

# KENTISH FLATS OFFSHORE WINDFARM

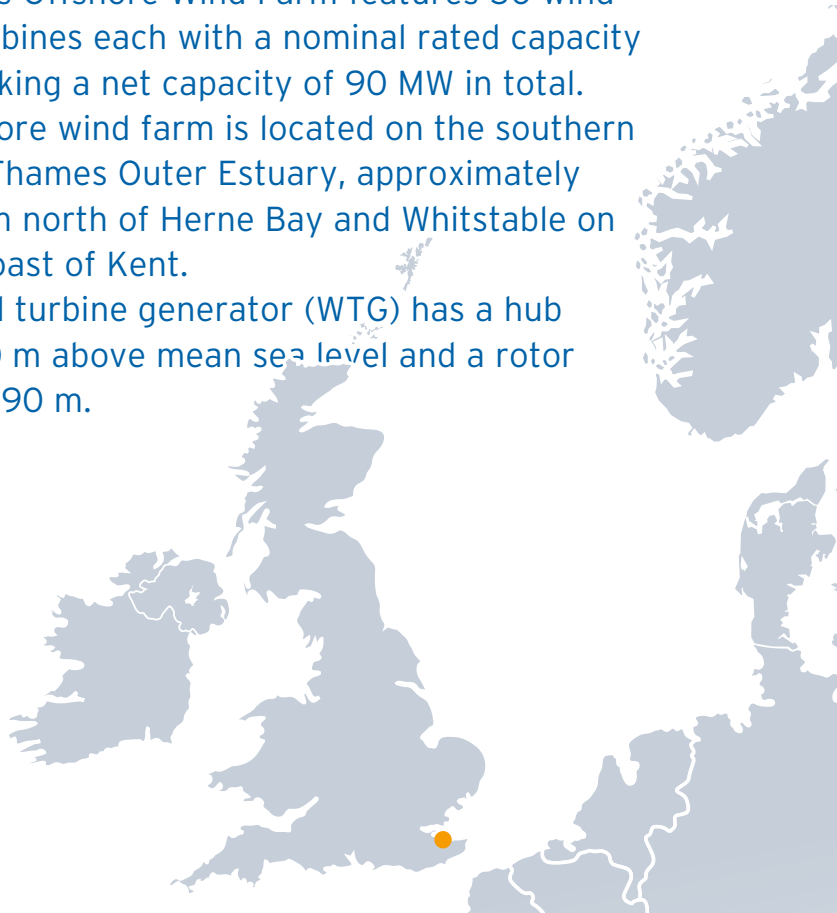


## A pure spot on the Map of the World

Kentish Flats Offshore Wind Farm features 30 wind-powered turbines each with a nominal rated capacity of 3 MW making a net capacity of 90 MW in total.

The offshore wind farm is located on the southern side of the Thames Outer Estuary, approximately 8.5 to 13 km north of Herne Bay and Whitstable on the North coast of Kent.

Each wind turbine generator (WTG) has a hub height of 70 m above mean sea level and a rotor diameter of 90 m.



## Construction of the Wind Farm

### **For the benefit of the environment**

Electric power produced by wind turbines is green energy. Both onshore and offshore wind energy contributes to reducing the emissions of greenhouse gases such as carbon dioxide seeking to reverse the trends of climate change.

The Kentish Flats wind farm alone supplies an estimated equivalent of over 100,000 households with clean, renewable, sustain-able energy. It will displace an estimated 4.4 million tonnes of carbon dioxide over its 20-year life time, compared to conventional fossil fuel generation.

### **Wildlife in focus**

In connection with the building of the wind farm, extensive research has been carried out in order to examine the expected effect on animals and vegetation. This included studies of the effect on the birds, seals, porpoise and fish in the area.

The results concluded that the development will not result in any significant

adverse environmental impacts on the Thames Estuary environment, with only a few exceptions during the construction phase, which have been subject to suitable mitigation.

### **Impacts on the biological environment**

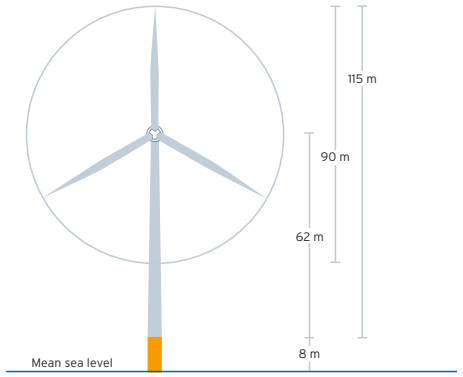
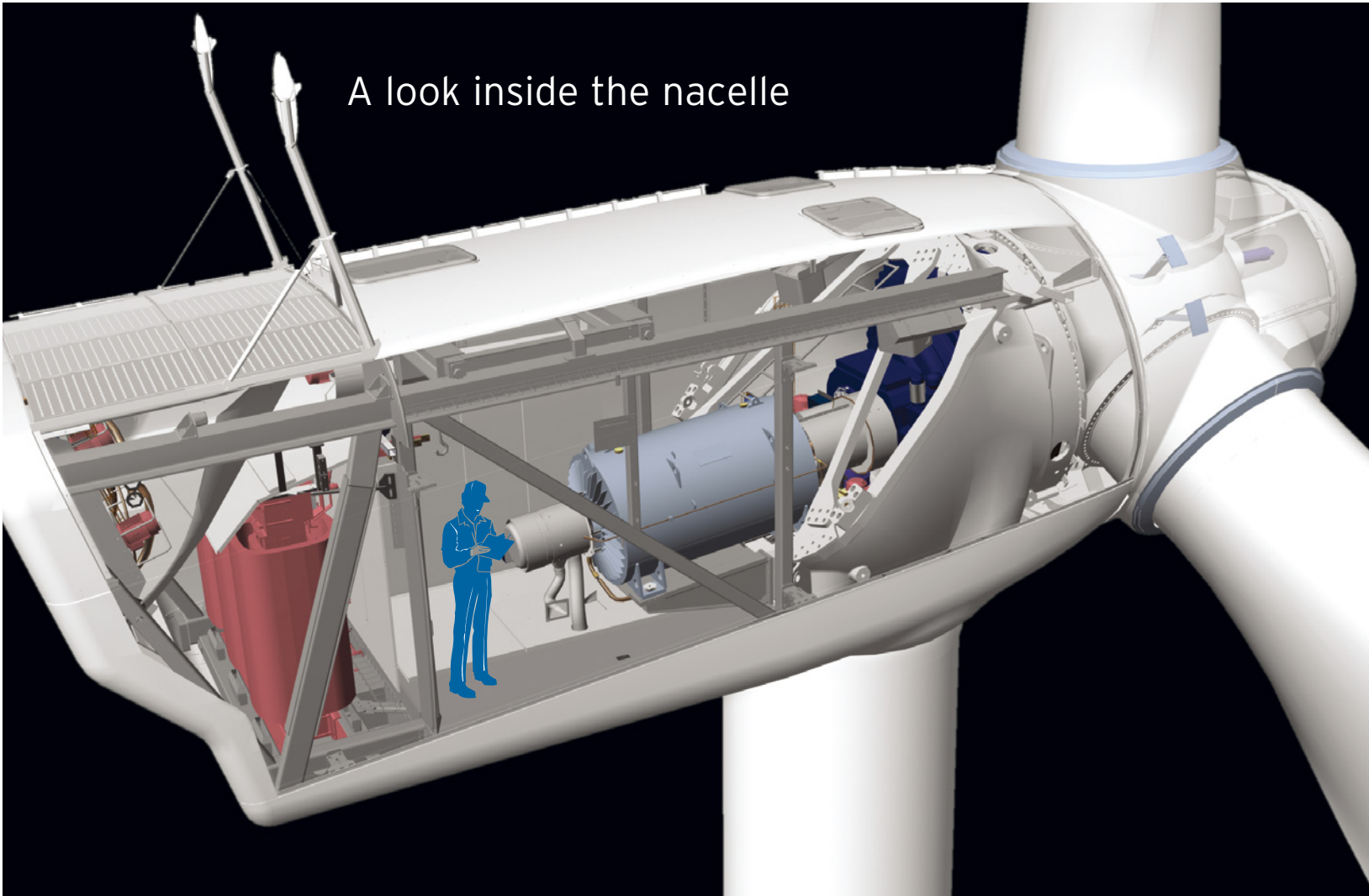
Impacts on the animals living on the seabed as a result of the construction process are assessed to be of low significance due primarily to the small area affected by both turbine installation and cabling.

The biological communities on the seabed have been studied and it has been confirmed that they are typical of the Thames Estuary and indeed the wider southern North Sea, so that no effects on rare species or habitats will occur.

### **Post construction surveys**

- Seabed Monitoring
- Monitoring the Benthic Ecology
- Fish Monitoring
- Bird Monitoring

## A look inside the nacelle



### Facts

Wind turbine type (Vestas)	<b>V90/3.0</b>
Total output	90 MW
Expected annual output	280,000,000 kWh
Rotor diameter	90 m
Hub height	70 m
Weight, blade	6.6 tonne
Weight, nacelle	68 tonne
Weight, rotor	39.8 tonne
Weight, tower	108 tonne
Weight, foundation	247-292 tonne
Total weight per wind turbine	487-532 tonne
Length of mono-pile	38-44 m
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 70 m height	8.7 m/s
Depth of water	5 m
Distance from shore	10 km
Distance between wind turbines	700 m
Wind farm site	10 km <sup>2</sup>
Project costs (GBP)	105 million

All surveys have been conducted and reported according to the consents and show no or negligible impact on the environment and the surroundings.

### **The installation of 30 turbines**

The weather conditions in the Thames Estuary required detailed planning of the project, but the site is calmly sheltered from the heavy wave conditions due to a network of sandbanks located further offshore.

The foundation installation commenced in August 2004. The cable installation took place during the winter 2004/2005 and finally the erection of the turbines started in May 2005. Commissioning of the entire wind farm was completed by the end of August 2005.

The construction and the commissioning were actually completed without any major incidents or accidents.

### **Foundations**

The structure used to support the WTGs is a monopile foundation. A main steel pile is driven into the seabed by means of a hydraulic hammer. Then the transi-

tion pieces with a service platform for operation and maintenance and the connecting flange to the wind turbine tower is grouted onto the pile.

### **Cabling**

In order to connect the WTGs to the grid, the foundation holds internal J-tubes for installation of submarine cables. These interconnect in three groups of ten WTGs, each group having its own export cable to the shore.

The sea cables arrive at the shore at Hampton Pier and are then installed 2.5 km through the town of Herne Bay. This part of the installation involved crossing of the railway and the main road up to EDF Energy's substation in Herne Bay.

The cables themselves do not only hold the three main phases for high-voltage transmission of power from the WTGs, but also vital fibre optic cables for remote communication with the WTGs.

### **Pre-assembly of wind turbine**

A comprehensive logistics puzzle was put together in the harbour of Felixstowe where tower sections, nacel-





les, hubs, blades, cables, screws and bolts from Vestas' Production Units in Denmark and Germany arrived.

The goods were shipped by means of special vessels to the port of Felixstowe, where fitters started the pre-assembly.

Top and bottom tower sections were pre-assembled in vertical position on the quay. Cables, switchgear, ground controller and man-lift installation were completed prior to shipment to the site. Nacelle and hub were assembled together with two blades, into the so called "bunny ears" configuration.

#### **Wind turbine installation**

Two complete WTG subassemblies were transported on a special, adapted vessel to the Kentish Flats. Here three lifts were applied for a complete wind turbine (the V90). The first lift was the complete tower. The second lift was the nacelle with "bunny ears". The third lift was the final blade, which finalises the mechanical installation.

On average, the installation of a complete turbine required about 24 hours, including transport to the site, positioning and pre-load and three lifts. After the above procedure, installation teams of engineers were transported to the turbines by boat in order to perform commissioning, energizing and tests

prior to taking over the plant.

#### **Navigational safety measures**

The following navigational safety measures are installed at the wind farm:

- Navigation lights (at 8 positions)
- Fog horns (at 4 positions)
- Yellow colour on turbine up to 12 meters above sea water level.
- Radar installed at one turbine - integrated into the surveillance system used by Port of London.
- Safety zone (with radius of 50 meter) around each turbine.

#### **Access arrangements**

The wind turbines are accessed using either a transfer vessel or a rigid inflatable boat.

Transfer can take place at wave heights up to about 1.5 m. When wave heights are above the safety limits or adverse weather prevents safe access to the turbines the day is registered as a weather day.

#### **Public Relations**

Kentish Flats has been very well accepted by the local population as well as tourists.

The local tourist office reports big interest of the wind farm. A local company has even gained success offering trips by rigid inflatable boats to the wind farm.

In July 2006 Prime Minister Tony Blair visited Kentish Flats, presenting the Government's new Energy Plan with more focus on renewable energy. Statement from the PM: "He said "If we are going to protect our environment and our energy supply in years to come, then there is no question that we need to bring on projects like Kentish Flats much faster.""



[www.vattenfall.se/vindkraft](http://www.vattenfall.se/vindkraft)