Equinor:
A leader in floating wind

Bergen Wind Academy,
June 20, 2024

Arild Lithun – Operations Manager, Hywind Tampen

WE ARE EQUINOR

A broad energy company, searching for better solutions

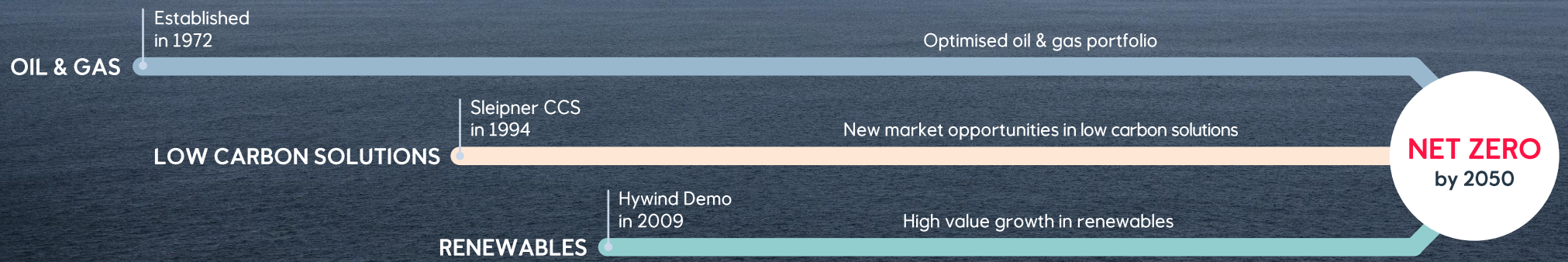
We are a Norwegian energy company, determined to use our competence, skills and innovation, continuously searching for the solutions that will drive the energy transition.

22,000
EMPLOYEES
Across the world

30
COUNTRIES
Presence and business operations

8,000
SUPPLIERS
Working together with us

170
MILLION PEOPLE
Get access to our energy – everyday



2023 PERFORMANCE

Reliable energy provider with a global presence

High value

19.7

BN USD

Full year cash flow from operations after tax

Low carbon

6.7

KG / BOE

CO2 upstream intensity

Scope 1 CO2 emissions, Equinor operated, 100% basis

2,082

MBOE PER DAY

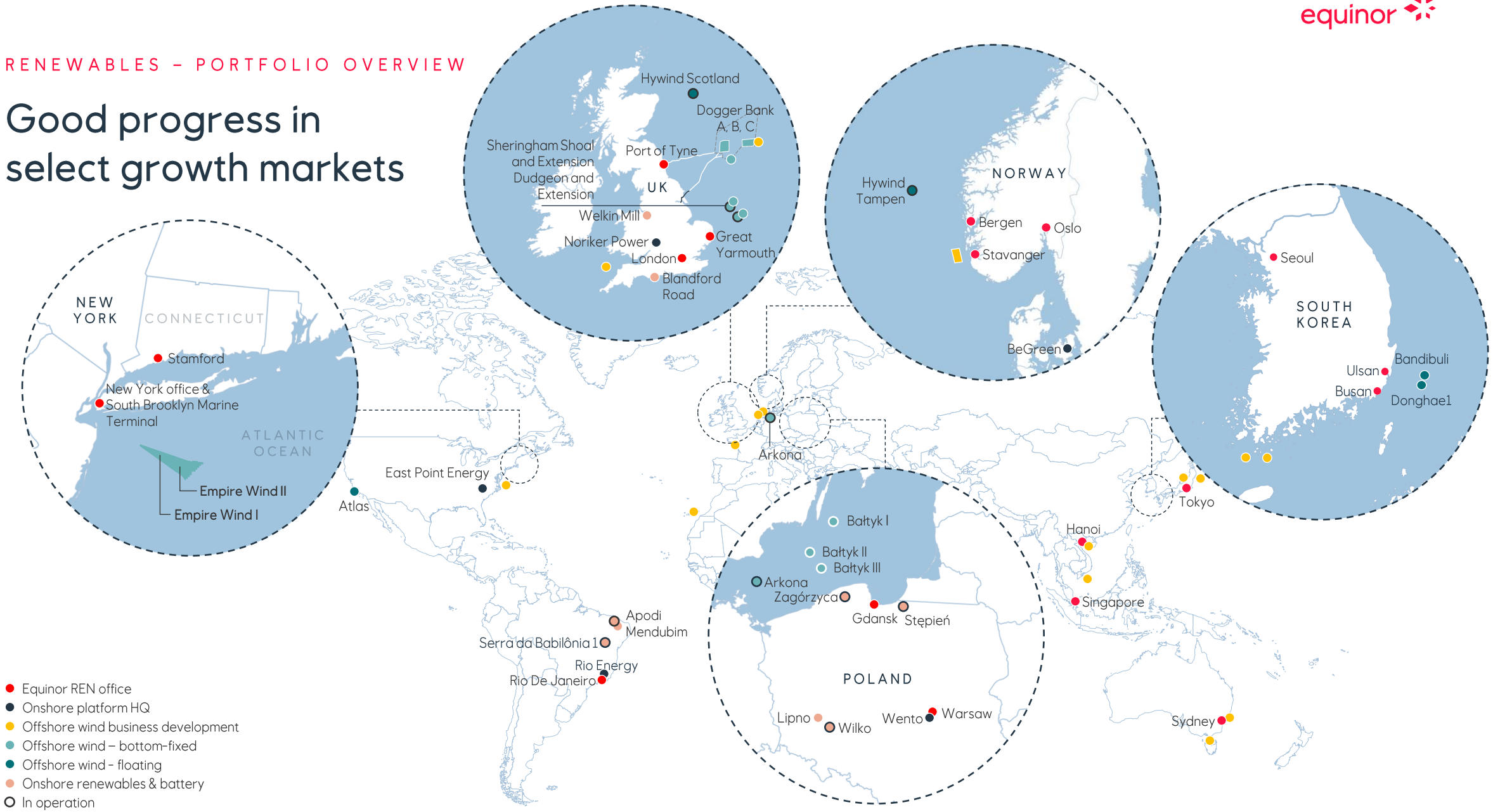
O&G production

1,937

GWH

Power from renewables

Good progress in select growth markets



FLOATING OFFSHORE WIND

Hywind Demo

- 2.3 MW Siemens WTG
- Located 10 km off Norwegian coast at 200 metre water depth
- In operation since September 2009
- Capacity factor (overall) exceeding 40%
- Maximum wind speed of approx. 44 m/s and maximum wave height of approx. 19 metres
- Performance beyond expectations
- Proved the technology

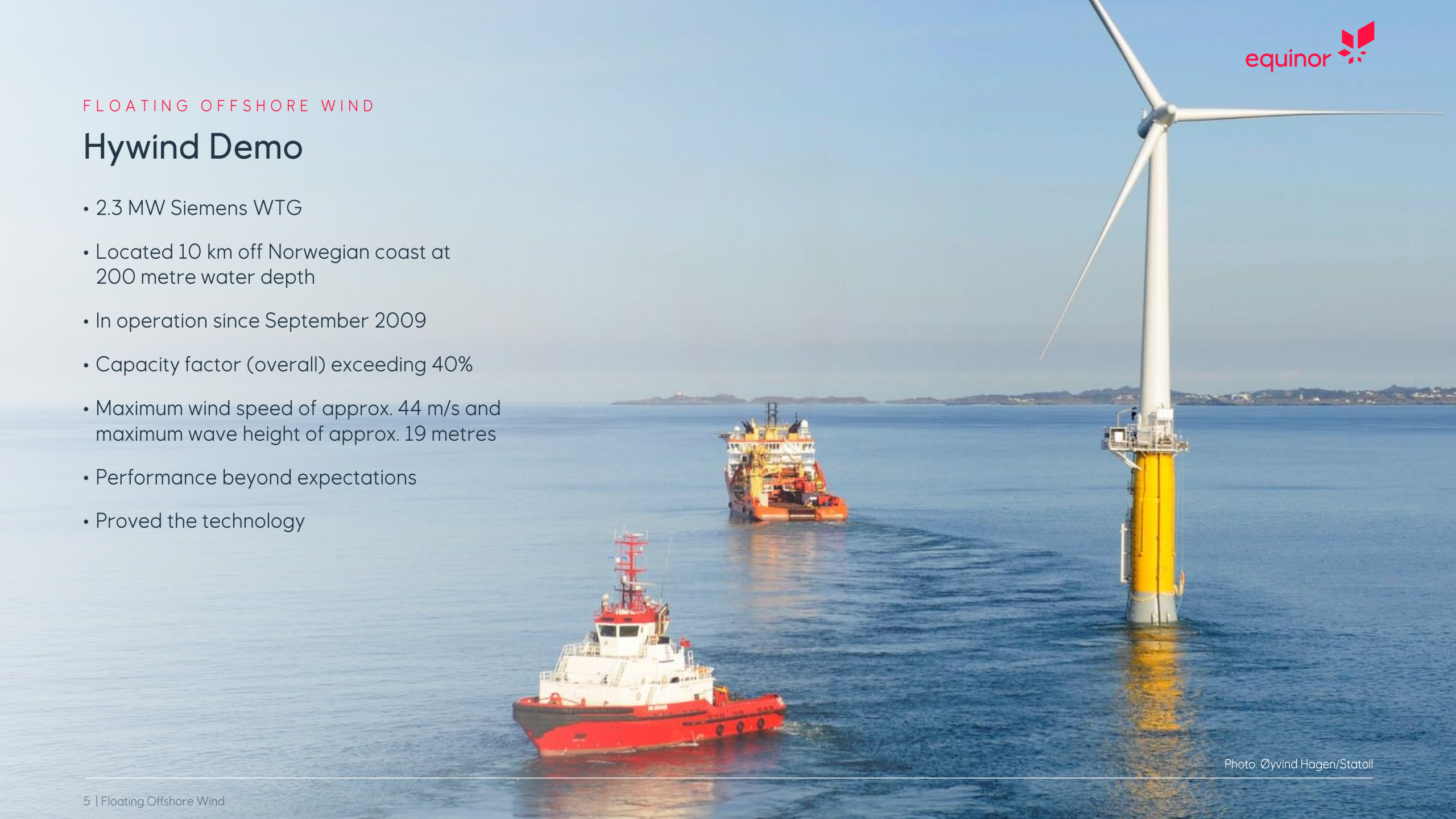
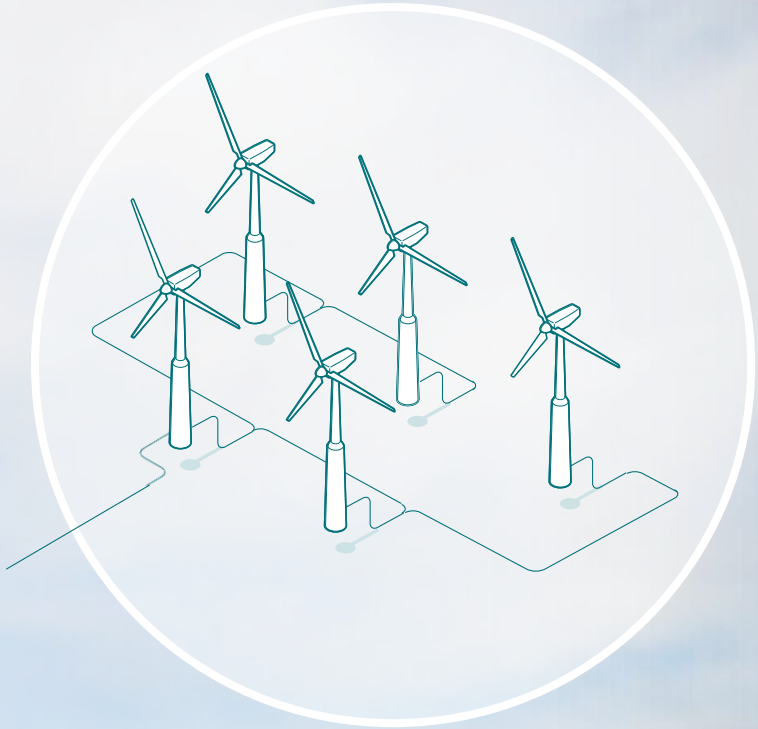


Photo: Øyvind Hagen/Statoil

HYWIND SCOTLAND

The world's first floating wind farm

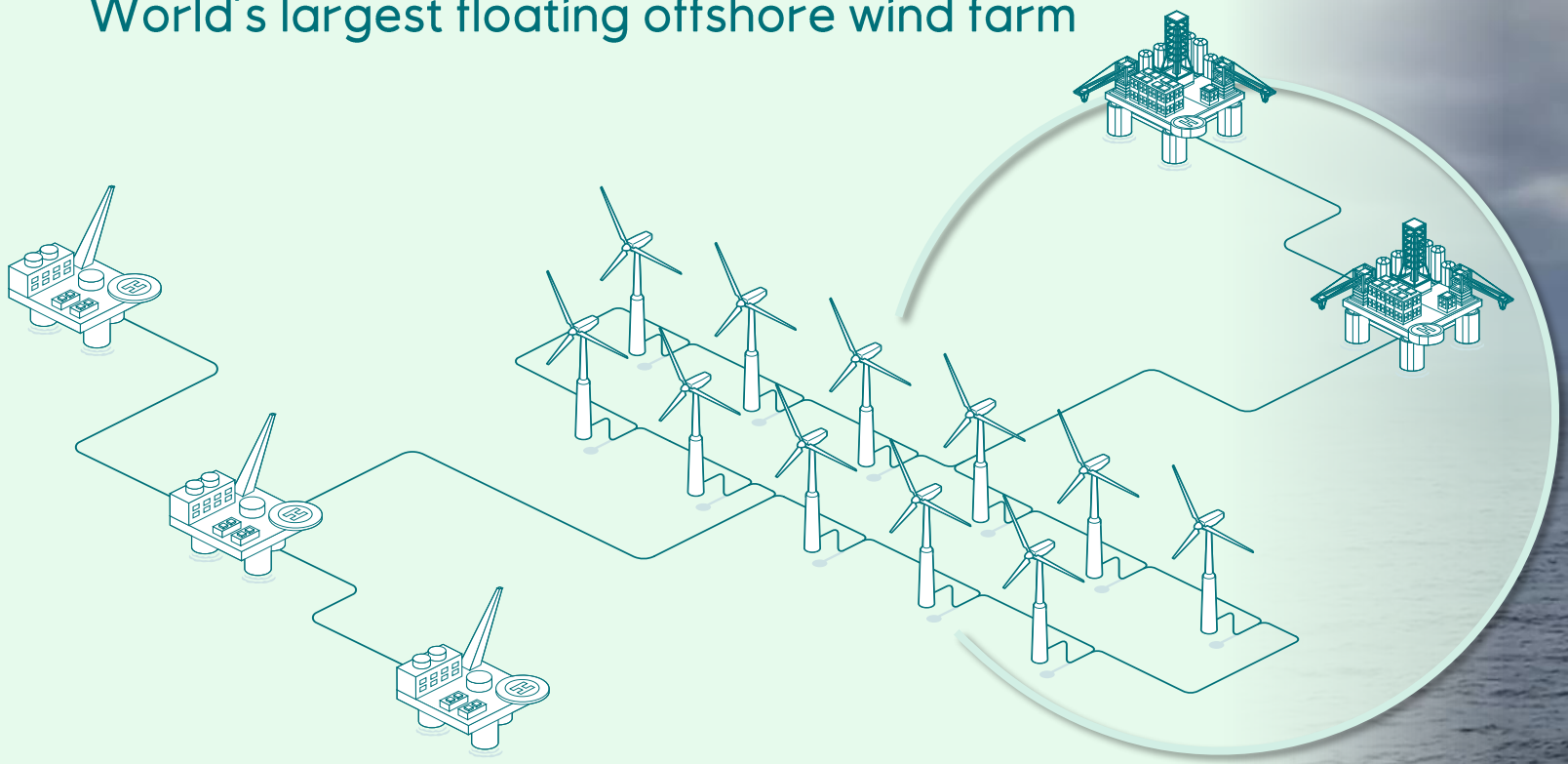
- Operational since 2017
- Installed capacity 30 MW
- Powering ~35,000 UK homes
- World class capacity factor (54%)
- A test bench for:
  - O&M strategies
  - further development of floating wind turbine controller
  - design and simulation tools validation
  - sharing operational data
  - co-existence solutions




equinor
Hywind Tampen

Hywind Tampen

World's largest floating offshore wind farm



First floating offshore wind farm supplying power to oil and gas installations

Start-up in 2022, installation of 4 remaining turbines in 2023	11 wind turbines (total capacity 94.6 MW)	200.000 ton/yr reduction in CO2-emissions	Monitored out of Sandsli Main Control Room, Bergen	Setting direction for future offshore wind projects

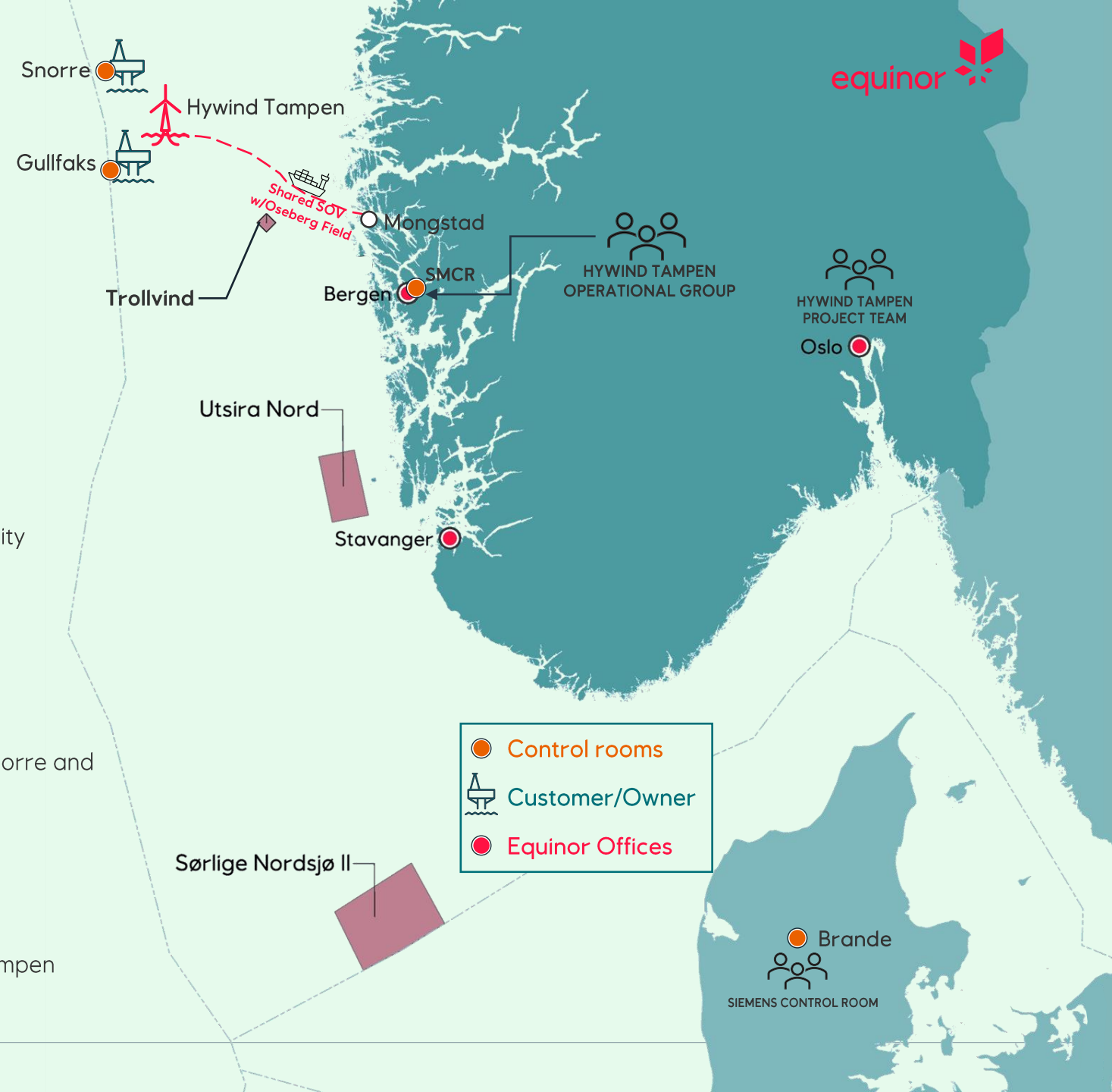
Hywind Tampen
Operational Philosophy

Operational group – Bergen
- Responsible operator on behalf of the partners in GF/SNO license.
- Daily power optimization towards GF/SNO.
- Plan, Operate and maintain.
- Work permits and logistics (vessels).
- Contract responsible for the agreement with SGRE.

Sandsli Main Control Room - Bergen
- Responsible for daily control of Hywind Tampen wind farm, monitor performance of the wind turbines and keep the wind turbine availability planner updated.
- Weather and marine surveillance (Site + vessels).
- Emergency preparedness in cooperation with Kvitebjørn.

Gullfaks and Snorre Platform – North Sea
- Both customers and owners of Hywind Tampen.
- Responsible for maintaining a balanced power system on Gullfaks/Snorre and control incoming high voltage switch on Gullfaks A / Snorre A.

Siemens Gamesa / Control room - Brande, Denmark
- Siemens Gamesa Renewables have a five-year service agreement
- Responsible for monitoring and troubleshoot wind turbine faults.
- Responsible for the maintenance and performance of the Hywind Tampen wind turbines



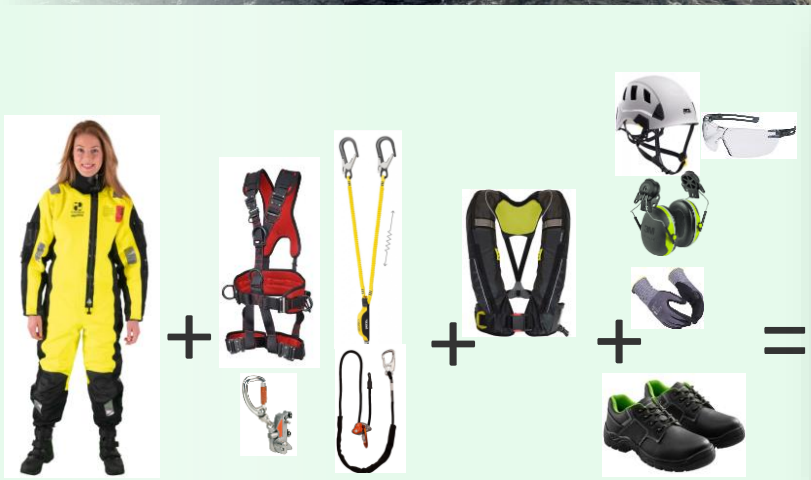
Assembly Hywind Tampen Wergeland Base, Gulen

Equinor Mediabank - Equinor Mediabank (fotoware.cloud)

Hywind Tampen Operations

Operational Experiences

- **IT WORKS!!!**
- When pushing boundaries, expect challenges
- Implementing an (international) project in a pandemic has been challenging
- Lack of national wind regulations
  - As of today: HyT comply with the PSA´s (Havtil) regulations. Not always «fit for purpose».
- Access to floating wind turbines is challenging at Hywind Tampen:
  - Harsh weather conditions, lack of operational uptime. Especially during winter months.
  - Requires robust SOV with stable walkway system
  - Safe logistics operations (floating to floating)
- Integrating a wind farm into an existing platform power generation system is complex



Q&A

What is being monitored, both physically and digitally?

Both larger components and equipment have **instrumented monitoring**; examples include: Vibrations, temperatures in cabinets and components, pressure, etc.

Physical monitoring is visual inspection of wear and tear, etc., primarily from our annual maintenance campaign and inspection programs.

What is expected and performed in terms of maintenance?

Preventative Maintenance program is currently in progress! Including 4 weeks of '*Service Train*' by Siemens Gamesa in June every year.

Corrective Maintenance performed is normally triggered from planned activities- like findings from inspections- but also in many cases from anomalies detected by instrumented monitoring (high temperatures, abnormal vibrations, noise, etc).This can then lead to corrective maintenance or just a check-up.For all maintenance, we follow the recommendations from the supplier/sub-supplier until we have gathered enough history and experience to be able to challenge the frequency (both in one direction and the other).

Q&A

How minor warranty and claim works are carried out:

These are carried out together with other maintenance in campaigns and/or individual visits to the facility.

Who performs monitoring of the turbines?

During the warranty period, monitoring and triggering of findings are performed by Siemens in their control room.

Equinor has access to the data and can (if desired) monitor individual parameters or composite data sets themselves already.

Error messages and anomalies automatically trigger follow-up by Siemens Gamesa.