

# Burbo Offshore Wind Farm

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**DONG Energy Renewables**

**SeaScape**  
Energy



# Agenda

- The Project
- What did we learn on previous projects
- What did we so far learn on Burbo



# DONG Energy sites in UK

Barrow

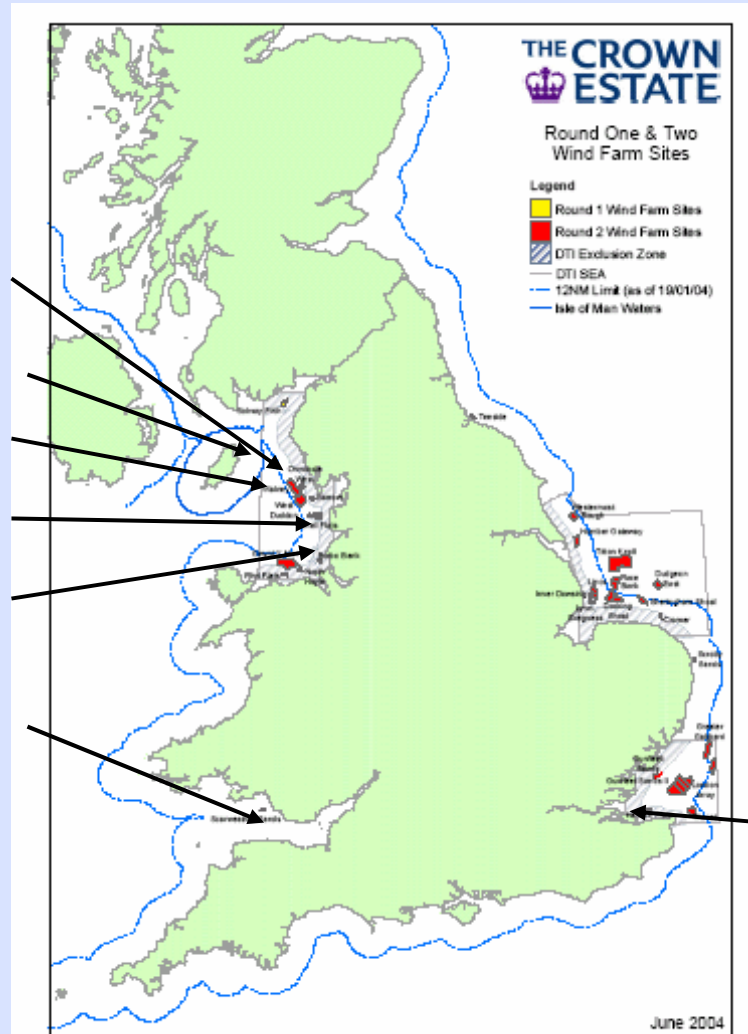
Walney

West of Duddon

Shell Flats

Burbo

Scarweather Sands

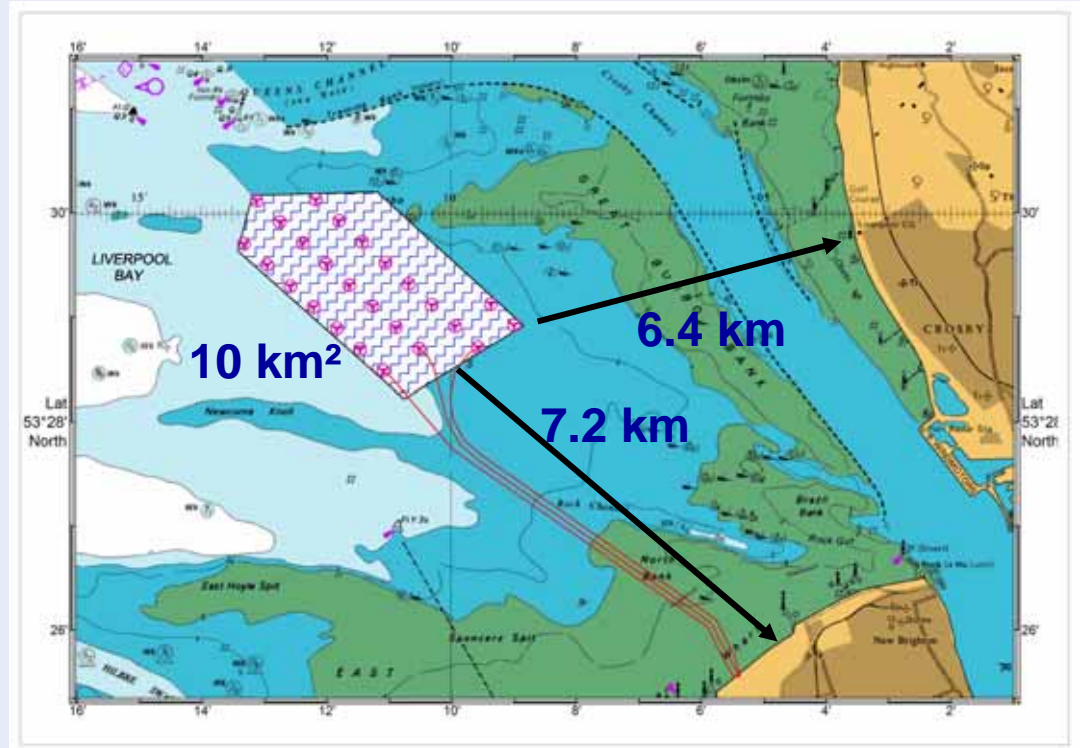


London Array

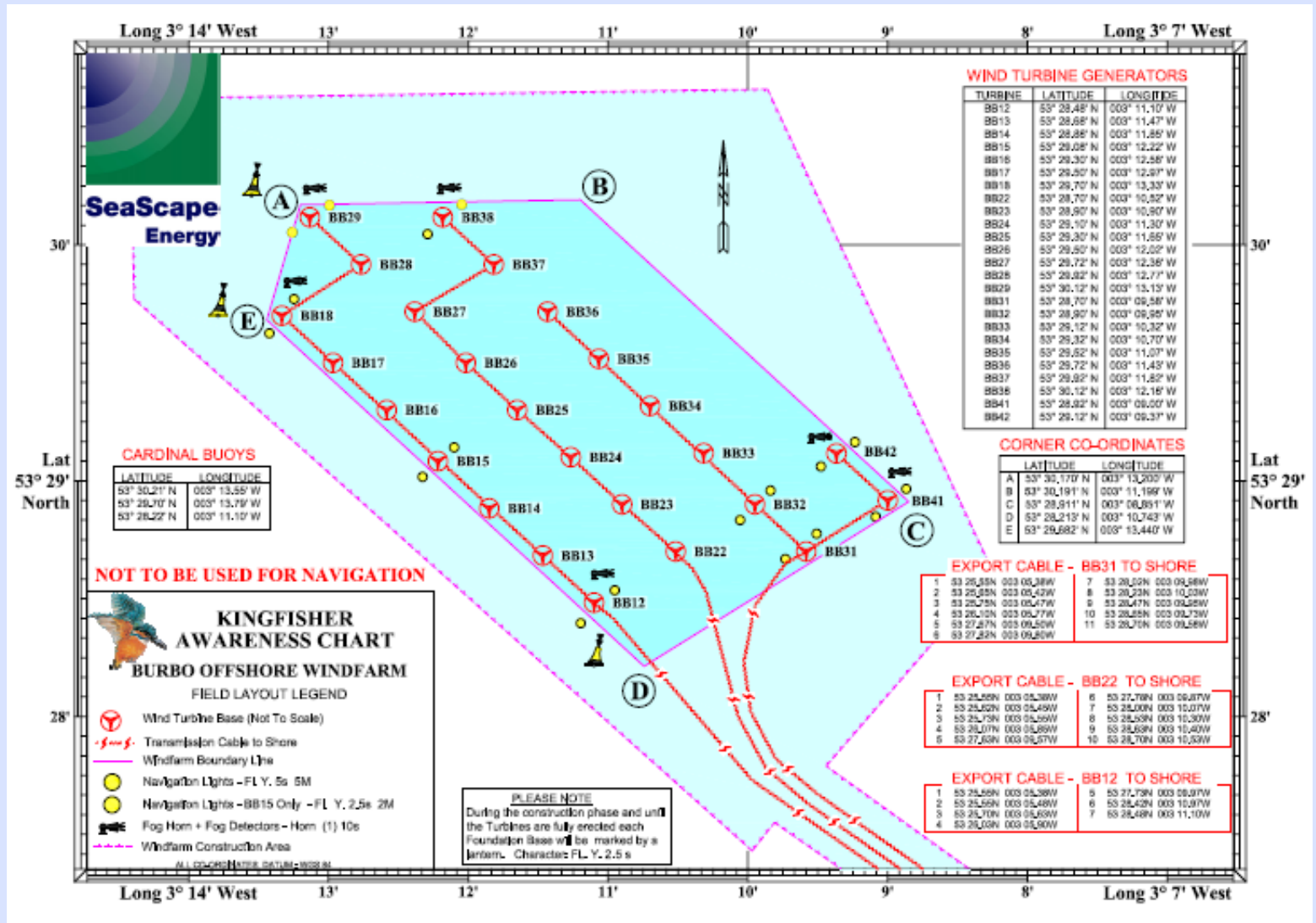
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# Burbo Bank, Liverpool Bay.



# Layout

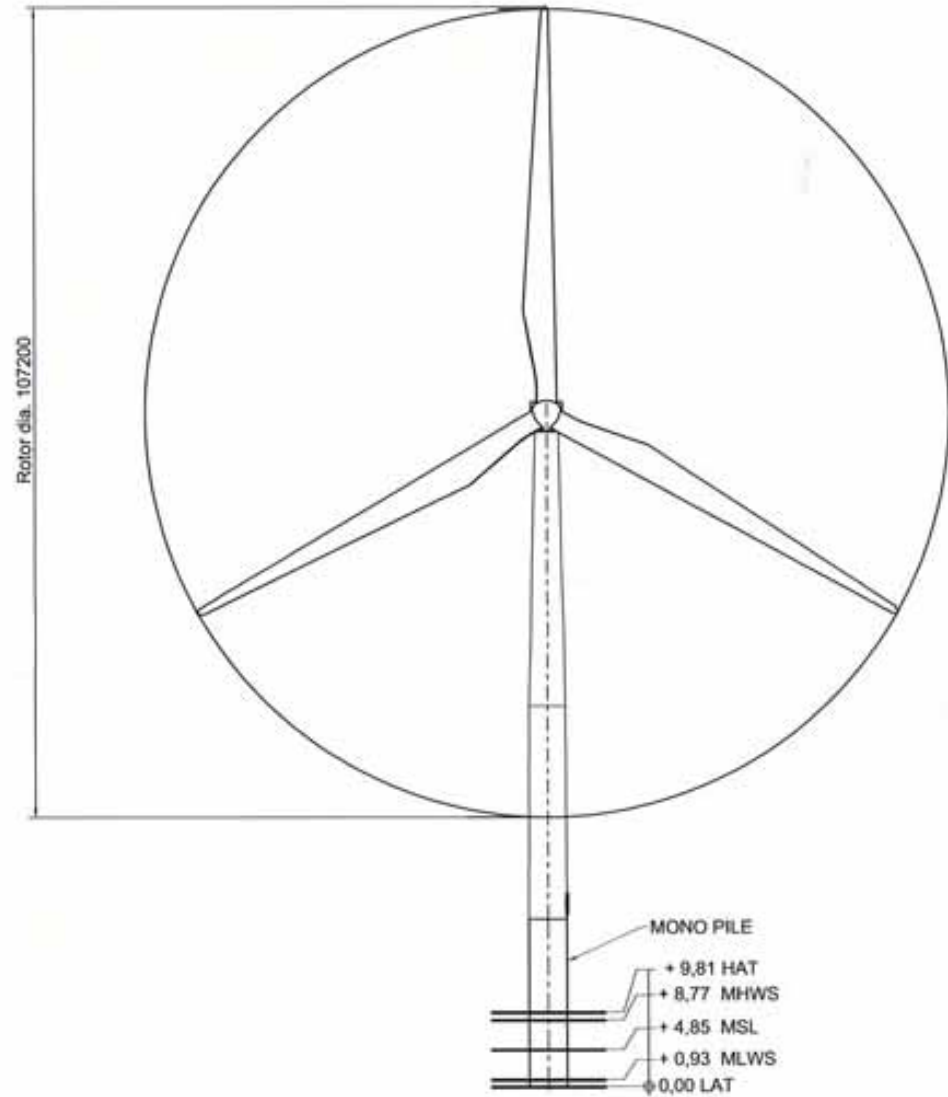
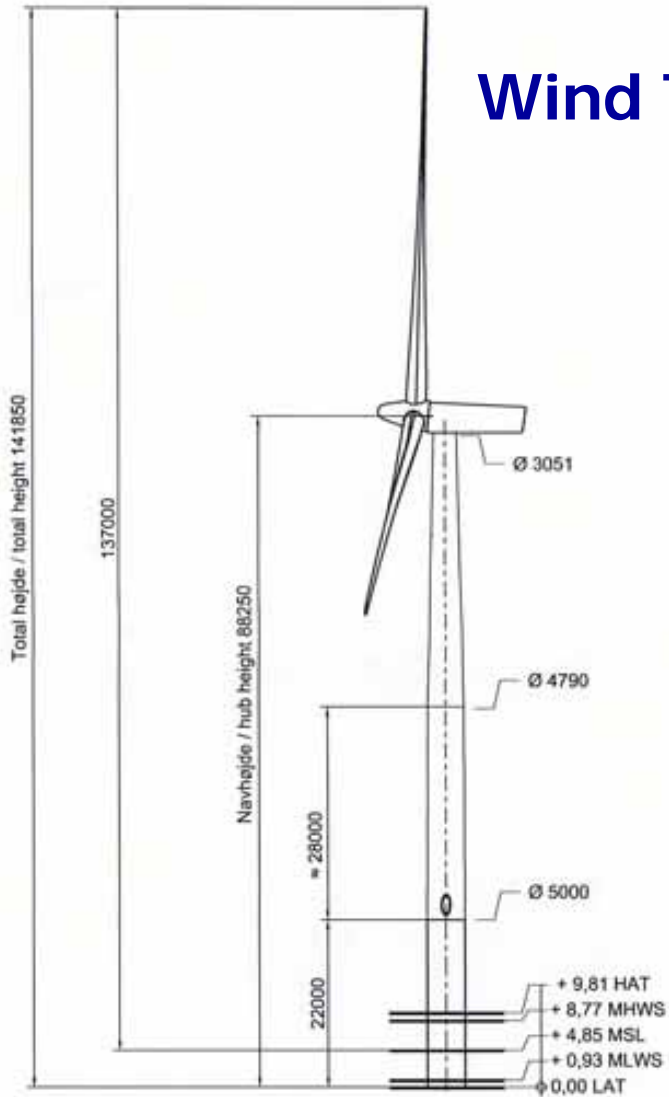


# Burbo Offshore Wind Farm - Facts

Wind turbine type:	SIEMENS 3.6 MW
Number of Turbines:	25
Total output:	90 MW
Expected annual output:	315,000,000 kWh
Rotor diameter:	107 m
Hub height:	83 m
Weight, blade:	17.5 tonnes
Weight, nacelle:	125 tonnes
Weight, rotor:	95 tonnes
Weight, tower:	180 tonnes
Total weight per wind turbine:	800 tonnes
Cut-in wind speed:	4 m/s
Full power output from:	14 m/s
Cut-out wind speed:	25 m/s
Mean wind speed at 84 metres' height:	>9 m/s
Distance from shore:	10 km
Distance between wind turbines:	530-720 m
Wind farm area:	10 km <sup>2</sup>



# Wind Turbine



# Foundations

## Weight.

-Monopile: 220 tonnes

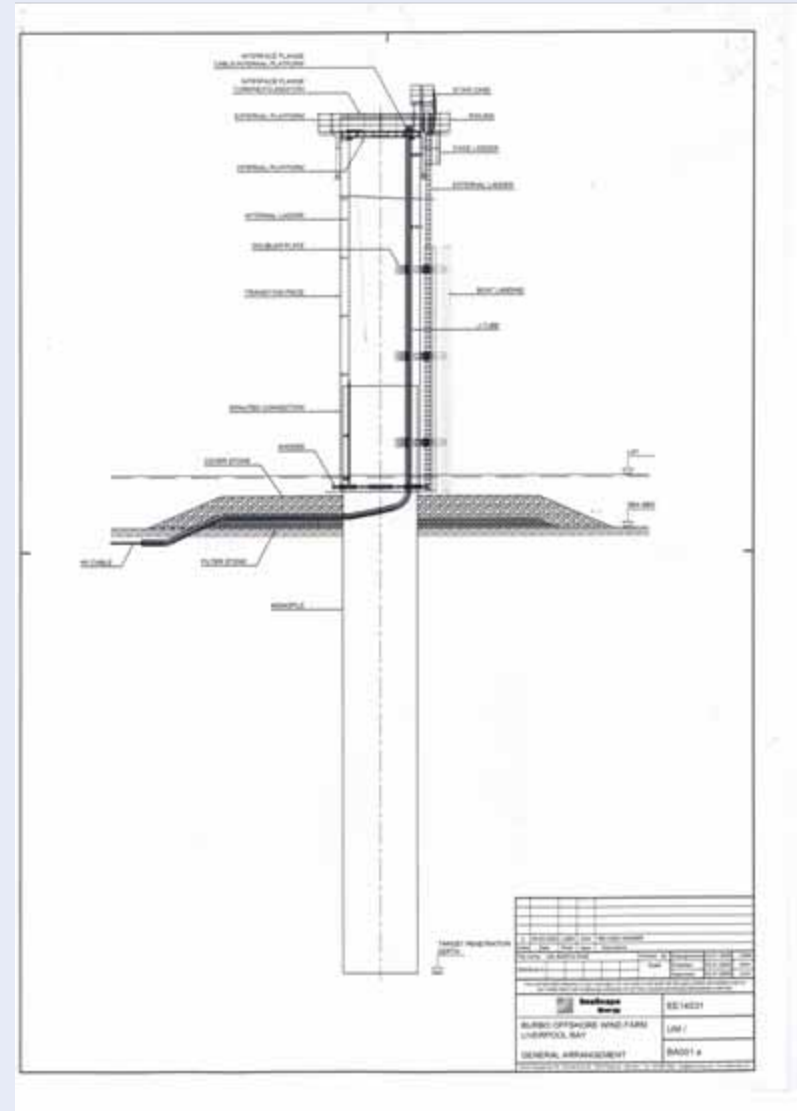
-Transition piece: 160 tonnes

-Secondary steel: 65 tonnes

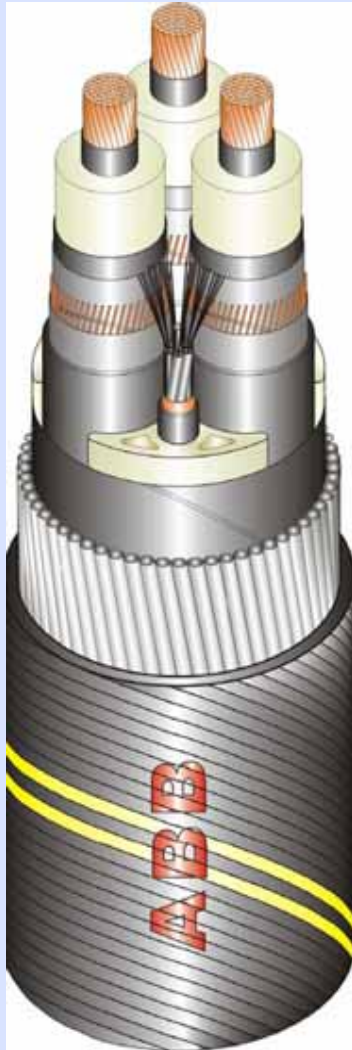
Depth of water: 4 – 8 m (LAT)

Filter stones : 220 m<sup>3</sup>

Cover stones: 275 m<sup>3</sup>



# Marine Cable (example)



Designation FXCTV 3 x 500 mm<sup>2</sup>

Rated voltage 18/30 kV U<sub>max</sub> 36kV

Impulse level 170 kV

## Conductor

type round, compact

material copper

longitudinal water seal compound + swelling tape

cross-section 3 x 500 mm<sup>2</sup>

diameter 26,2 mm

## Complete cable

diameter = 140 mm

weight = 35 kg / m





# The First Year of Construction

The summer of 2006



# Installation, Scour



## Installation. Monopile

Lifting a monopile from Jumping Jack with an IHC Up-ending tool



## Installation. Monopile

Placing the monopile in the pile gripper. The hydraulic pile gripper is to ensure verticality of the pile



## Installation. Monopile

Piling a monopile with a Menck hammer to penetration depth, approx. 20-22 meters below seabed.

Hammer piling with approx. 550 tonnes/blow



# Installation. Transition Piece

Mounting of the transition piece on the monopile.

The weight of the TP is approx. 230 tonnes and the height is 23 meters.

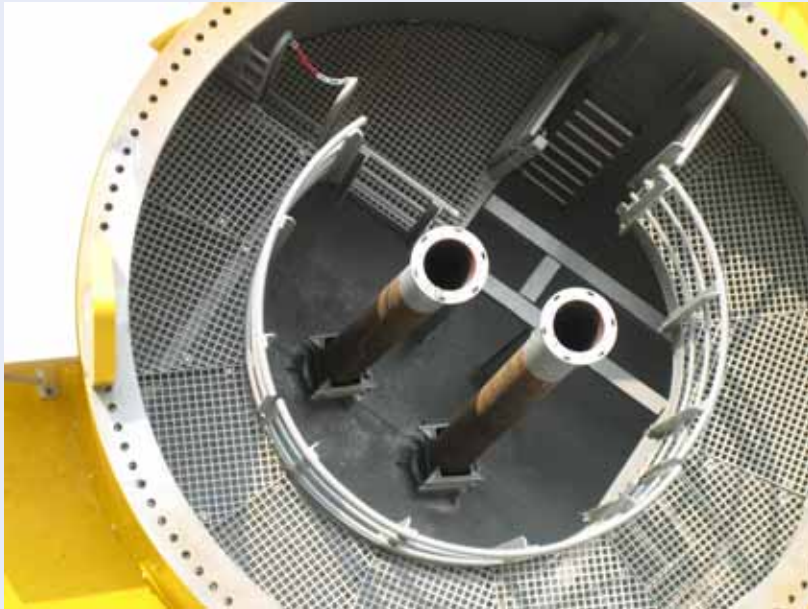
The TP is grouted to the MP with high strength concrete.



# Installation. Monopile

## Secondary works

After installation of the TP, various secondary items are mounted, eg. Switch Gear, Crane.



# Cable Installation Barge on the Foreshore



## Offshore cables

- Cables buried in the seabed
- Three buried export cables to the shore
- Cable laying before the turbine installation.
- The 33-kV PEX cable: copper conductors and fibre optics for communication and control purposes.



# Onshore Cable

Horizontal drilled ducts under sea defence

Cable route onshore: 3.5 km in ducts and trenches, following existing roads, to Wallesey Substation



# Diver coordinator office



# Vessel coordinator office



# Inspection vessel connected to the Windfarm



## Project Programme

Id	Opgavenavn	2003				2004				2005				2006				2007			
		Kvt 1	Kvt 2	Kvt 3	Kvt 4	Kvt 1	Kvt 2	Kvt 3	Kvt 4	Kvt 1	Kvt 2	Kvt 3	Kvt 4	Kvt 1	Kvt 2	Kvt 3	Kvt 4	Kvt 1	Kvt 2	Kvt 3	Kvt 4
1																					
2																					
3	<b>All main consents in place</b>		◆	14-07																	
4	<b>Engineering and procurement of plant</b>																				
5	<b>Geotechnical site investigation</b>																				
6	<b>Manufacturing of components</b>																				
7	<b>Onshore cable supply and laying</b>																				
8	<b>Onshore substation</b>																				
9	<b>Foundation installation</b>																				
10	<b>Offshore cable supply</b>																				
11	<b>Ofshore cable laying</b>																				
12	<b>Wind turbine installation</b>																				
13	<b>Commissioning of turbines</b>																				
14	<b>Wind farm tests</b>																				



# What did we learn on previous projects?

- **Tendering**
  - Contract strategy
  - Award of contracts and final investment decision
- **Engineering**
  - Design improvements
  - Design flexibility
  - Design verification
- **Planning**
  - Slack in programme



# What did we learn so far on Burbo?

- Liaison with national authorities
- Liaison with local authorities
- Liaison with local stakeholders
- Liaison with the public
- Site management
- Programme
- Construction experiences



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Thank you for listening

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