

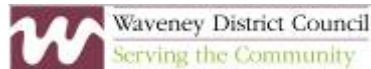
Offshore Wind

The Germany / UK Connection



5th October 2006 – Astral Centre, Lowestoft College

Sponsored by:



www.offshore-power.net



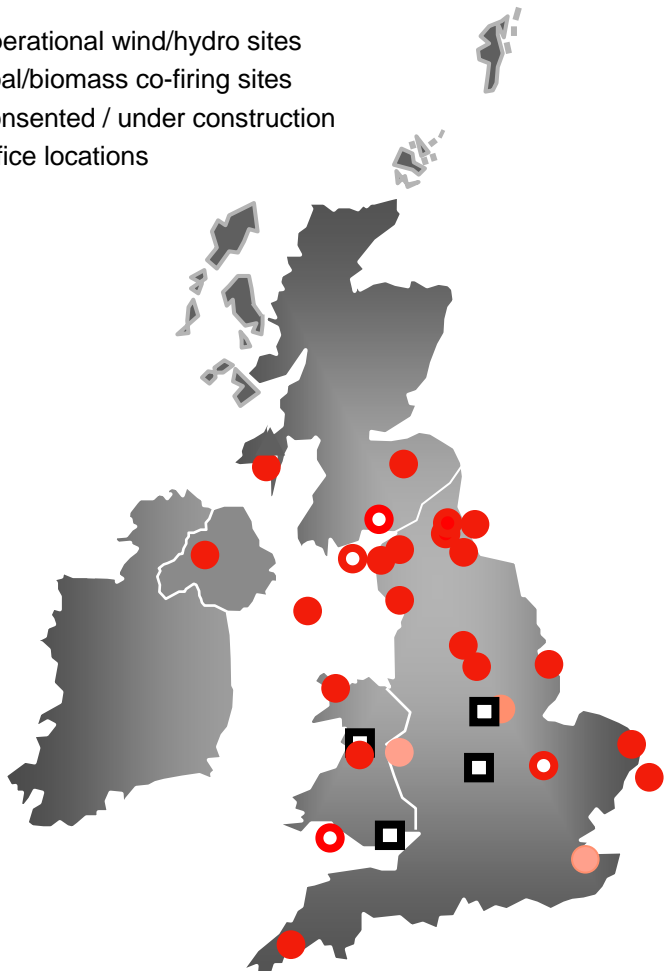
Offshore Wind & Scroby Sands

A Utility Perspective

Paul Chilvers – Offshore Design Engineering

E.ON UK Renewables – Who We Are

- Operational wind/hydro sites
- Coal/biomass co-firing sites
- Consented / under construction
- Office locations



E.ON Renewables are playing a key part in delivering E.ON UK's low carbon agenda

- Developer Owner/Operator
- 20 existing wind farm sites (2 offshore)
- 3 coal plant co-firing biomass
- Building UK's largest dedicated biomass power station.
- Wave and Tidal Team established 2005
- Largest UK purchaser of renewable output from third party projects in 2003/04
- 110 staff based at 4 sites



Scroby Sands Offshore Wind Farm

30 Vestas V80 2MW offshore

Eon's first commercial offshore wind farm

Pioneering project

Commissioned Dec 2004

Built as part of 'Round 1' offshore

£75 Million project

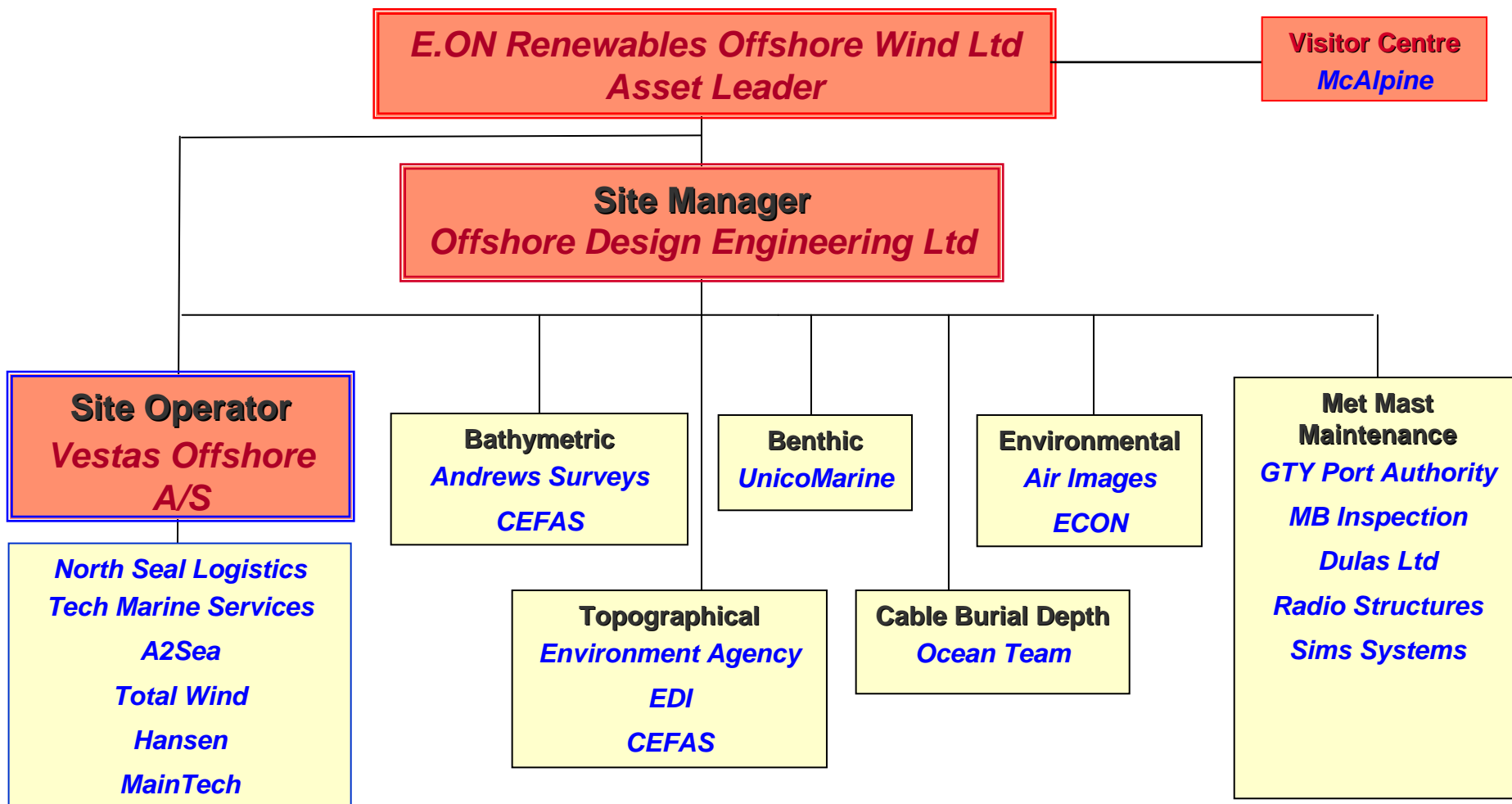
Part Government funded via DTI capital grant



Wind Farm - Site



Scroby Site Management





ode – Who We Are

ENGINEERING & OPERATIONS CONTRACTOR

to the

OFFSHORE & ONSHORE

ENERGY SECTOR

ode

27 Years in the Energy Business

ode – What we do

PROJECTS



OPERATIONS

CONSULTING



Site Managers Responsibilities

ode

5 Year Site Management Contract

Employed by E.ON Renewables to provide;

- Support E.ON and local representation
- Planning operations and maintenance
- Daily management of site activities
- Provide support to Vestas
- Routine reporting mechanisms
- Technical Advice
- Audit and legislative compliance
- Community liaison and public relations

Site Operators Responsibilities



5 Year Performance Warranty

Employed by E.ON Renewables to provide;

Warranted availability via a performance based contract to ensure maximum performance and availability

Operation and maintenance of wind farm and HV network - Routine preventative maintenance and defects

Provision of maintenance Technicians, sub-contractors, vessels and O&M base

Remote monitoring

Operations and Maintenance Challenges

Offshore pioneering environment – Many long term unknowns?

Health and Safety Culture – New Industry, rapidly growing

Turbine Access

In 2005, 145 days were lost due to bad weather (40%)

Gearboxes

Intermediate speed & high speed bearings suffering premature wear

Generators

- Insulation and bearing failures

Turbine Access

Transit to Wind Farm

Fast speed
High people capacity & deck space



Transfer vessels

Stability for safe transfer
Suitable platform
Highly Manoeuvrable
High capability in adverse weather

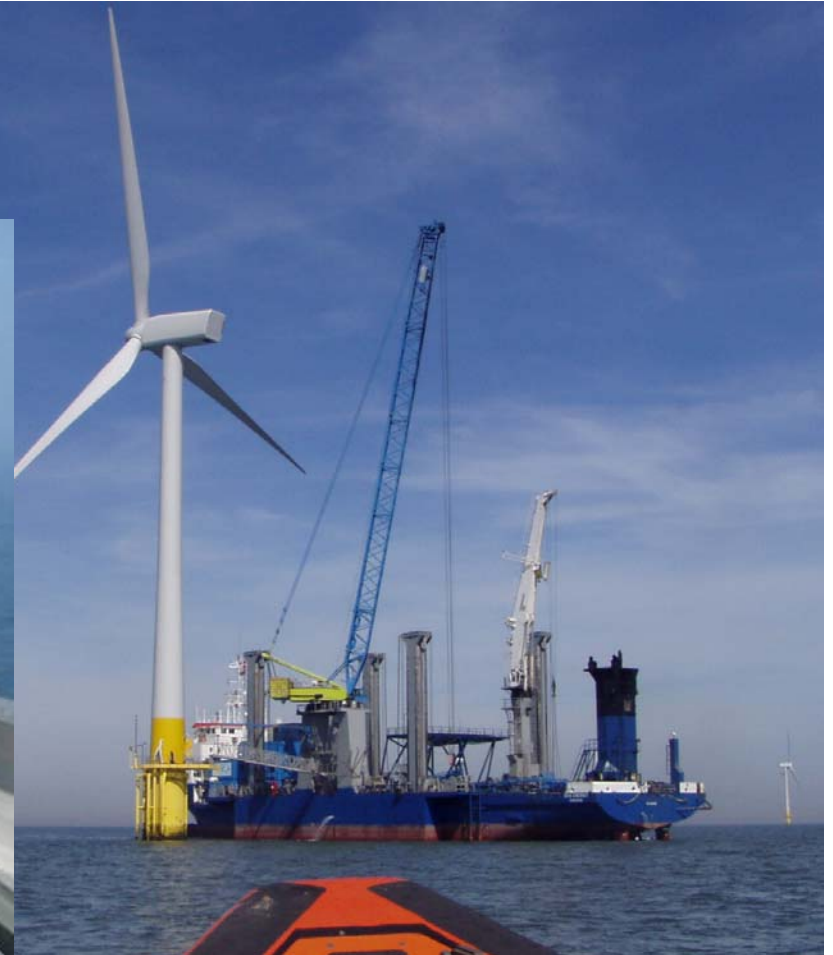


Maintenance Access Vessels

Jack-Up barge

Used for stable lifting platform

Large external crane for major defect component replacements
e.g. gearboxes and generators



Environmental Obligation

Wind Farm consent requirements

Pre, During and Post Construction analysis

Surveys

| | |
|----------------|---------------------|
| Seabed profile | 6 monthly |
| Beach profile | 3 monthly |
| Sea life | Seasonal |
| Little Terns | Seasonal monitoring |
| Seals | 11 annual surveys |



Survey Results

Seabed and beach profile

Local changes as predicted

Scour erosion - less than 5% of the total sandbank volume

Impact insignificant compared to the natural variability

No global effect to the sand bank

Sea life

Sparsely populated sandbank

No impact from Wind Farm as results

Potential for species to develop around monopile

Survey Results

Little Terns

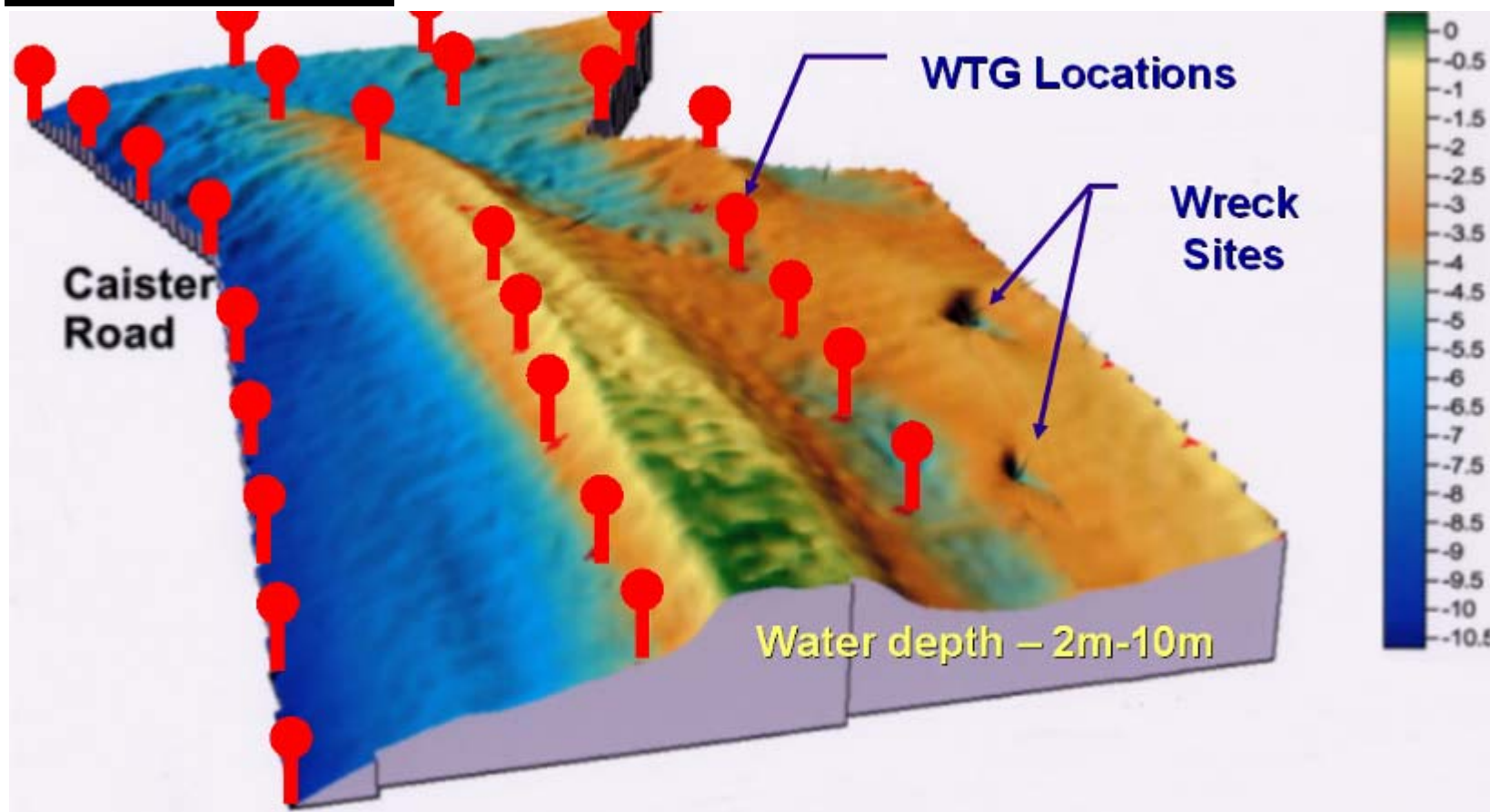
Chicks decline during 2005 due to Kestrel pair
Positive results 2006 Little Terns foraging at Scroby

Seals

Breeding (July) not impacted by construction
Grey seals increasing in population
Common seal in national decline

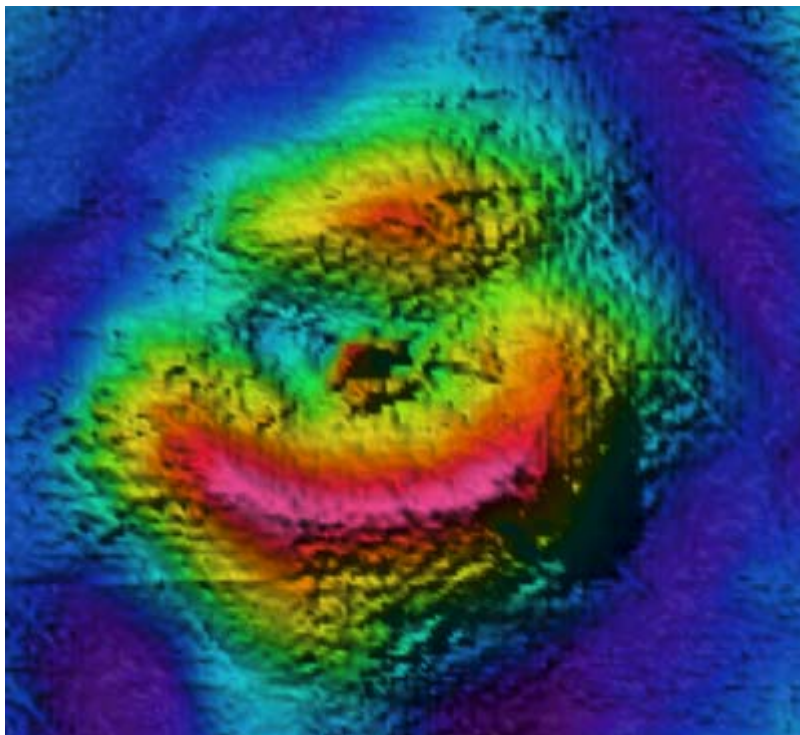


Bathymetric Surveys (sea bed) 3D Visualisation



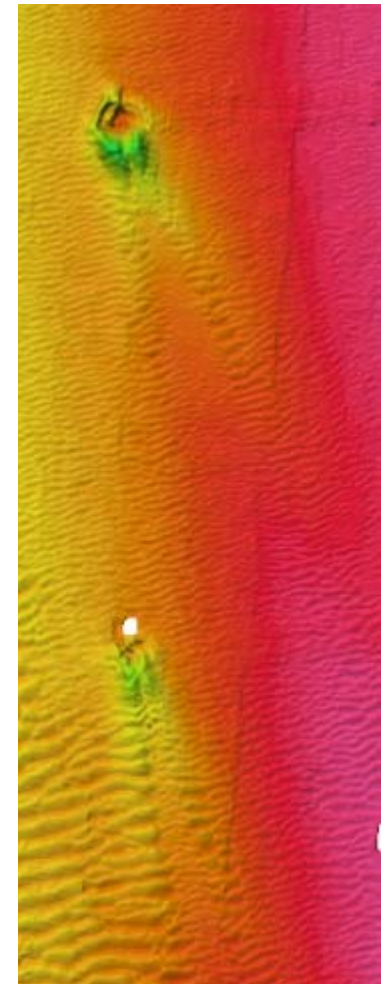
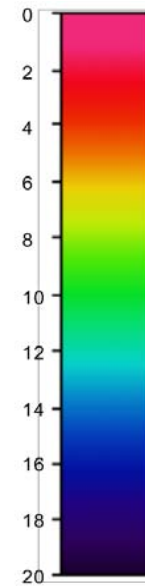
Bathymetric Survey - Interpretation

Secondary Scour



Scour tails

Prevailing SE tide



Cable Burial Depth Surveys

To check the integrity of HV submarine cables

3 x 33kv Export cables 3-4km

29 x 33kv Inter-array cables ~0.5km

Methods

Tracked ROV

Towed sled (runs perpendicular)

Diver surveys



Public Relations - Local Benefits

Visitor centre had 35,000 visitors in
2005

- 2000 during wind-
weekend 2006

Community involvement

- Caister Lifeboat
- Working with local Schools

High profile tourist attraction

Direct local employment

- 21 fulltime
- Many indirect from local services

VIP Visits



Performance

- No major Health and Safety incidents
- Long-term Average Performance, - Enough energy for 41,000 homes – Approx Yarmouth, Caister & Gorleston combined
- Energy Production -171 GWh per year
- Reduction of 75,000 tonnes of CO₂ per year

Scroby Sands Generation Performance - 2005

| | Long term Average | 2005 Actual |
|---|------------------------------|--------------------------------------|
| Capacity Factor | Budget 32% | Actual 29.8% |
| Energy Generated | 171 GWH | 153 GWH - 90% (87% up to June 06) |
| Commercial Availability | 95% | 89% |
| Long Term Average Wind Speed | 100% | 96.2% 3.8% less wind |
| Reduction in CO₂ | 75,000 t | 65,000 tonnes |
| Homes Supplied | 41,000 homes | 36,000 Homes |

E.ON UK Renewables - Future Projects

We are serious about renewable energy generation

- In the last 5 years we have invested £225m
- We have committed to investing a billion pounds over the next 5 years

In construction

- Stevens Croft - dedicated biomass plant (44 MW)
- Stags Holt Onshore wind farm in Cambridgeshire (18 MW)

Imminent decisions and announcements

- Robin Rigg (Solway Firth) offshore wind farm (180 MW)

Future

- London Array in Thames Estuary – 1000MW (JV)

Summary

Performance

2005 was the first year of this pioneering site, in which we experienced some technical difficulties. Despite this and lower than average winds, production and profitability has been very good.

Safety

Our safety performance is excellent with no major incidents

Environment

Impact on the environment has been negligible and in some cases has had a beneficial effect

Future

The success and lessons learned has given us the confidence to invest further in offshore sites including Robin Rigg, London Array, etc.

A photograph of two offshore wind turbines in the ocean at sunset. The sun is low on the horizon, creating a bright orange and yellow glow that reflects on the water. The sky is filled with soft, wispy clouds. The turbines are silhouetted against the bright sky.

Questions and Answers

Paul Chilvers

Offshore Design Engineering