

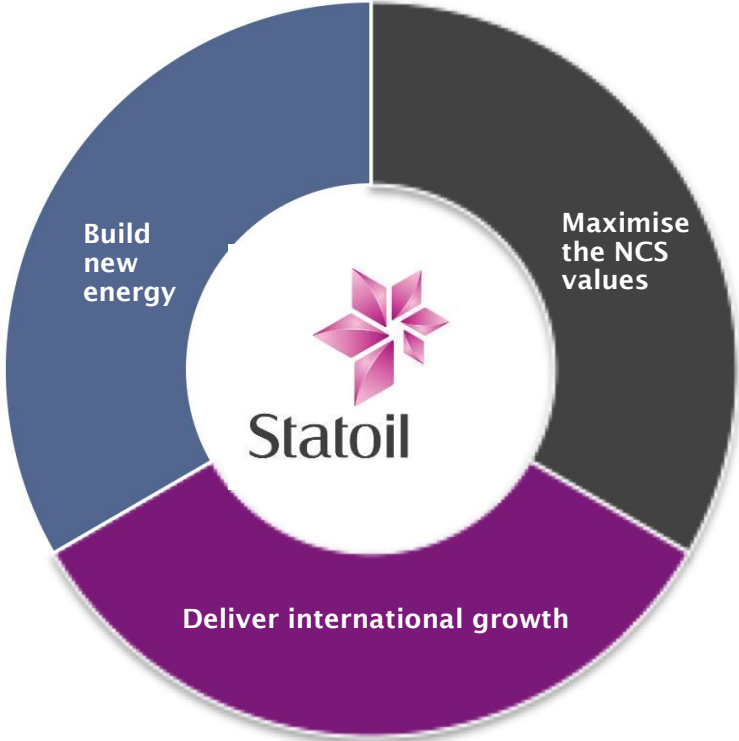
The Norwegian experience: The Sheringham Shoal and Doggerbank Offshore Wind Farms

Offshore Wind China 2010

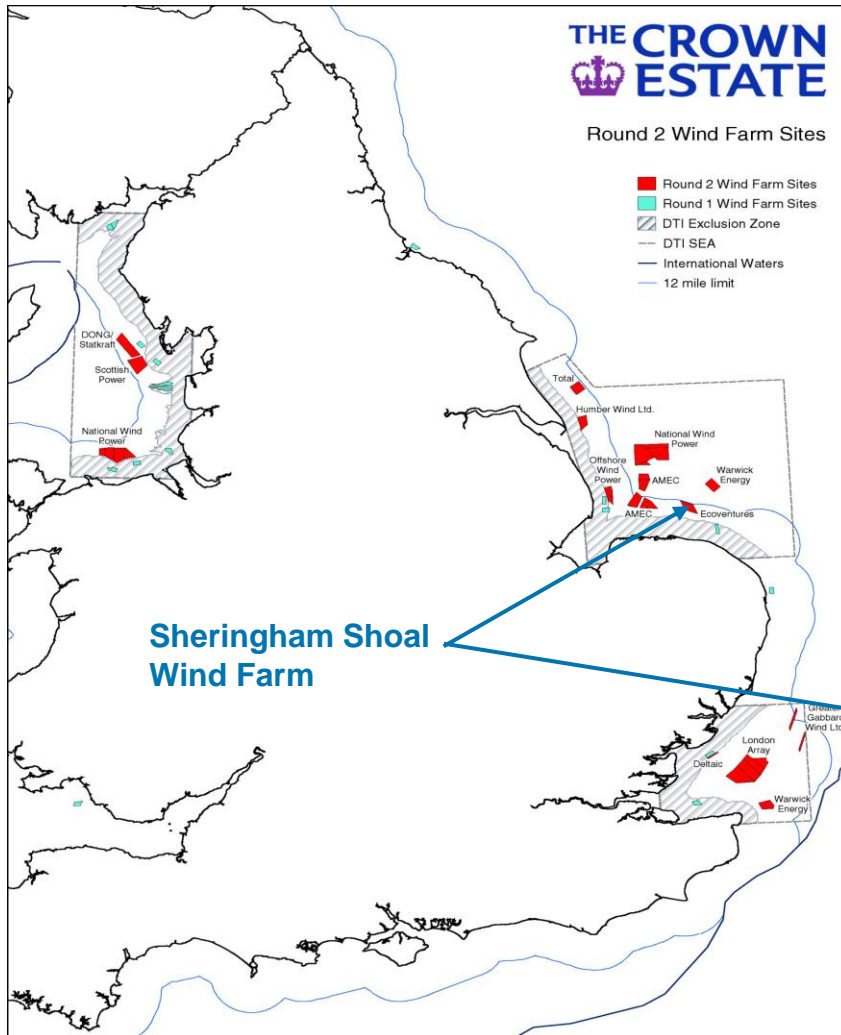
Knut M. Aanstad, Statoil

Statoil - Building growth from a firm strategy

“Gradually grow a portfolio within renewable energy”

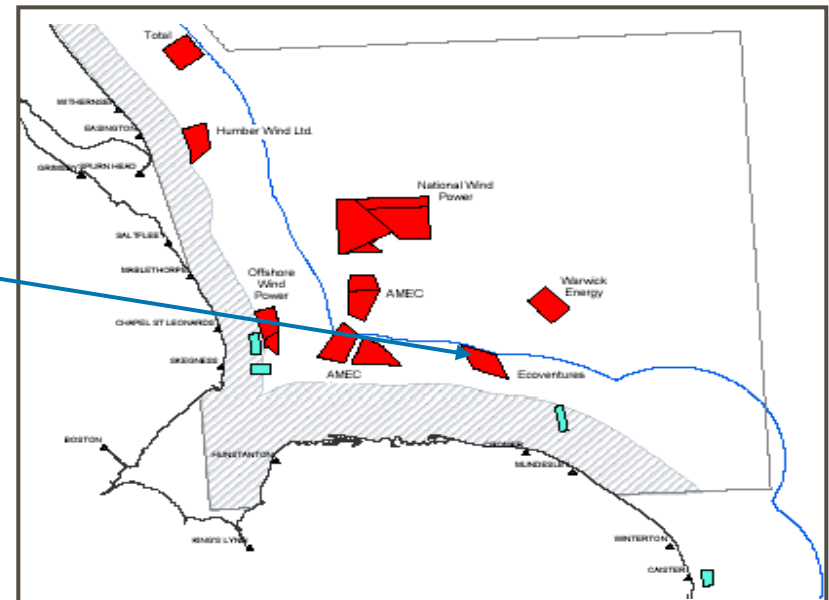


Sheringham Shoal Offshore Wind Farm



- Located in Greater Wash
- Awarded December 2003
- Scira Offshore Energy Ltd.

Statoil 50 % (development manager)
Statkraft 50%



Sheringham Shoal Offshore Wind Farm

Project Highlights

- Installed capacity 317 MW
- Average annual production 1.1TWh
- 35 km² wind farm appr. 20 km off the coast
- Water depth 17m – 22m

Development Concept

- 88 wind turbine generators, each 3.6 MW
- 2 offshore substations
- Submarine infield cables (33 kV)
- Submarine export cables (132 kV) to shore
- Ca 22 km underground cabling from shore to Salle

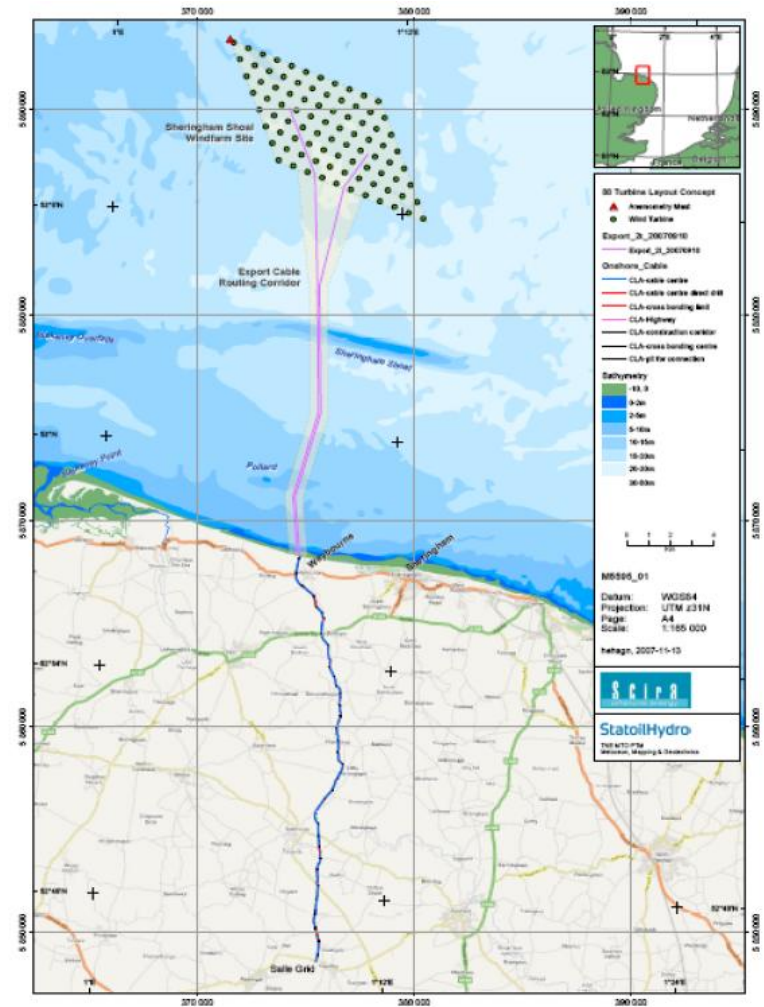


Fig. 1.1 Layout of Sheringham Shoal Offshore Wind Farm

Cost and Schedule



- **Status February 2010**

- About 25 % progress - on cost and schedule
- End of engineering phase, fabrication for offshore equipment started
- Onshore construction ongoing
- Harbour development ongoing

- **2010**

- Install foundations

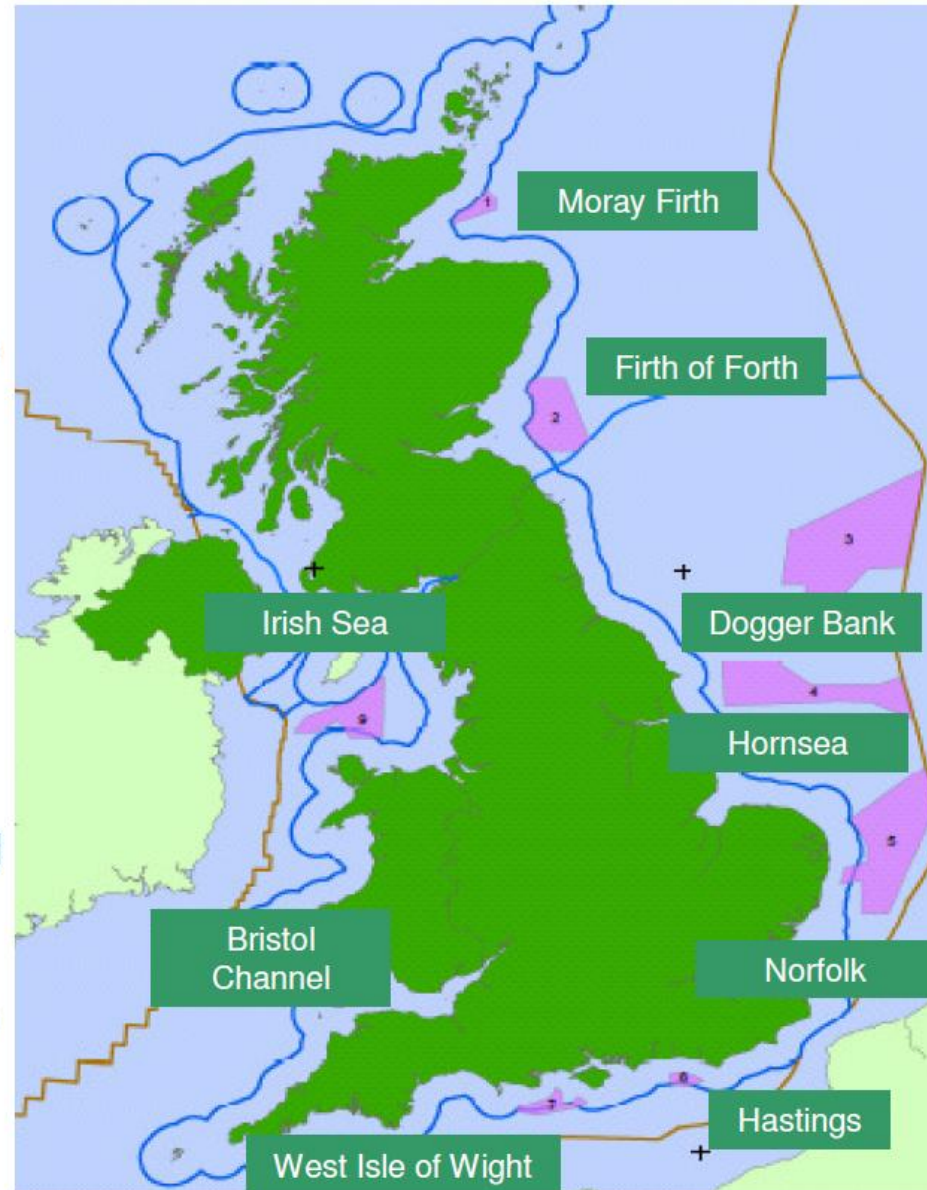
- **2011**

- Install wind turbine



Offshore Wind Farms - Round 3

- Government aim: 25 GW from Round 3 in operation or under construction by end 2020
- About 26 600 km²
- Award December 2009
- Zone Development Agreements
 - The Crown Estate participate with wind farm developers up to consent of a site within the zone
 - Consented site taken out of the zone to be constructed and operated under Lease Agreement



Forewind partners

RWE npower renewables

RWE npower renewables is the UK subsidiary of Pan-European renewable energy company RWE Innogy and has a strong diversified position in renewables with significant ambition for growth.

Scottish and Southern Energy

Scottish and Southern is one of the largest energy companies in the UK.

Statoil

Statoil is a world leading offshore oil and gas operator.

Statkraft

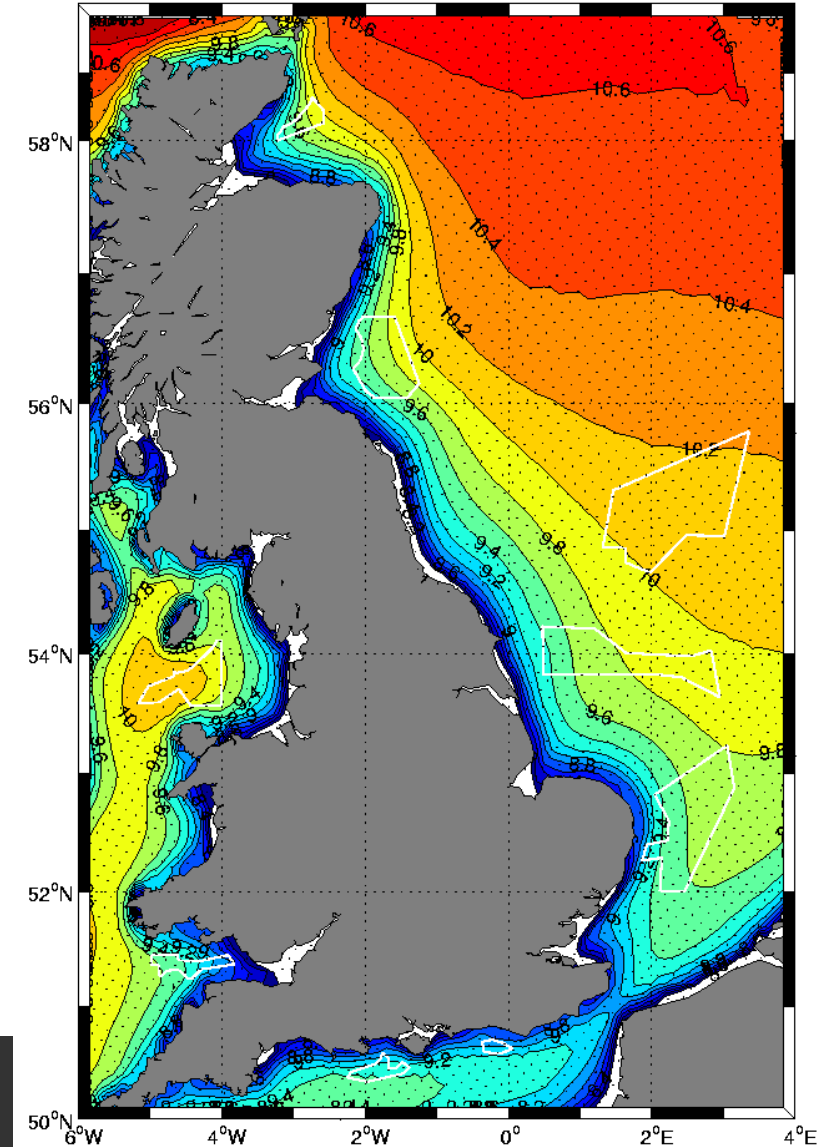
Statkraft is Europe's largest generator of renewable energy.



Some characteristics of Dogger Bank

- High wind speeds $>10\text{m/s}$
- Area of 8.660 km^2
- Relatively unconstrained
- Relatively good ground conditions

- Harsh wave climate
- $125 - 195\text{km}$ offshore

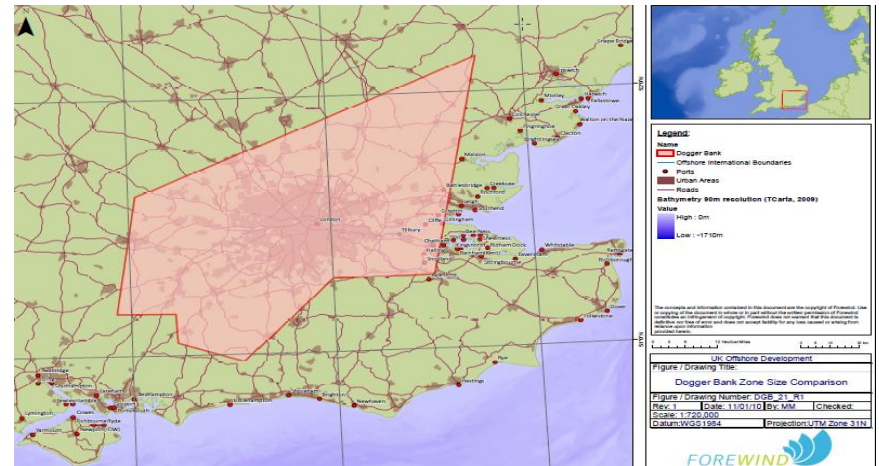


Doggerbank

World's 4th largest power project
10% of UK power consumption

Strategic challenges

- Cost
- Grid
- Finance
- Government support



Main Data

- WTG: 2.3 MW
- Turbine weight: 138 tons
- Draft: 100 m
- Displacement: 5300 m³
- Diameter at water line: 6 m
- Water depths: 120-700 metres

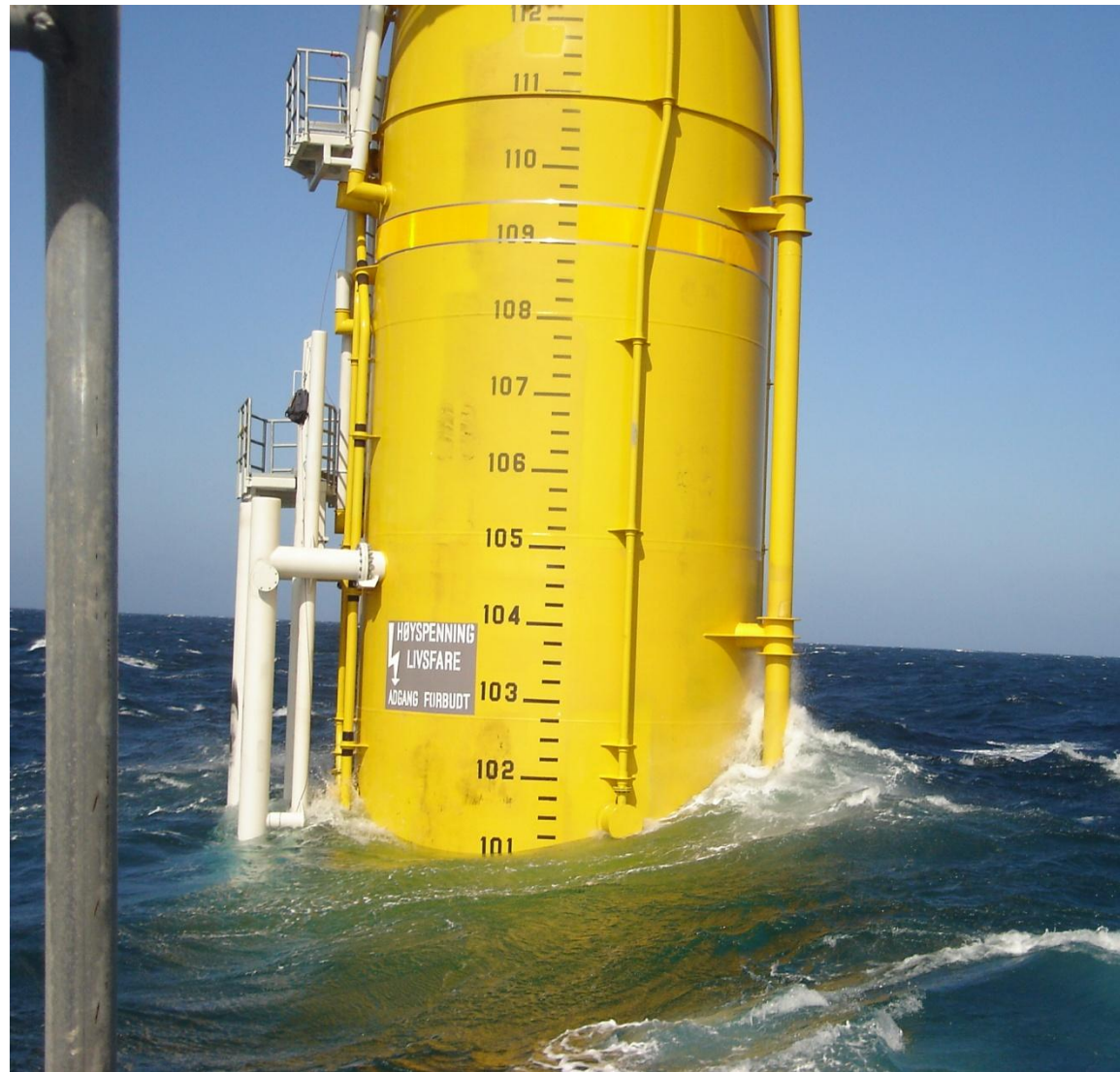
Characteristics

- Steel tower and substructure
- Dynamic pitch regulation
- Completed at inshore site
- Towed upright to field
- Designed for extreme North Sea conditions



Challenges

- Increased production
 - Regularity
 - Efficient use of the wind
 - Larger turbines
- Reduced CAPEX
 - Optimise technical solution
 - Fabrication
 - Installation
- Reduced OPEX
 - Increase turbine reliability



Offshore Wind – some learnings

- Offshore wind projects are huge – in planning, execution, operations and financing
- Wind turbine generators and towers make up almost half of total capex with few suppliers and continuous need for technology development
- Increased water depth and/or increased turbine loads will require new and cost effective foundation solutions
- Limited capacity and few purpose-build Installation vessels
- Predictable regulatory system is vital

Thank you

Presentation title

Presenters name

Presenters title

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