<p>AkerSolutions</p> <p>Concrete substructures & mooring system</p>  <p>fabrication</p>	<p>AkerSolutions</p> <p>Assembly Site Management</p>  <p>integration</p>	<p>DCF Subsea</p> <p>Mooring System Installation</p>  <p>DCF Subsea</p>	<p>subsea 7</p> <p>Tow Out and Hook-up</p>  <p>subsea 7</p> <p>Cable Installation</p> 	
<p>SIEMENS Gamesa RENEWABLE ENERGY</p> <p>Turbine & towers</p> 	<p>IBC</p> <p>Cable manufacturing</p> 	<p>wood Group</p> <p>Topside modifications</p> 	<p>WERGELAND BASE</p> <p>Assembly site</p> 	<p>MAMMOET</p> <p>Assembly crane</p> 

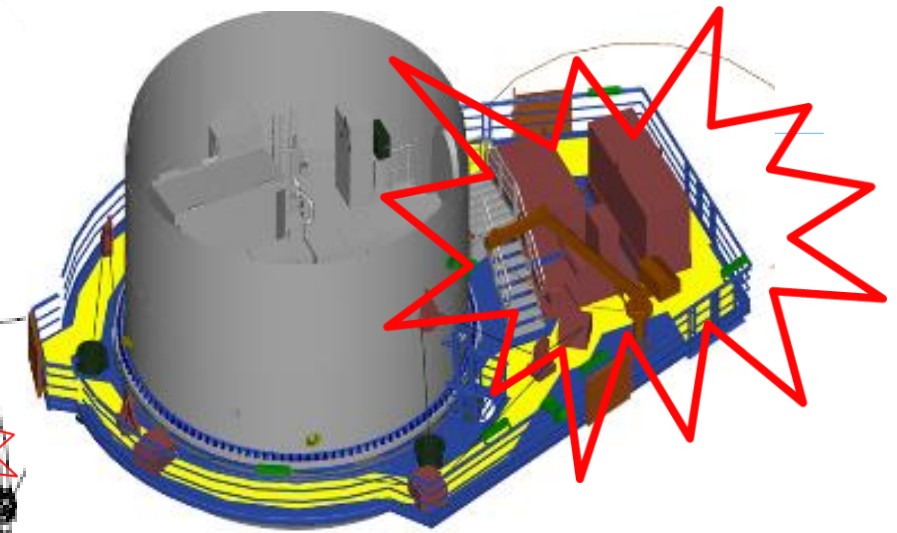
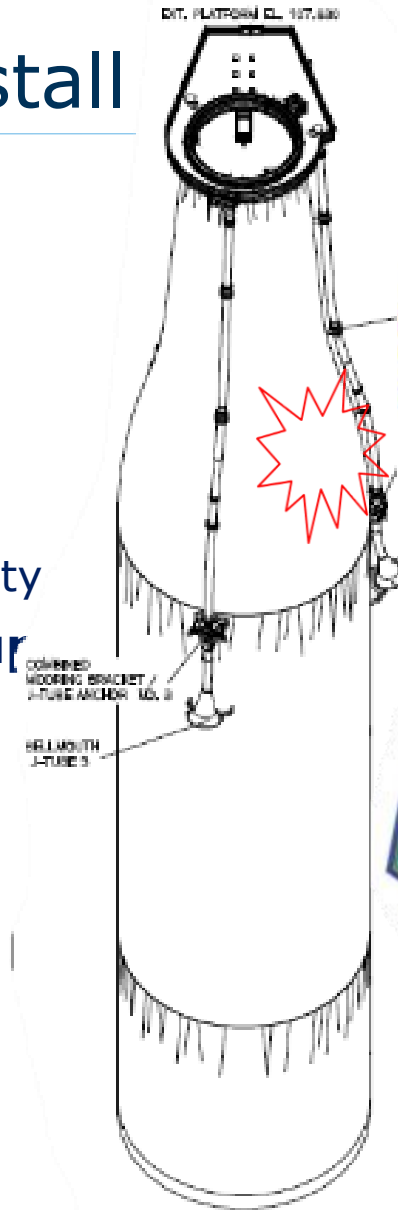
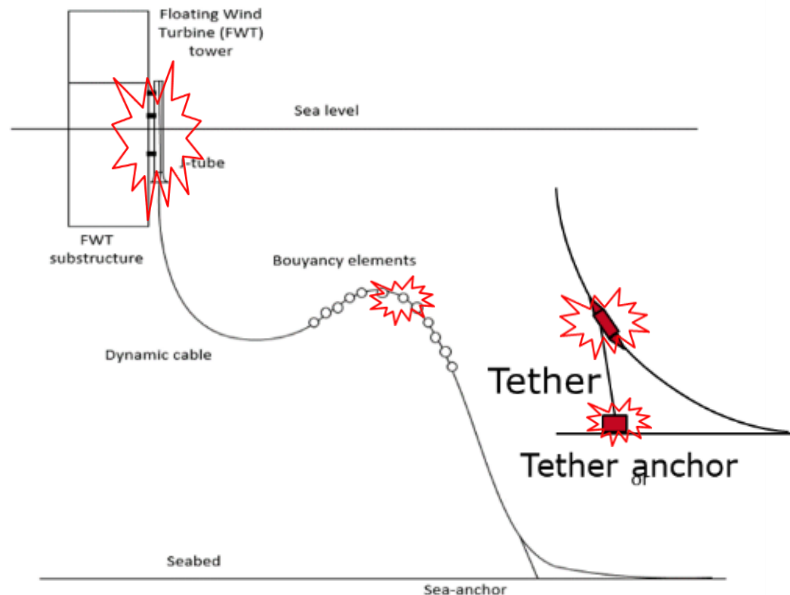


“Safety in design”, think to install

Early engagement

Interfaces = fix design for use

- Pulling systems: congested platforms
 - 3D-J.tubes: sizes & geometry, not a detail
 - Ancillaries handling: governs times
buoys need, clamps mechanics, tethers connectivity
- ➔ Organize **integration test & items mock-up**

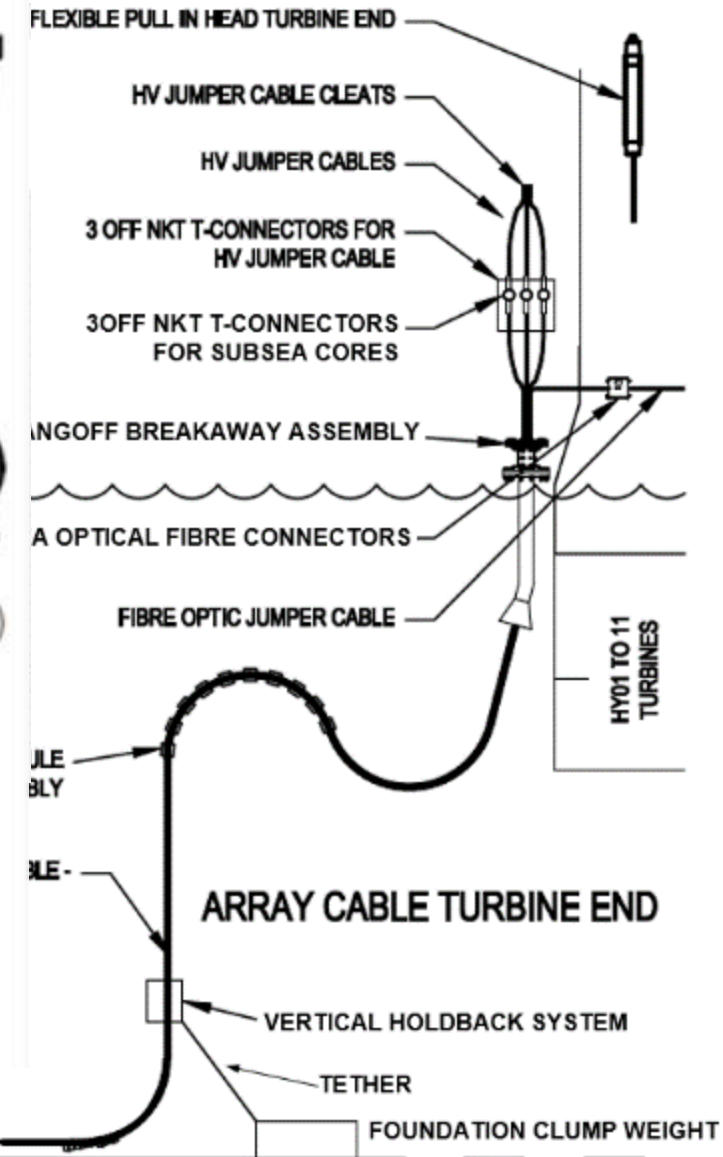
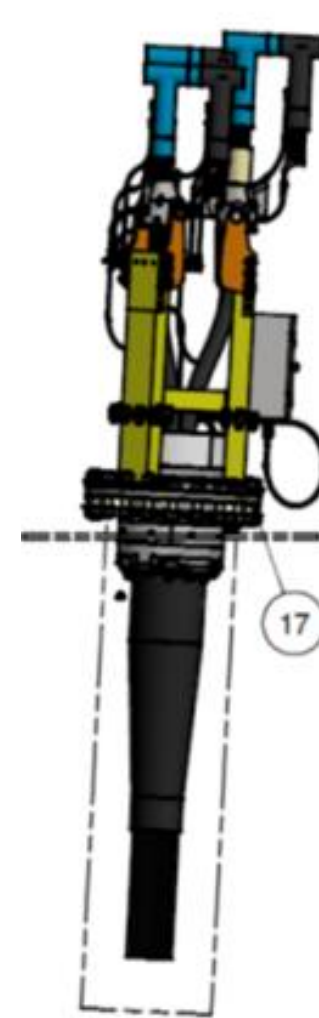
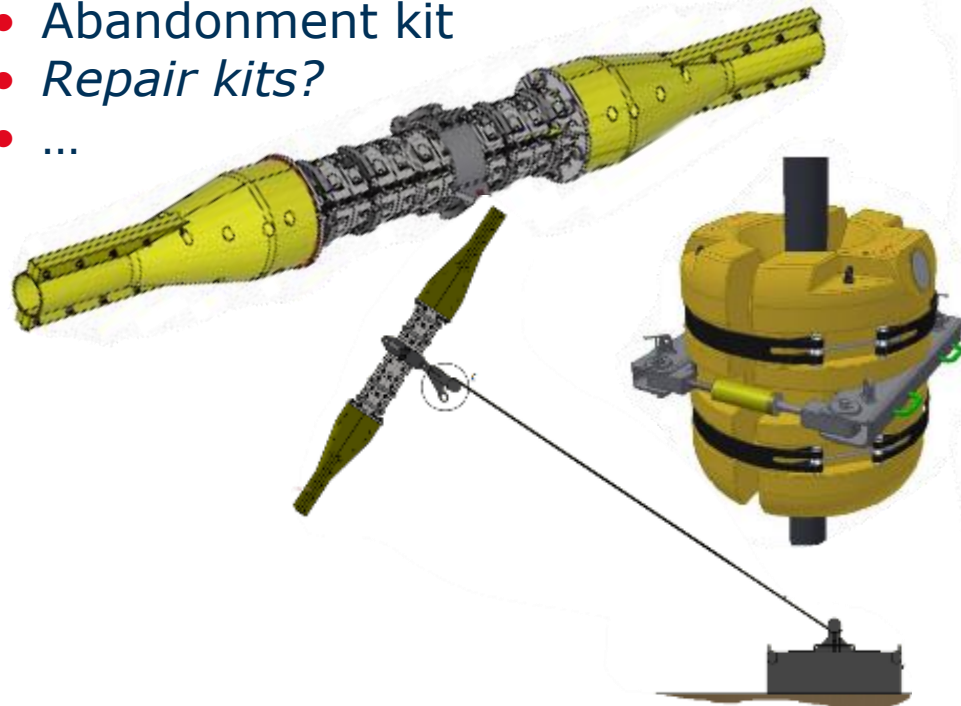


CONCRETE SUBSTRUCTURE
J-TUBE ARRANGEMENT
*NEW / PENDING

Cables systems = Accessories!

Devils in the details

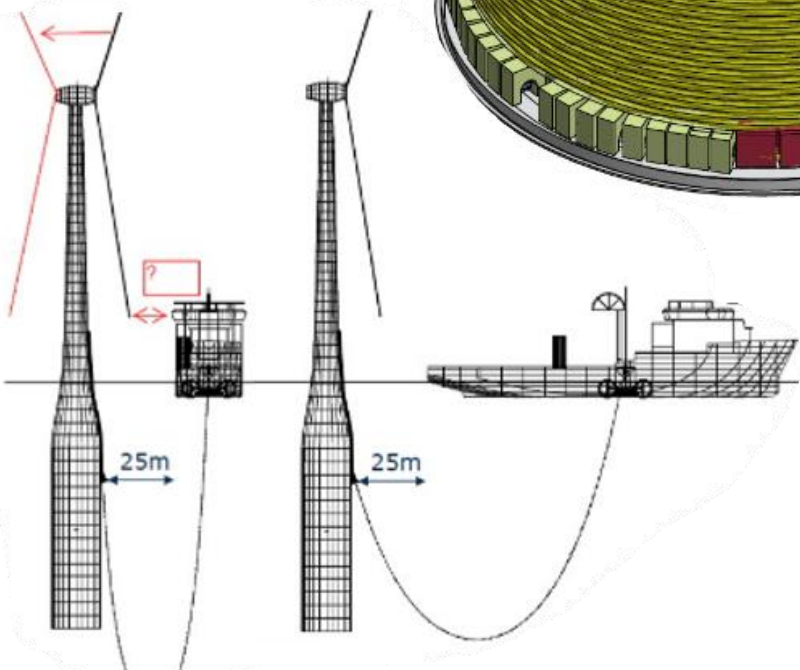
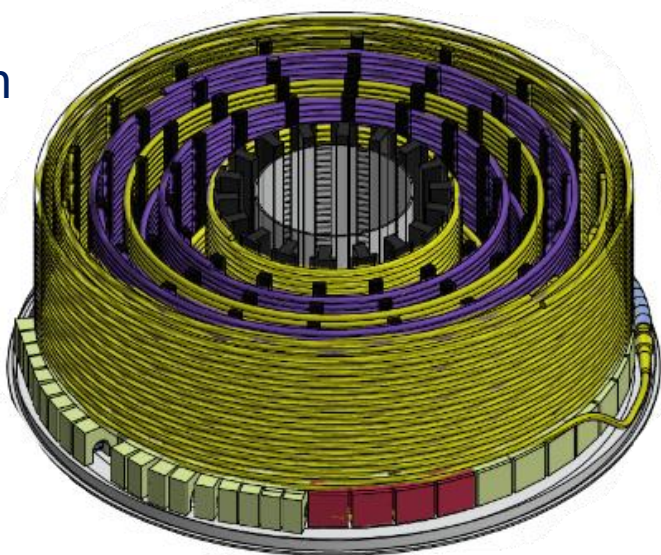
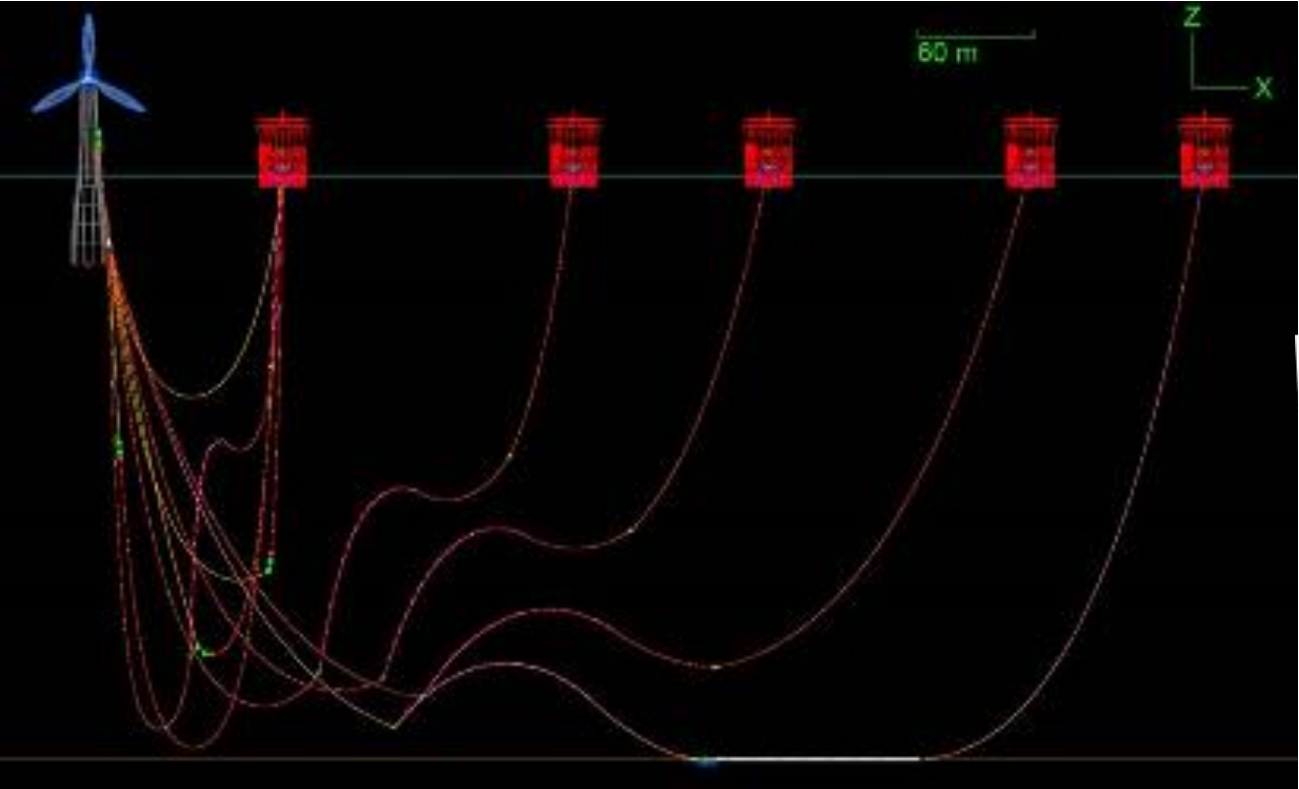
- cross sections x...
- Pull-in heads & Bend Stiffeners
- *Touch down protection?*
- Vertical Hold Back clamps
- Buoyancy modules logistics
- Hang-off /Breakaway assemblies
- Abandonment kit
- *Repair kits?*
- ...



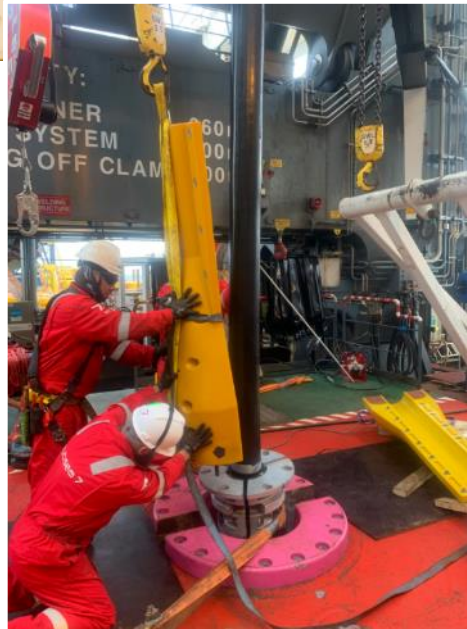
Installer: engineer & analyze... anticipate specific aids

Ancillaries management & Cable integrity

- Carousels Packing
- Cables angles
- floating section stability @deployment
- Contingency abandonment



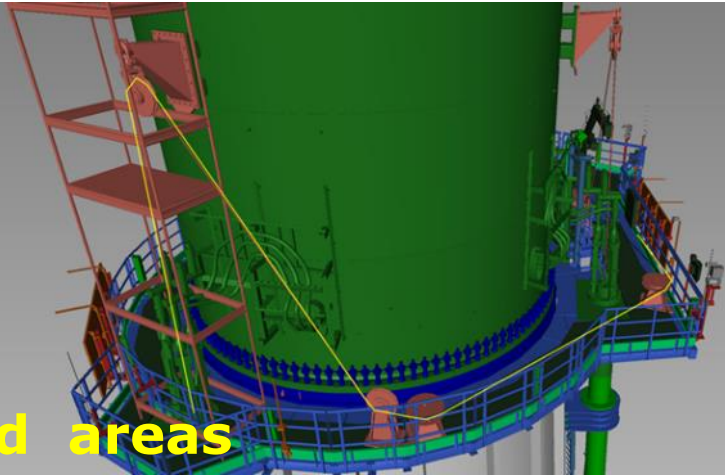
Cable lay: on-deck operations & repeated lifts



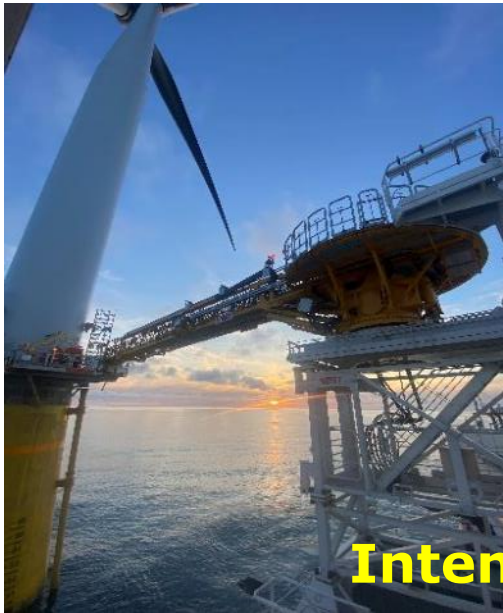
Floater works = critical path



Congested areas



heavy duty



Intensive SOV operations

≠ fixed wind: higher loads

**floater layout!
accommodate equipment**

Ship-2-ship @all weather

Access to FWT & Night-shift required

Operational model = split of contracts

- SOV marine crew & 3D-gangway operators
- SGRE (blade & nacelle)
- Power supply technicians
- Winches maintenance & scaffolders?
- Pulling riggers & coordination
- Elect-Optical testing / Terminations
- Certifier?

FWT = unmanned (life & rescue)
FW categorization from authorities?



Pulling system access



Clash analysis

generator powered...
maintenance & refuel



habitat

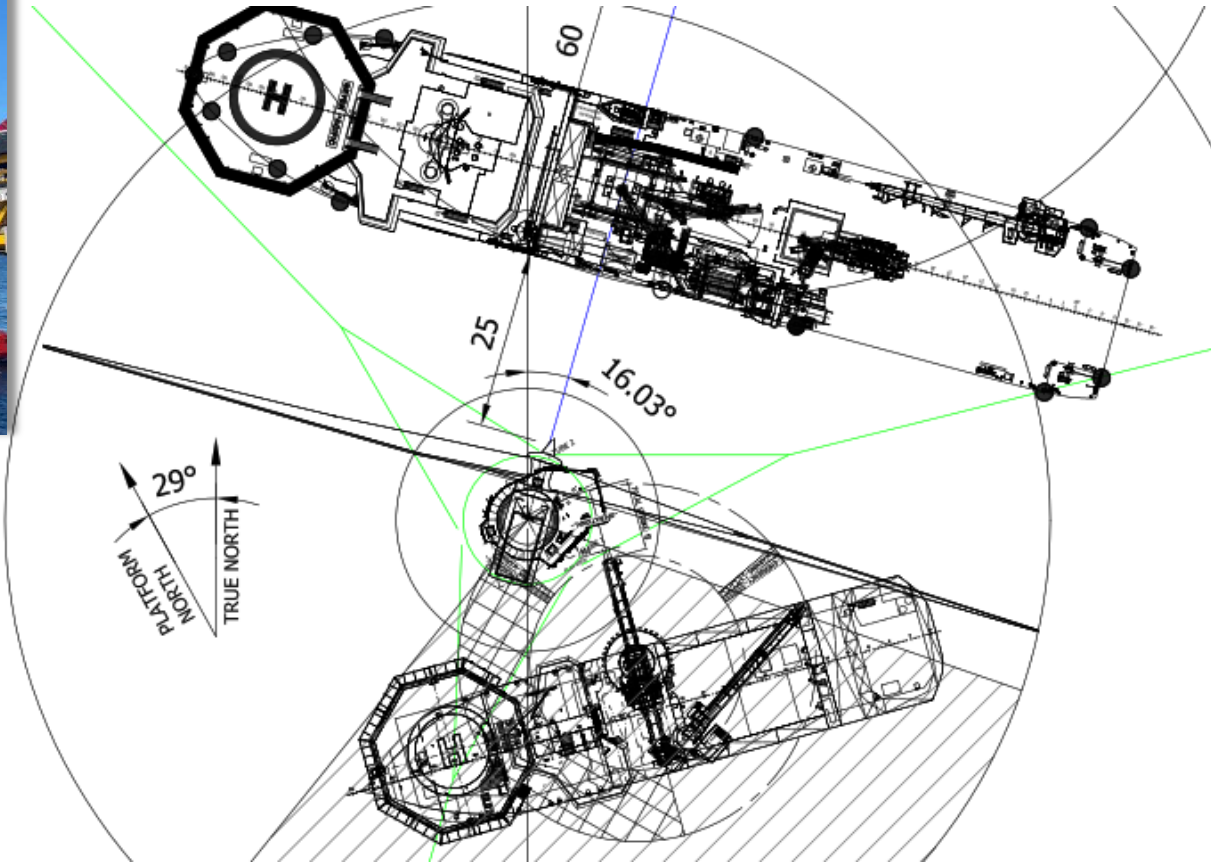


dismantling



Access to gates / marine SIMOPS

several ships
@same time



THANK YOU

seaway⁷ subsea 7