Capital Grant Scheme for the North Hoyle Offshore Wind Farm

Annual Report: July 2005 – June 2006

EXECUTIVE SUMMARY

Built in 2003, North Hoyle is the UK's first major offshore wind farm and represents a major milestone in the UK's drive towards cleaner sources of power.

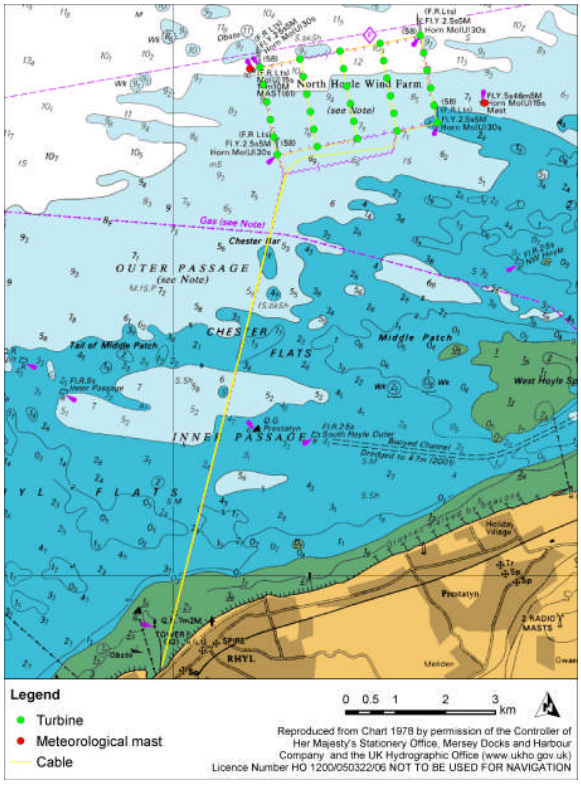
The project is located 4-5 miles off the North Wales coast between Rhyl and Prestatyn and comprises 30 Vestas V80 2MW wind turbines.

The majority of the offshore construction work at North Hoyle was carried out during 2003. The work was carried out by The North Hoyle Consortium, a consortium of two UK companies – Vestas Celtic Wind Ltd and Mayflower Energy Ltd.

Total overall final project cost totalled £81m (prior to grant) which equates to £1.35m/MW. The DTI grant for the project of £10m reduced the total cost to £1.18m/MW.

The wind farm has successfully completed its 2nd full year of operation achieving 89.1% availability without any significant Health & Safety incidents. The ownership of the wind farm changed in December 2005 from npower renewables to Beaufort Wind Limited.

SITE PLAN



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CONSTRUCTION

1. Overview of the Construction Programme

The approximate timeline for the different components of construction was as follows:

- Wind turbine foundations — April 2003 – July 2003
- Boat landings — June 2003 – August 2003
- Transition pieces — July 2003 – August 2003
- Export Cables — August 2003 – October 2003
- Wind turbines — August 2003 – March 2004
- Offshore cable works — September 2003 – December 2003
- First power generation — November 2003

2. Description of Construction Methods:

The construction methods used at North Hoyle, together with a description of those issues which impacted on the original programme schedule, are set out below

- Construction of foundations;

  30 Tubular steel piles (monopiles) were fabricated in Holland by Smulders BV and transported to Port of Mostyn by barge in groups of 4. Foundations were designed by LIC engineering and the design is certified by Germanischer Lloyd. After delivery monopiles were temporarily stored in a compound at Mostyn. Steel stoppers were then fitted to both ends of the monopiles which were then floated to site and lifted to the exact final position by the installation barge Excalibur. The pile was then installed into the sea-bed by a combined drive - drill - technique. The pile was initially driven through upper sand and clay layers, then a hole was drilled into the underlying rock layers and the pile finally driven into this hole. After the pile was installed the transition piece was landed and grouted in place from the jack up vessel the Wind. The J-tubes for protection of power cables and turbine access ladders were then installed on hangars and bolted into place from the barge Forth Guardsmen.

- Erection of towers

  The towers and nacelles were delivered to Port of Mostyn by barge from the fabrication yard at Cambeltown in the West of Scotland. Towers were lifted onto the transition pieces then bolted into place. The first 27 towers were installed by the MEB JB1 and Seacore Excalibur vessels, with the final three towers being installed by the Mayflower Resolution.

- Installation of nacelles

  Nacelles were assembled in Cambeltown and delivered to Port of Mostyn by barge and road. Final assembly and checking of the nacelle were completed in Mostyn. Nacelles were then delivered to site by barge and lifted into position by the construction jack-up vessels. Nacelles were then bolted into place on top of the towers. Delays of varying degrees to nacelle installation were caused by ground

conditions, weather conditions (preventing lifts) and also storm damage to one of the construction vessels.

- Fixing of blades to hubs

  Nacelles were installed on the towers in a "bunny-ears" configuration, with two blades attached. The third blade of each machine was bolted onto the hub of the nacelle after the nacelle was in position on top of the tower. Some delays to blade installation were caused by high wind speeds preventing safe lifting.

- Power cable installation and connection.

  Power cables were installed by two different methods offshore. The inter-array cables were installed by a new remotely operated vessel, the LBT1. The inter-array cables were wound directly onto a drum on the LBT1 and were unrolled into a trench cut by the vessel on the seabed. Some programme delay was experienced due to the late arrival of the LBT1 from the fabrication yard in Middlesborough.

  The beach to wind farm cables (the export cables) were installed by a new plough constructed in Newcastle which arrived on site on time. The plough was towed behind the vessel the Pontra Maris and the cable was dragged into the trench behind the plough.

  The export cables were connected to land based cables installed into buried ducts in Rhyl, connecting through to the substation and the grid at the Manweb compound next to the technical college in Rhyl.

- Installation vessel issues

  It was originally intended for the Mayflower Resolution to install all monopiles, towers and nacelles at North Hoyle and also support the installation of inter-array cables by the LBT1. This brand new and purpose-designed vessel experienced a substantial delay in delivery from the shipyard. This impacted on the North Hoyle build programme in various ways, however major delays were avoided by procuring and adapting existing construction vessels (MEB-JB1 and Seacore Excalibur) to undertake the work originally intended to be undertaken by the Resolution.

WIND FARM ANNUAL OPERATIONAL INFORMATION

PERFORMANCE REPORTING

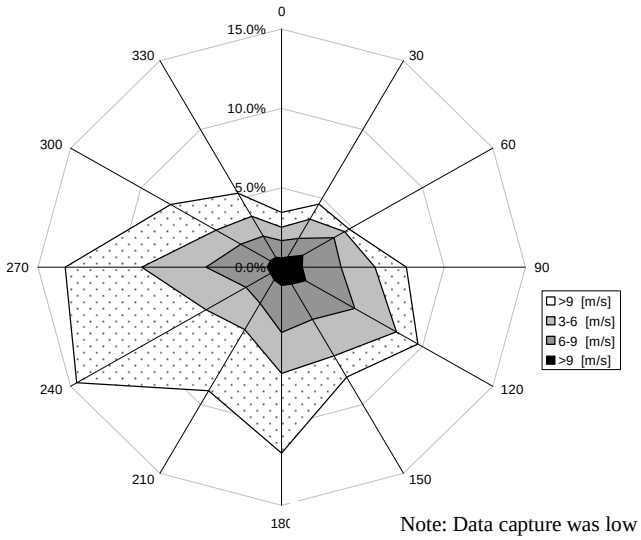
1. Availability (%)

	Wind turbine and wind farm commercial availability (%). (Note reported availability considers scheduled servicing and non-access time as unavailable time)												
	Jul 05	Aug 05	Sep 05	Oct 05	Nov 05	Dec 05	Jan 06	Feb 06	Mar 06	Apr 06	May 06	Jun 06	Overall
Overall	86.9	84.3	88.7	95.1	92.9	94.6	94.0	91.0	94.2	94.4	89.0	88.1	91.2
												Commercial availability (DNO related downtime assumed as unavailable time)	89.1
												Total Budgeted Availability	91.3

The causes of non-availability are discussed in the Operational Issues Section.

2. Wind speed (m/s) and wind rose

	Mean wind speed at 67 m [1] (m/s)	Gust wind speed at 67 m (m/s)
Jul-04	6.3	21.0
Aug-04	7.4	23.8
Sep-04	7.6	24.8
Oct-04	8.1	26.3
Nov-04	9.3	30.8
Dec-04	8.3	24.6
Jan-05	7.5	25.3
Feb-05	8.2	22.5
Mar-05	8.6	26.1
Apr-05	8.4	27.2
May-05	7.5	24.6
Jun-05	5.8	24.2
Overall	7.8	30.8
Budget	9.0	-



Note: Data capture was low in Sep 05 (~80%) and Feb 06 (~90%).

3. Output (MWh)

	Wind turbine and wind farm net output (MWh) Note production figures use the Wind Turbine Generator Counters, these do not directly correlate to the metered export of the site.												
	Jul 05	Aug 05	Sep 05	Oct 05	Nov 05	Dec 05	Jan 06	Feb 06	Mar 06	Apr 06	May 06	Jun 06	Overall
Overall	10,767	12,276	13,332	16,181	19,111	17,392	14,620	17,301	21,370	16,873	13,406	7,290	179,917
												Total metered output at the point of export	178,958
												Total budgeted output	197,400*

* Note this is the Beaufort Wind Limited P50 budget

The difference between budget and actual output is due to the combined effect of availability and wind speeds. Electrical losses within the wind farm are estimated to be 0.5% based upon the net metered export and wind turbine generator counters.

4. Load factor (Capacity factor, %)

	Wind turbine and wind farm capacity factor (%) Note production figures use the Wind Turbine Generator Counters, and therefore the periods may not correspond exactly to calendar months.												
WTG	Jul 05	Aug 05	Sep 05	Oct 05	Nov 05	Dec 05	Jan 06	Feb 06	Mar 06	Apr 06	May 06	Jun 06	Overall
Overall	23.4	28.4	30.7	36.2	44.2	39.0	32.8	42.7	48.1	39.1	30.0	17.3	34.3
												Budgeted capacity factor	37.6*

* Note this is the Beaufort Wind Limited P50 budget

5. Annual input (MWh, MVAr)

	Imported power (real) (MWh)												
	Jul 05	Aug 05	Sep 05	Oct 05	Nov 05	Dec 05	Jan 06	Feb 06	Mar 06	Apr 06	May 06	Jun 06	Overall
MWh	42.8	27.2	30.1	15.6	14.4	21.6	25.0	24.0	11.7	27.0	29.4	79.2	348.5

No specific import power budget was established at the start of the year (this being part of the overall import electricity line item which includes import power, use of systems costs and metering costs) and reactive power statistics are not available (these are not routinely recorded and have not been invoiced by the DNO).

OPERATIONAL REPORTING

1. Operating and Maintenance Cost

Total annual operating costs in the 2nd year of operation amounted to £2.5m (equivalent to £41k/MW or 1.37p/kWh). Direct comparison against a single budget is complicated by the sale of North Hoyle to Beaufort Wind Limited in December 2005. However comparison against the Beaufort Wind Limited Operating Budget set during the sale in December 2005 shows the wind farm has performed closely in line with expectations. This is not unexpected as the wind farm remains within its warranty period and therefore the availability and non-routine maintenance cost risk (approximately one third of the operating costs) is carried by the manufacturer. The reduction in the O&M costs from last year are due to the costs of contractors completing any outstanding obligations post take over reducing in the 2nd year of operation. Environmental management costs have reduced slightly from the previous operating year.

As highlighted in last years report the following cost items may be subject to significant future changes.

- Continued reduction in environmental management costs relating to a reduced consent compliance monitoring programme (anticipated to be completed in 2007).
- North Hoyle is currently within its warranty period and the availability and non-routine maintenance cost risk is carried by the manufacturer.
- Insurance costs will reflect trends in the insurance markets especially those which provide cover for off-shore wind farms and the wider offshore oil and gas business.

2. Operational issues

The overall availability for the year is reported as 91.2%, examples of major component failures that made a significant contribution to the downtime and significant periods of grid loss are summarised below:

- 2 WTG have suffered extended outages due to generator bearing faults (WTG 23, WTG 30), with the all the repairs being carried out in situ.
- 6 different incidents of extended outages due to gearbox faults:
    - In situ repairs, were made to WTG 20, WTG 1, WTG 6, WTG 24.
    - Gearbox replacements were made to WTG 20 and WTG 27.

- Grid outages. The single event of note was one planned outage during May which lasted 3 days. The preparation and return to service of the turbines further extended the down time.

In addition to the above there is the ongoing operation and maintenance cycle of monitoring, investigation and unscheduled repairs which cause downtime of varying lengths.

The availability of specialist contactors to perform repairs to major components has in a few instances caused some longer repair times than anticipated, reflecting growth and stretched resources in the wind energy market.

The present transfer method is a classical access ladder and boat fender system in which the vessel presses against the outer tubular steel fenders while the technician steps either from boat to ladder or ladder to boat. As a result there are periods when weather and wave conditions prevent travel and transfer to the turbines extending down time. However it is rare for these conditions to persist for more than a couple of days when they do occur. There is clearly a seasonal relationship, with winter access being most affected (particularly November 2005 and February 2006 this operating year).

Planned maintenance has principally comprised the performance of routine 6 and 12 monthly services, some minor retrofit programmes also took place to address specific plant issues. Typically each of these services would require 3 days to undertake and depending on scheduling, can significantly impact the availability of the wind farm during individual months. However, it continues to represent a small proportion of any downtime during the year (<1% of annual availability).

3. Health & Safety

Health & Safety is a high priority and collaboration across the offshore and onshore wind industry is improving Health & Safety Standards and allows lessons learnt from incidents to be shared. More than 10,000 transfers between boat and tower have occurred without major incident at North Hoyle.

A close working relationship with the contractor and regular face to face reviews allow any incidents and near misses to be assessed and actions to improve Health & Safety considered jointly. There have been few incidents in the last year, see summary below:

- A near miss due to a technician ruck sack being dropped from the platform onto the service vessel.
- A strained back due to over reaching whilst undertaking maintenance on a gearbox (no lost time).

4. Environmental

Environmental monitoring has continued over the past twelve months and has focussed on the following areas:

- Ornithology
- Benthic Ecology
- Fish & Fisheries
- Marine Mammals
- Sediments
- Physical Processes

Environmental monitoring to date indicates some small scale changes with variable trends in marine sediment composition, benthic ecology and bird distribution. None of these trends (up or down) can be firmly attributed to construction or operation of the wind farm.

In general, during the construction phase and two years of operation of the wind farm there has not been any significant affects on the environment. Continued monitoring over the next 12 months will provide further evidence to support these early findings.

- **Ornithology**

The ornithological monitoring carried out during the period April 2005 to March 2006 found that more than 2.5 times as many birds were recorded during the boat surveys as in the previous period March 2004 to March 2005 inclusive, but the range of species recorded was similar.

The statistical analyses only found one statistically (highly) significant result. Guillemots appeared to be making more use of the wind farm site since it became operational, the estimated increase being 55%. No other changes were found to be statistically significant.

No conclusions can be drawn from the aerial or boat survey data for any changes in the two qualifying interest species for the proposed Liverpool Bay mSPA which might be attributable to the construction or operation of North Hoyle Wind Farm. Analysis of the mean densities of sea ducks revealed by aerial survey showed no statistical evidence of changes between the pre-construction, construction and operational phases of the wind farm.

The results of the density analyses of boat survey data for divers were also inconclusive because of the small number of occasions when birds were present at both the wind farm site and surrounding buffer zone. The data suggests that the divers may have made less use of the wind farm site since it became operational but there is no clear evidence that this is the case. During the operational phase no conclusions can be made.

Auks were recorded within the wind farm site, although most were observed on the water. Other species such as common and sandwich tern may have flown through the wind farm and a gannet was recorded flying through the wind farm. These observations suggest that for these species any barrier effect is not insurmountable.

- **Benthic Ecology**

At this stage, with two years post-construction data available, it is possible to tentatively suggest that observed variability in the measured benthic invertebrate community parameters is more closely related to factors that are believed to be subject to natural variability, such as local sediment characteristics, than the construction and operation of the offshore wind farm.

Benthic communities would be expected to respond to variation in seabed sediment characteristics, especially particle size, as a primary factor influencing community composition and distribution. The absence of any identifiable trend in sediment particle size characteristics associated with construction of the offshore wind farm suggests that North Hoyle has not, to date, affected benthic invertebrate communities through this mechanism. However, possible reasons behind observed community changes will be further explored.

Overall, the beam trawl surveys presently give no indication of any changes closely related to the development of the wind farm, with variations in species and communities occurring in control areas as well as in and adjacent to the wind farm, and appearing to be within the bounds of natural variation.

- **Fish & Fisheries - CEFAS**

The 2005 CEFAS beam trawl survey report for the Irish Sea examined trends in the relative abundance of the dominant demersal fish species in the eastern Irish Sea region and at the station in the vicinity of the North Hoyle wind farm. Approximately 40 species of demersal fish occur in the vicinity of the North Hoyle site, with about 15 of these abundant. Data from 2005 indicated that catches of most of the abundant commercial species declined slightly from 2004, though the catch rates of fishes at the station near North Hoyle were broadly comparable to previous years for most species. The number of pogge captured at the North Hoyle site was again low, but there were increases in catch rates of scaldfish and tub gurnard, with 2005 catches greater than observed previously. Catches of dab, common dragonet and grey gurnard at North Hoyle also increased in 2005, though catch rates of these species were within the range observed during the overall time series. Catches of the three species of elasmobranch all declined near North Hoyle in 2005, with only spotted rays remaining above the long-term average for the sampling station.

- **Fish & Fisheries - Fisheries Consultation**

During the latter stages of the North Hoyle construction phase (spring 2004), and possibly throughout the summer-autumn of 2004 it appears that fish distributions or behaviour were affected in some way that resulted in poor catches for all sectors. Initially, this appeared to continue into 2005 but from spring 2005 the general impression is that netting (for rays) in close proximity to North Hoyle wind farm picked up and spring fishing was not significantly different from how it was immediately before construction work began.

- **Marine Mammals**

A total of 46 marine mammals were recorded during the period 2003-2006, primarily from boat transect surveys during bird survey work. Harbour porpoise and grey seal were the most commonly observed species. The site-specific sightings data alone indicate that marine mammals do not tend to be seen within the operational wind farm

array; however, other evidence (from CMACS surveys and third party tracking studies) demonstrates that both harbour porpoise and grey seal will enter the array.

The reason for this disparity is not clear. Marine mammal sightings are, in general, relatively rare events in the context of many hours observations at sea and it may be that further monitoring will reveal more animals to be using the wind farm array area.

- **Sediments**

Particle size analysis revealed a heterogeneous sea-bed of fine and medium sands with varied amounts of gravel, the gravel sometimes being dominant. Gravels and sands were fairly evenly distributed over the survey area with no obvious inshore/offshore differences. There has not been a consistent pattern of change in dominant sediment type near to or within the turbine array or along the cable route between 2002 and 2005. As sites both within the wind farm array and in control areas have shown both increases and decreases in coarseness during this period there is no trend present that would suggest that wind farm construction, cable burial or adjustment of hydrodynamic forces due to the presence of the piles in the seabed are responsible for changes in sediment characteristics at each site.

There also continues to be little evidence that the distribution of drill cuttings over the sea bed during construction has acted to noticeably increase the coarseness of sea bed sediments at the wind farm site with most of the wind farm sites having the same, or very similar, sediment classification in all sampling years.

- **Physical Processes**

From the North Hoyle Environmental Statement it has been recognised that the dominant factor in mobilising soft re-workable surface sediment (i.e. sands) at North Hoyle was the action of tidal current (ebb and flood tides). Based upon surveys and subsequent assumptions, backed by coastal processes expert opinion, and from the latest set of surveys (Spring 2006); it can be concluded that, to date, no long term scour is developing at the North Hoyle Offshore Wind Farm.

5. Public relations

The official launch of the North Hoyle Offshore Wind Farm Community Fund took place at Rhyl Lifeboat Station in September 2005. The Fund, set up by npower renewables in partnership with Denbighshire County Council and the Area Partnerships for Rhyl and Prestatyn & Meliden, will provide £60,000.00 (index-linked) into communities local to North Hoyle every year for the 20 year life of the wind farm to support a variety of local community projects.

From the report submitted by Denbighshire County Council to npower renewables in June 2006, the successful applicants in 2005 are shown in the following table.

Distributed by Rhyl Area Partnership	Distributed by Prestatyn & Meliden Area Partnership
Alzheimer Society	Young Firefighters Association
Clwyd Amateur Boxing Club	Jubilee Community Centre
Clwyd Coast Credit Union Ltd	Prestatyn Athletics JFC
Community Mediation North Wales	Disability Resources Centre
Denbighshire Access Group	High School Eco Club
Denbighshire Foster Carers Association	Meliden History Society
Rhyl CREATE	3rd Scouts/Prestatyn Classic Car Show/
Rhyl Week	Prestatyn Flower Show
Russel Court Residents Association	Prestatyn History Club
The Benefit Advice Shop	Community Safety Pop-In Centre
TiC Parents and Friends Association	Nant Hall Church Hall
St Vincent De Paul Society	Meliden Bowling Club
Baby Simulator Equipment	
Community Agency, Rhyl	

This report was prepared by npower Renewables Limited.

For further information on the project contact Ben Furlong, Asset Manager, Ben.Furlong@npower-renewables.com**.**

For further information on the Capital Grant Scheme contact Mark Thomas at mark.thomas@aeat.co.uk or on Tel 0870 190 6286.