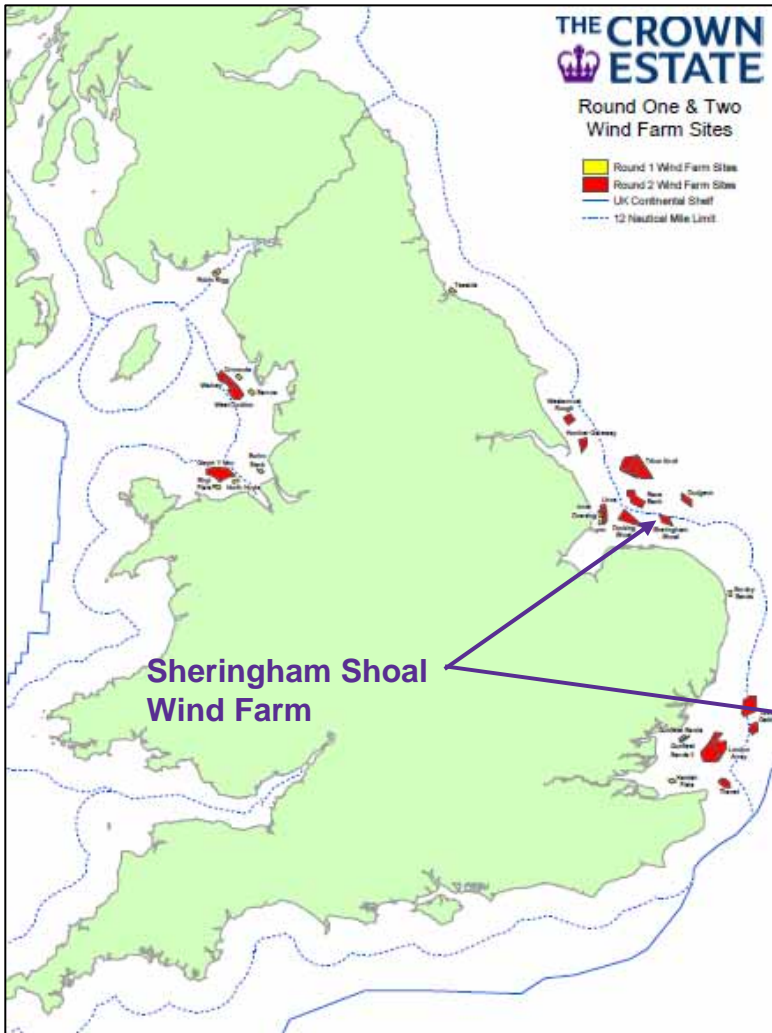


# Sheringham Shoal Offshore Wind Farm at the installation phase – some learning and experiences

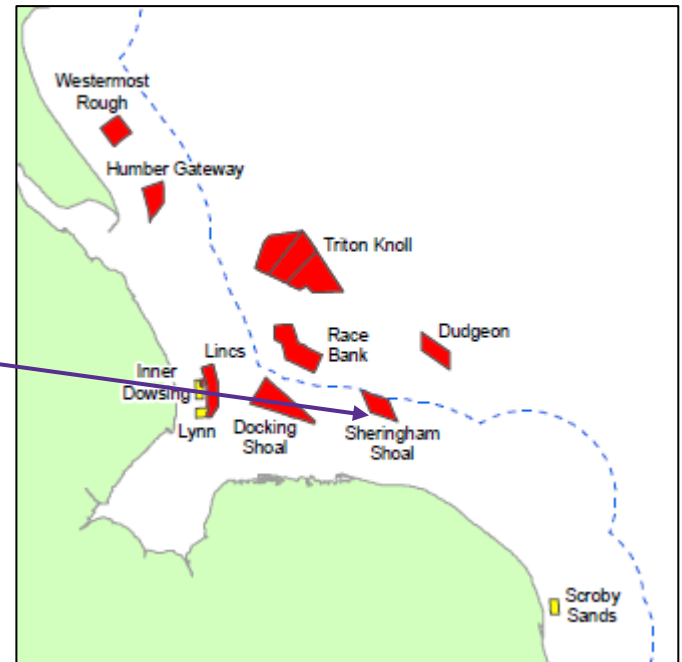
Renewable UK Offshore Wind 2010  
Liverpool, 30<sup>th</sup> June 2010  
Rune Rønvik, Project Director

# Sheringham Shoal Offshore Wind Farm by Scira Offshore Energy



Scira Offshore Energy Ltd.

50 years lease agreement with  
The Crown Estate



# Scira Offshore Energy Ltd.

Statoil 50%, Statkraft 50%

Statoil is operator for Scira during the Development and Construction Phase

- **Manager for construction activities and preparation for operations**

Scira will be responsible for the operation and maintenance phase.

- **Personnel working for Scira during the O& M phase will be a mix of secondees from the owners, local employees and service contractors**

# Wind Farm Highlights

## Project Highlights

- Installed capacity 317 MW
- 35 km<sup>2</sup> 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
- Connection to regional grid (EdFE) at Salle for further connection to National Grid (NGET) at Norwich

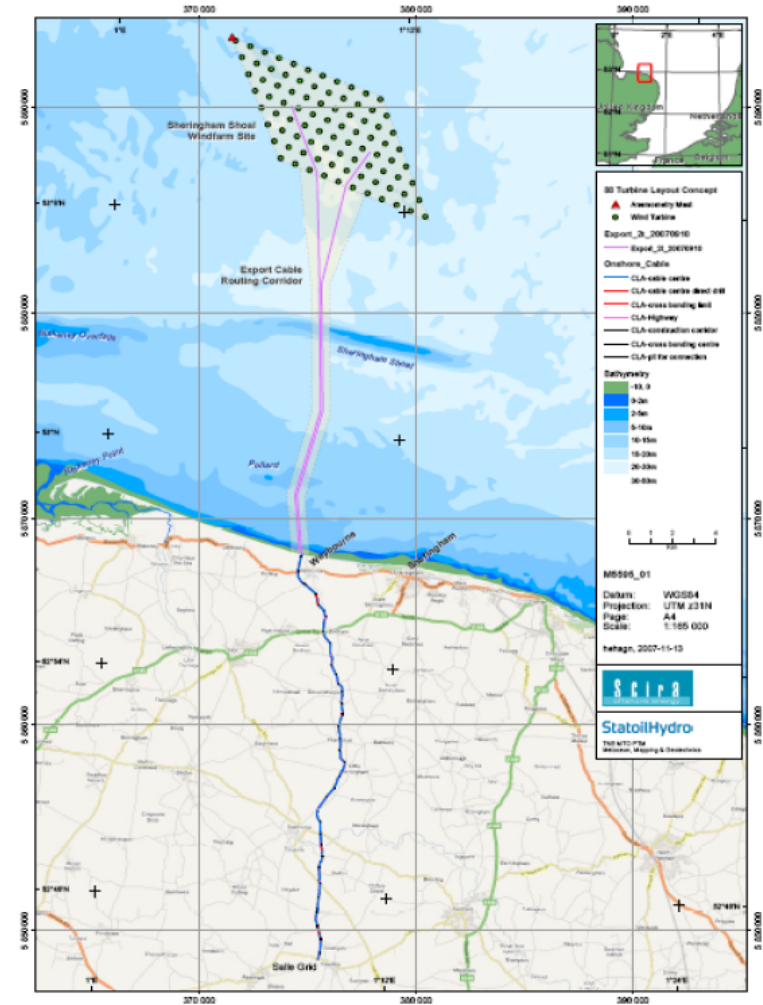


Fig. 1.1 Layout of Sheringham Shoal Offshore Wind Farm

# Schedule and Cost

## Status

- Onshore construction ongoing
- Harbour development complete
- Foundation installation started

## 2010

- Install foundations and cables offshore
- Commissioning onshore substation

## 2011

- Install offshore substations
- Install wind turbines
- First production of electricity 2Q
- Installation complete by 4Q
- Final commissioning and capacity testing

## Total estimated cost:

- £ 1 billion



# Multi-contract strategy

Wind Turbine Generators

Foundations

Electrical Infrastructure

Subsurface Export and Infield Cables

Onshore cable

Cable Installation

WTG Installation vessel

EPC(I) Siemens

EPCI MT Højgaard

EPCI AREVA T&D

EPC Nexans Norway AS

EPCI Carillion Utility Services

Visser and Smit

Master Marine ASA



# Operation & maintenance

## Service Warranty Agreement

- 2 years
- Thereafter Service Agreement 3 years

## Involvement by the Owners from day 1

- Control of asset
- Learning and a seamless handover as warranty period expires

## Build on Statoil's offshore oil & gas operating and maintenance experience

- best practices are transferable to wind

## Build on Statkraft's experience from operations and maintenance of hydro power plants and onshore wind farms



# Learning related to the area

**Environmental challenges** – Schedule risk, no Round 2.5 awards

**Aviation issues** (military and civil radars) – cost and schedule risk

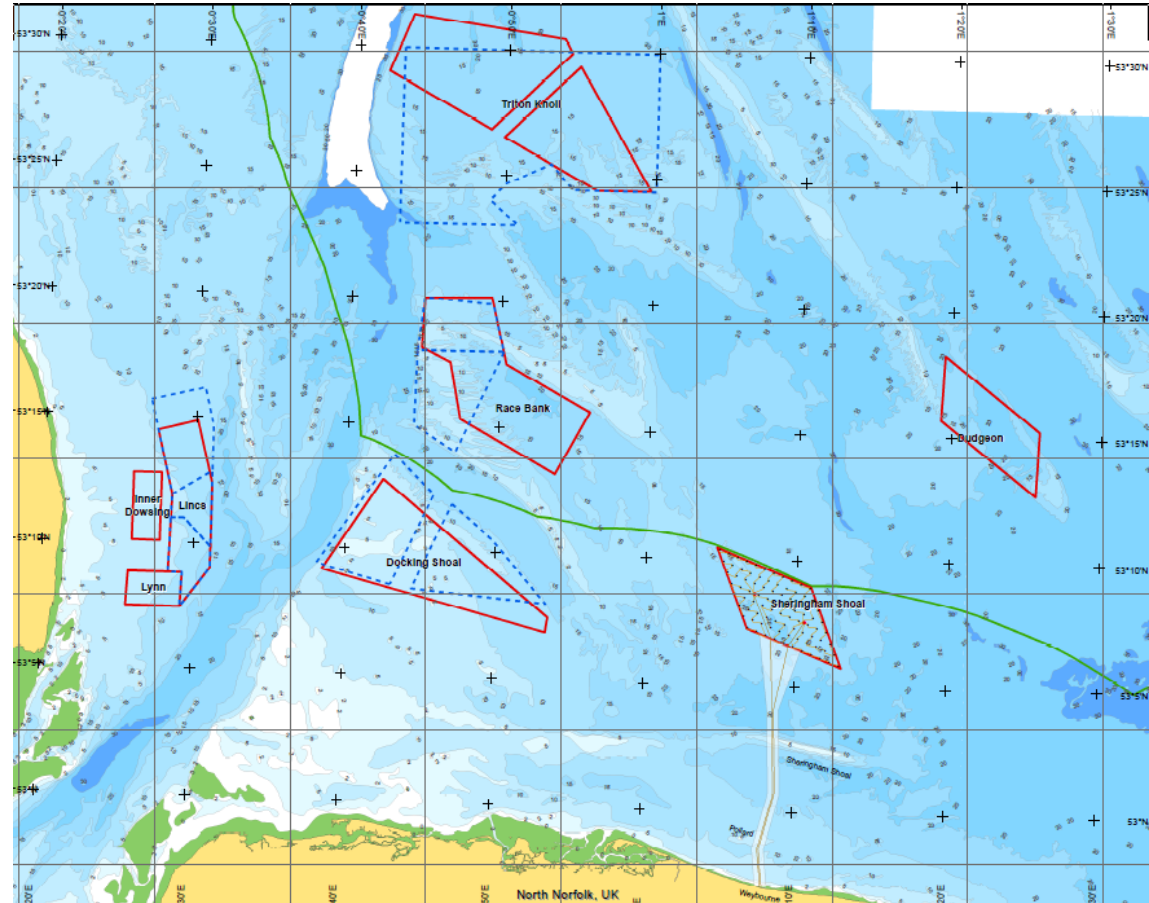
**Grid capacity constraints** – schedule challenge, cost risk

**Commercial Fishing** – Complex stakeholder management, risk during execution

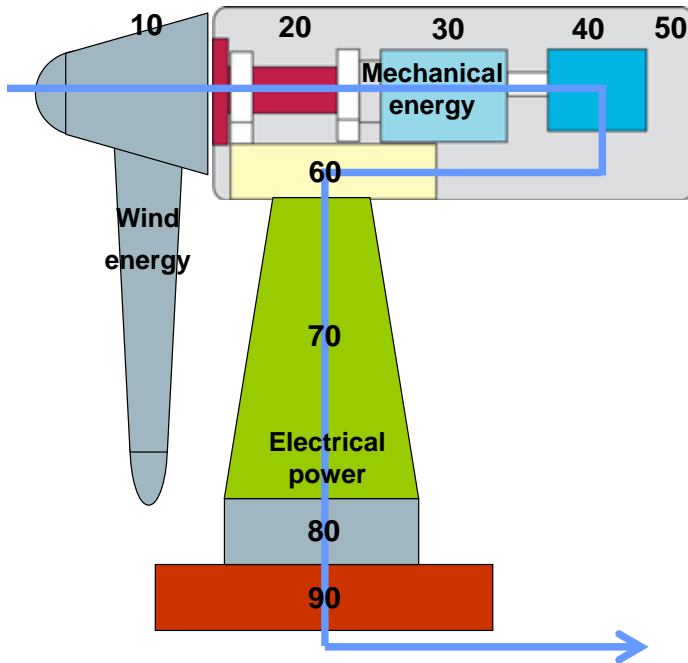
**Harbour infrastructure** – long distance from good harbour facilities

**Regional cooperation** – potential for more cooperation during operations phase (infrastructure, maintenance vessels, training, etc.)

## Greater Wash – home to several wind farms



# Standardise tag structure



centrica

e-on

DONG  
energy

SIEMENS  
Siemens Wind Power

Statkraft

Statoil

## Will benefit:

- Documentation
- Failure rate tracking with benchmarking
- Spare and stock management
- LCC analyses

# Ministry of Defence (MoD) objected to the consent applications

Sheringham Shoal is in line of sight from the Air Defence Radar at Trimingham

- Significant impact on modelled radar performance

Cooperation Scira-MoD through the consent application phase

- Agreed on specific and measurable consent criteria based on what is feasible within time frame available

Novelty

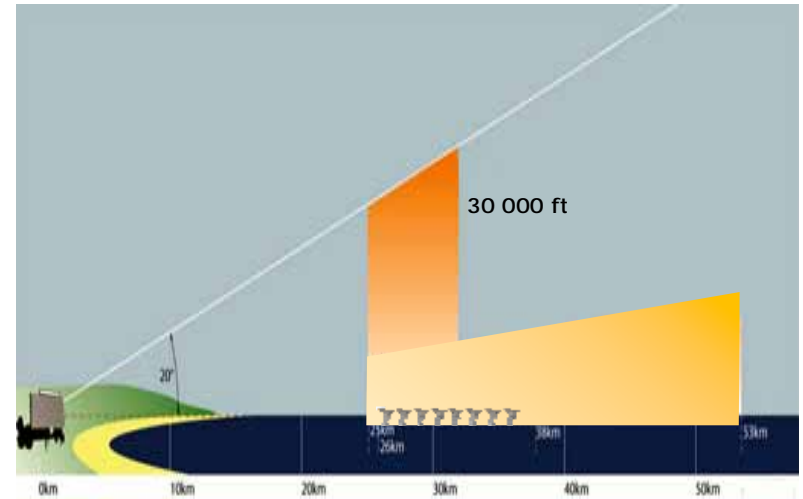
- MoD agreed to a degradation in radar coverage
- Wind farm developer responsible for the mitigation

Scira entered a Strategic Agreement with MoD

- Later broadened to include all R2 developers in the Greater Wash in line of sight from Trimingham

Solution reached in March 2010 – New Regional Radar:

- Agreement involving wind farm developers, TCE and DECC ensured a new wind farm resilient air defence radar to be located at Trimingham



# Failure in the grouted connections between the monopile and the transition piece

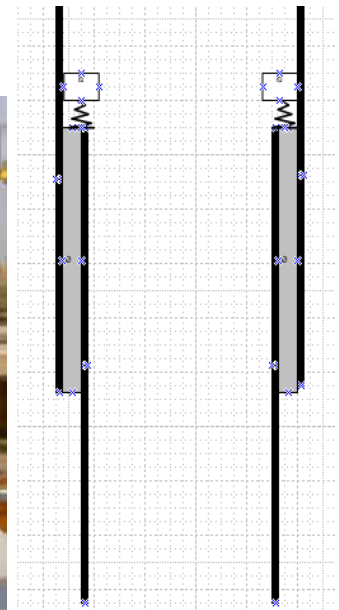
Error in the industry standard used as the basis for the design of the foundations

→ not sufficient friction in the grouted connection

Discovered by the time the Sheringham Shoal fabrication was about to start

Task Force established:

- Recommended spring (elastomer) bearing on pile carrying the vertical load as a solution to the axial forces
- We are still working on a solution for torque forces



Thank you for listening!

