P·O·W·E·R
Pushing Offshore Wind Energy Regions

# POWER: Pushing Offshore Wind Energy Regions

## Transnational Offshore Wind Supply Chain Study

Update – June 2007

A Report to the POWER Project

DOUGLAS-WESTWOOD

Interreg North Sea Region

This study was commissioned by Suffolk County Council on behalf of the following partners of POWER's supply chain / economic development work stream:

- Denmark: Offshore Center Denmark
- Germany: Business Development Corporation Nordfriesland (WFG NF); The Senator for Construction, Environment and Transport of the Free State of Bremen; Wind Energy Agency Bremerhaven/Bremen (WAB)
- The Netherlands: Stichting Bedrijfsregio Kop van Noord-Holland, Den Helder; City of Den Helder
- The UK: Suffolk County Council; EEEGr - East of England Energy Group; Waveney District Council

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# 1 Executive Summary

The focus of the offshore wind industry still resides in the southern North Sea area and companies in POWER partner countries are being successful in winning work throughout the region as a whole. Current activity levels are high, with multiple projects currently under construction. Tendering is also well underway for offshore activity in 2008, which is expected to be a record breaking year in the industry. However, growing project costs and supply chain constraints, particularly with regard to turbines, are causing delays. The compound effect of these factors is resulting in slower overall progression in the industry than expected when the *Transnational Supply Chain Study* was first published in 2006. Whilst few projects have been cancelled and many more have been approved, the outlook to the end of the decade has been reduced in scale.

There has been encouraging signs for future market growth: grid connection agreements in Germany; the first 'Round 2' approvals in the UK; tendering for the two large Danish projects; and progress with the next phase of Dutch projects. However, each of the four countries has challenges to overcome to ensure the potential market growth takes place. Acknowledgement of, and solutions to, the industry-wide issues is needed. The economics of offshore wind have become ever more marginal in the last two to three years to a stage where only large utility companies are making progress in project completion. There has been an almost total shift in contracting from EPC to a multiple-contract approach which has had the desired result of reducing levels of risk but it has not sufficiently affected overall costs as much as expected in light of other cost increases. Continued long-term financial support is required to ensure the future marketplace can develop to a stage where new technologies and economies of scale are in place to make offshore wind more viable.

## 1.1 Future Market Outlook

The total global offshore wind capacity forecast for installation between 2006 and 2010 stands at 3 GW. The four POWER countries have a total of 2.4 GW of this total capacity, over 78% of the world market. This shows the considerable importance of Denmark, Germany, The Netherlands and the UK on a global scale.

Total global expenditure in offshore wind is forecast to exceed €6.6 billion for the 2006-2010 period. The POWER countries are forecast a total expenditure of €5.3 billion over the next five years which is 80% of all global offshore wind expenditure.

## 1.2 2006 Global Activity Review

There is currently 919 MW of offshore wind capacity installed worldwide across 20 offshore wind farms in seven countries. A further 200 MW will come online in 2007. 95% of all current capacity is from projects located in the four POWER region countries.

In 2006, two full sized projects were completed, the 90 MW Barrow project off the UK and the 108 MW Egmond aan Zee project off the Netherlands. Additionally, a single 2.5 MW turbine was installed at Breitling in Germany and one of two 5 MW turbines was installed at the Beatrice Demonstration Project off Scotland.

Construction began at the 110 MW Lillgrund project off Sweden, the 90 MW Burbo project off the UK and the 120 MW Q7-WP project off the Netherlands. With the exception of the Q7-WP project, which will be complete in 2008, the other projects are due for completion in 2007.

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# 2 Offshore Wind Market Forecasts

Analysis of the future offshore wind market is presented below for forecast installed capacity and capital expenditure. It should be noted that these figures represent projects installed anywhere off the respective countries and not just inside the specific study areas within those countries.

Previously forecast activity from the original *Transnational Supply Chain Study* is displayed in the charts below to show the significant reduction in capacity now expected online. A current global forecast is also displayed to show the importance of the POWER countries on a global scale. In the capital expenditure forecasts, expenditure is allocated to the year the project comes online.

## 2.1 Forecast Capacity

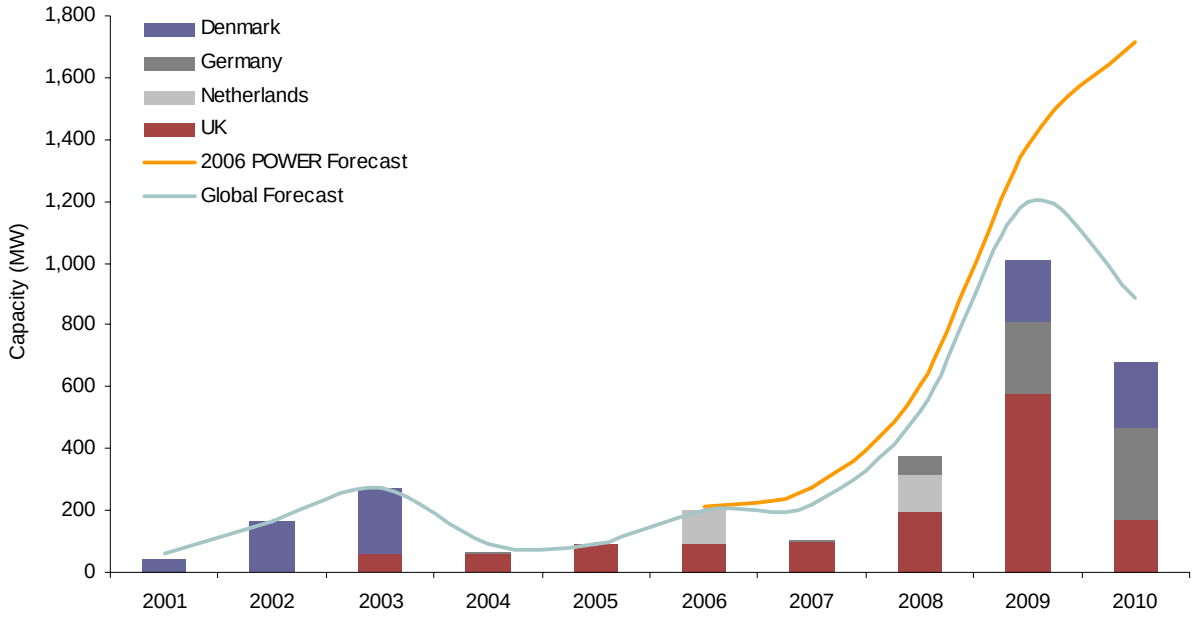


**Figure 2-1: Forecast Annual Capacity MW**

**Table 2-1: Forecast Annual Capacity MW**

| Capacity MW | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2006-2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Denmark | 40 | 163 | 213 | | | | | | 200 | 215 | 415 |
| Germany | | | | 4.5 | | 2.5 | 4.5 | 60 | 231 | 294 | 592 |
| Netherlands | | | | | | 108 | | 120 | | | 228 |
| UK | | | 60 | 60 | 90 | 90 | 100 | 194 | 579 | 172 | 1,135 |
| **2007 POWER Total** | 40 | 163 | 273 | 65 | 90 | 201 | 105 | 374 | 1,010 | 681 | 2,370 |
| **2006 POWER Total** | | | | | | 213 | 272 | 611 | 1,380 | 1,715 | 4,191 |
| **Global Total** | 60.5 | 163 | 273 | 91 | 90 | 201 | 216 | 522 | 1,195 | 885 | 3,019 |

A total of 2.37 GW of offshore wind capacity is expected to be installed in the POWER region in the 2006-2010 period from a total worldwide capacity of slightly over 3 GW.

The UK is expected to be the largest market with over 1.1 GW of capacity forecast, almost twice that of Germany with 592 MW. Remarkably, 2003's record installed capacity will not be bettered until 2008.

The UK's Round 1 projects are continuing to be installed at the rate of one to two per year. The decrease in capacity at the end of the period is due to 'Round 2' projects having slipped back in time

slightly. Construction activity will be taking place in 2010 on a number of large projects (most notably London Array) but completions are not expected until early in the next decade (with the exception of the Thanet project).

Germany has so far seen only minor installations, but the first significant activity is expected to begin in 2008 with the Borkum West project. One completion in 2009 is forecast and two in 2010. The bulk of projects, however, will not begin construction until the turn of the decade.

The only activity off Denmark in the period will come with the construction and completion of the Horns Rev II and Nysted II projects in 2009 and 2010 respectively.

Whilst the Netherlands is currently seeing a period of activity with the completion of the Egmond aan Zee project and construction of Q7-WP, it will not be until after this decade that the next projects are completed. Whilst not reflected in the above forecast, long term prospects are good.

In comparison to the original forecasts conducted for the POWER project, forecast regional capacity for the period to 2010 has reduced from 4,191 MW to 2,370 MW, a reduction of 1,821 MW. The fall in expected capacity is largely due to projects previously expected in 2010 failing to make sufficient progress to ensure completion that year. Current forecasting indicates the completion of just 681 MW in 2010 in comparison to 1,715 MW expected originally. Projects have not generally been cancelled or been rejected, but many have been delayed.

Beyond 2010 we expect annual installations to be maintained at over 1 GW per year, reaching 2 GW per year by 2015. The UK will maintain steady installation rates through to around 2015 but failure to announce a new round of offshore licensing in the next year will likely result in a lull in activity around 2015 after the strongest Round 2 projects have been completed and weaker projects abandoned.

Germany is expected to finally see a steady flow of projects entering construction post 2010. Although installation rates will not initially be as strong as the leading UK market we believe the new grid-connection agreement will prompt major developers to succeed with the leading projects.

New project approvals in the Netherlands confirm potential growth post 2010 although solid market commitment from the government will be needed to ensure long-term confidence can be created.

Denmark’s long term prospects appear to also be strong, although it is not anticipated that significant projects will be built from the current scoping exercise until at least 2012. When development does increase, however, we expect rapid deployment of projects of 200-400 MW in size.

Growth in the next decade is wholly dependent on supply chain development this decade. For example, we currently have strong concerns over turbine installation vessel availability (and pricing). The cost of offshore wind development must display signs of stabilisation going into the next decade to ensure survivability in the longer-term.

## 2.2 Forecast Capex

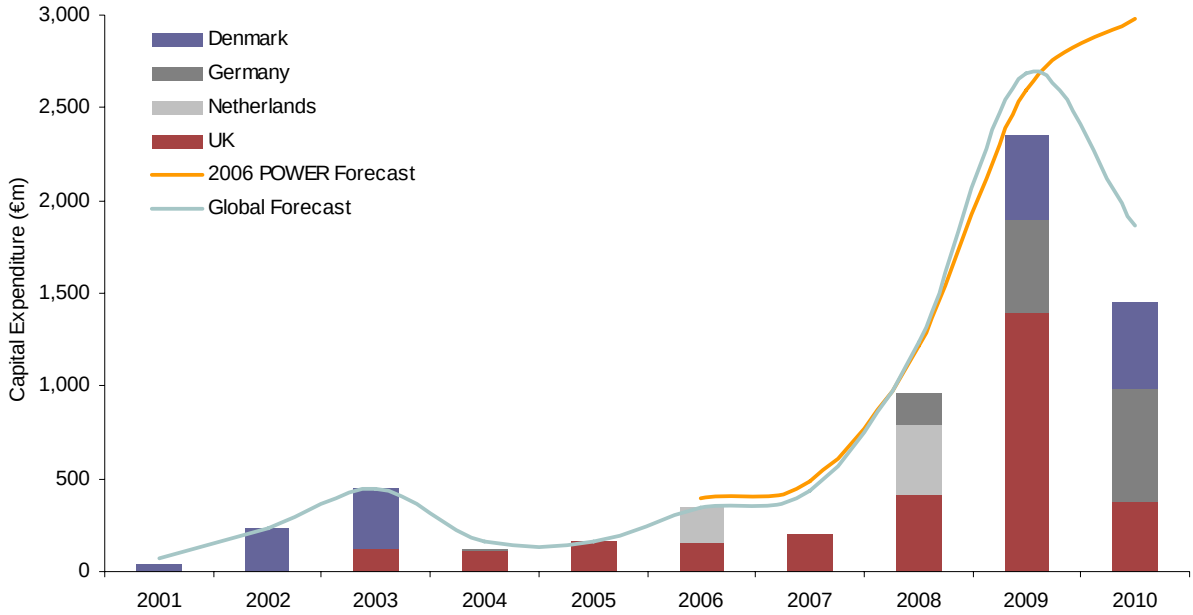


**Figure 2-2: Annual Capex €m**

**Table 2-2: Annual Capex €m**

| Capex €m | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2006-2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Denmark | 42 | 230 | 321 | | | | | | 456 | 467 | 923 |
| Germany | | | | 7 | | 3 | 7 | 170 | 494 | 608 | 1,283 |
| Netherlands | | | | | | 190 | | 374 | | | 564 |
| UK | | | 122 | 113 | 159 | 150 | 200 | 418 | 1,404 | 372 | 2,544 |
| **2007 POWER Total** | 42 | 230 | 443 | 120 | 159 | 343 | 207 | 962 | 2,354 | 1,448 | 5,313 |
| **2006 POWER Total** | | | | | | 396 | 491 | 1,212 | 2,592 | 2,981 | 7,672 |
| **Global Total** | 71 | 230 | 443 | 159 | 159 | 343 | 438 | 1,235 | 2,688 | 1,870 | 6,574 |

The POWER region is expected to see a total capital expenditure of €5.3 billion during the 2006-2010 period. Total worldwide expenditure in this period is €6.6 billion.

The UK, the most valuable market, will attract €2.5 billion in expenditure during the period, peaking at €1.4 billion in 2009. The German market is expected to see almost €1.3 billion spent with Denmark close behind with €900 million.

This most recent capital expenditure forecast has decreased from the previous regional forecast but it is important to note that project costs have risen. Compared to the decrease in capacity forecast above, the decrease in expenditure is not proportional. Average capital costs of €2.24m/MW are now expected, in comparison to average costs of €1.83m/MW previously expected. The effect of the price rises has been reflected in project timescales.

Price rises are having a damaging effect on the industry with some projects failing to move forward because of capital costs. Projects under development by small developers are being hardest hit. Sales of offshore wind projects are increasing with major utility companies usually the buyers. These companies are now frequently the only ones with the financial muscle to push projects through to completion.

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# 3 Regional Development

## 3.1 Summary of Market Development in POWER Regions

The table below shows the differences between the regional timeframes when comparing installed capacity with forecast capacity and the period of initial major development and the forecast period of significant market growth. Installed capacity figures are as of April 2007.

**Table 3-1: Summary of Market Development in POWER Regions**

| | Installed Capacity | Forecast Capacity | Initial Development* | Major Growth |
|---|---|---|---|---|
| **Denmark** | 426 MW | 415 MW | 2001-2003 | 2009-2010+ |
| **Germany** | 7 MW | 589 MW | 2008-2010 | 2010+ |
| **The Netherlands** | 127 MW | 120 MW | 2006-2008 | 2010+ |
| **The UK** | 309 MW | 1,040 MW | 2003-2004 | 2008-2010+ |

*Although some small projects may have been installed prior to these periods, the dates given represent the first significant project installations.

## 3.2 Denmark

### 3.2.1 Market

**Installations to date** – Following a strong history in onshore wind, Denmark installed the first offshore wind turbines in 1991 at Vindeby and installed a second project in 1995 at Tunø Knob. The first large project, a 40 MW site, was completed at Middelgrunden in 2001. In 2002, the 160 MW Horns Rev project was completed, which was the largest project ever built. The 165 MW Nysted project at Rødsand followed it in 2003 with several smaller sites also coming online.

**Future market outlook** – Since 2003 no further installations have occurred. The Danish government had originally planned for several other major projects to be built, but this policy changed and they were stalled. Later the government announced the intention to build two 200 MW 'extensions' to the Horns Rev and Nysted projects.

Horns Rev II is currently scheduled for completion in 2009. In June 2005, the Danish Energy Authority (DEA) awarded In June 2005, the Danish Energy Authority (DEA) awarded Energi E2 (now Dong Energy) the contract to build the wind farm. The wind farm will be built 10 km west of the Horns Rev wind farm and is currently expected to become operational in 2009. The 200 MW Nysted II project will be built by a consortium consisting of Energi E2, E.ON Sweden and Dong Energy. It is expected online in 2010.

Beyond these two main wind farms there are currently few other planned projects at an advanced stage. The Danish Government initiated a screening process of Danish waters for potential future offshore wind sites. The Government's Energy Strategy 2025 was supportive of offshore wind and stated its future competitiveness with growing energy prices. The industry anticipates a new tender round for offshore wind by the Danish Energy Authority in 2008.

In April 2007, the DEA announced the first results from the screening of locations of new offshore wind farms. 23 concrete locations, distributed among 7 areas, were identified to be able to provide 4600 MW of offshore wind. The Danish government was positive over the findings and proclaimed the importance of Denmark continuing the instillation of offshore wind in order to meet the goal of doubling use of renewable energy before year 2025 . The screening recommends prioritising installation of wind farms, with wind farms close to shore at low water depths being installed first. Findings show that installation in water depths of 40 m is four times as expensive as installations at 10 m. Regarding the distance to shore, it was found that it is almost twice as expensive to build wind

farms 50 km from shore as it is 15 km from shore. Given these findings it can be expected that the next offshore wind farms in Denmark will be located relatively close to shore.

In August 2006, a joint venture called Danish Offshore Wind A/S (WPD and Wind-projekt) filed an open door application for a 455MW offshore wind farm at Kriegers Flak. The area Kriegers Flak is situated approximately 25 km east of Mon and the application covers a maximum of 91 turbines of 5 MW. WPD and Wind-Projekt have already been involved in project development on the German and Swedish parts of Kriegers Flak. In total, almost 300 turbines could be installed in the Kriegers Flak area.

Two new offshore wind farms near the existing Rønland wind farm (north western Denmark) have been proposed. One is from the private consortium involved in the existing Rønland wind farm. The other is a test area for large offshore wind turbines assigned by the DEA.

The DEA have also assigned an area near Frederikshavn for testing large offshore wind farms.

Finally Vattenfall have showed interest in a wind farm at Kriegers Flak totalling 600-700 MW.

**Timeframe summary:**

- Initiator of offshore wind industry in 1991
- First large scale projects
- From 2003 progress stalled
- Current prospects: 2x 200MW projects for construction 2009/2010
- Long term prospects are strong

### 3.2.2 Supply Chain

The Danish offshore industry is in a busy period with the issuing of the 6$^{th}$ oil & gas licensing round and the exploitation of the international market is proving fruitful for Danish firms. In offshore wind, Horns Rev II and Nysted II are approaching fabrication and construction and Danish firms are employed in the UK and Dutch offshore wind markets.

This activity is driving a need for employees and the offshore industry is struggling to find skilled individuals within Denmark. The impact will initially most strongly be felt in the oil and gas industry but may have impact on offshore wind.

In February 2007 A2Sea took over the Jumping Jack barge and related assets from Dutch competitor Mammoet Van Oord. A2Sea have installed over 75% of all offshore wind turbines and this acquisition further expands capabilities in offshore wind foundation and turbine installation.

Principal Danish turbine manufacturers Vestas and Siemens are behind their German competitors in development of next-generation 5 MW class turbines. Vestas has already postponed production of its V120 4.5 MW turbine, although a prototype is expected to be installed onshore soon. Siemens is not pushing such large turbines and is concentrating on its 3.6 MW turbine.

## 3.3 Germany

### 3.3.1 Market

**Installations to date** – Germany has a very strong onshore wind industry but its offshore wind installations have barely begun yet. A 4.5 MW prototype turbine was installed at Ems Emden in 2004 and in 2006 a 2.5 MW turbine was installed at Rostock. These are both nearshore turbines – no full offshore projects have yet been built.

**Future market outlook** – Germany has set a government target for the development of offshore wind farms with an installed power of 25 GW by the year 2030. The construction of the first projects is currently forecast to begin between 2008 and 2010 and several large developments are expected online by the end of the decade.

The majority of sites suitable for offshore wind development are in deep waters and/or far offshore. These technically difficult conditions naturally mean the German sector will develop later than other countries, but progress is currently being held back by the permitting issues.

Germany will benefit once 5 MW class turbines are commercially available as many of the proposed wind farms plan on using these to make overall project economics more viable. A 12-turbine development at Borkum West for 5 MW turbines is currently planned for 2008. This test site will be home to prototype 5 MW turbines from the manufacturers REpower and Multibrid (owned by Prokon Nord).

In October 2006, the German Federal Government passed the Infrastructure Planning Acceleration Bill. It means grid operators will in future bear the grid connection costs for offshore wind farms. Electricity losses through the offshore part of the grid will also be covered by grid companies. This offsetting of grid costs has a limited time period – site construction must have begun by 31st December 2011. The bill should trigger significant interest in the German offshore industry which has so far failed to make any real progress. The bill could see project cost savings of up to 30% of total investment costs. It is also an initial step towards creating the same support and payment structures already enjoyed in neighbouring European countries. There is, however, concern that planning efforts might be delayed by handing over responsibility for cable routes to grid operators. A review of German feed-in tariff is due later in 2007 but only minor changes for offshore wind are expected.

The payments for power generated from offshore wind farms under Germany's renewable energy law are not seen as sufficient to ensure independently owned offshore wind projects proceed to construction. This situation has been compounded by the current turbine supply shortage and increase in prices due to the booming onshore wind market. Compared with other European countries, the German purchase price for offshore wind energy is relatively low. This situation means that planned offshore wind farms looking to progress via project financing may struggle. Under this situation it could come to pass that only major energy companies are able to provide the financial and strategic muscle to push projects forward.

The size of the opportunity is attracting the interest of foreign developers. Irish utility company Airtricity has taken control of financing, construction and operation of the Butendiek project.

The demonstration project GEOFReE which has just been licensed: 5 wind turbines, to be built 20km off the coast of Ostholstein. It has not yet been decided which turbines will be used; any turbines between 3.6 and 6MW are principally possible. The wind farm could possibly be completed by 2008.

Nineteen projects in the German Exclusive Economic Zone have now received approval from the federal marine authority BSH.

**Timeframe summary:**

- Only individual nearshore prototype turbines recently installed
- No full-scale projects built
- Technically difficult project locations
- Very high number of projects planned
- Permitting system is inefficient
- New grid connection offer will aid development
- Large scale development only begins late this decade.

### 3.3.2 Supply Chain

Whilst little offshore activity has yet taken place, the region is scaling up its capability for when the growth occurs towards the end of the decade. Bremerhaven now has a new wind channel to test rotor blades and a new Fraunhofer research institute for offshore wind research will be established. Recent developments in next-generation turbine capability will help position the region at the head of the supply chain.

In December 2006, Multibrid successfully completed the second onshore erection of the M5000 offshore wind turbine. The turbine is installed on an offshore tripod, making it the first application of this technology. A number of sensors will collect data of structural loads of the wind energy plant that are affecting the foundation. Two further M5000 turbines will be erected in 2007 in Bremerhaven. The first M5000 for offshore deployment is scheduled for installation at the German offshore test field Borkum-West in 2008. Six M5000 turbines will be erected there. As of 2007, the M5000 will be manufactured in Multibrid's own production facility in Bremerhaven's Fischereihafen. The manufacturing and mounting hall, with direct access to the quay is currently being erected in the southern fishing harbour. The facility will have a production rate of 50 turbines per year.

Also in December 2006, REpower Systems decided on the future production site for the REpower 5M. In order to be able to begin serial production, due to the great demand for this 5 MW turbine developed specifically for offshore use, production in Bremerhaven will start in 2007. In the long-term, the turbine nacelles are to be produced in Rendsburg-Osterrönfeld in Schleswig-Holstein. The requirements in terms of planning for this, for example the important quay connection for transportation are not yet in place. In the future, depending on demand, production could be undertaken at both sites. The first offshore installation of the 5M took place at the end of 2006 at the Beatrice Demonstration Project off Scotland – a second 5M turbine will be added here in early 2007.

The dimensions of the 5M, place particular demands on the size and infrastructure of the production site. The first 5M was thus manufactured at HDW shipyard in Kiel and the four subsequent 5Ms were produced at the J. Kramer shipyard in Bremerhaven. All other REpower Systems AG wind turbines are manufactured in Husum and Trampe/Brandenburg. REpower plan to produce 200 to 250 units by the end of 2011.

## 3.4 The Netherlands

### 3.4.1 Market

**Installations to date** – The Netherlands has a total of three offshore wind farms in operation. Its first installation was Lely, a four-turbine 2 MW project built in 1994 which was followed by the 16.8 MW Dronten project completed in 2006. The first major project, The 108 MW Near Shore Windpark off Egmond was constructed in 2006. The 120 MW Q7-WP project off Ijmuiden is currently under construction and will be completed in 2008.

**Future market outlook** – When the Dutch Exclusive Economic Zone was opened up for offshore wind development in winter 2004, 78 projects were registered for the 48 locations on offer. Many projects overlapped and at the time there were only subsidies available for several of them. The high number of applications led to the Ministry of Economic Affairs putting a stop on subsidy requests in May 2005 whilst it re-assessed its position on offshore wind.

Then the approval process was restarted, 25 of the 78 projects registered in 2004 were at a stage of being able to submit environmental impact assessments (EIAs) with just a few having filed them so far. Subsidies were made available for 700 MW of capacity and 228 MW of this has been taken by the recently built 108 MW Egmond aan Zee project and the 120 MW Q7-WP project which is under construction

There is now only funding for just 472 MW of new developments. Projects that submit their EIAs for approval are likely to be chosen on a first-come first-served basis – there is only enough capacity available for a few projects. Project processing is undertaken by the Ministry of Transport, Public Works and Water Management.

It had been hoped that the Dutch Parliament would vote to reinstate the Milieukwaliteit ElekriciteitsProductie (MEP – which stands for ‘electricity generation environmental quality’) renewables subsidy in October 2006. This failed to transpire when the second chamber backed the government’s decision to halt the programme with the view that no further support was necessary for the Netherlands to achieve its renewable energy target of 9% by 2010. The stop was implemented by the government in August 2006 and has failed to be overturned. The MEP was introduced in July 2003 and was originally planned to last for ten years or more. Under the MEP, wind power received €78/MWh (reduced to €65/MWh in July 2006). The subsidy supports a specific level of production usually fulfilled after 10-12 years of plant operation.

The new Dutch government must now consider a new market framework. This framework must then be approved by the EU administration. As such, The Netherlands is likely to have no new renewables law until the third quarter of 2007.

**Timeframe summary:**

- Early adopter – Two small projects in 1990s
- First major projects now under construction
- Moderate future prospects, but little activity until next decade
- Market support conditions are not ideal and long term stability is needed.

## 3.5 The UK

### 3.5.1 Market

**Installations to date** – The UK's first entrance into offshore wind came in 2000 with the two turbine Blyth project. The first commercial scale projects began in 2003 with the 60 MW North Hoyle wind farm off the Welsh coast. Scroby Sands, another 60 MW project, followed in 2004 off the East of England. In 2005 the 90 MW Kentish Flats project was completed and work began on the 90 MW Barrow project which will come online in spring 2006. One of two 5 MW turbines was installed at the Beatrice Demonstration Project at the end of 2006. Current capacity stands at 309 MW, second to only Denmark.

**Future market outlook** – The UK is the strongest market through to the end of the decade. The industry here has seen slow but steady growth since the first major installation in 2002. Project proposals were placed through a round-based system of which there have so far been two.

The future of the Renewables Obligation was considered in the 2006 Energy Review. The present system is widely judged to be a success for onshore wind, which has flourished during 2006 and is expected to see strong growth into the next decade. Planned changes announced in May 2007 will introduce banding to the system which would mean that some technologies receive a higher level of Renewable Energy Certificates for generated electricity. Offshore wind would receive 1.5 Certificates per MWh generated – a significant rise which should help support the industry in light of cost increases currently being experienced.

Other problems still exist for UK offshore wind. One of the main ones concerns is radar interference from offshore developments which the Maritime and Coastguard Agency and Ministry of Defence regularly object to. The North West strategic area is particularly difficult with the additional complication of poor grid connection – an issue which is of paramount importance for the long-term future of UK offshore wind.

Round 1 projects built to date are North Hoyle (60 MW), Scroby Sands (60 MW), Kentish Flats (90 MW) and Barrow (90 MW). Under construction at the end of 2006 for completion in 2007 is Burbo (90 MW). Outside of the Round system is the Beatrice Demonstration project where one of two 5 MW turbines was installed in 2006 with the other to follow in mid-2007.

Three Round 2 projects have now been approved, these are London Array (1 GW), Thanet (300 MW) and Greater Gabbard (500 MW). These three projects are in the Thames Estuary strategic area and local content could be gained by the East of England region.

In February 2007, EDF Energy cancelled development of its Cromer project off the East of England Coast, citing difficult seabed conditions as the main reason for abandonment.

**Timeframe summary:**

- Pilot project in 2000
- Four full-size projects in operation, one in construction
- Very good market prospects, with many projects planned for installation over the next 8-10 years
- Structured and supportive development framework.

### 3.5.2 Supply Chain

OrbisEnergy, the physical offshore renewables hub to be built in Lowestoft, secured additional funding, coming now to a total of £9m (€13.2m). Completion is due in mid 2008. The centre will comprise workspace units, together with conference, exhibition and library facilities.

The East Port (Outer Harbour) project in Great Yarmouth is making progress towards construction. In December 2006, the European Commission gave its final approval to a €6.6m grant. The grant is part of an €26.4m public funding package already approved by the UK government. Construction is expected to begin Spring 2007 with tendering underway. The Outer Harbour offers the potential for use by large offshore wind construction vessels which the port was previously unsuited for. Discussions are underway with potential users. The main focus of the port will be aimed at cargo and passenger ferries and it is yet unclear how this will be compatible with potential offshore wind construction activities.

The Outer Harbour will provide sufficient space for vessels of up to 210m length and 8.5m draught at all states of the tide, with at least one dedicated roll-on/roll/off terminal. There is also space for another, when required, and two general purpose quays will also be available. According to the local council, the harbour is projected to create around 1,000 jobs and bring over 120,000 extra visitors a year to the region. The development will increase the proficiency of the port to handle offshore wind projects – the current harbour lacks required capabilities for major offshore wind farm construction. Whilst the capability of the port will grow any potential move to capture offshore wind work would need to be balanced against the main intended uses of freight and passenger ferries.

In September 2006, Thanet Offshore Wind Limited (TOW), a subsidiary of Warwick Energy Limited, chose SLP Energy as the preferred supplier of foundations for the 300MW Thanet project. SLP Energy is based in Lowestoft and will supply 100 monopiles and transition pieces.

Project management experience is growing with East of England company ODE (Offshore Design Engineering) Ltd being awarded the Works Management Contract by E.On UK Ltd for its 180 MW Robin Rigg Offshore Windfarm development.

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# 4 Issues and Potential Further Actions for POWER

### 4.1.1 Cost

The cost of offshore wind has grown significantly from the first major installations of 2002-2004. From €1.85m/MW future projects have been progressing through to tendering with costs as high as €2.7m/MW. Cost savings in the region of 20-30% need to be found. Currently high turbine prices are part of the problem but savings throughout other aspects of the supply chain are crucial. Cost savings are not expected until true cost efficiencies can be achieved through much greater market activity and larger projects being built. A challenge to potential savings is that the technological difficulty of projects will increase in the future and this will push costs higher.

### 4.1.2 Supply chain capability

There is a need to gain more thorough understanding of actual supply chain capabilities throughout the POWER region. The authors of this report are not aware of any such study having been carried out. Such work should contain assessment of current and future supply chain capacity including major aspects such as turbine production, construction vessels, cables, foundations, etc. and also subcomponent supplies such as generators and gearboxes. Mapping the supply chain will provide analysis of local and regional content in offshore wind activity and highlight gaps where supply is constrained.

The major bottleneck in the industry is turbine supply, with high growth in the onshore market causing shortages and significant price increases. The onshore industry is a lower-risk market for turbine manufacturers and has a more secure outlook. Future production of 5 MW class turbines will become a key issue as we progress towards the end of the decade because of the number or projects seeking to use this class of turbine in the future. More immediate, however, is the supply chain constraints that are currently being felt and which are pushing turbine prices upwards.

### 4.1.3 Regional content

*The Scroby Sands Supply Chain Study* looked in detail at every contract placed on the East of England's Scroby Sands offshore wind farm to determine local and national content through all aspects of the supply chain. It also showed regional gaps where value could not presently be generated.

This level of analysis has not been conducted on any other offshore wind farm yet built. Similar studies of other regional projects would allow an accurate picture of each POWER region's supply chain to be built. It enables each region to judge how successful it currently is in the industry and place a value on current activity.

### 4.1.4 Exporting POWER region products/services abroad

Whilst Europe is currently the leader in offshore wind two other regions hold great potential. The most immediate is North America whilst South East Asia is also progressing projects. Other than a small two-turbine project in Japan, these two regions have no installed capacity and only a handful of projects between them. Growth is expected next decade and this brings with it substantial opportunity for POWER region manufacturers and service providers. Detailed analysis of the regional supply chain and market forecasting for the target regions would enable the opportunity to be quantified.