DEPARTMENT OF ENERGY & CLIMATE CHANGE

OFFSHORE WIND CAPITAL GRANTS SCHEME

Kentish Flats Offshore Wind Farm 3rd Annual Report

JANUARY 2008 - DECEMBER 2008

URN NUMBER: 09D/P46B

EXECUTIVE SUMMARY

The Kentish Flats Offshore Wind Farm's third year of operation in 2008 is summarised in this report. The operation in the first and second years has been similarly reported previously.

The Kentish Flats Offshore Wind Farm consisting of 30 V90 3MW Vestas Wind turbines is located in the Thames Estuary, some 8 km to the nearest point of the north Kent coast, north of Herne Bay and Whitstable. The main export cables come ashore at Hampton Pier, Herne Bay and run 2.5km inland to an existing substation where connection to the National Grid distribution network is made.

The project was initially developed by Grep Marine UK and was bought from its parent company NEG Micon UK, by the former Danish Power Utility Elsam in 2004. In mid 2006 the Swedish utility company Vattenfall took over the wind farm following a major reorganisation of the Danish power sector. The main contractors are:

- Grid Connection: EDF Energy, UK;
- Wind Farm: Formerly NEG Micon UK, now Vestas Offshore.

Associated contractors:

- MT Hojgaard, DK (foundations);
- AEI Cables, UK (cables);
- MPI, UK (installation, foundations);
- Global Marine, UK (installation, offshore cables);
- Fitzpatrick, UK (installation, onshore cables);
- A2SEA, DK (installation, turbines).

The wind farm was commissioned in September 2005 and the commercial Taking-Over Certificate (TOC) was signed on 8th December 2005.

In 2008, the production was disturbed by exchange of 20 gearboxes and continuation, from 2007, of a generator exchange and refurbishment programme. Despite this, average contractual availability in 2008 was 89% and a Capacity Factor of 33.5% was achieved.

The annual exported production in 2008 was 269,267MWh compared to a budget of 285,000MWh. This was significantly higher than previous years (27% more than in 2007 and 16% more than in 2006).

The first Kentish Flats monitoring summary report was published in August 2007 and summarised most of the environmental surveys completed under the three-year monitoring program laid out by the Food and Environment Protection Act (FEPA) licence issued by the Marine and Fisheries Agency (M&FA). Pending consideration of the outstanding surveys, it was agreed that the monitoring programme has satisfied the conditions set out in the FEPA licence and no further environmental monitoring will be required at Kentish Flats Offshore Wind Farm.

In order to complete the monitoring requirements, a final monitoring summary report incorporating all the survey work completed is planned. This will be produced early in 2009.

Overall project cost: £105,000,000 (i.e. £ 3,500,000 per wind turbine).
BERR Capital Grant: £10,000,000 (i.e. £ 111,111 per MW installed).

CONTENTS

SITE PLAN & LOCATION

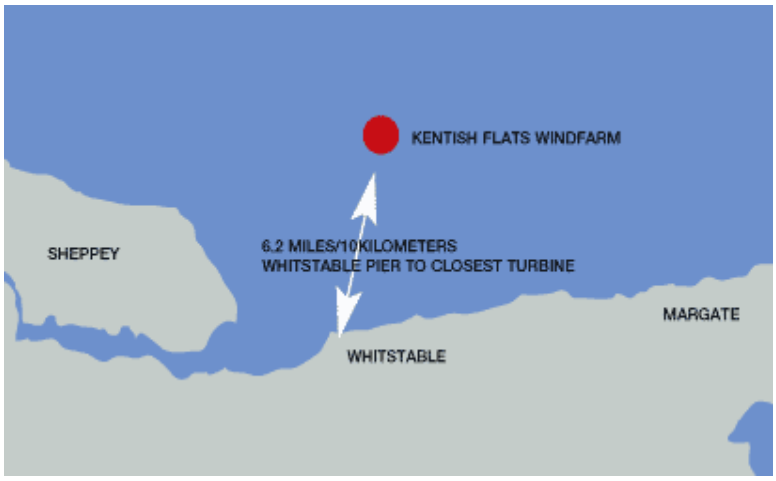

Figure 1: Location off the north Kent coast

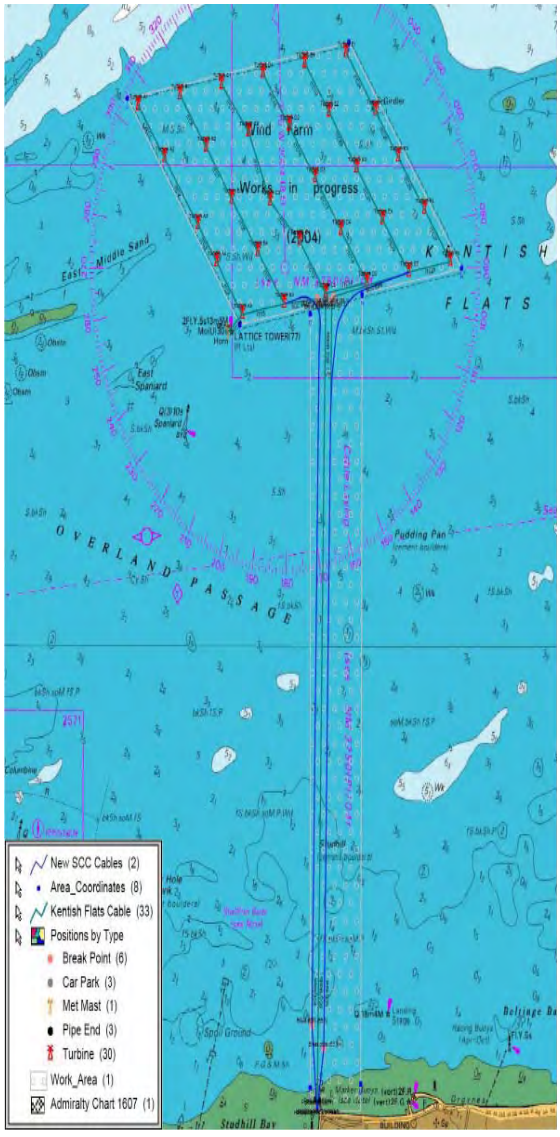

Figure 2: Site Plan

Foundation / WTG		Coordinates UTM Zone 31 - Datum (WGS 84)	
No.:	(Alias)	E	N
KF01	A5	366681,33	5701388,63
KF02	B5	367377,09	5701483,12
KF03	C5	368072,47	5701576,47
KF04	D5	368769,36	5701670,74
KF05	E5	369464,38	5701765,40
KF06	F5	370159,78	5701858,68
KF07	A4	366263,11	5701951,89
KF08	B4	366957,72	5702046,45
KF09	C4	367654,29	5702140,16
KF10	D4	368348,68	5702235,41
KF11	E4	369044,87	5702327,68
KF12	F4	369740,54	5702421,41
KF13	A3	365962,77	5702357,35
KF14	B3	366538,98	5702609,35
KF15	C3	367176,66	5702569,86
KF16	D3	367930,79	5702798,22
KF17	E3	368626,75	5702891,83
KF18	F3	369322,42	5702985,23
KF19	A2	365425,52	5703079,50
KF20	B2	366119,26	5703171,95
KF21	C2	366836,51	5703314,27
KF22	D2	367512,18	5703360,69
KF23	E2	368175,90	5703489,55
KF24	F2	368956,36	5703481,45
KF25	A1	365005,72	5703643,98
KF26	B1	365701,35	5703737,47
KF27	C1	366396,91	5703831,28
KF28	D1	367092,85	5703924,55
KF29	E1	367788,64	5704018,42
KF30	F1	368484,24	5704112,96

Table 1: Turbine Locations

CONSTRUCTION

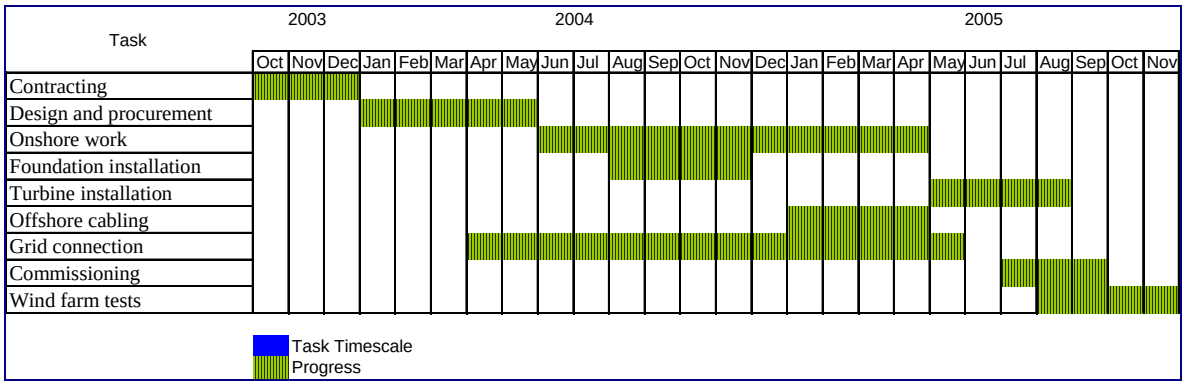

Table 2: Construction Programme

The Employer issued a Taking-Over Certificate (TOC) on 8th December 2005.

Description of Construction Methods

Kentish Flats Offshore Wind Farm features 30 wind-powered turbines each with a nominal rated capacity of 3 MW. The offshore wind farm is located on the southern side of the Thames Outer Estuary, approximately 8.5 to 13 km north off Herne Bay 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. The total weight of the wind farm in terms of consumed steel is approximately 15,000 tonnes.

Foundations

The structure used to support the wind turbines is a monopole foundation. This construction has also been used on previous sites, for example Horns Reef offshore wind park, located in Danish waters.

A main steel pile is driven into the seabed by means of a hydraulic hammer. Then the transition piece with built on service platform for operation & maintenance and the connecting flange to the wind turbine tower is grouted onto the pile.

In order to connect the WTGs to the grid, the foundations have internal J tubes for the installation of submarine cables. These interconnect in three groups of 10 WTGs, each group having its own export cable to the onshore substation.

Figure 3: Installation of the transition piece onto the monopole foundation. Photo: Chris Laurens

Cabling

The sea cables meet the shore at Hampton Pier and then continue underground for 2.5 km through the town of Herne Bay. The onshore installation route required the cables to cross the railroad and the main road to EDF Energy's substation in Herne Bay.

Figure 4: Cable installation from barge. Photo: Chris Laurens

The offshore cables were installed on the Flats by means of a special purpose cable installation vessel.

The three main export cables, weighing a total of ~900 tonnes, were ploughed approximately 1.5 metres into the seabed, whereas the cables between the turbines were water jetted into the seabed.

The wind farm is connected to the grid by means of three independent export cables, each exporting the power from 10 turbines. The export cables are operated at 33 kV and terminated in a dedicated switchgear located in EDF Energy's 132/33 kV 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 optical fibre cables for remote communication with the WTGs.

Pre-assembly of wind turbine

The turbine components were shipped to the port of Felixstowe from Vestas' production units in Denmark and Germany by means of special vessels. A comprehensive logistics programme was then completed in Felixstowe harbour, where fitters undertook pre-assembly of the component parts, consisting of tower sections, nacelles, hubs, blades, cables.

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

Batches of two complete WTG subassemblies were transported on a special adapted vessel to the Kentish Flats site. Here, three lifting operations were required for a complete wind turbine erection. The first lift was the complete tower, the second lift was the nacelle with 'bunny ears' blade configuration and the third lift was the final blade, which completed 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.

Figure 5: A2SEA “Sea Energy”. Photo: Chris Laurens

After the above procedure was completed, teams of installation engineers were transported to the turbines by boat in order to perform commissioning, energizing and tests prior to taking over the plant. Low wind speeds in the Autumn 2005 delayed the over speed test on some WTGs, which then delayed the schedule for the individual WTG tests, and the overall wind farm test.

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 up to 12 meters above sea water level;
- Radar installed at one turbine - integrated into the surveillance system used by the Port of London, and
- Safety zone (with a radius of 50 meters) around each turbine.

ANNUAL OPERATIONAL REPORT 2008

PERFORMANCE REPORTING

Availability

Availability means the accumulated time in which each turbine is operating or is ready and available for operation. Included in the wind turbines readiness are the periods of time when there occurs:

- Force majeure events;
- Electrical outage of the export grid;
- Meteorological conditions outside the agreed limits of the turbines main specifications;
- Stoppages ordered by the Employer or by third parties e.g. Authorities not related to the operation of the wind turbines, and
- Scheduled service.

Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
A1	80.2	91.9	98.1	74.9	94.6	97.8	95.9	94.7	93.8	97.0	99.5	100	93.2
A2	96.2	99.9	99.2	96.5	0	70.8	91.5	91.6	58.0	99.2	93.6	98.5	82.9
A3	76.0	97.4	99.1	100	96.2	4.4	0	0	0	72.3	99.9	96.7	61.8
A4	99.4	98.1	98.7	99.9	99.2	100	99.1	96.9	99.9	99.5	86.3	45.7	93.6
A5	25.4	93.3	94.7	98.7	99.1	99.7	99.9	94.4	99.9	93.6	97.9	95.0	91.0
B1	66.1	35.1	99.2	99.3	99.1	100	96.9	74.6	99.7	97.8	80.8	81.0	85.8
B2	98.3	49.8	95.4	60.3	92.8	99.4	93.3	94.8	100	83.8	99.7	87.7	87.9
B3	99.4	98.5	99.9	99.9	99.5	100	99.7	97.3	99.5	99.6	99.8	99.4	99.4
B4	98.3	98.7	98.6	99.9	96.7	99.9	100	78.0	34.7	98.5	98.0	97.6	91.6
B5	72.4	67.4	98.8	99.9	99.1	96.3	100	97.3	99.9	99.6	100	99.6	94.2
C1	99.5	79.8	99.9	100	99.6	98.9	99.9	97.4	96.8	94.2	98.3	100	97.0
C2	70.7	51.6	88.0	94.2	7.6	100	99.9	90.4	100	99.9	100	99.9	83.5
C3	93.8	97.4	99.9	100	85.0	99.9	97.5	96.9	77.6	68.3	95.8	100	92.6
C4	99.4	98.5	98.5	76.4	0	85.1	99.7	97.0	89.9	98.5	99.8	100	86.9
C5	96.4	100	92.5	100	96.6	99.8	99.9	88.7	0	70.0	86.2	83.0	84.4
D1	91.0	99.2	82.2	100	99.4	100	100	94.2	99.8	99.6	73.4	47.2	90.5
D2	97.5	94.7	99.8	93.0	97.6	100	98.0	76.2	1.4	94.8	99.2	87.6	86.7
D3	99.6	88.2	99.2	99.0	99.5	99.1	100	96.6	99.3	94.2	56.5	0	85.9
D4	71.4	98.9	99.9	89.9	97.9	99.7	99.8	96.3	99.9	100	99.5	99.3	96.0
D5	1.8	85.9	99.1	99.8	99.1	82.6	99.9	97.2	99.9	94.8	100	100	88.3
E1	100	98.1	99.2	99.3	100	99.8	100	95.9	96.2	99.7	100	99.6	99.0
E2	99.6	98.8	99.9	100	99.5	99.9	99.9	99.7	94.0	88.6	91.5	76.8	95.7
E3	0	91.9	99.9	99.9	99.1	97.5	100	100	92.5	94.9	100	95.6	89.3
E4	97.4	92.1	99.9	100	99.0	99.8	98.1	99.9	81.3	87.0	100	99.7	96.2
E5	91.1	98.5	99.9	100	91.0	99.8	99.9	97.1	98.5	99.6	99.8	96.6	97.6
F1	73.8	19.4	96.9	98.3	100	95.4	97.6	96.2	100	96.1	100	99.6	89.7
F2	99.1	99.3	64.1	0	0	51.7	99.9	99.9	84.8	96.0	92.4	100	73.9
F3	52.3	71.3	96.6	97.2	95.7	99.7	100	98.8	97.5	99.6	100	99.5	92.3
F4	0	27.7	90.1	99.0	99.3	99.4	100	99.8	97.4	99.9	100	98.8	84.3
F5	85.7	98.3	90.2	99.9	98.7	91.8	96.0	62.6	8.8	98.3	94.6	99.9	85.3
Avg	77.7	84.0	95.9	92.5	84.7	92.3	95.4	90.0	80.0	93.9	94.7	89.5	89.2

89.2 %

Table 3: Average Contractual Availability in 2008

Average contractual availability for 2008 was 89.2 %, compared to 73.5% in 2007 and 87% in 2006. Turbine availability has been affected mainly due to bearing failures in the planetary gear stage, resulting in several gearbox exchanges.

The operational availability is defined as the actual turbine availability regardless of any downtime. The operational availability is calculated at 89.1%, only 0.22%-point less than the contractual availability, due to the fact that nearly all the risks (except those mentioned) are covered by the manufacturer guarantee.

Wind speed

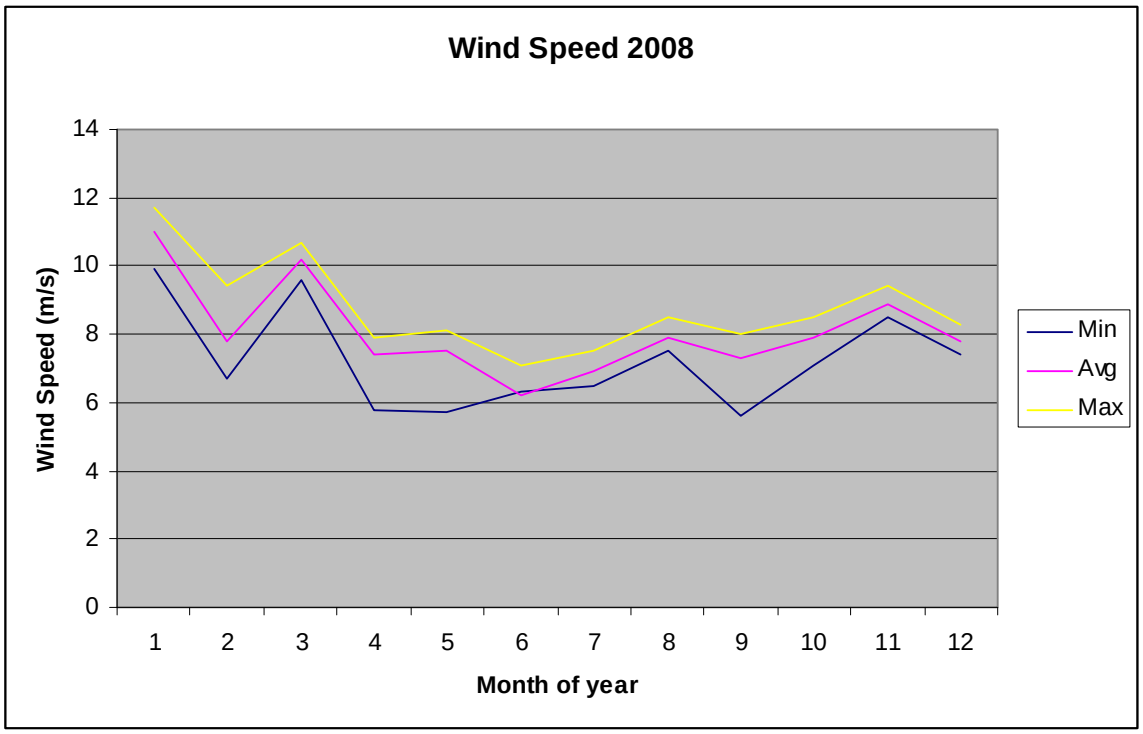

Figure 6: Monthly average wind speed at hub height.

Yearly average wind speed was calculated at 8.0 m/s compared to the long term wind speed estimate of 8.7 m/s at a height of 70 m in a 'normal year'. This compares to 7.8 m/s in 2007 and 8.0 m/s calculated in 2006. Wind speed was calculated as an average anemometer signal from the Wind Turbines' Scada system, and not from the Met mast, due to a faulty electrical cable. Wind vane and anemometers are currently being replaced, and work will be completed on 30th April 2009. The individual wind speed signals are not calibrated and so the average value is presented.

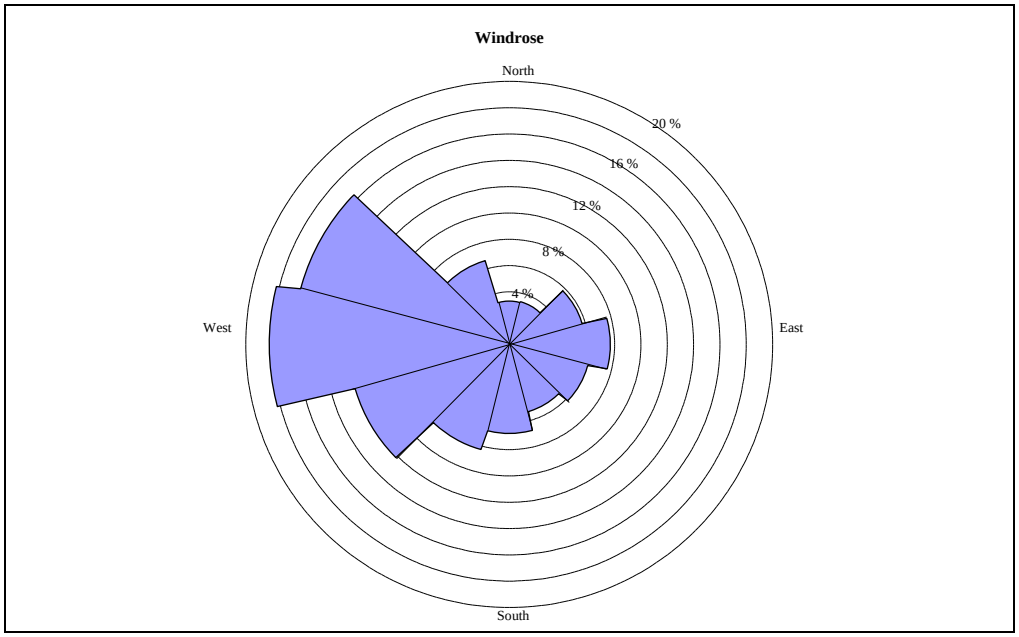

Figure 7: Windrose (Power)

Power output

Month	Period length	Import	Theoretical production at Maximum rated output	Gross Power exported	Capacity factor
	Days	MWh	MWh	MWh	%
January	31	22	66,960	32,980	49.3%
February	29	65	62,640	19,100	30.5%
March	31	16	66,960	33,786	50.5%
April	30	56	64,800	20,056	31.0%
May	31	64	66,960	19,215	28.7%
June	30	82	64,800	13,395	20.7%
July	31	62	66,960	17,748	26.5%
August	31	54	66,960	21,592	32.2%
September	30	50	64,800	15,667	24.2%
October	31	64	66,960	22,400	33.5%
November	30	26	64,800	27,200	42.0%
December	31	42	66,960	22,000	32.9%
Total	**366**	**603**	**790,560**	**265,139**	**33.5%**

Table 4: Power Input, Output and Capacity factor

Annual power production was reasonably high in 2008, due to strong winds in the early part of the year. Exported power was significantly higher in 2008 compared to previous years: 27% more than in 2007 (209,444 MWh) and 16% more than in 2006 (227,977 MWh).

The annual power production of 269 GWh was 5.6% lower than the budget of 285 GWh. This was due to mechanical failures in the gearboxes.

Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
A1	1,193	708	1,252	586	733	492	625	851	572	830	1,054	886	9,782
A2	1,399	820	1,222	721	0	464	575	763	313	840	932	859	8,908
A3	1,056	802	1,228	742	664	0	0	0	0	542	1,010	799	6,843
A4	1,465	804	1,205	751	683	513	652	810	690	854	808	366	9,601
A5	313	708	1,101	760	718	508	667	786	686	770	973	777	8,767
B1	1,046	311	1,213	770	780	509	617	507	701	839	708	684	8,685
B2	1,435	453	1,119	403	668	456	611	823	691	638	1,006	726	9,029
B3	1,404	757	1,173	737	716	497	631	817	679	828	981	825	10,045
B4	1,460	784	1,179	739	716	497	638	764	219	813	972	824	9,605
B5	1,130	440	1,175	742	734	449	653	811	699	826	983	811	9,453
C1	1,380	597	1,207	751	782	489	603	777	628	810	995	864	9,883
C2	1,055	395	1,063	657	18	487	626	747	684	825	988	818	8,363
C3	1,296	740	1,151	697	568	469	568	760	505	467	912	818	8,951
C4	1,410	773	1,153	460	0	441	603	770	538	770	970	792	8,680
C5	1,401	800	1,082	736	733	493	641	787	0	512	898	617	8,700
D1	1,303	759	999	735	786	482	620	752	674	829	652	355	8,946
D2	1,357	697	1,174	629	735	464	601	683	19	731	964	686	8,740
D3	1,371	587	1,150	711	766	454	593	743	664	708	469	0	8,216
D4	1,049	756	1,153	695	729	468	612	761	688	801	964	797	9,473
D5	22	615	1,184	745	767	338	654	831	716	804	1,006	810	8,492
E1	1,395	761	1,205	740	803	480	617	759	636	819	1,007	850	10,072
E2	1,374	763	1,174	722	782	456	589	761	643	655	842	626	9,387
E3	0	649	1,163	715	778	433	591	760	541	705	968	784	8,087
E4	1,390	735	1,160	722	773	471	611	776	468	742	975	792	9,615
E5	1,307	799	1,191	748	693	497	650	838	699	802	987	777	9,988
F1	1,104	138	1,178	735	837	465	616	747	690	807	1,007	870	9,194
F2	1,375	752	778	0	0	356	608	747	549	693	882	848	7,588
F3	723	432	1,160	718	805	471	616	780	680	804	981	813	8,983
F4	0	224	1,065	735	811	478	629	790	700	811	998	819	8,060
F5	1,290	806	1,120	773	815	475	652	537	60	821	938	844	9,131
Total	33,503	19,365	34,377	20,375	19,393	13,552	17,969	22,038	16,032	22,696	27,830	22,137	**269,267**
Total production = 269,267 MWh													

Table 5: Monthly power production (MWh) in 2008 for each WTG

The exported power of 265,139 MWh shown in Table 4 above is 1.5% less than the power produced by the wind turbines: 269,267 MWh per Table 5. This loss is accountable within the transport cables to the onshore substation and is within expected limits. Cable and transformer losses in 2007 and 2006 were 1.4% per annum.

OPERATIONAL REPORTING

Operational and Maintenance (O&M) Cost

Vestas Offshore operate the Kentish Flats Offshore Windfarm on a five year O&M contract; the operational and maintenance costs are mainly covered by the O&M contract with Vestas. The value of this contract is not available to the general public, but an approximate breakdown of costs has been calculated as follows:

	2006 (1st year)	2007 (2nd year)	2008 (3rd year)	comments
Operating and maintenance costs	1,300,000	1,375,000	1,100,000	
Administration	100,000	75,000	70,000	
Import power	120,000	190,000	85,000	ref. Note1
Surveys	130,000	110,000	35,000	ref. Note2
Insurance	450,000	430,000	400,000	
Lease & rent	250,000	245,000	400,000	ref. Note3
Grand total in £	**£ 2,350,000**	**£ 2,425,000**	**£ 2,090,000**	

Table 6: Breakdown of O&M costs for years 2006 to 2008

Notes:
1. A payback for miscalculation of reactive power, has resulted in lower import power expenses;
2. Surveys were completed during 2008 and so expenses have decreased significantly, and
3. Increase due to cable wayleave from Hampton pier to substation.

Cost in £	2006 (1st year)	2007 (2nd year)	2008 (3rd year)
per MW Installed	£26,100	£26,900	**£23,200**
per wind turbine	£78,300	£80,800	**£69,700**
per MWh produced / exported	£10.31	£12.30	**£7.90**

Table 7: Annual O&M costs by performance indicator for years 2006 to 2008

Due to higher generated electricity volume during 2008 and reduced costs, the average cost per MWh is significantly lower in 2008 than the first two operational years 2006 and 2007.

Operational issues

All work performed on the wind turbines can be categorised as either planned or upgrade activities.

Planned work

The annual planned work included:

- Annual Full Turbine Servicing;
- Mandatory HV Equipment Inspections;
- Safety Inspections of climbing equipment. PPE audit carried out;
- Lift inspections every six months. Inspected by a specialist company ‘LGH’ and Avanti;
- Annual Inspections of Fire Fighting Equipment;
- Audit of all offshore transfer vessels;

- Environmental Surveys as agreed within the Site Consent, and
- Ongoing CIM (Component Improvement Management).

The annual Full Turbine Service was performed in August/September 2008 according to Vestas' service standards and no unexpected failures were found.

Upgrade / Scheduled work

Task	*Year To Date*	*Project*
Gearbox Changes	20	CIM Upgrade
Gearbox Commissioned	17	Scheduled
Hub Re-alignment	20	Scheduled
DE Ground Brush Installation	18	CIM Upgrade
DE Bearing Replaced	18	CIM Upgrade
NDE Bearing replaced	20	CIM Upgrade
Internal Rotor Cable Changes	20	CIM Upgrade
External Rotor Cables	20	CIM Upgrade
Prop V/Vs	1	Scheduled
Accumulators	16	Scheduled
Hub Door Changes	1	CIM Upgrade
Oil Samples	37	Scheduled
6 month Lift Checks	60	Scheduled
Nav Light checks	8	Scheduled
TX Brackets	9	CIM Upgrade
Pitch Upgrades	2	CIM Upgrade
Fire Extinguishers	30	Scheduled
Yearly Service	30	Scheduled
Generator Exchange	20	CIM Upgrade
Voltage Contactor	30	CIM Upgrade
Roof Brackets	30	CIM Upgrade
Hydraulic Coupling	29	CIM Upgrade
Safety Key Boxes	30	CIM Upgrade
Hub Door Locks	30	CIM Upgrade
Skii Pack Exchange	26	CIM Upgrade
Encoder Change	4	CIM Upgrade
Rotor Lock Bolt Change	31	CIM Upgrade
Capacitor Cable Exchange	29	CIM Upgrade
Logo Exchange	12	Project
Numeric ID Lights	15	Project

Table 8: Component Improvement Management (CIM) and Scheduled works

During 2008, a total of 20 gearboxes were exchanged due to failures on bearings in the planetary gear stage. Following an evaluation based on the endoscope inspections and technical reports, it was agreed by Vestas and the gear manufacturer to replace these 20 gearboxes with the newly tested upgraded solution. This upgraded solution will be applied to the remaining WTGs at a later date.

Due to the extent of the work this has been governed under the Construction Design Management (CDM) regulations 2007.

Vestas acted as the principal contractor and SeaRoc represented Kentish Flats Ltd as CDM co-ordinator during the gear exchange programme.

As part of the ongoing generator exchange and refurbishment program, a total of 27 generator exchanges have been completed since 2007. These generators have been exchanged due to the following faults:

- Damage on internal rotor cable and rotor cable connection;
- Drive End (DE)/Non-Drive End (NDE) shaft intolerance, and
- Grounding of DE and NDE bearings to avoid current passage.

One of the remaining generators was refurbished offshore and the remaining two will be exchanged during 2009.

Other unscheduled tasks (ad hoc activities) performed during 2008 included:
- Numeric ID Lights: 15 turbines, and
- 12 turbines had their logo exchanged, and the remaining 18 will be completed during 2009.

HEALTH & SAFETY

The health and safety standards at Kentish Flats are considered to be excellent, which is reflected in the low occurrence of incidents during 2008 and earlier years.

The statistics for 2008 are as follows:
- 0 Deaths;
- 0 Medical Treatment Injuries (casualty department / hospital);
- 2 Minor Injuries (local site first aid only), and
- 0 Incidents.

Medical Treatment Injuries:

Minor Injuries

- Thumb trapped between two magnets, and
- Burn to arm whilst soldering.

Near Miss / Safety Observation Reports:

A total of 38 hazardous reports were made in 2008.

Incidents:

No incidents were reported in 2008.

Proactive Safety Initiatives:

In order to support a continuous improvement of safety standards at the site a number of initiatives have been put in place:

- All safety and environmental incidents are reported through the Operators HSE system in copy to the owner Vattenfall;
- Incidents are reviewed at regular O&M meetings;
- Compulsory use of Method Statements / Risk Assessments;
- Initiative to get near hits reported by focusing on legitimacy on reporting, and
- Monthly Site Safety audit.

Access Arrangements

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

Transfer can take place at wave heights of 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 counts as a 'Weather day'.

Figure 8: Transfer from the 'Celtic Storm'.
Photo: Erik Slot, Vattenfall

Remote Monitoring System

The wind farm has a 24-hour surveillance system called SCADA (Supervisory Control and Data Acquisition) in operation, which is located both at Whitstable harbour and at the Vattenfall Central Operation and Maintenance Surveillance Centre located at Esbjerg in Denmark.

The daily monitoring of the SCADA system enables the experienced operators to have a complete overview of all turbines and, therefore, they are able to monitor daily production, and of course can take action if any abnormalities occur.

From the onsite control room at Whitstable, a parallel 2Mbit ADSL connects to the control room in Denmark, which enables a complete overview of the wind farm operation.

By mid 2009 Vattenfall will move into a brand new WindPower O&M centre including a modern 24/7 Operations Centre, where all Vattenfall wind turbines will be monitored and controlled.

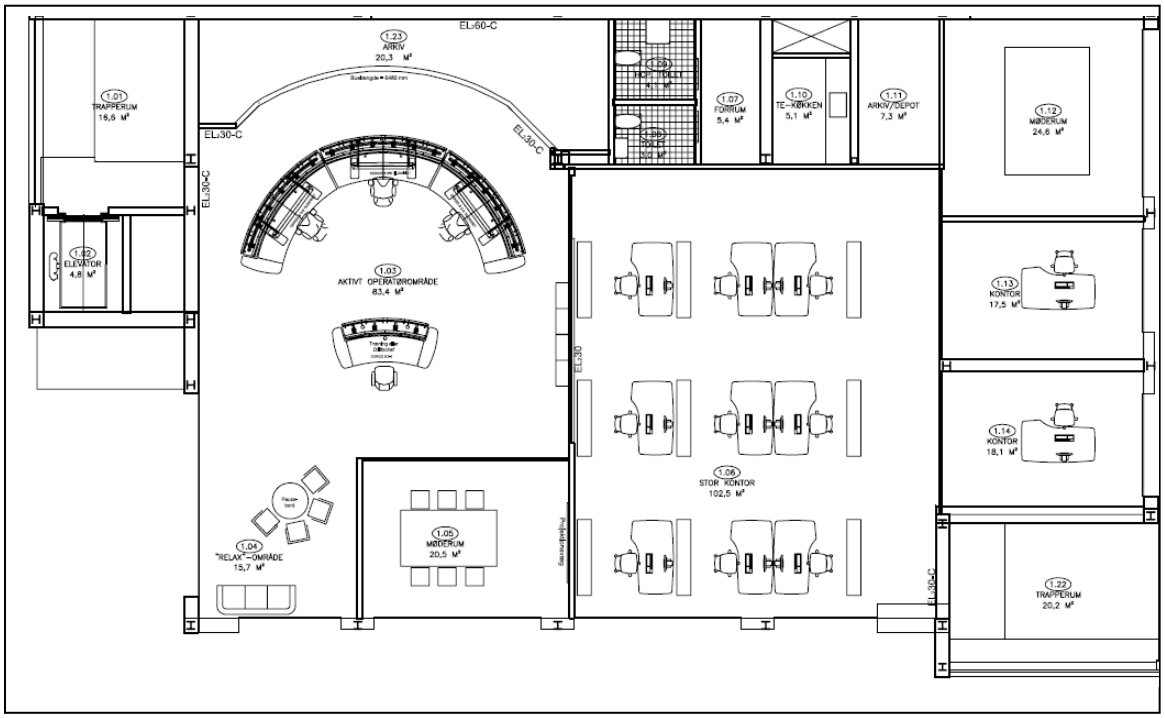

Figure 9: Lay-out of the Vattenfall Wind Power “24/7 surveillance centre” floor in the new O&M building in Esbjerg, Denmark.

Weather days

Weather days, which are defined as days where access to the turbines is not possible, influence the availability, but do not jeopardize the contractual availability, as this is included in the contract on the contractor's account.

Month	Weather days	Monthly %
January	14	45.2%
Febuary	4.2	14.5%
March	16.4	52.9%
April	8.2	27.3%
May	8.0	25.8%
June	3.0	10.0%
July	0	0%
August	6.0	19.35%
September	5.0	16.7%
October	10.4	33.5%
November	8.4	28.0%
December	5.0	16.13%
Total weather days 2008 = 88.6 days		

Table 9: Weather days in 2008

The Kentish Flats wind farm is located in sheltered waters, which makes it difficult to estimate over an extended period of time. Weather days can vary and in 2008 there was recorded a total of 88.6 weather days, compared to the previous years totals of 89 days in 2007 and only 31 days in 2006.

ENVIRONMENTAL MONITORING

The three-year post-construction monitoring programme largely ended at the end of 2007. During 2008, environmental monitoring was therefore limited to the reporting of a number of the monitoring programmes that ended in 2007 and the completion of the final monitoring study relating to the colonisation of the turbine foundations. The following summary therefore deals with:

- The final bird survey report (published July 2008);
- The final benthic ecology survey report (published June 2008);
- The turbine foundation colonisation survey report (published November 2008), and
- The final Kentish Flats monitoring summary report (in preparation).

In addition, Vattenfall has commissioned some voluntary additional bird monitoring over the winter 2008/2009 period to investigate potential effects on Red Throated Divers and this is described.

Bird Monitoring

Boat based and aerial bird survey data were collected in and around the Kentish Flats area during 2007 (covering the operational phase). Data has been analysed and reported in July 2008, in relation to the key ornithological monitoring objectives set out under the FEPA licence issued by the Marine and Fisheries Agency (M&FA).

The data collected in 2007 continued to suggest the avoidance of the immediate operational wind farm area by red throated diver (although not at statistically significant levels) tending to confirm observation made from the 2006 data.

However, unlike 2006 a small number of red throated diver were seen within the turbine array on a number of occasions during 2007. This may suggest the potential for longer term habituation by red throated divers. That said, it remains the case that the Kentish Flats wind farm area and surrounding area have always been of relatively low importance for red throated diver when compared to other parts of the Thames Estuary.

In relation to other bird species, there is a suggestion of some reduction in numbers of lesser black-backed gulls and guillemot during operation when compared to pre-construction. No change in densities of gannet, cormorant, great black-backed gull, herring gull and common tern was apparent. However, there is an indication that some slight change to common tern flight lines may have occurred, although effects on the Medway tern breeding colonies is not considered to be significant.

Additional Voluntary Bird Monitoring Programme

Vattenfall, as owners of the Kentish Flats Wind Farm, are committed to increasing knowledge of the environmental effects of offshore wind farm development. As a result, it has been decided to continue focused boat monitoring work at Kentish Flats to investigate trends in the distribution and populations of red throated divers in and around the wind farm (this being done outwith the requirements of the FEPA monitoring programme which has now come to an end with the agreement of Natural England).

A number of boat surveys will be completed over the period December 2008 to March 2009 and the data will be analysed and reported during the first half of 2009. It is currently anticipated that this voluntary monitoring will also continue through the winter 2009/2010 period.

Monitoring the Benthic Ecology

Samples collected from the seabed in and around the Kentish Flats site during May 2007 have been analysed and were reported in June 2008, representing the final benthic monitoring survey required under the FEPA licence issued by M&FA.

Comparison of the 2007 data to the pre-construction monitoring data indicates that there have been no significant changes to the benthic fauna across the wind farm area attributable to the construction or operation of the Kentish Flats project, although natural variation in the composition of the benthic faunal communities has been observed.

Turbine Foundation Colonisation Survey

A one-off diver survey of two turbine foundations at Kentish Flats was completed in July 2008, where video, stills photography and samples were collected and analysed to describe the fauna colonising the foundations, as required by the FEPA licence issued by M&FA. The survey described three distinct zones related to depth below sea level including an upper barnacle zone; a mid level dominated by mussels and a lower level dominated by anemones alongside a range of other fauna and predated by starfish. The zonation and associated fauna is considered typical of that recorded in UK waters.

Figure 10: Mussel growth at foundation. Photo: EMU Ltd

Review of the Monitoring Programme

The first Kentish Flats monitoring summary report was published in August 2007 and summarised most of the surveys completed under the monitoring program laid out by the FEPA licence issued by M&FA. Pending consideration of the outstanding surveys (including those above), it was agreed that the monitoring program has satisfied the licence conditions set out in the FEPA licence and no further environmental monitoring will be required at Kentish Flats Offshore Wind Farm.

In order to complete the monitoring requirements, a final monitoring summary report incorporating all of the survey work completed, including those listed above, is planned. This will be produced early in 2009.

Figure 11: Vattenfall facilities Whitstable Harbour. Photo: Erik Slot, Vattenfall.

PUBLIC RELATIONS

Once again, Vattenfall welcomed visitors to our local office at the harbour in Whitstable. We at Vattenfall take relationships very seriously, and are always open to the general public.

At the yearly Oyster festival, Vattenfall were on the keyside, and were once again ready to show commitment at the traditional tug of war, on the beach.

At a recent meeting, the Whitstable Harbour Board stated that not only do Vattenfall have a fantastic relationship with the local community, but that our financial contribution to the community and harbour infrastructure was highly valued.

Coast Guard Search & Rescue (SAR) exercise

The SAR helicopter requested a visit to exercise its onboard equipment. All methods of tracking vessels and potential personnel in the water were used.

An exercise was also performed on a WTG with the rotor locked to establish the effects of the down force generated by the helicopter on the blades and nacelle.

At the Kentish Flats Wind Farm we train to descend a casualty from the nacelle, either internally or externally and then to transfer to the vessel. A pick up from the vessel to helicopter can then be made if necessary outside of the Windfarm and clear of the WTGs.

Figure 12: Vestas Offshore. Photo: Andrew Dever.

References:

- Main report written by Paul Thomson, Site co-ordinator Kentish Flats Ltd and Erik Slot, Owner's representative, Kentish Flats Ltd.
- Project description figures etc. Input mainly from Vattenfall Engineering Wind. Dept.
- Operational matters and HSE. Input from Operations Manager Andrew Dever, Vestas Offshore
- Wind and wind rose data processed by Torben Rokkedal, Vestas and Per Wriedt, Vattenfall.
- Reports taken from Vestas Online Scada system.
- Vestas Monthly reports for Kentish Flats 2008.
- Environmental reporting, Steve Bellew, OES UK.
- Meter data and advice notes from EDF Energy and Smartest Energy Ltd.
- Accountant Gary Chapman, Warrener & Stuart, London.

This report was prepared by Vattenfall VindKraft A/S.

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