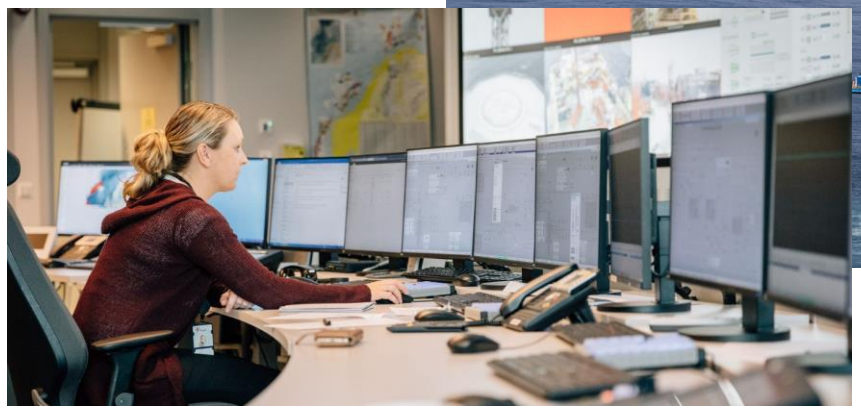
Experience with Hywind Tampen seen from a HF perspective

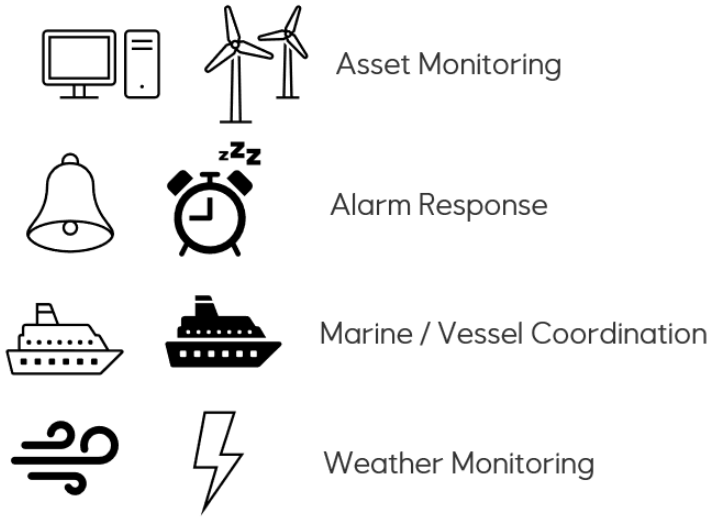
Vidar Hepsø (PhD) Human Factors Integration Lead
Equinor Technology, Digitalization and Innovation
Facilities technologies, Technical Safety



Offshore wind farm facility: Overview

Gullfaks A and Snorre A

Tasks – What does a Wind Farms Control Room do?



Asset Monitoring

Alarm Response

Marine / Vessel Coordination

Weather Monitoring

Communication with O&M Teams

Site access control

Control of work - Check permits / SSOW / Qualifications

HV Monitoring / Switching

Emergency Response

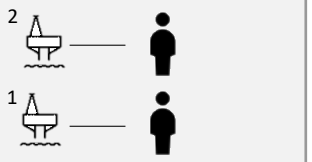
National Grid instructions / BM / EDT / EDL

PPA / Offtakers obligations

Two key aspects of multi-facility control

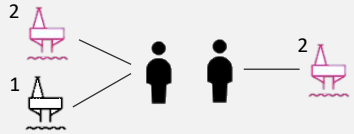
Team organization

Team organised by asset



Each operator responsible for X asset(s)

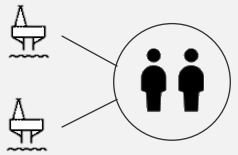
Team organised by function/activity



E.g: unmanned assets in normal operations

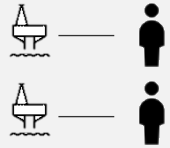
EG: deviations. Disturbances, campaigns and manned assets

Degree of flexibility in roles/responsibility



Flexible roles and responsibilities

Flexibility adjusted to situation

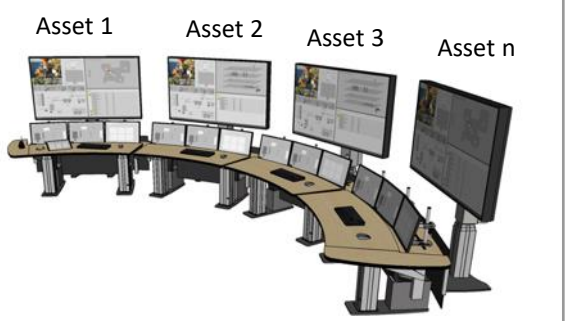


Fiixed roles and responsibilities

Strategic direction for flexibility and scalability

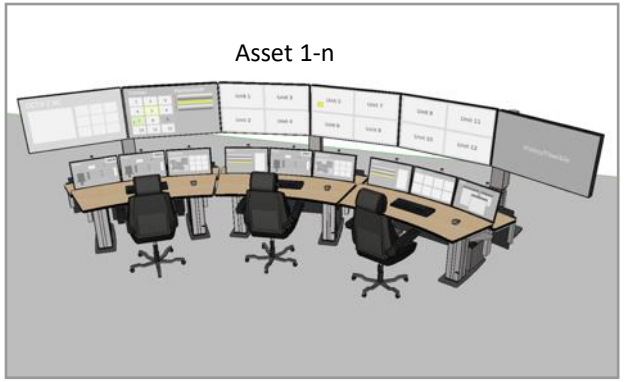
HMI & control room layout

Separate HMI pr asset



Partly integrated HMI across assets

Integrated HMI across assets



HF-related challenges and risks for multi-facility control centers

1. Loss of situational awareness/understanding across facilities
2. Differences between assets can cause confusion and lead to erroneous operations
3. Lack of plant-specific local knowledge can lead to loss of control
4. Simultaneous events at multiple sites can create unexpected peaks in workload
5. Misconceptions about responsibilities and the division of labouR
6. The operator role becomes less attractive

Paper: Concepts for operating multiple petroleum facilities from a single control centre (ESREL 2022)

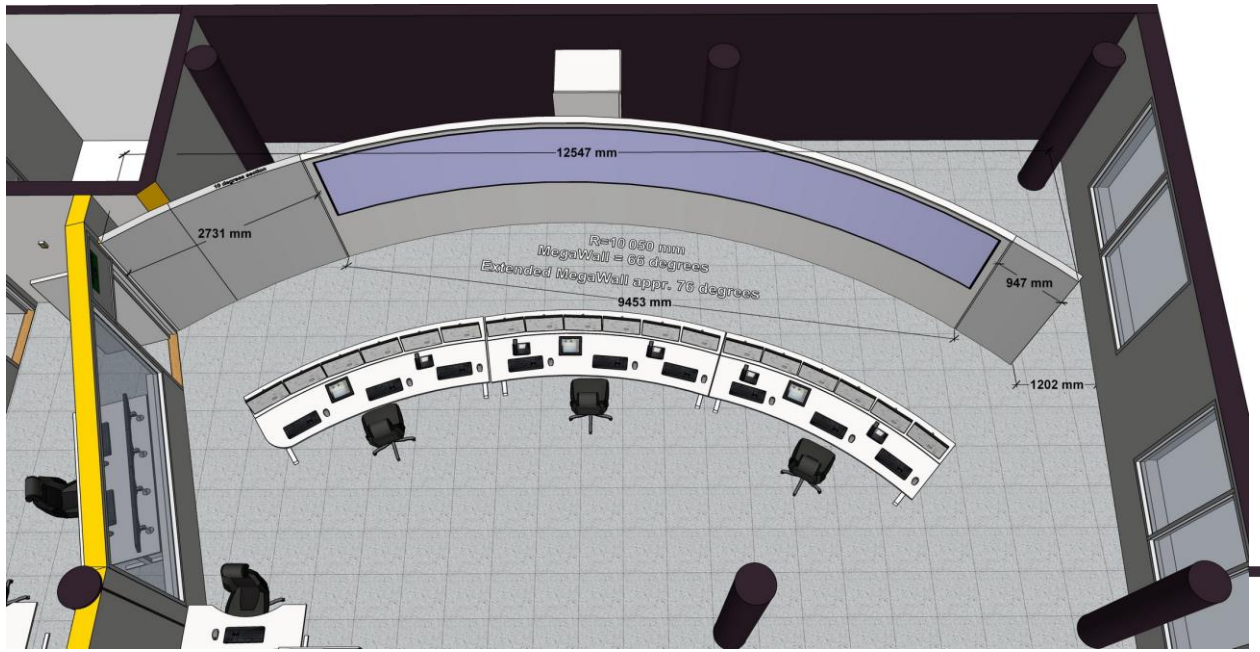
Sandsli Main control room:
Combined control room for O&G (Valemon NNM) and offshore wind (Hywind Tampen)

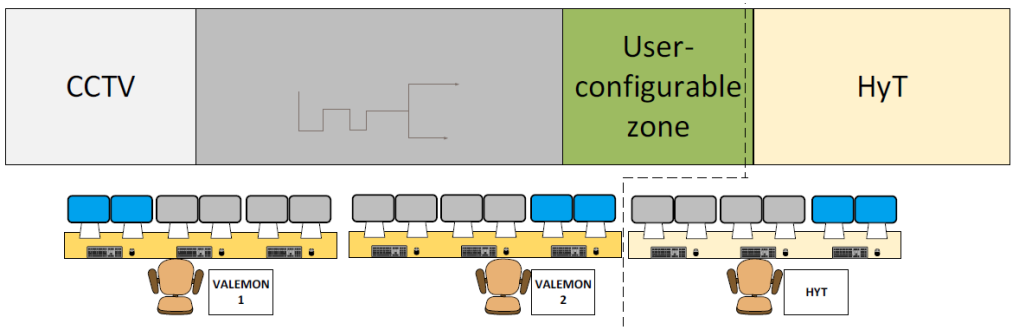
Integration alternatives

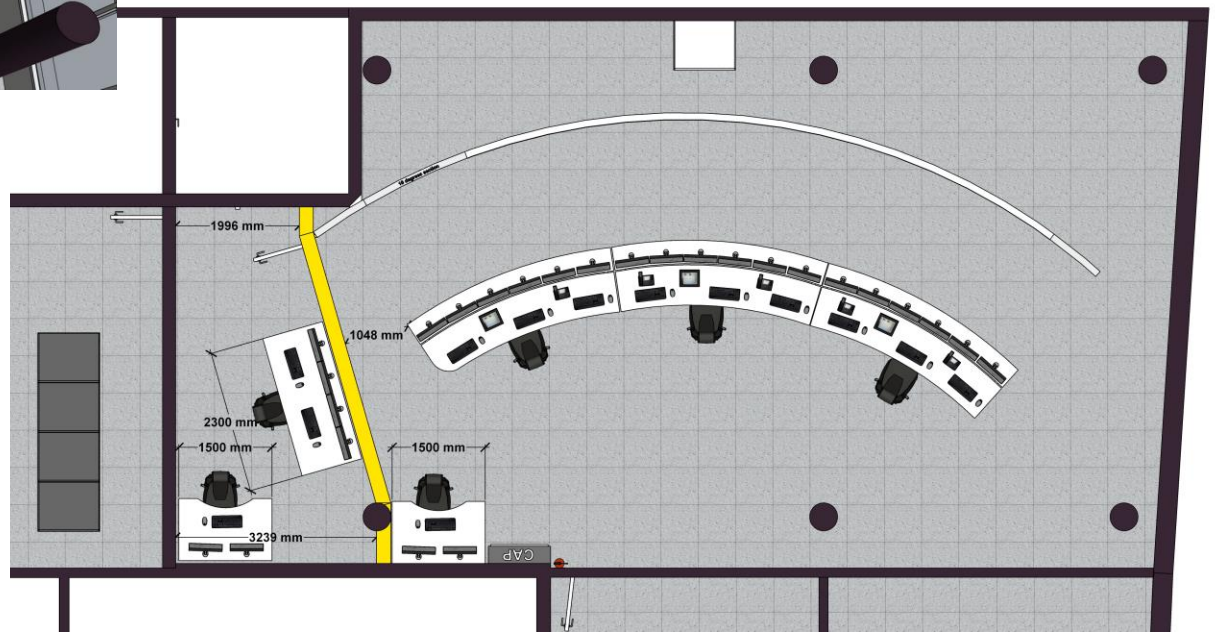
- Hywind Tampen has a variant of a side-by-side solution
- CCR operators are cross-trained so they can operate both Valemon and Hywind Tampen

Integrated approach	Side-by-side approach	Island approach
• SAS/SCADA solution is the same for all facilities • Can be based on multiple vendors but has the same operator HMI • Full or partly integration of all systems across assets • Same system and generation from vendor, upgrade of all installations to same uniform standard to ensure integration	• No HMI integration in SCADA/SAS • Some functions can be in spatial proximity to each other, eg: CCTV and separate alarm lists • Dedicated operator stations for each facility • Can use same HMI symbols • Different vendors/generations of equipment is spatially integrated	• Every new SAS/SCADA HMI is spatially separated but can use the same HMI • No integration and separate workstations pr asset • Different vendor and generations of equipment that is spatially separated with no system integration
		

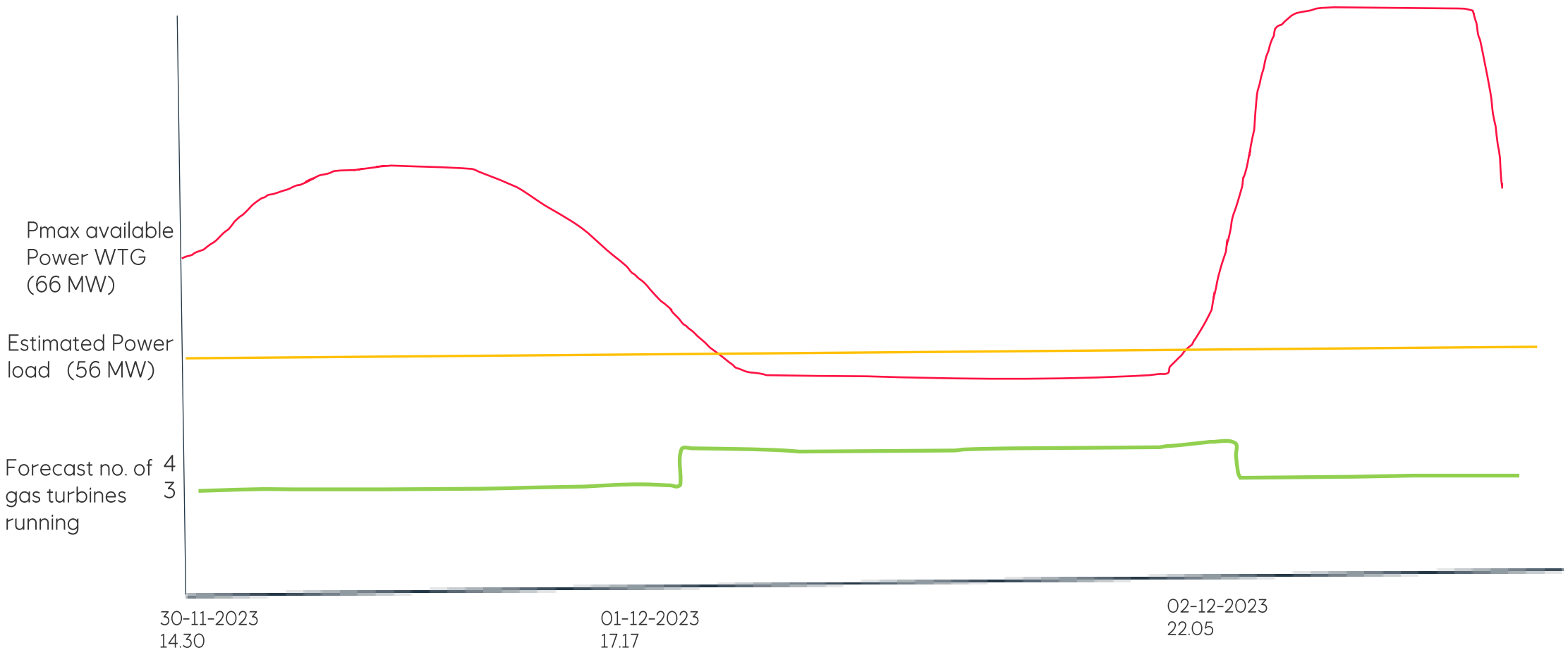
Refurbishment of the existing Valemon MCR to multi-field control room for Valemon and Hywind Tampen (Equinor Sandsli)



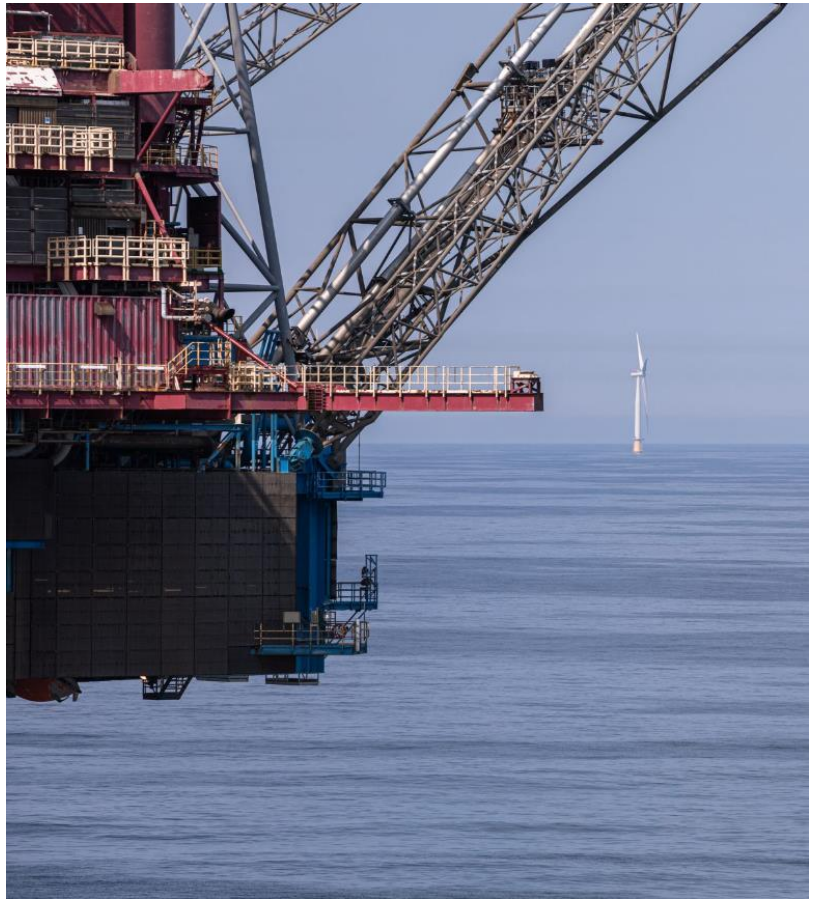




Energy management wind



First year of operations of Hywind Tampen



Gullfaks brown field with Hywind Tampen floating wind turbine. Picture by Equinor

- First year 302 GWh (original plan to authorities 390 GWh)
- Ended 2024 with record high production, a total of 110 GWh on during October, November and December in demanding weather and wave conditions
  - Capacity factor of 53 percent (World class offshore wind Hywind Scotland 57,1% 2020) and a reduction of 56,000 tonnes in emissions for the Snorre and Gullfaks fields. Delivers better than expected in full production, 70% of total power load to Gullfaks/Snorre in peak production periods
  - In average 38% capacity factor the first year, reduced CO2 emissions of 83.500 tons at Snorre
- There have been no injuries or serious incidents related to operations and maintenance during 2024
  - High maintenance load, replacement of electrical equipment (service warranty)
  - Challenges to get people omboard the WTGs during bad weather
- **Power forecasting has been a challenge**

Equinor: Elektrifisering av sokkelen må skje med kraft fra land – Hywind Tampen-løsning ikke aktuelt

Equinor mener elektrifisering av norsk sokkel er essensielt for å kutte utslipp og nå klimamål. Havvind er en del av løsningen – men de vil ha kraften via land .

Konsernsjef i Equinor Anders Opedal, her fotografert ved en tidligere anledning. (Foto: Anders Lie Brenna / Europower)

https://www.europower.no/elektrifisering/equinor-elektrifisering-av-sokkelen-ma-skje-med-kraft-fra-land-hywind-tampen-losning-ikke-aktuelt/2-1-1698375

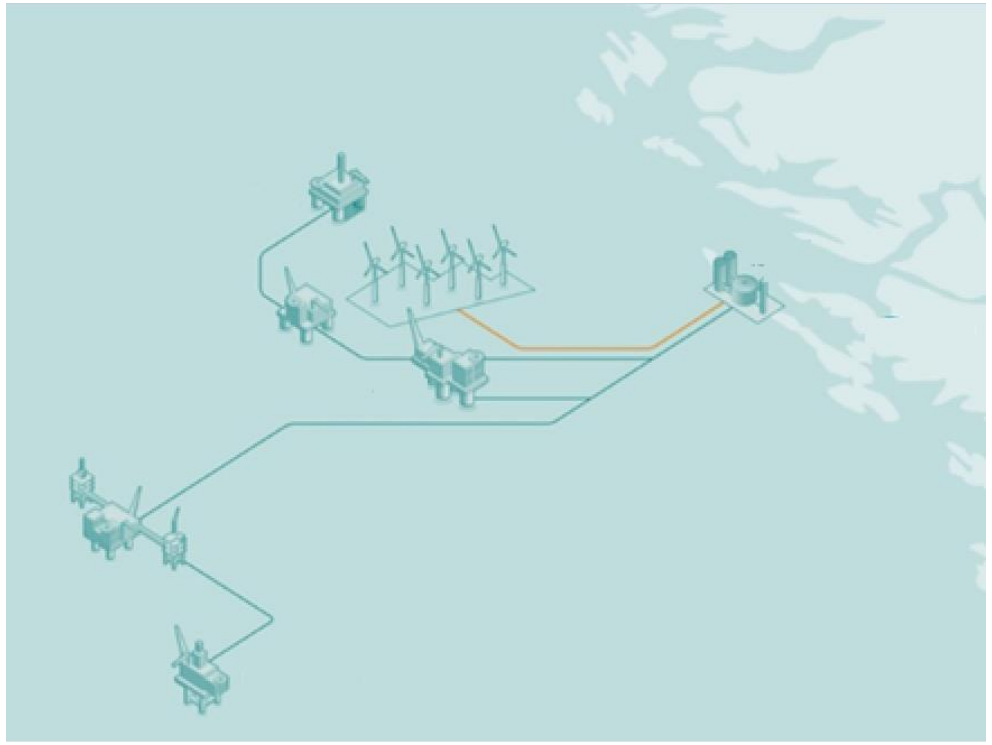
"Offshore wind can be part of the solution, but offshore wind must come ashore via cables, be balanced in the grid, and then go out in its own cables to installations....Hywind Tampen; it was a pilot project, not a final solution."

Important test facility for the further development of floating wind and its operations

- Technical integrity, availability and maintenance
- Improved access and walk-to-work
- Better weather and power forecasting
- Integration between renewables/O&G
- Understanding of environmental consequences of offshore wind
- Competence development for scaling up offshore wind

Securing the Norwegian offshore power supply
-Hywind Tampen and concession rounds for offshore wind in 2025

Private offshore wind park producing directly to offshore assets power supply



Future offshore wind concession rounds. Offshore wind producing directly to the onshore grid and redistribution to offshore area grid

Thank you!

Inside Siemens Gamesa 8,8MW WTG at Hywind Tampen (2022)